MECHANISMS THAT PROMOTE THE AUTONOMOUS WORK OF UNIVERSITY STUDENTS

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Abstract
Although there are some advances regarding the mechanisms used to promote the autonomous work of university students, it is considered relevant to identify the design of the activities that make it possible. The purpose of this study was to determine the autonomous work and the mechanisms that university teachers use to promote in students the design of autonomous activities such as 1) Research 2) Case studies 3) Analysis of business situations and 4) projects. Teachers from a Colombian public university participated. For the study, an online questionnaire called 'Mechanisms that promote the autonomous work of university students' was completed. Bayesian hypothesis testing was used for the analysis as it is considered a more intuitive tool for statistical inference, the results of the sequential analysis compared the Bayes factor (BF) to evaluate the evidence in favor of an alternative hypothesis (H1), compared to a null hypothesis (H0), according to the BFs provided and as part of the conclusion, more information or further analysis is required to make a conclusive decision.

Keywords: *Self-employment, university students, Bayes factor*.

INTRODUCTION

Technological advances have contributed to the progress and economic development of society, making academic demands on university students, who must have good independent learning skills to meet these demands. Information and communication technologies have had great developments at the international level and this has allowed boosting training processes (Hernández et al., 2015). Autonomous learning requires certain prerequisites, such as students must have an adequate motivation for learning and need to master learning strategies that suit themselves (Wei, 2021). From the above, the importance of autonomous work in the formation of students, because it allows to have a great academic value for the contribution that students can make with their new knowledge. Integrate technology into academic preparation, promote autonomous learning skills, and increase their ability to implement innovative teaching strategies (Alkandari & Al-Failakawei, 2022). The rapid development of science and technology provides equipment for autonomous learning (Chen, 2022). Promoting students' independent work is an essential part of higher education, helping to ensure that students have the ability to work independently, which is fundamental to academic success, as well as the development of new roles and responsibilities.

The development of new roles and responsibilities of students in the teaching-learning process, leading to the practice of self-regulated learning strategies in flexible work environments, encouraging their participation (Pegalajar, 2020). Self-directed learning strategies are critical to the successful implementation of self-directed learning objectives and the development of student

capacity and motivation for self-directed learning (Anthonysamy & Singh, 2023). In a university environment where autonomy and self-regulation are important skills, it is imperative to identify and promote effective mechanisms that strengthen these qualities in students. Autonomous work plays an important role in teaching-learning, allowing students to be aware of their own capabilities and to use a series of didactic strategies according to their needs and realities (Arauco-Mandujano et al., 2021). The research project focused on the study of different mechanisms that can favor students' independent work. By implementing special strategies, educational institutions can provide students with the tools and environment to develop self-organization, self-management and self-reflection skills.

In university education, in addition to teaching students professional knowledge and skills, what should be cultivated is the "autonomous learning capacity" of students. (Hu & Yang, 2018). Teaching-learning sometimes becomes unpleasant and ineffective, generating dissatisfaction in students, often due to the method applied, the teaching style and the learning activities that do not produce a pleasant learning experience. (Yusnimar, 2019). From setting clear objectives to promoting active learning and collaboration, there are several approaches that help strengthen students' autonomy and prepare them to meet the challenges of research and work with confidence and competence. Students' autonomous learning is significantly related to motivation and academic goals. (Roque Herrera et al., 2020). It is good for the teacher to instruct students on how, when and why strategies are used in the learning process.

Transferring the implementation of strategies in new contexts and tasks is important in autonomous learning. (Dmitrenko et al., 2021). Autonomous learning is advanced learning based on change and personal development on the part of the student, where the teacher has the role of a guide, preparing study plans, objectives and tasks according to the learning situation of each student. Self-directed learning requires learners to be "in the process of taking various control measures to optimize their learning", it is important to find appropriate control measures based on the advantages of knowledge graphs. (Shi, 2022). As more and more countries adopt autonomous student learning as one of the important goals of teaching, autonomy in learning will become an important issue in higher education. (Liu, 2022). This new student-centered perspective has changed the roles of students and teachers, and created an autonomous learning environment in the classroom. (Alemu et al., 2023). Finally, it is hoped that the results of this research will contribute to the development of more effective pedagogical practices and the creation of learning environments that promote student autonomy and academic success in higher education.

Autonomous learning is advanced learning based on change and personal development. (Ali Krishan et al., 2023). Since digital technologies can help create an effective learning method that promotes autonomous learning, especially during online teaching and learning, further studies should be conducted to provide more comprehensive pedagogical models (Pratiwi & Waluyo, 2023). Demonstrating autonomous learning behaviors not only has positive effects on students, but also benefits their teachers and the classroom environment. (Weijers et al., 2023).

