

Association between modality of teaching and academic performance, with learning strategies in higher education

Asociación entre la modalidad de enseñanza y el desempeño académico, con las estrategias de aprendizaje en Educación Superior

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Abstract

Learning strategies are actions and cognitive processes that enable self-control and mastery of content by the learner. Therefore, strategies in higher education are a determining factor in achieving good academic performance. The present study aims to define the learning strategies in university students according to some factors, as well as to determine the existing relationships between the course and academic performance. A descriptive, cross-sectional and ex post facto study was carried out with a national sample of 2736 students. The IBM SPSS® 23.0 software is used for data analysis. As results, it was observed that scholarship students obtained a higher value in learning strategies, using the Motivation and Learning Strategies Scale—Short Form (MLSQ-SF). Likewise, in the face-to-face mode there is a better development in the value of the task and anxiety, while in the online mode a higher value has been obtained in the strategies of content development, meta-cognition and self-regulation of effort, being these last two are the same for blended learning. Finally, an inverse relationship was obtained between age and grade with learning strategies.

Key words: higher education; learning methods; teaching method innovations; academic achievement.

Resumen

Las estrategias de aprendizaje son acciones y procesos cognitivos que posibilitan el autocontrol y dominio de los contenidos por parte del aprendiz. Por lo tanto, las estrategias en la educación superior son un factor determinante para lograr un buen rendimiento académico. El presente estudio tiene como objetivo, definir las estrategias de aprendizaje en estudiantes universitarios en función de algunos

factores, así como determinar las relaciones existentes entre el curso y el rendimiento académico. Se realizó un estudio descriptivo, transversal y ex post facto con una muestra nacional de 2736 estudiantes, utilizando la escala de Motivación y Estrategias de Aprendizaje- Short Form (MLSQ-SF) software IBM SPSS® 22.0 se utilizó para el análisis de datos. Como resultados se observó que los estudiantes becados obtuvieron un mayor valor en las estrategias de aprendizaje. Asimismo, en la modalidad presencial se produce un mejor desarrollo en el valor de la tarea y la ansiedad, mientras que en la modalidad online se ha obtenido un mayor valor en las estrategias de desarrollo de contenidos, meta cognición y autorregulación del esfuerzo, siendo estos dos últimos iguales para blended learning. Finalmente, se obtuvo una relación inversa entre la edad y el curso con las estrategias de aprendizaje.

Palabras clave: educación superior; estrategias de aprendizaje; modalidades de enseñanza innovadoras; rendimiento académico.

1. Introduction

Higher education is that which tends to adapt to the transformations brought about by capitalism in different spheres, such as the social and political spheres, where the mission is to prepare professionals who learn and contribute to the process of society, as well as to the resolution of national and global social problems (Calderón et al. 2017).

The one hand, strategies in higher education are an essential element to achieve a good academic development. When this occurs, the subject takes hold of the curricular content in an orderly and meaningful way. However, learning strategies vary depending on the teaching modality, but studies such as those by Pegalajar-Palomino (2016) affirm that there are no statistical differences in the use of learning strategies in university students depending on the teaching modality.

However, if we look at blended learning, we find that the fact that students do not attend university on a daily basis increases the need to promote a process of self-regulation of learning (Mason & Rennie, 2006; Zimmerman, 2000), while in the face-to-face mode, according to studies such as those by Barca et al. (2009), students demonstrate better capacities for storing information. Next, and with regard to the virtual mode, according to Meza-López et al. (2016), students must be able to regulate the actions necessary for learning, psychological factors, management factors and factors of use of the technology by themselves. To this end, studies such as those by Cabrera et al. (2007) show that university students tend to automate basic processes, such as organizational processes, as they develop more complex cognitive processes, such as processing.

Therefore, the aim of this study is to define learning strategies in university students, considering the differences according to access route, teaching modality and scholarship award, as well as to determine the existing relationships between the different learning strategies and their relationship with age, academic year and academic performance.

