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Learning by doing and academic performance in Business Administration students

Learning by doing y rendimiento académico en estudiantes de Administración de Empresas

Learning by doing e desempenho acadêmico em estudantes de Administração de Empresas

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RESEARCH ARTICLE

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Abstract

Introduction: Traditional education in the classroom has been questioned in its ability to respond to the needs of the knowledge society, so the center of the discussion is directed to the change of methodologies that are more suitable and coherent with the environment, such as the *learning by doing* methodology, expressed as experiential learning that forces the student to solve problems outside the classroom. **Objective:** The objective of this article is to analyze how the *Learning by doing* methodology is related to the academic performance of business administration students. **Methodology:** the comparison of the final grades of two groups of students is proposed: group A made up of a sample of 34 students (control group that took the subject in the first semester of 2022, in the traditional way) and group B (experimental group that took the subject in the second semester of 2022 under the aforementioned methodology) made up of a sample of 29 students. Likewise, group B was measured at two moments (before and after having participated in *learning by doing* activities) with a pre and post test. **Results:** The results showed an improvement in the grades of group B, additionally an improvement in leadership, innovation and creativity skills was observed in the students of this group **Conclusions:** This research highlights the need to adopt methodologies such as *learning by doing* in the training of business administrators.

Keywords: Higher education; Business management; Teamwork; *Learning by doing*[1].

Resumen

Introducción: La educación tradicional en el aula se ha visto cuestionada en su capacidad de responder a las necesidades de la sociedad del conocimiento, por lo que el centro de la discusión se dirige al cambio de metodologías más aptas y coherentes con el entorno, como lo es la metodología *learning by doing,* expresada como el aprendizaje experiencial que obliga al estudiante a resolver problemas fuera del aula. **Objetivo:** analizar cómo la metodología *Learning by doing* se relaciona en el rendimiento académico en estudiantes de administración de empresas. **Metodología:** se propone la comparación de las calificaciones finales de dos grupos de estudiantes: grupo A conformado por una muestra de 34 estudiantes (grupo de control que cursó la asignatura en el primer semestre del año 2022, de manera tradicional) y grupo B (grupo experimental que cursó la asignatura en el durante el segundo semestre del año 2022 bajo la metodología mencionada) conformado por una muestra de 29 estudiantes. Asimismo, el grupo B fue medido en dos momentos (antes y después de haber participado de actividades de *learning by doing*) con un pre y post test. **Resultados:** Los resultados evidenciaron una mejora en las notas del grupo B, adicionalmente se observó una mejora en las habilidades en liderazgo, innovación y creatividad en los estudiantes de este grupo. **Conclusiones:** Esta investigación subraya la necesidad de adoptar metodologías como *learning by doing* en la formación de administradores de empresas.

Palabras clave: Enseñanza superior; Administración de empresas; Trabajo en equipo; Aprender haciendo.

1 Los términos clave han sido consultados en Los Tesauro de la UNESCO, la UNIVERSIDAD DE BARCELONA Y JEL

RESEARCH ARTICLE

Resumo

Introdução: A educação tradicional em sala de aula tem sido questionada em sua capacidade de responder às necessidades da sociedade do conhecimento, por isso o foco da discussão está direcionado para a mudança de metodologias mais adequadas e coerentes com o ambiente, como é o caso da metodologia *learning by doing,* expressa como aprendizagem experiencial que força o aluno a resolver problemas fora da sala de aula ii) **objetivo:** analisar como a metodologia *Learning by doing* está relacionada ao desempenho acadêmico em alunos de administração de empresas iii) **metodologia:** Propomos a comparação das notas finais de dois grupos de alunos: o grupo A, formado por uma amostra de 34 alunos (grupo de controle que cursou a disciplina no primeiro semestre de 2022, de forma tradicional) e o grupo B (grupo experimental que cursou a disciplina no segundo semestre de 2022 com a metodologia mencionada), formado por uma amostra de 29 alunos. Da mesma forma, o grupo B foi medido em dois momentos (antes e depois de ter participado das atividades de aprender fazendo) com um pré-teste e um pós-teste iv) **Resultados:** os resultados mostraram uma melhora nas notas do grupo B, além de uma melhora nas habilidades de liderança, inovação e criatividade dos alunos desse grupo. **Conclusões:** Esta pesquisa enfatiza a necessidade de adotar metodologias como a aprendizagem pela prática no treinamento de administradores de empresas.