Methodology

In order to provide a solution to the objectives established in the research, a quantitative approach based on a descriptive-correlational non-experimental research methodology is used, using the questionnaire as the main tool for the collection of information. Seeking to describe and analyze the relationships between variables, without intervening or manipulating the variables of interest. For the selection of the sample, the guidelines proposed by Hernández, Fernández and Baptista (2014) were taken into account, where they indicate that: access to the sample and its acceptance, the necessary attention to the impositions of the study, as well as the availability of the participants for the data collection process in an optimal and efficient form.

Results

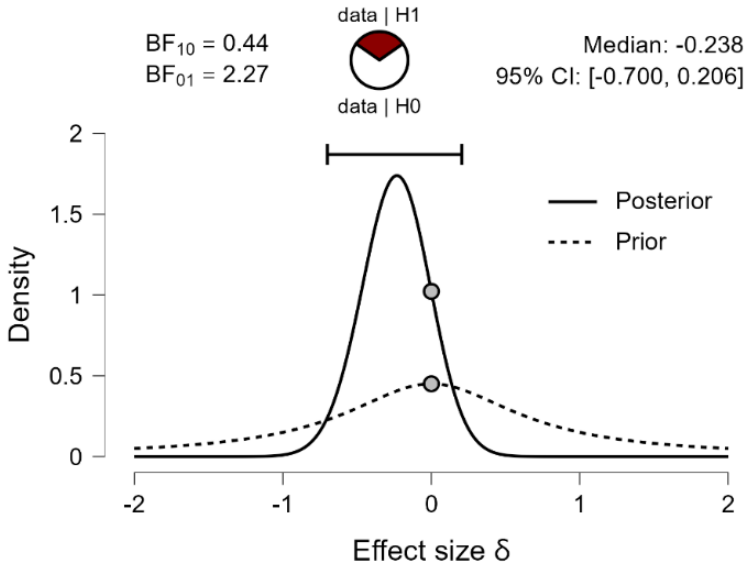
In order to test the validity of the results of this research, the Bayesian hypothesis test was chosen because it is considered a more intuitive tool for statistical inference.

Table 1.Independent Bayesian T-Test Results

	BF_{10}	error %
P1	0.440	0.011

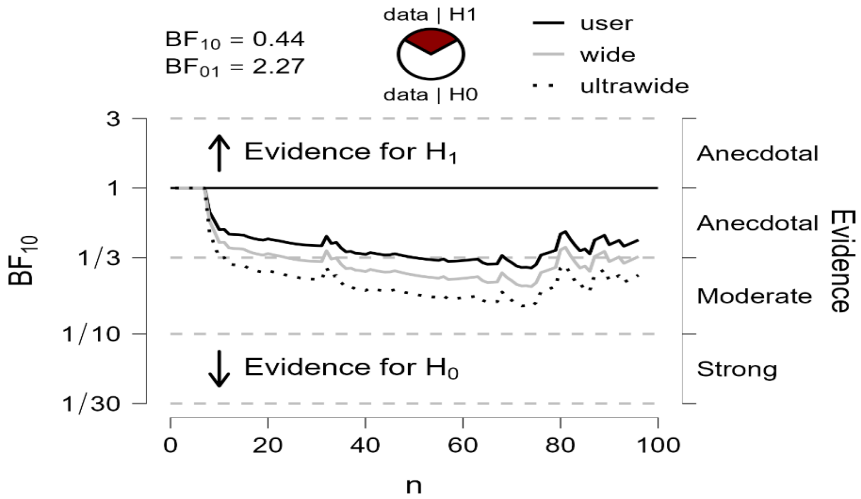
Regarding the question: What mechanisms do you use to promote students' autonomous work? The summary data from the Bayesian contingency tables present the following results. The independent sample value gave 0.440 with an error percentage of 0.011. With a BF_{10} of 0.440, the evidence in favor of the null hypothesis regarding the mechanisms employed by students for the development of autonomous work is approximately 2.27 times more likely than the evidence in favor of the alternative hypothesis. This value suggests some favorability toward the null hypothesis, but is not very strong. An error of 0.011 may refer to the standard error associated with the estimate of the parameter of interest; this value is generally used to calculate confidence intervals around the point estimate. It is important to note that a standard error of 1.1% (0.011 expressed as a percentage) is quite small, indicating a relatively high precision in the estimation.

Figure 1. Inferential Plots P1 Prior and Posterior



For the question What mechanisms do you use to promote students' autonomous work? reflects that a Bayes factor of 0.1 (1/10) indicates that it is ten times more likely that there are no differences than that there are differences. In this study, the BF_{01}= 2.27 as two point twenty-seven more data compatibility with H_0 compared to H_1. The analysis shows that with the evidence observed in the study and considering a priori neutral beliefs, the updated probability is 95 % in favor of a differential effect between treatments versus 0.5 % in favor of being equal. This analysis also allows us to determine the least probable estimate of the difference (-0.238 mm less) and its possible variation, i.e. this is the 95% credible interval.

Figure 2. Sequential Analysis



The sequential Bayes analysis here compares the Bayes factor (BF) to evaluate the evidence in favor of an alternative hypothesis (H1) compared to a null hypothesis (H0), according to the values provided: BF_{10} = 0.44 (evidence in favor of the alternative hypothesis H1); BF_{01} = 2.27 (evidence in favor of the null hypothesis H0).