1.1 Background

Emerging adulthood is a stage between 18 and 29 years of age, which is culturally constructed and not universal. It is an evolutionary stage that coincides with the passage through university in young people, so it is important to know and understand the characteristics of the profile of university students in order to answer all the questions that refer to how it is perceived and whether it presents changes and, if so, what the perceived changes are (Araneda et al. 2018; Barrera & Vinet, 2017). Likewise, according to Rodríguez-Espinar (2015), the characteristics of university students are pragmatic, i.e., they have a survival instinct, their goal is to train in order to get a job and achieve

sufficient economic resources to live comfortably, they are optimistic about their personal future but pessimistic about that of their country, and they belong to a generation that finds in technology the way to "be connected but isolated". On the other hand, attitudinal development is in the background, demanding instant gratification and fearing failure, skilled at finding information about everyday life, and in the worst economic situation, becoming dependent on their parents.

Therefore, higher education has adapted to all the transitions that capitalism has undergone in each of the areas that make up life, such as the social and political spheres, where the mission is to prepare subjects for the resolution of social problems. However, education is increasingly aware of the need for transformation, where the most demanded skills are the use of new technologies, the ability to pose issues and communication skills, among others (Misas, 2004; Ramos, 2017). Thus, authors such as Arias & Strassman (2020) state that the university must recognize its role in society, as a trainer and generator of new knowledge, and the value of innovation as a competitive virtue that will turn it into an ally for technological and productive innovation, which allows it to offer novel solutions to the country's concerns.

1.2. Teaching methods

Among the teaching modalities, we find face-to-face teaching, which is characterized by the presence of the teacher, direct contact and the possibility for students to be listened to, understood and corrected by the teacher. This has advantages such as socializing contact and corporal expression, but it also has disadvantages such as synchrony in space and time (Martínez, 2017; Solovieva, 2019; Solovieva & Quintanar, 2021). On the other hand, and on the contrary, the virtual modality involves teaching and learning in which teachers and students are in different dimensions and establish a relationship through communication media. Some of its advantages are flexibility and savings on travel, but it has disadvantages such as depersonalized teaching (Iriondo & Gallego, 2013; Pardo, 2014; Martínez, 2017).

Finally, we find the blended learning modality, which is understood as a process through which the subject learns by means of online learning and a physical site with some kind of control and supervision. This is based on the level of digital competence of teachers and students, the time and scope of communication channels. One of its advantages is the promotion of flexibility and accessibility, while some of its disadvantages are that defining assessment criteria requires extra effort on the part of teachers (Binimelis, 2010; Salinas et al. 2015; Ibáñez et al. 2018).

1.3. Learning strategies

According to Vivas (2010), if the concept of strategy is taken as a plan whose objective is to achieve a goal, learning strategies can be understood as all those tasks that enable and facilitate learning and self-control on the part of the learner. Biver et al. (2020) have also pointed to the existence of a wide range of learning strategies, including rehearsal strategies, which are based on active repetition of content, elaboration strategies, which involve making connections between the familiar and the new, organizational strategies, which allow information to be organized, and affective strategies, which are designed to improve the effectiveness of learning and the conditions in which it takes place.

Therefore, strategies in higher education are essential to achieve good academic development and learning. When this happens, the subject takes hold of the curricular content in an orderly and meaningful way. Therefore, an adequate use of them allows for successful learning (Llera, 2003; Mendoza et al., 2017). However, learning strategies vary depending on the teaching modality, but studies such as those by Pegalajar-Palomino (2016) state that there are no statistical differences in the use of learning strategies among

university students depending on the teaching modality. On the other hand, there are differences with respect to planning strategies, where these are more used in blended learning. The different learning modalities facilitate the development of different types of groupings and allow for certain didactic tasks, as well as requiring different work from both teachers and students.

Therefore, the fact that students do not attend university every day increases the need to promote metacognition, which encompasses a set of stages in which planning, execution and self-evaluation of what has been learned play an essential role (Mason and Rennie, 2006; Zimmerman, 2000). In contrast, for the face-to-face model, students demonstrate better information storage skills (Barca et al., 2009; Mérida, 2006; Pegalajar-Palomino, 2016).

Finally, with regard to the virtual modality, self-regulation factors stand out, where students must be able to regulate the actions necessary for learning by themselves, psychological factors, which are motivation and concentration, management factors, which are the administration of strategies and time control, and factors of technology use, which are the intelligent selection of technologies and knowing when to use them (Meza-López et al. 2016).

In conclusion, studies such as those by Cabrera et al. (2007) show that university students tend to automate basic processes, such as organizational ones, while they develop more complex cognitive processes, such as elaboration, relating the content they study to their previous knowledge and experiences and looking for examples. On the other hand, students have three mechanisms for coping with tasks: an organizational one, focused on the task and the organization of information, a cognitive one, focused on understanding and learning the content, and an approximate one, which focuses on emotional aspects.

