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Scientific articles

Programa de desarrollo de habilidades del pensamiento como estrategia para disminuir el rezago educativo

Thinking Skills Development Program as a strategy to reduce educational failure

Pensando o programa de desenvolvimento de competências como estratégia para reduzir o atraso educacional

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Resumen

El rezago educativo es un tema de preocupación para las instituciones educativas por las implicaciones negativas que conlleva en el logro de objetivos institucionales orientados al desarrollo de los individuos y la prosperidad, en especial en países como México, cuyo gasto promedio en formación profesional por estudiante es muy bajo con respecto a la media de la OCDE. Por tal motivo, este trabajo tuvo como propósito formular un programa de habilidades del pensamiento como una estrategia para combatir el rezago educativo en un instituto tecnológico. El proyecto se llevó a cabo con una metodología de investigación-acción, es decir, un enfoque mixto que corresponde a un tipo de investigación descriptiva, con las siguientes fases: 1) fundamentación del programa con base en indicadores institucionales; 2) diseño del programa y publicación de una convocatoria para alumnos; 3) fase de reclutamiento y selección de alumnos; 4) implementación de un curso-taller, y 5) evaluación de resultados. Se conformó un grupo de 20 alumnos como muestra para la aplicación de herramientas de diagnóstico y evaluación y para participar en el curso-taller de desarrollo de habilidades del pensamiento. En los hallazgos se identificó una mejora notable en una evaluación final del curso con respecto a una evaluación diagnóstica en temas de habilidades del pensamiento, así como un buen nivel de satisfacción del grupo con el curso-taller. A partir de estos datos, se concluye que la estrategia basada en un programa de desarrollo de habilidades del pensamiento puede ser útil para la disminución del rezago educativo, ya que brinda a los estudiantes herramientas cognitivas para mejorar su desempeño académico, lo que requiere de un estudio longitudinal posterior para comprobarlo de forma empírica.

Palabras clave: habilidades de pensamiento, estrategia educativa, rezago educativo.

Abstract

Educational failure is a matter of concern for educational institutions due to the negative implications it has on the achievement of institutional objectives aimed at the development of individuals and the prosperity of countries, especially in countries like Mexico, as it has a very low average expenditure on professional training per student compared to the OECD average. The purpose of this work was to formulate a thinking skills program as a strategy to fase educational failure in a technological institute. The project was carried out with an action research methodology, a mixed approach that corresponds to a type of descriptive research, with the following phases: 1) foundation of the program based on institutional indicators; 2) program design and publication of a call for students; 3) recruitment and selection phase of students; 4) implementation of a course-workshop; and 5) results evaluation. A group of 20

students was formed as a sample for the application of diagnostic and evaluation tools and to participate in the thinking skills development course-workshop. Findings identified a significant improvement in a final course evaluation compared to a diagnostic evaluation on thinking skills topics, as well as a high level of satisfaction within the group with the course-workshop. From this, it is concluded that the strategy based on a thinking skills development program can be useful for reducing educational failure by providing students with cognitive tools to improve their academic performance, requiring further longitudinal study to empirically verify it.

Keywords: Thinking skills, Educational strategy, Educational failure.

Resumo

O atraso educacional é uma questão que preocupa as instituições de ensino devido às implicações negativas que acarreta na consecução dos objetivos institucionais que visam o desenvolvimento dos indivíduos e a prosperidade, especialmente em países como o México, cujo gasto médio com formação profissional por aluno é muito baixo em comparação com o Média da OCDE. Por esta razão, o objetivo deste trabalho foi formular um programa de habilidades de pensamento como estratégia para combater o atraso educacional em um instituto tecnológico. O projeto foi realizado com metodologia de pesquisa-ação, ou seja, abordagem mista que corresponde a um tipo de pesquisa descritiva, com as seguintes fases: 1) fundamentação do programa com base em indicadores institucionais; 2) concepção do programa e publicação de edital para estudantes; 3) fase de recrutamento e seleção de estudantes; 4) implementação de curso-oficina e 5) avaliação de resultados. Um grupo de 20 alunos foi formado como amostra para aplicação de ferramentas de diagnóstico e avaliação e para participação no curso-oficina para desenvolvimento de habilidades de pensamento. Os resultados identificaram uma melhoria notável na avaliação final do curso no que diz respeito a uma avaliação diagnóstica sobre tópicos de habilidades de pensamento, bem como um bom nível de satisfação do grupo com o curso-oficina. A partir destes dados, conclui-se que a estratégia baseada num programa de desenvolvimento de competências de pensamento pode ser útil para reduzir o atraso educacional, uma vez que fornece aos alunos ferramentas cognitivas para melhorar o seu desempenho académico, o que requer um estudo longitudinal posterior para verificá-lo empiricamente.