The following can be inferred: As known BF_{10} evidence in favor of the alternative hypothesis H1, where: 1) A value less than 1 suggests evidence in favor of H0; 2) A value greater than 1 suggests evidence in favor of H1. For this case, BF_{10} = 0.44, indicating that the evidence in favor of H1 is moderate. On the other hand, BF_{01} is evidence in favor of the null hypothesis H0, where: 1) A value less than 1 suggests evidence in favor of H1; 2) A value greater than 1 suggests evidence in favor of H0. For this case BF_{01} = 2.27, which indicates that the evidence in favor of H0 is also moderate. According to the above, the BF_{10} and BF_{01} values suggest moderate evidence for both H0 and relatively moderate evidence for H1. What this means is that there is no strong preference for any of the hypotheses based on the data and BFs provided. More information or further analysis is required to make a conclusive decision. Once the mutually exclusive and exhaustive hypotheses have been established, their Bayesian a priori probability (level of credibility) is determined. As stated by (Mason, 2011), this probability can be expressed as a ratio (pre-result odds or a priori odds): P(H1)/P(H0); where: P(H1) = Probability of veracity of the hypothesis of difference or association; P(H0) = Probability of no difference or no association. As the value of BF_{10} < 1, and the value of BF_{01} > 1, then both values suggest evidence in favor of the null hypothesis (H0).

Table 2. Descriptive table

							95% Credible Interval	
	Group	N	Mean	SD	SE	Coefficient of variation	Lower	Upper
P1	0	21	0.619	0.498	0.109	0.804	0.393	0.846
	1	75	0.747	0.438	0.051	0.586	0.646	0.847

When comparing the two groups obtained (Group 0 and Group 1). The following can be inferred: group 0: has a mean of 21.61, a standard deviation of 0.49, and a standard error of 0.10; the 95% credibility interval for this group ranges from 0.393 to 0.846.

Group 1: Has a mean of 75.74, a standard deviation of 0.43, and a standard error of 0.051. The 95% credible interval for this group ranges from 0.586 to 0.847. As P1 is framed with group 0, it is

important to remember that in the independent results the standard error was (0.011 expressed as a percentage), which compared with that of the descriptive table (0.010) are almost equal, indicating a relatively high precision in the estimation, likewise the BF_{10} was 0.44, which according to the descriptive table is within the credibility interval that for this group goes from 0.393 to 0.846.

CONCLUSIONS

The evidence provided by the Bayesian Factor suggests some preference for the null hypothesis, and the low value of the error may indicate a more accurate estimate. Bayesian hypothesis testing is used as it is considered a more intuitive tool for statistical inference. Faced with the question: What mechanisms do you use to promote students' autonomous work? Bayesian contingency data present the independent sample value with a percentage error and a BF_{10}, evidencing in favor of the null hypothesis regarding the mechanisms employed by students for the development of autonomous work of approximately two point twenty-seven times more likely than the evidence in favor of the alternative hypothesis. The conclusion is that there is a certain favorability towards the null hypothesis, but it is not very strong. Where the standard error is associated with the estimation of the parameter of interest and the calculation of the confidence intervals around the point estimate where the standard error is quite small which indicates a relatively high precision in the estimation.

The Bayes factor is ten times more likely that there are no differences than that there are differences. Where the BF_{01} as two point twenty-seven more data compatibility with H0 compared to H1. The analysis shows that with the evidence observed in the study and considering a priori neutral beliefs, the updated probability is in favor of a differential effect between treatments versus zero point five percent in favor of being equal. The least likely estimate of the difference and its possible variance where the credible interval at ninety-five percent where the sequential analysis to evaluate the evidence in favor of the alternative hypothesis compared to the null hypothesis. Where BF_{10} evidence in favor of the alternative hypothesis, where a value less than one suggests evidence in favor, indicating that the evidence in favor of H1 is moderate. BF_{01} evidence in favor of the null hypothesis H0 indicates that the evidence in favor of H0 is also moderate.

Where the BF_{10} and BF_{01} values suggest moderate evidence for H0 and relatively moderate evidence for H1. Meaning that there is no strong preference for any of the hypotheses based on the data and the BFs provided, more information or further analysis is required to make a conclusive decision, already established the hypotheses, mutually exclusive and exhaustive, their a priori Bayesian probability (level of credibility) is determined, then both values suggest evidence in favor of the null hypothesis, meaning that the probability P1 which posits that the design of autonomous activities. (research, case studies, analysis of business situations and projects), does not conclusively answer the question ‘What mechanisms do you use to promote students' autonomous work?’

Additionally, the values found in the descriptive table, when contrasted with the values of the independent Bayesian T-Test results for P1, allow us to infer that they indicate a relatively high precision in the estimation that suggests evidence in favor of the null hypothesis.

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