Taking into consideration the above, the research pursues the following objectives:

- To define learning strategies in university students, considering the differences according to access routes, teaching modality and scholarship concession.
- To determine the existing relationships between the different learning strategies, as well as their association with age, year and academic performance.

2. Method

2.1. Population and sample

The study presents a quantitative, descriptive, cross-sectional design. Likewise, it is an ex post facto design, by means of a single measurement in a single group. The sample was selected by simple random sampling. With respect to the latter, and taking into account the criteria established by Bartlett et al. (2001) and the total population universe, a total of 3,500 university students were included.

The representativeness of the sample was estimated with the margin of error being 1.7% and a confidence level of 95%. In this way, 3,500 surveys were sent out and then the exclusion criteria (EC) were used, which were 1. Not having passed at least half of the credits enrolled in the previous academic year and 2. Presenting pathologies or problems that biased the data collection process, and inclusion (IC), which were 1. To be enrolled in an undergraduate university degree in 2018/2019 in a private or public Spanish university; 2. to be enrolled in 60% of the credits that make up the academic year, for the individuals who completed the scales; 3. have a residence in a country of the European Union and 4. Be over 18 years old. Finally, the sample reached was 2,736 university students. On the other hand, it has been possible to determine that, despite the persons

and subjects suppressed by the EC and IC, the sample is representative, accepting a sampling error of 0.05 and a confidence index equal to 99%. Thus, the sampling error finally obtained is 0.017. The mean age of the individuals surveyed was 23.33 ± 5.77 years, while the distribution by sex was 33.8% ($n=924$) for the values and 66.2% ($n=1812$) for the values and 66.2% ($n=1812$) for the females.

2.2. Instrument

The Motivation and Learning Strategies Scale—Short Form (MLSQ-SF), which was validated by Pintrich et al. (1993), was used. The version adapted to Spanish consists of 40 items and was developed by Sabogal et al. (2011). Moreover, these items are scored using a 5-point Likert scale, where 5 = Always and 1 = Never. The items are grouped into 8 dimensions, which are composed as follows: Critical thinking (items 15, 6, 1); Anxiety (items 29, 21, 12, 3); Self-regulation of metacognition (items 36, 35, 34, 32, 31, 30, 16); Intrinsic goal orientation (items 37, 10); Self-regulation of effort (items 28, 27, 19, 11, 9, 7), Elaboration strategies (items 25, 24, 22, 5, 4); Task value (items 20, 26, 39); Organizational strategies (items 13, 14, 23, 40); Time and study habits (items 38, 33, 18, 17, 8, 2). This scale showed an acceptable Cronbach's alpha coefficient ($\alpha = 0.883$).

2.3. Information collection procedure

Firstly, the corresponding permissions were requested in order to carry out the research. The process was carried out by means of an informative letter produced by the Department of Music, Plastic and Corporal Arts of the University of Granada. The letter specified the objectives of the research, the nature of the research, the instruments to be used, as well as the data processing, where the anonymity of the participants was guaranteed. The written informed consent was also included in the document itself. On a general level, this study followed the principles set out in the Declaration of Helsinki (2008 amendment) and the subjects' right to confidentiality. On the other hand, completion of the surveys lasted between 10 and 15 minutes.

Regarding data collection, a total of 19 Spanish private and public universities collaborated. The surveys were conducted in March and April during the 2018/2019 academic year, while the application of the instruments was carried out by means of a digital survey through the “Lime Survey” platform. Finally, once the survey was completed, participants were thanked for their participation.

2.4. Data analysis

The statistical package IBM SPSS® 22.0 (IBM Corp, Armonk, NY, USA) was used for data analysis. Student's t-test and one-factor ANOVA were used for the comparison of independent sample means, depending on the nature of the variables. Pearson's bivariate correlations and univariate linear model are also used. The normality of the data was verified by means of the kurtosis and skewness values of each item of the scales. Likewise, Bonferroni was applied as a post hoc test in order to establish intergroup differences. Finally, the internal reliability of the instruments used was evaluated by Cronbach's alpha.