Palavras-chave: Ensino superior, administração de empresas, trabalho em equipe, aprender fazendo.

Introduction

John Dewey, one of the most influential pedagogues for education and the incursion of more practical methodologies within learning, alludes that education is the fundamental method for the progress of a society, and the teacher not only educates a person, but also contributes to the formation of a transforming social lifestyle (Dewey, 1952).

However, the responsibility of this task is not an easy task; it is a complex process that regularly exists in controlled spaces, called classrooms. The traditional classroom, as it was conceived centuries ago, has surpassed its physical and temporal limits thanks to different aspects framed in the globalization and industrial and technological revolution (Rodríguez, 2021; Del Castillo, 2022). This has led to the emergence of a type of student who is more attentive and connected to his or her environment, who simultaneously carries out various activities such as working and studying.

Thus, in the university environment, learning has had to evolve along with the role of each party involved in the process, to methodologies in which the roles traditionally established in education are displaced by more proactive roles, where the student is not only satisfied with a master class, but seeks to participate as a protagonist of his learning (Gómez, et al., 2022), that is, we can speak of a student profile that is able to assimilate the knowledge presented in training sessions, and take it to the environment.

For business administration programs, business reality is a continuous source of information that facilitates the implementation of this type of methodologies. One of these methodologies is *learning by doing*, which seeks to immerse the student in the learning process through the experience itself, to develop a critical and reflective posture and performance of reality, and to interact with the environment with the knowledge learned. For this reason, the present study seeks to analyze how the *learning by doing* learning tool is related to the academic performance of a sample of 29 students who took the course Administration of MSMEs, of the business administration program at the American University Institution, Barranquilla, Colombia, during the second semester of the year 2022.

On the other hand, the document has a structure that obeys the following order: the first section offers a look at the literature review and conceptual and theoretical approach to the research; the second section contains the methodology adopted, followed by two sections corresponding to the purposes of this document: description of the use of *learning by doing* in university students with respect to their final grades and the relationship of this in the aspects of leadership, innovation and creativity after the application of the *learning by doing* method. Finally, conclusions and implications are presented.

1. THEORETICAL FRAMEWORK

The ability to learn and knowledge is one of the main resources that any organization possesses to develop its competitive advantages and sustain itself in the market (Nonaka and Takeuchi, 1995), so the role of learning in its members is highlighted from the moment they are students and are acquiring knowledge in the area in the earliest form, that is, in education (Nonaka and Takeuchi, 1995).

higher education. Education models, not only for business administration or related programs but for all professional programs, constitute a route for the development of knowledge in the individual that has an impact on the shaping of society and its success depends largely on the teaching strategies employed by the teacher (Dewey, 1952).

Some influential authors in the pedagogical field began to make contributions that gave progress to the traditional learning methods that had been carried out so far. Thus, John Dewey highlighted his dynamic vision of man where learning was a matter of exchange of a being with his physical and social environment and not only a matter of knowledge (Ruiz, 2013), i.e., he proposed the unification of thought and action, theory and practice.

Under this principle, the author considers the role of the teacher as a designer of methodology, activities and processes that generate situations in which students must experiment (Dewey, 2008). However, it is not only a matter of living the experience, but Dewey emphasizes that learning occurs in the reflection that takes place on the basis of that experience. In this understanding, the process is incomplete if the individual does not engage in a process of intellectual and affective reflection, in order to arrive at new meanings, implications and appreciations (Boud et al., 1985). One of the visible results of his postulates detonated in the project-based teaching methodology, in which students (generally in groups) choose a topic and develop it.

As a consequence of the introduction and acceptance of Dewey's thinking, and the evolution of educational processes, the need to implement methodologies focused on the student who, with the guidance or supervision of the teacher, assumes greater autonomy and responsibility for their learning process, identifying in turn the optimal competencies related to knowing how to know, knowing how to do (practical application of knowledge) and knowing how to be, for their academic and professional performance (Arias and Fidalgo, 2013; Fernández, 2006), gained strength. This action rethinks in teachers their work and training practice, around the so-called active methodologies that stimulate autonomous learning and knowledge development in students (Ontoria, 2004; Margalef and Pareja, 2008; Zabalza, 2011; Palazón-Pérez et al., 2011; Robledo et al., 2015).