Palavras-chave: habilidades de pensamento, estratégia educacional, atraso educacional.

Fecha Recepción: Mayo 2023 **Fecha Aceptación:** Diciembre 2023

Introduction

Educational lag is an indicator that provides information on the delay and poor academic performance of students, which frequently precedes school dropout, which reveals the difficulties that the student experiences cumulatively, and which is expressed in the systematic failure of a series of subjects (Díaz Barajas and Ruiz Olvera, 2018). The Royal Spanish Academy (2023) defines it as a delay or residue of something, while for Muñoz (2009) educational lag is defined as the result of a process in which various factors intervene, such as exclusion from the educational system, school achievement below the minimum necessary and the repetition of courses, which represents an immediate antecedent of school dropout.

For this research, educational lag is understood as the academic level of an individual that is lower than expected and that does not accredit or limits the advancement of the student's academic life. According to Espinoza *et al.* (2012), lag is caused by multiple factors, which can be studied from two perspectives: intra-school variables and extra-school variables.

Some examples of intra-school factors that influence academic results are teachers' perception and beliefs about students, teachers' working conditions, salaries, teaching model, study plans, assignment and administration of resources, as well as the training provided to teachers. Regarding extracurricular factors, some of them are the students' family context, socioeconomic situation and culture. Some of these variables do not depend on the students' efforts, but affect academic achievement, such as the lack of support in the family context or the economic and cultural situation (Mendoza and Zúñiga, 2017).

In this context, universities and higher education institutions can contribute significantly to improving educational quality and educational indicators by focusing their efforts on the factors that affect the educational lag and dropout of students (Durán et al. , 2018). . According to the Ministry of Education and Vocational Training (2022), in Mexico, the average expenditure per student is $7,341, while the average in the OECD for higher education amounts to $17,559. This disparity is largely due to the allocation of resources for research and development, which reaches 33% in the organization's countries, compared to 15% allocated in Mexico.

Table 1. Entry, graduation and higher level qualifications in Mexico and the state of Jalisco

Data on entry, graduation and higher level qualifications in Mexico (2019-2022)						
Period	Enrolled students	New entry	Graduates	% graduated	Graduates	% of graduates
2021-2022	5,068,493	1,357,872	892,836	18%	no data	No data
2020-2021	4,983,204	1,291,677	855,731	17%	525,593	eleven%
2019-2020	4,931,200	1,409,386	826,817	17%	612,814	12%
Data on admission, graduation and higher level qualifications in Jalisco (2019-2022)						
Period	Enrolled students	New entry	Graduates	% graduated	Graduates	% of graduates
2021-2022	285,423	55,099	49,930	17%	No data	no data
2020-2021	286,039	50,756	54,794	19%	25,700	9%
2019-2020	13,031	3,116	2,640	twenty%	1,204	9%

Source: Own elaboration based on data from ANUIES (2022)

As evidenced, the percentage of graduates in relation to the total higher level enrollment in Mexico during 2019-2020 was 17%, which remained at the same level during 2020-2021 and experienced a slight increase to 18%. in 2021-2022. Regarding graduation, the percentage was 11% in 2019-2020, then increased to 12% in 2020-2021, and no information is available for 2021-2022.

In the specific case of the state of Jalisco, it is observed that the percentage of graduates in relation to total higher level enrollment was 20% in 2019-2020, decreased to 19% in 2020-2021 and fell to 17% in 2021- 2022. Regarding qualifications, the percentage was 9% in 2019-2020 and remained at the same level in 2020-2021 (no information available for 2021-2022).

These figures offer a clear vision of the situation facing the country in the field of higher education and show a low percentage of graduates and graduates, which reflects a considerable level of educational lag. This panorama highlights the importance of designing strategies that contribute to counteracting these figures (National Association of Universities and Higher Education Institutions [ANUIES], 2022). In addition to this, it is worth noting that both ANUIES and the Organization for Economic Cooperation and Development (OECD) agree that the educational lag in Mexico is significant in higher education institutions.

Indeed, Mexico faces a delicate situation in terms of failure and poor academic performance (Díaz Barajas and Ruiz Olvera, 2018), a reality that has international reach. In this context, the World Bank supports educational programs in 90 countries and is committed to helping them achieve development goal 4 of the 2030 Agenda for sustainable development, which seeks to "ensure inclusive and equitable quality education, and promote opportunities of lifelong learning for all, no later than 2030" (World Bank, January 25, 2023).