3. Results

Table 1 shows the dissimilarities in learning strategies based on receiving a scholarship to pursue a university degree, finding statistically significant dissimilarities in all dimensions except for critical thinking ($p = 0.909$) and metacognition strategies ($p = 0.804$). In this way, we found statistically significant differences in the value of the task, where we found a higher mean value in the subjects who did not receive a scholarship (2.36 ± 0.79 vs. 2.46 ± 0.81 ; $p = 0.001$), while for anxiety, a high mean score was obtained

in those who did receive a scholarship (3.46 ± 0.82 vs. 3.27 ± 0.86 ; $p < 0.001$). On the other hand, regarding specific learning strategies, statistically significant differences were obtained for information organization strategies (3.99 ± 0.75 vs. 3.89 ± 0.75 ; $p < 0.001$), strategies elaboration (4.01 ± 0.57 vs. 3.96 ± 0.60 ; $p = 0.037$), effort self-regulation (4.01 ± 0.55 vs. 3.92 ± 0.60 ; $p < 0.001$), time and study habits ($3.46 \pm 0.81 \pm 0.59$ vs. 3.68 ± 0.67 ; $p < 0.001$) and intrinsic orientation goals (3.94 ± 0.66 vs. 3.88 ± 0.68 , $p = 0.023$). In short, in all cases higher mean scores have been found for individuals who have received a scholarship to pursue university studies.

Table 1.
Learning strategies according to scholarship receipt

	Scholarship	M	SD	Levene Test		T-Test	
				F	Sig.	T	Sig.
VAT	Scholarship	2.36	0.79	3.323	0.068	-3.291	0.001
	No Scholarship	2.46	0.81				
ANS	Scholarship	3.46	0.82	1.684	0.195	5.920	0.000
	No Scholarship	3.27	0.86				
EEL	Scholarship	4.01	0.57	0.231	0.631	2.084	0.037
	No Scholarship	3.96	0.60				
EOR	Scholarship	3.99	0.75	0.003	0.955	3.500	0.000
	No Scholarship	3.89	0.75				
PCR	Scholarship	3.50	0.65	0.002	0.961	-0.114	0.909
	No Scholarship	3.51	0.66				
EMC	Scholarship	3.57	0.57	0.236	0.627	-0.248	0.804
	No Scholarship	3.58	0.57				
THE	Scholarship	3.81	0.59	10.492	0.001	4.972	0.000
	No Scholarship	3.68	0.67				
ARE	Scholarship	4.01	0.55	8.649	0.003	4.121	0.000
	No Scholarship	3.92	0.60				
MOI	Scholarship	3.94	0.66	2.928	0.087	2.281	0.023
	No Scholarship	3.88	0.68				

Note 1. MOI, Intrinsically oriented goals; ARE, self-regulation of effort; THE, Time and Study Habits; CRP, Critical Thinking; EOR, Organization Strategies; VAT, Value of the task; EMC, Meta-cognition Strategies; EEL, Elaboration Strategies; ANS, Anxiety.

Table 2 shows the dissimilarities in the learning strategies and the teaching modality. Statistically significant differences were obtained for anxiety (3.39 ± 0.84 vs. 3.31 ± 0.74 vs. 3.21 ± 0.94 ; $p = 0.012$) and the value of the task (2.43 ± 0.80 vs. 2.31 ± 0.74 vs. 2.20 ± 0.78 ; $p < 0.001$), with the highest mean values found in those subjects who attended their studies in person. On the other hand, differences in elaboration strategies have also been observed, obtaining the highest average in the virtual and blended modalities compared to face to face modality (3.97 ± 0.57 vs. 4.09 ± 0.66 vs. 4.08 ± 0.65 , $p = 0.005$). Statistically significant differences were also observed in organization strategies, showing higher mean values in the subjects who study in face-to-face and semi-face-to-face

modality compared to the virtual modality (3.96 ± 0.74 vs. 3.91 ± 0.71 vs. 3.76 ± 0.90 , $p = 0.002$).

Subsequently, the metacognition regulation strategies have reflected statistically significant differences, obtaining higher mean values in the individuals of the blended modality, followed by the online modality (3.56 ± 0.56 vs. 3.72 ± 0.62 vs. 3.67 ± 0.64 , $p < 0.001$). Finally, it should be noted that the existence of statistically significant differences in the effort self-regulation strategy, which reflects higher mean scores in the subjects who study in the blended online modality, with those in the face-to-face modality having the lowest score (3.95 ± 0.55 vs. 4.06 ± 0.74 vs. 4.08 ± 0.70 , $p = 0.002$).