Learning by doing

Although it may seem new and avant-garde, the underlying concept of learning by doing dates back to the time of ancient philosophers such as Aristotle, who mentioned "what we have to learn to do, we learn by doing". In the Middle Ages, some countries were already adopting forms similar to the method, as in the European case when vocational training was designed through the relationship between experts and their disciples. Later, towards the 19th century, a high value is given to the practicality of things, that is, to all knowledge, theory, learning that can be applicable in real life; among other things, which leads the thinking of pragmatism (Putnam, 1992).

Landing in the modern era, Dewey's appreciations of the teaching-learning process trigger the need to set up clear scenarios for students that make possible the opportunity to do and reflect on the results beyond the classroom (Rodriguez and Ramirez, 2014). One of the names that has been coined for the proposal that achieves a practical teaching program, centered on the students' experience and that involves both doing, testing and reflection, is learning by doing (*learning by doing)*. It is worth mentioning that this methodology comes from the constructivist current,

The program is based on the development of know-how or know-how-by-doing, while moving away from traditional teaching techniques based on memorization.

For the method to generate the proposed impact, it is important to evidence the relationship of the method with the concerns and expectations of the student's personal experience, as well as for the student to have clarity and awareness of his experience during his performance, which is conducive to the performance and achievement of the learning objectives set (Dewey, 1952).

In this same line of thought, together with cognitive psychology, appear the arguments of Ro- ger Schank, who states that learning occurs when someone wants to learn, not when someone wants to teach, with special emphasis on the complexity represented by the way in which one teaches and how one learns. This perspective offers a critique of the learning offered by educational institutions and what he calls natural learning, another way of stating the need for human beings to learn by doing (Schank, 2005).

Research on the *Learning by doing* methodology has gained relevance in the educational field due to its potential to enrich the learning process. Azanza et al. (2022) have explored how combining the *Learning by doing* approach with team coaching can improve the depth of learning, motivation and engagement in tourism education. Through a case study on strategic planning for sustainable tourism (Betancourt et al., 2022), students experienced more enriching learning, working within the professional reality and sharing ideas with their peers. The results support the usefulness of this methodology in enhancing learning in a specific context.

The importance of the *Learning by doing* methodology has also been highlighted in diverse contexts. Brad- berry and De Maio (2019) highlight how simulations and experiential learning provide students with the opportunity to apply knowledge to real-world situations, strengthening skills in writing, communication, analysis and synthesis of information. This type of hands-on experience also positively influences students' confidence and contributes to their success in future careers. Experiential learning programs not only improve time to graduation, but also increase the likelihood of attending graduate school or another college, as well as finding employment, improving their overall welfare and entitlement (Cortés et al., 2020).

Niiranen (2021) also highlights how the *Learning by doing* approach has been integrated into craft and technology education in Finland, enabling students to develop their technological understanding through practice. The research focused on how the Learning by doing pedagogical approach impacts on craft and technology education. The results of the study underline the relevance of providing practical opportunities to access technological knowledge and develop skills by working technologically.

2. METHODOLOGY

Application of the learning by doing method

The context in which the application of the *learning by doing* method is found, arises from an inter-institutional project that sought the interaction of teachers and students with the external sector of the city.

of Barranquilla, under the development of consultancies. The American University Institution provided its knowledge services, through the professors of the business administration program, to different functional areas of the Red Cross organization, Atlántico section. Specifically, for this study it was the training area, called institute for training for work and human development.

The objective of the consultancies was to respond to situations and problems that had been occurring for several years. These aspects are contemplated in the exercise of the subject MSME (micro, small and medium-sized enterprises) administration, which is part of the program's curriculum. Therefore, a detailed work plan was structured in three phases developed during semester 2022-2, in which the students were fully involved, since the duration of the course coincided with the development of the project.

In this way, during the first days of class, the way in which the content of the course would be covered was explained to the students through the *learning by doing* methodology, applied in the organizational context of the Red Cross. The development phases were as follows:

- **Diagnostic Phase:** In this phase, semi-structured diagnostic interviews were conducted to determine the current state of the training area. The students formed working groups, for which in a period of 4 weeks they had to make visits to the Red Cross facility and interviews with officials of the area studied; contributing to the preparation of the diagnostic report of the area.