According to the study of the evidence gap map presented by Mexicanos Primero (January 25, 2023), the Latin American Network for Education (REDUCA) and the SURA Foundation, the director of Agent Activation at Mexicanos Primero, Laura Ramírez, highlighted in During the International Education Day, one million three hundred thousand students were lost in Mexico during the pandemic. Furthermore, he pointed out that of every 100 children who start primary school at age 6, only 40 manage to reach higher education and the other 60 are left out of the educational system.

Strategies to combat educational lag

Based on what was pointed out by Navarro (2003), the Mexican government has implemented strategies since 1991 with the objective of reducing educational lag, which encompass the design and implementation of programs that include aspects such as the provision of school materials and textbooks, the training and recognition of teachers, investments in infrastructure, institutional strengthening, as well as the promotion of greater commitment on the part of the community and families in the educational process. Some of these strategies are:

- The program to reduce educational backwardness (PARE, 1991-1996).
- The support program for disadvantaged schools (PAED, 1992-1996).
- The project for the development of initial education (PRODEI, 1993-1997).
- The program to reduce backwardness in basic education (PAREB, 1994-1999).
- The comprehensive program to reduce educational lag (PIARE, 1995-2000).
- The program to reduce backwardness in initial and basic education (PAREIB, 1998-2006).

Development of thinking abilities

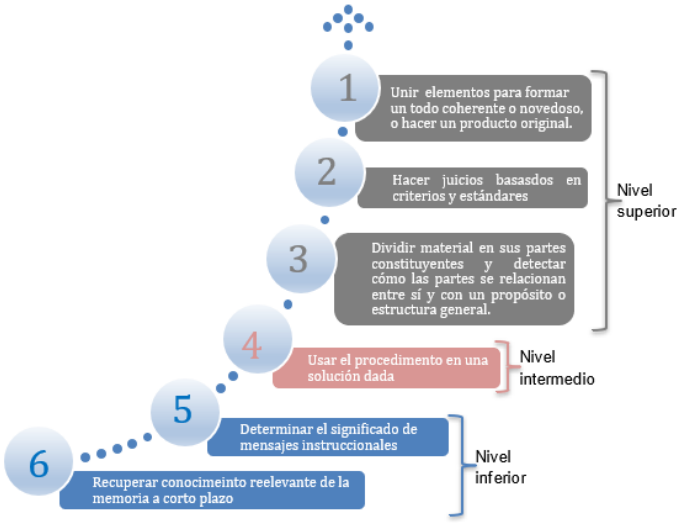
In academia, higher-order thinking skills have gained prominent importance in recent years. Various current publications highlight the relevance of its study, since it promotes the development of critical thinking and the use of cognitive abilities that make it easier for

individuals to search for solutions and innovations for both everyday and complex and abstract problems.

Critical thinking is defined as the ability inherent in every person to analyze, criticize, question, evaluate and reach their own conclusions regarding facts or topics. An effective strategy to cultivate it is the inductive model, which is presented as an efficient approach to teaching concepts, generalizations, principles and academic rules. This model makes it possible to issue conclusions that explain reality based on the information obtained by direct observation. Despite requiring considerable time as an instructional model, it has the advantage of generating high levels of commitment and motivation on the part of the student (Eggen and Kauchak, 2012).

González Murillo *et al.* (2017) carried out a categorization of thinking skills based on Bloom's taxonomy, which identifies six levels of cognitive complexity. This classification is structured in a hierarchy of three thought processes: lower order, medium order and higher order (figure 1).

Figure 1. Revised Bloom's Taxonomy



Source: González Murillo *et al.* (2017)

Figure 1 shows the application of Bloom's taxonomy to categorize thinking skills. Lower-order skills, which require basic cognitive processes, are identified at level six as "remembering" and at level five as "understanding." Intermediate-order skills include the category of "application," which involves the development of procedures. Finally, higher order skills, which demand greater capacity for abstraction and reasoning, are identified with "analyze", "evaluate" and "create" in points three, two and one, respectively (González Murillo et al., *2017*). .

This proposal arises in response to the situation of educational backwardness in Mexico. According to the 2017-2018 report of the World Economic Forum, Mexico ranks 80th internationally in the global competitiveness index of higher education and training, which evaluates the quality of the educational system, the quality of education in mathematics and science , and the higher education coverage rate (WEF, 2018). In addition, the institutional development program of the Tecnológico Nacional de México (2019), PDI 2019-2024, has among its objectives " strengthen the quality of the educational offer" (objective 1) and "promote the comprehensive training of students to contribute to the development of all its potential" (objective 3).

In this context, the proposal for a course-workshop for the development of thinking skills is presented with the objective of addressing educational lag at the José Mario Molina Pasquel y Henríquez Technological Institute, Puerto Vallarta campus (ITJMMPYH), for which the following questions: What are the key characteristics of a course to develop thinking skills in university students? To what extent can a workshop course with exercises to strengthen cognitive abilities benefit the development of thinking skills in university students? What could be the impact of developing thinking skills through a course-workshop on the educational lag of university students? To what extent can educational indicators be improved in a higher education institution by implementing a thinking skills development course?