Table 2.
Learning strategies according to type of teaching

	Type	M	SD	F	Sig.
VAT	Face to Face	2.43*	0.80	8.712	0.000
	Blended modality	2.31	0.74		
	Online	2.20*	0.78		
ANS	Face to Face	3.39*	0.84	4.455	0.012
	Blended modality	3.31	0.74		
	Online	3.21*	0.94		
EEL	Face to Face	3.97*	0.57	5.385	0.005
	Blended modality	4.09*	0.66		
	Online	4.08*	0.65		
EOR	Face to Face	3.96*	0.74	6.341	0.002
	Blended modality	3.91	0.71		
	Online	3.76*	0.90		
PCR	Face to Face	3.50	0.65	1.934	0.145
	Blended modality	3.61	0.63		
	Online	3.48	0.75		
EMC	Face to Face	3.56*	0.56	8.012	0.000
	Blended modality	3.72*	0.62		
	Online	3.67*	0.64		
THE	Face to Face	3.75	0.62	2.477	0.084
	Blended modality	3.66	0.65		
	Online	3,81	0.75		
ARE	Face to Face	3.95*	0.55	6.515	0.002
	Blended modality	4.06*	0.74		
	Online	4.08*	0.70		
MOI	Face to Face	3.91	0.65	0.017	0.983
	Blended modality	3.91	0.74		
	Online	3.92	0.81		

Note 1. MOI, Intrinsically oriented goals; ARE, self-regulation of effort; THE, Time and Study Habits; CRP, Critical Thinking; EOR, Organization Strategies; VAT, Value of the task; EMC, Meta-cognition Strategies; EEL, Elaboration Strategies; ANS, Anxiety.

Note 2. *, Significant differences between groups (Bonferroni).

Table 3 exposes the differences in access to higher education and learning strategies. Continuing along the same lines, statistically significant differences have been obtained for anxiety (3.38 ± 0.85 vs. 3.47 ± 0.82 vs. 3.15 ± 0.83 ; $p < 0.001$) and the value of the task (2.38 ± 0.80 vs. 2.52 ± 0.78 vs. 2.37 ± 0.84 ; $p < 0.001$), thus obtaining higher mean values

in FP and lower mean values for other access routes. However, differences in elaboration strategies were also observed, obtaining a higher mean for others degrees (3.99 ± 0.58 vs. 3.95 ± 0.59 vs. 4.08 ± 0.57 ; $p = 0.010$).

Table 3
Learning strategies according to access route

	Access	M	SD	F	Sig.
VAT	Selectivity	2.38*	0.80	7.703	0.000
	PT	2.52*	0.78		
	Other	2.37*	0.84		
ANS	Selectivity	3.38	0.85	13.077	0.000
	PT	3.47*	0.82		
	Other	3.15*	0.83		
EEL	Selectivity	3.99	0.58	4.599	0.010
	PT	3.95*	0.59		
	Other	4.08*	0.57		
EOR	Selectivity	3.96	0.74	2.733	0.065
	PT	3.90	0.78		
	Other	3.87	0.75		
PCR	Selectivity	3.50	0.64	0.476	0.621
	PT	3.49	0.67		
	Other	3.54	0.68		
EMC	Selectivity	3.56	0.57	2.713	0.067
	PT	3.58	0.59		
	Other	3.65	0.56		
THE	Selectivity	3.75	0.62	0.404	0.667
	PT	3.73	0.67		
	Other	3.77	0.64		
ARE	Selectivity	3.97	0.57	2.305	0.100
	PT	3.94	0.59		
	Other	4.03	0.58		
MOI	Selectivity	3.92	0.65	2.232	0.107
	PT	3.87	0.71		
	Other	3.97	0.72		

Note 1. MOI, Intrinsically oriented goals; ARE, self-regulation of effort; THE, Time and Study Habits; CRP, Critical Thinking; EOR, Organization Strategies; VAT, Value of the task; EMC, Meta-cognition Strategies; EEL, Elaboration Strategies; ANS, Anxiety.

Note 2. *, Significant differences between groups (Bonferroni).

Table 4 shows the relationships between learning strategies, course, grade and age. Regarding age, a negative relationship was found with anxiety ($r = -0.082$; $p < 0.01$) and organization strategies ($r = -0.040$; $p < 0.05$), while there was a positive relationship with elaboration strategies ($r = 0.057$; $p < 0.01$), meta-cognition ($r = 0.095$ $p < 0.01$) and effort self-regulation ($r = 0.059$; $p < 0.01$).