- **Co-creation Phase:** Based on various analysis tools (brainstorming, business model analysis - Canvas, SWOT, etc.), students, teachers and the Red Cross organization's team sought to respond to the objectives set out in each tool, as well as to gain in-depth knowledge of the organization's capabilities and resources.

- **Propositional Phase:** The construction of the strategic portfolio was carried out between teachers and students.

It is important to note that the way in which the application of this methodology was explored in the students' training process is represented, on the one hand, by the comparison of the final grades of two groups of students in the subject Administration of SMEs: the grades of group A correspond to students of semester 2022-1 who developed the subject in the traditional way, that is, the group was not subjected to the methodology; versus the grades of group B, which refers to the group of students of semester 2022-2 who were involved in the project under the *learning by doing* methodology. In this sense, the study sought to determine whether the application of the methodology influenced the improvement or not of their respective final grades obtained in the subject.

And, on the other hand, the focus was refined on the students of group B (semester 2022-2), reviewing the comparison coming from an applied instrument (pre- and post-test), which is detailed below.

Sample and data collection

This research was carried out among business administration students at the American University. Specifically, the sample consisted of students who took the MSME administration course with one of the authors during the year 2022 (in period 1).

and 2 of the year). In this sense, period 1, called group A, had a total of 34 students (control group), while group B, period 2 of the same year, had a total of 29 students. The data used corresponds to the scores obtained by both courses once they finished their period of study, which were downloaded from the institution's academic system.

With group B (experimental) of the observed students, two instruments were designed (pre-test and post-test) that collected data at two moments: the first moment, a few days before the realization of the work plan, the pre-test was applied, as well as for the second moment the post-test was applied, which sought to analyze aspects of *learning by doing* related to leadership, innovation and creativity. Both tests were developed based on an adaptation of previous works and questions defined in Rodríguez-Conde et al. (2017), whose parameter was to measure the implementation of active methodologies, as is the case of *learning by doing*.

Finally, to guarantee the reliability and replicability of the study, the Cronbach's Alpha test was applied, obtaining a coefficient of 0.92 for the pre-test and 0.98 for the post-test.

Data processing and analysis

For the processing and analysis of the data collected, statistical analysis software such as SPSS and RStudio software were used to organize and review the descriptive and comparative inferential results.

Following the methodological order of ideas, for the first aspect studied (comparison of grades of group A and B), an analysis based on the descriptive comparative statistic of means was implemented. For this purpose, a Student's t-test was applied for independent samples with unequal variances at one-tailed, which yielded a p-value of 0.05, confirming the difference between the groups based on the observed variable "final grade" (for further information, see Table 1). Likewise, Fisher's F distribution was taken into account in the analysis of variance and hypothesis tests to determine whether the variances of the groups are equal in order to analyze the existing difference (for further information see Table 2). This was visualized using the one-way Anova methodology, which presented a p-value of 0.014, rejecting the null hypothesis associated with equality of variances. Lastly, the averages corresponding to the classification of the grades in the respective groups (Not presented, Passed, Good, Outstanding) were established. It is worth mentioning that the results of the grades are presented on a scale of 0 to 5, where the range from 0 to 2.9 is "Not presented", 3 to 3.9 is "Pass", 4 to 4.5 is "Remarkable" and 4.6 to 5 is "Outstanding".

Regarding the second aspect studied, i.e., the comparison of the results of the pre-test and post-test in group B, non-parametric tests were applied since the responses of the items of both tests were presented on a Likert scale, showing that these responses do not come from a normal distribution, and in this particular case, had a one-tailed bias to the right, given the ordinal and categorical nature of the data.

In this way, the Wilcoxon Mann-Whitney test was applied to compare the medians of two related samples and determine the existence of differences between them, as well as to determine the difference in the dispersion of data from one group with respect to another. Vargha and Delaney's A test was applied to compare the dominance of the groups, that is, which group dominates the other,

as well as the WilcoxonOR test, to explain how many times the dominant group overlaps with the other, taking into account the odd ratio (OR). Finally, the Kruskal test is applied to confirm whether the difference between the two groups is significant, and whether the data come from the same population or not.

3. RESULTS AND DISCUSSIONS

Comparison in the score of the final grades of the groups:

The analysis of the "final grade" scores of group A (control) and group B (experimental) was presented in Student's t-test and Fisher's F-test.

Tabla 1.
Prueba t para dos muestras suponiendo varianzas desiguales

	Grupo B	Grupo A
Media	4.1	3.67941176
Varianza	1.34357143	0.60532086
Observaciones	29	34
Diferencia hipotética de las medias	0	
Grados de libertad	48	
Estadístico t	1.66078838	
P(T<=t) una cola	0.05163764*	
Valor crítico de t (una cola)	1.6772242	
P(T<=t) dos colas	0.10327527	
Valor crítico de t (dos colas)	2.01063476	

Fuente: Elaboración propia

Observing the p-value result of the one-tailed Student's t-test in Table 1 above, it can be seen that there is not enough evidence to reject the alternative hypothesis, therefore, the means presented a difference. In other words, group A and B present significant differences in their final score distributions.

The distribution of the data presented with Fisher's F test (Table 2), in the one-tailed p-value of 0.014, an improvement of group B over group A can be observed. It can also be seen that group B ends up being the more homogeneous of the two groups. This result rejects the null hypothesis that states the equality of variances of the groups studied.

Tabla 2.
Prueba F para varianzas de dos muestras

	Grupo B	Grupo A
Media	4.1	3.67941176
Varianza	1.34357143	0.60532086
Observaciones	29	34
Grados de libertad	28	33
F	2.21960208	
P(F<=f) una cola	0.01456894*	
Valor crítico para F (una cola)	1.8193758	

Fuente: Elaboración propia

The analysis of the data in both tables shows that group B improved in relation to group A. In parallel, under descriptive analysis of the data set determined to compare the variable "final grade" of group A and B, it is highlighted that the average grade of course A is 3.6 points, classifying them as students who passed the course, while group B obtained an average of 4.1, associating these students to the classification of "notables" at the end of the course. This indicates that those who underwent the *learning by doing* methodology had better final grades.

Tabla 3.
Calificaciones de los grupos A y B de estudiantes observados

Calificaciones	Escala de la nota final	Grupo A	Grupo B
No presentados	0 – 2.9	7%	7%
Aprobados	3.0 – 3.9	50%	8%
Notable	4.0 – 4.5	35%	44%
sobresaliente	4.6 – 5.0	6%	41%

Fuente: Elaboración propia

Similarly, when analyzing the details of the grading scales presented in Table 3, it can be clearly noted that group B concentrates a large number of notable and outstanding students (85% overall), that is, those with a performance above 4.0 points on a classic grading scale from 0 to 5 (scale used in academic courses in Colombia). On the other hand, it is noteworthy that of group A, up to 41% achieved notable and outstanding grades, which is still less than half of what was achieved by the experimental group.

These results are supported by the literature review, which highlights the effectiveness of experiential learning in developing practical skills and improving academic performance. The combination of approaches such as team coaching and *Learning by doing*, as discussed in the study by Azanza et al. (2022), shows how this methodology can enrich students' learning and motivation by allowing them to work in real situations and foster leadership, innovation and creativity skills.

Comparison of pre- and post-test on learning by doing variables.

The variables used in the application of the tests are grouped around some of the main characteristics of the *learning by doing* method: leadership, innovation and creativity. Below are the questions used in the pre-test and post-test for each of the variables measured, in which the students rated the associated statements on a scale from 1 (totally disagree) to 5 (totally agree) (see Table 4):

Tabla 4.
Variables del pre y post test

Pre test	Post test
Liderazgo	
Consideras que dentro de los equipos de trabajo eres el integrante que resalta por su liderazgo	Bydoing_decision La experiencia con la metodología *learning by doing* me ayudo al autoconocimiento y me facilitó la toma de decisiones a partir de la reflexión
	Bydoing_lider La experiencia con la metodología *learning by doing* afianza mi capacidad de liderazgo
	Val_liderazgo Consideras que dentro de los equipos de trabajo eres el integrante que resalta por su liderazgo
Innovación	
Al momento de dar soluciones a una problemática, considera que destaca el componente innovador en tus propuestas	Bydoing_innova Considero que la metodología *learning by doing* fomenta la capacidad de innovación de las personas, ya que se requiere encontrar el nexo común entre diversos puntos de vista
	Val_innovador Al momento de dar soluciones a una problemática, considera que destaca el componente innovador en tus propuestas
Creatividad	
Me satisface el resultado de las ideas generadas para dar solución a un problema desde el punto de vista del grado de creatividad en la solución	Bydoing_crear Considero que esta actividad me permitió desarrollar soluciones a los problemas que fomentan mi creatividad
	Val_creati Me satisface el resultado de las ideas generadas para dar solución a un problema desde el punto de vista del grado de creatividad en la solución
El nombre de las variables que inicia con "bydoing" se refiere a la experiencia que vivió el estudiante una vez participó en la enseñanza bajo la metodología *learning by doing*; mientras que los nombres que inicien por "val" indican la valoración que dan al aspecto señalado dentro del ejercicio metodológico.	