On the other hand, age was positively related to the course ($r = 0.190$; $p < 0.01$) and negatively related to the grade ($r = -0.075$; $p < 0.01$). In relation to the course, an inverse relationship was observed with anxiety ($r = -0.082$; $p < 0.01$), intrinsic orientation goals ($r = -0.118$; $p < 0.01$) and all learning strategies, there was the highest correlation for effort self-regulation ($r = -0.109$; $p < 0.01$). Likewise, the course was negatively related

to the grade ($r = -0.094$; $p < 0.01$). Examining the correlations given for the average grade of the students, a negative relationship with the value of the task ($r = -0.153$; $p < 0.01$) and anxiety ($r = -0.057$; $p < 0.01$) has been reflected but positive with intrinsic orientation goals ($r = 0.054$; $p < 0.01$) and all learning strategies. The strongest correlation was also shown for study time and habits ($r = 0.182$; $p < 0.01$) followed by organizational strategies ($r = 0.129$; $p < 0.01$).

Finally, it should be noted that the value of the task has shown a positive relationship with anxiety ($r = 0.167$; $p < 0.01$) and a negative relationship with all learning strategies, with the greatest correlation strength for time and study habits ($r = 0.287$; $p < 0.01$). The rest of the learning strategies showed a positive relationship in all cases.

Table 4.
Relationship between learning strategies age, course and grade

	ANS	EEL	EEO	PCR	EMC	THE	ARE	MOI	Age	Course	Grade
VAT	0.167**	-0.150**	-0.195**	-0.018	-0.087**	-0.287**	-0.241**	-0.083**	-0.035	-0.009	-0.153**
ANS		0.164**	0.157**	0.129**	0.062**	0.154**	0.187**	0.086**	-0.082**	-0.137**	-0.057**
EEL			0.573**	0.516**	0.628**	0.535**	0.653**	0.439**	0.057**	-0.097**	0.112**
EOR				0.368**	0.423**	0.535**	0.511**	0.334**	-0.040*	-0.072**	0.129**
PCR					0.551**	0.397**	0.429**	0.373**	0.027	-0.043*	0.063**
EMC						0.524**	0.599**	0.411**	0.095**	-0.048*	0.060**
THE							0.611**	0.323**	-0.011	-0.091**	0.182**
ARE								0.398**	0.059**	-0.109**	0.092**
MOI									0.030	-0.118**	0.054**
Age										0.190**	-0.075**
Course											-0.094**

Note 1. VAT, Task value; ANS, Anxiety; EEL, Preparation strategies; EOR, Organization Strategies; PCR, Critical Thinking; EMC, Meta-cognition strategies; THE, Study time and habits; ARE, Self-regulation of effort; MOI, Goals of Intrinsic Orientation.

Note 2. *, Statistically significant differences at $p < 0.05$ level; **, Statistically significant differences at $p < 0.01$ level.

Finally, the univariate linear model was executed in order to analyze the relationships between the variables, considering academic performance as the dependent variable. First, the Levene test for equality of variances specified a value less than 0.05, assuming the rejection of the null hypothesis and assuming differences between the variables. Likewise, the value of R^2 was 0.195, which represents an explained variance of almost 20%. However, this value must be interpreted with caution because, although it assumes a high variability of the data, in educational sciences and psychology, variances of less than 50% can be accepted when explaining human behavior - as long as significant values are observed. of p and relevant effect sizes.

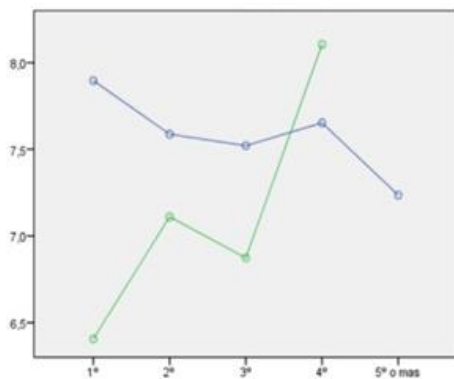
In this way, both Table 5 and Figure 1 show how academic performance is influenced by the strategies of elaboration, metacognition and study time, these factors being modulated by the granting of a scholarship, the course and the teaching modality. Specifically, an increase in academic performance is observed in students who receive scholarships in virtual mode as the course increases, the opposite happening in face-to-face degrees. On the other hand, an inverse trend is observed in non-scholarship students for distance students, maintaining the performance in those who study face-to-face.