Fuente: Elaboración propia

The findings of the non-parametric tests shown in Table 5 represent the basis for the explanation of the difference found in the improvement of the final grades of group B, who participated in the application of the learning by doing method.

Then, when observing Table 5, it is highlighted in each of the variables leadership, innovation and creativity, a statistical significance in the post-test observations regarding "Bydoing_decision" with a value of 0.0265 and "Bydoing_lider" with 0.0021, which represent the student's perception regarding the experience obtained during the development of the methodology in aspects related to decision making and their leadership capacity, respectively. Both correspond to the leadership variable.

Likewise, regarding the development of innovation from the experience of *learning by doing* in the course, the variable "Bydoing_innova" had a considerably high statistical significance, with a value of 0.00024.00024; while, with respect to creativity, the variable "Bydoing_create" reached a low significance, with a value of 0.059; which indicates that the students perceive a notable improvement in their capacity for innovation, and only a slight improvement in creativity after developing the activities involving the learning method.

The importance of these variables is confirmed by the non-parametric Kruskal-Wa- llis test, which in all the cases indicated reached a value below 0.05, rejecting the null hypothesis that

indicates that the variables are equal in both the test and the post-test, so it can be stated that the lower the p-value, the lower the p-value, there is no evidence that these two variables are in the same distribution. Likewise, the dominance of the results of the post-test compared to the pre-test can be observed, that is, that the post-test improved with respect to the pretest, when reviewing the results of the confidence interval in the Vargha and De- laney's A test, in whose column to the right, the data are close to 1, for the variables with statistical significance; and the power in which this variable improves can be evidenced with the WilcoxonOR test.

Tabla 5.
Pruebas no paramétricas al grupo B, participante de la metodología *learning by doing*

Pre	Post	Wilcoxson - Mann Whitney		Vargha and Delaney's A			WilcoxonOR		Kruskal
		Statist	p-valor	Statist	IC		OR IC		p-valor
Liderazgo	Bydoing_decision	369	0.02656**	0.6758242 (m)	0.676 0.825	0.526	**3.09** **16.2**	1.17	0.02577*
	Bydoing_lider	385	0.002131***	0.7403846 (l)	0.74 0.864	0.597	**6** **33.8**	1.95	0.002044*
	Val_liderazgo	226	0.2973	0.4148352 (s)	0.415 0.586	0.261	0.601 1.58	0.219	0.2921
Innovación	Bydoing_innova	412	0.0002447***	0.7923077 (l)	0.792 0.906	0.661	**9.22** **77.1**	2.71	0.0002334*
	Val_innovador	199	0.09732	0.3653846 (s)	0.365 0.513	0.223	0.437 1.07	0.134	0.09505
Creatividad	Bydoing_crear	333	0.05973**	0.6413462 (s)	0.641 0.773	0.503	**3.04** **13.1**	0.991	0.05801*
	Val_creati	286	0.7633	0.5247253 (n)	0.525 0.683	0.377	1.17 3.64	0.469	0.7545

* significancia estadística
IC = intervalo de confianza
OR= La razón odd, o el odds ratio
Letras entre paréntesis: (m) medium; (l) large, (s) small, (n) negligible.
En negrita OR relevantes.

Fuente: Elaboración propia

In this order of ideas, not only are there relevant aspects that had an impact on the student's experience with the *learning by doing* methodology, but they are even more important when the magnitude of the effect of these variables (measured in the WilcoxonOR test) is obtained. Thus, when the OR is less than 1.68 its magnitude is considered insignificant; if it is between 1.68 - 3.47 it is considered small; between 3.47 - 6.71, moderate; and if it is greater than 6.71 it is considered large (Mateos-Noza and Martínez Velilla, 2018).