Table 5.
Univariate linear model for academic achievement

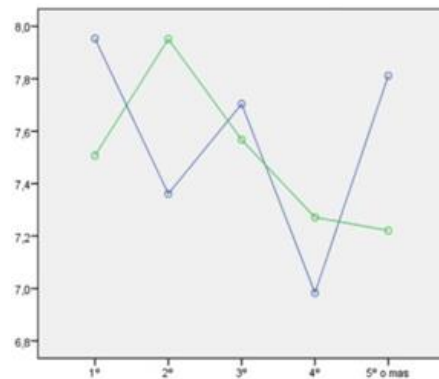
Origin	Addition Square	DF	Root mean Square	F	Sig.	μ^2
Corrected model	311.44 ^a	53	5.87	12.29	*	0.195
Intersection	1616.44	1	1616.44	338.10	*	0.558
EEL	4.33	1	4.33	9.06	*	0.003
EOR	0.66	1	0.66	1.38	0.240	0.001
EMC	2.99	1	2.99	6.26	*	0.002
THE	20.06	1	20.06	41.97	*	0.015
Access	1.24	2	0.62	1.30	0.271	0.001
Ens_dico	5.20	1	5.20	10.87	*	0.004
Scholarship	5.67	1	5.67	11.87	*	0.004
Curse	4.55	4	1.14	2.38	*	0.004
Access * Modality	7.34	2	3.67	7.68	*	0.006
Access * Scholarship	0.38	2	0.19	0.39	0.672	0.000
Access * Curse	39.35	8	4.92	10.29	*	0.030
Modality * Scholarship	2.23	1	2.23	4.67	*	0.002
Modality * Curse	35.16	4	8.79	18.39	*	0.027
Scholarship * Curse	29.48	4	7.37	15.42	*	0.022
Access*Modality* Scholarship	0.81	1	0.81	1.69	0,193	0.001
Acceso * Modality * Curse	12.29	8	1.53	3.21	*	0.010
Access * Scholarship * Curse	13.76	6	2.29	4.79	*	0.011
Modality * Scholarship*Curse	14.97	3	4.99	10.44	*	0.012
Access*Modality *Scholarship*Curse	2.95	1	2.95	6.18	*	0.002
Error	1281.84	2682	0.47			
Total	160000.03	2736				
Total corrected	1593.28	2735				

Figure 1.

Estimated marginal means of academic achievement



Academic achievement scores for scholarship students according to course (Green: Face to face; Blue: Online)



Academic achievement for scholarship students according to course (Green: Face to face; Blue: Online)

4. Discussion

University students face numerous challenges, which can vary depending on factors such as economic situation and teaching modality, when accessing Higher Education. Consequently, in certain cases, they encounter obstacles and difficulties that can negatively affect their academic performance, thereby increasing the likelihood of dropping out. Therefore, it is particularly relevant to understand the learning strategies, which are the foundation of professional development, used by students to improve their performance and avoid dropping out (Atashinsadaf et al., 2024; Abbas et al., 2024; Casillas et al., 2018; Freiberg et al., 2017; Hendrie & Bastacini, 2020; Salazar & Heredia, 2019; Tajvar et al., 2024).

Likewise, one of the responsibilities of Higher Education lies in ensuring meaningful learning and the development of skills that facilitate control over learning processes to achieve educational objectives (Casillas et al., 2018; Fajardo et al., 2017; Saha et al., 2024; Salazar & Heredia, 2019). In this regard, the objectives of the present study were to define learning strategies in university students, taking into account differences based on access routes, teaching modality, and scholarship provision, and to determine the relationships between different learning strategies, as well as their association with age, course, and academic performance.

Specifically, the results have shown that learning strategies are higher in scholarship-holding students residing with their parents, meaning they exhibit high academic performance and, therefore, better learning strategies facilitating the achievement of learning objectives. Specifically, previous studies in similar lines (Biwer et al., 2020; Freiberg et al., 2017; Hendrie & Bastacini, 2020; Juárez et al., 2016; Rea et al., 2022; Soto-González et al., 2015) have shown that students who self-regulate their learning and use effective learning strategies acquire knowledge and skills significantly, resulting in optimal academic performance. Additionally, this is also positively influenced by residing in the family home, meaning those who live with their parents have high academic performance due to lower levels of peer distractions and a high level of adherence to responsibilities and obligations.