Evidently, the leadership variable (in its Bydoing_leader variable) is reflected in that the post-test results dominate the results of the pre-test, showing that after experiencing the methodology in the course, the results of the group of students improve six times over the leadership perceived before the methodology. However, with regard to the student's perception that within the work teams he is the member who stands out for his leadership (Leadership_value), there was no statistical significance, i.e., there is no difference in this consideration with respect to before and after the application of the methodology (the p-value was above 0.05).

This indicates that the students of the Business Administration program maintain work groups where leadership is rotating according to the roles and moments determined by the dynamics of the activity, it was observed during the visit to the Red Cross facilities, as well as at the time of participating in the interviews, that each student adopted the role that best suits his personality and needs in the achievement of the objectives of the activity. It is necessary to contrast the association of this variable with the dynamics of teamwork (which is beyond the scope of the objective of this study).

Finally, innovation (in its variable Bydoing_innova) is quite impacted by the use of the methodology, since it was the p-value with the highest relevance of all the variables; with an effect magnitude of 9 times with respect to the non-application of the methodology, which also leads to note that the student who has contact with the context in which a problem is developed outside the classroom, This, in turn, with the variable Bydoing_create, shows a magnitude of three times in relation to the pre-test, despite having a slight difference with the post-test.

The literature review also aligns with the findings of Bradberry and De Maio (2019), who emphasize how hands-on experience and experiential learning contribute to students' success by improving their writing, communication, and analytical skills. In addition, Niiranen's (2021) study emphasizes the importance of applying the Learning by Doing approach in technology education, highlighting how this approach fosters higher-order thinking and cognitive skills through practical application.

4. CONCLUSIONS

Undoubtedly, the *learning by doing* methodology impacts the teaching and learning process in a positive way, on the one hand, it immerses students in the learning process through experience, which allows them to develop a reflective stance on reality, and on the other hand, it allows the teacher to have a 360° view of the student in practice, being able to evaluate not only technical skills but also the development of soft skills.

One of the most important aspects of success in this type of activities is the permanent feedback provided by the teacher to the work teams, since this is the way to adjust the experience to its objectives and to observe the evolution in the resolution of conflicts between work teams, organization and logistics, teacher leaders of the activity, among other aspects that do not include curricular content developed in the classroom.

Higher education institutions should play a more active role in encouraging this type of dynamics within the classroom, allocating resources and expanding their contact network in order to have organizations interested in being part of these activities. The government's evaluation system in Colombia continues to push higher education institutions to have traditional teaching methods, giving too much emphasis to educational ranking from written tests, which can hardly measure the scope of the knowledge acquired by the student in a real context.

This study allows highlighting the importance of academic activities under the learning by doing methodology in students, at the level of their role as leader, in the creative proposal of ideas that provide solutions to the problems presented, as well as in the way in which an innovative offer is accepted and combined, containing every aspect and detail resulting from the members of each work group, in order to respond assertively to the situation presented. It should be noted that the methodology is oriented more to the development of soft skills, where the student prioritizes his interaction with the work team and with the organization in which he intervenes, which was seen in the results of the test used, where leadership, creativity and innovation were the most highly valued and had the greatest effect.

Finally, the learning-by-doing exercise of the business administration student, from the educational centers, traces a path to develop or test the skills that every manager must have in his profession. The practice and the staging of the student in real situations or directly in the company, gives account of his reflection in the assimilation of his abilities as a simple or complex process. In short, the acquisition of skills such as leadership, teamwork, conflict and stress management, efficiency, among other aspects demanded of the modern manager requires the interaction and direct exposure of the written theoretical content with the environment, to learn it, experience it and exercise it (De la Barrera, 2019; De la Barrera and Ramírez, 2022).

As for the limitations, they are initially associated with the sample size and the exclusive context of the study. In addition, there were many changes and adjustments in the schedule initially proposed, which may have influenced the students' perception at the time of answering the questionnaire. However, part of this situation was taken into account as the daily experience that every organization undergoes, and both teachers and students were able to adapt to it. It is suggested to inquire about the methodology per se for the realization of activities under *learning by doing*, in order to find optimal ways to solve these problems for the next implementations that other researchers will carry out.

On the other hand, it is planned for future research to measure the impact caused by this activity in the host organization, in the case of this study, the Atlántico Red Cross, which would allow developing a more complete knowledge of the impact generated in various ways by the interaction of the academic environment with the business environment, through methodologies such as learning by doing.

RESEARCH ARTICLE

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