However, in contrast, some research (Saha et al., 2024; Lugosi & Uribe, 2022) argues that successful academic performance stems from self-motivation, enthusiasm, and interest, elements they consider the most influential in achieving learning objectives. Conversely, academic failure is attributed to ineffective study techniques, deficient subject knowledge, and learning difficulties.

Moreover, the study also demonstrated a higher level of development in homework appraisal and anxiety among students studying in face-to-face teaching settings. However, several studies (Ramli et al., 2018; Reddy et al., 2018; Starks, 2019) assert that virtual education leads to higher stress levels, especially in task monitoring. Nonetheless, it is evident that university students studying in face-to-face settings must combine on-site attendance with the same responsibilities demanded by virtual environments (e.g., submission of activities, oral presentations, adherence to academic schedules...), components that can increase stress.

Furthermore, it was also demonstrated how young people studying through virtual education develop higher scores in content elaboration strategies, metacognition, and effort self-regulation. Therefore, it is evident that with less supervision in this teaching modality, coupled with a more flexible methodology, there is a greater need for autonomy among students. In this sense, they are forced to better and more efficiently plan their learning and develop strategies that facilitate knowledge assimilation (e.g., outlines and

summaries) (Abbas et al., 2024; Broadbent, 2017; Girelli et al., 2018; Jaap et al., 2021; Lin et al., 2017; Pei & Wu, 2019).

Regarding access routes, students accessing through Vocational Education show higher task appraisal and anxiety, while those accessing through other routes exhibit elaboration strategies. Along similar lines, according to De la Cruz & Abreu (2014) and Martínez-Martínez et al., (2017), this evidence stems from Vocational Education having a more professional and practical profile. However, being a pathway to Higher Education, students opting for it do so due to their low academic performance.

On the other hand, it has also been observed that course and age were negatively related to them, while degree was positively related to their development. However, it is evident that the use of learning strategies facilitates the acquisition of knowledge and competencies, thereby ensuring successful academic performance (Castejón et al., 2016). Specifically, Becerra-González & Reidl (2015) and Feldman & Kubota (2015) concluded that as students progressed through courses, they utilized fewer learning strategies. This reality is a consequence of a high development of these strategies at the beginning of the university period, meaning a greater use of learning strategies to pass the entrance exams to Higher Education and adapt to new university teaching methods.

Taking into account the aforementioned, university students must plan, monitor, and execute their learning autonomously. However, many students struggle to use effective and optimal learning strategies for long-term learning, such as practice tests, and often rely on passive strategies such as rereading. Therefore, it is essential to promote self-regulated learning through the use of effective learning strategies. Additionally, despite having difficulties in using effective learning strategies, students often face additional regulation problems during their learning process, meaning they also need to employ resource management strategies, such as effort and motivation management, to optimize learning conditions (Biwer et al., 2020; Blasiman et al., 2017; Broeren et al., 2021; Dirx et al., 2019; Rea et al., 2022; Waldeyer et al., 2020; Fiorella, 2020). Therefore, to promote students' self-regulated learning, it is suggested to support them in building new study habits (Fiorella, 2020; Rea et al., 2022; Waldeyer et al., 2020).

5. Conclusions

In general, the findings of this study highlight the central role of learning strategies in Higher Education in achieving successful academic performance. Thus, understanding how teaching modalities and learning strategies influence academic performance provides valuable information about the importance of adapting educational strategies to better align with student objectives.

In this regard, the following conclusions were reached: a) Scholarship-holding university students residing in the family home make greater use of learning strategies; b) Students studying in face-to-face teaching mode have better development in task appraisal and anxiety; c) Students studying in virtual teaching mode obtained higher scores in content elaboration strategies, metacognition, and effort self-regulation, with the latter two being equal for the hybrid teaching mode; d) Students from Vocational Education have higher task appraisal and anxiety, while those accessing through other routes obtained higher scores in elaboration strategies; e) Age and course are negatively related to learning strategies, meaning the older and more advanced the course, the fewer strategies are utilized; f) Age and course are negatively related to grades, meaning the older and more advanced the course, the lower the grade.

Thus, the evidence has highlighted the need to strengthen the basic components of each teaching modality in order to achieve better development of learning strategies in the

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