Now, it is worth mentioning that this work focused on the foundation and description of the proposal for the Development of Thinking Skills course, as well as its evaluation as a pilot test. The measurement was carried out through performance in the course and self-assessment of learning strategies, essential to regulate metacognition. Therefore, some of the questions related to the effect on educational lag will be addressed in subsequent studies.

Materials and methods

Methodological aspects

The research presented was based on a descriptive and analytical approach, for which a mixed design was implemented. Furthermore, it is descriptive in nature, since it delimits aspects of reality, such as educational lag and strategies for the development of thinking skills. Likewise, through the analysis, a proposal was formulated with the objective of improving the training processes and having an impact on the educational indicators of the institution. The mixed approach is implemented for data collection and analysis through research techniques that address perceptions and satisfaction with a qualitative approach. Likewise, the results of the course are quantified to measure their impact on academic performance.

The Thinking Skills Program (DHP) was implemented in all ITJMMPYH majors, including Business Management Engineering, Computer Systems Engineering, Electromechanical Engineering, Tourism, Architecture and Gastronomy. The program targeted students with low academic achievement, identified through their GPA, and an invitation to participate in the program was extended to those with the lowest GPAs. The structure of the program included three phases: publication of the call, recruitment and selection of the course, and delivery of the course-workshop, with a total duration of 15 weeks.

The general objective of the DHP program

Implement a course-workshop to develop thinking skills as a strategy to combat educational lag in students of the different careers offered by the ITJMMPYH and to reduce failure and dropout rates.

Specific project objectives

1. Analyze the enrollment approval and failure rates to form a group with students with low academic performance.
2. Prepare a diagnosis of the group's requirements and design the course-workshop for the development of thinking skills.
3. Launch the pilot test of the course-workshop.
4. Evaluate the results of the pilot test with respect to the development of thinking skills and satisfaction with the course.

The program activity plan is shown in Table 2 below:

Table 2. DHP Program Activity Plan

Phase	Program activities (DHP) (August-December 2021)	Duration
1	Publication of call and dissemination of the program	2 weeks (16-27 Aug 2021)
2	Recruitment and selection of students with the following tools: a) Diagnostic knowledge assessment b) VARK test c) Machover test d) Raven Test e) Evaluation of interpersonal relationships f) Clinical analysis by the institute's doctor.	5 weeks (Aug 30-Oct 1, 2021.) 10 hours
3	Thinking skills course-workshop Student/teacher/program evaluation	8 weeks (04 Oct-26 Nov 2021) 40 hours

Source: Own elaboration based on ITJMMPYH data

Program structure

Phase I. In the first phase, lasting two weeks, a call was made considering all the institute's majors: Business Management Engineering, Computer Systems Engineering, Electromechanical Engineering, Tourism, Architecture and Gastronomy, and aimed at low-level students. academic performance. For this, the general average of the Kardex was considered, based on the analysis that can be seen in table 3:

Table 3. Students with failed subjects by major (2021)

	IGEM	ARQ	IEME	ISC	GAS	TUR	Total
Total current students	468	286	293	267	241	247	1802
Total students with at least one failed subject from second to fifth semester	65	75	48	3. 4	35	53	310
Percentage of students with at least one failed subject from second to fifth semester	13.89%	26.22%	16.38%	12.73%	14.52%	21.46%	

Source: Own elaboration based on ITJMMPYH data

Phase II . The second phase lasted 5 weeks (10 hours), where the recruitment and selection of students was carried out with the purpose of having an approved group with an identified lag situation (failed subjects), and the need to develop thinking skills, as well as the interest of students to participate in the program. Psychometric tests were also applied.

The first psychometric test that was applied was the VARK (Fleming and Mills, 2001) in order to know their learning style (visual, auditory, reader-writer and kinesthetic). The second psychometric test that was applied was Machover (Escribano, 1976)with the objective of identifying personality traits . Then another psychometric test known as the Raven test (Gordillo and Daza , 2005) was administered to the students , which measures reasoning abilities, with an intellectual quotient (IQ) scale. Subsequently, the CERI psychometric test was applied with the objective of evaluating interpersonal relationships (Janampa, 2018). Finally , a clinical interview was carried out with the support of the ITJPV medical and psychological area. At the conclusion of the recruitment procedure, a group of 20 students was formed through convenience sampling from the population of 310 students who had been identified as having failed subjects.

Phase III . In this phase, a thinking skills course-workshop was developed and implemented with a duration of 40 hours (30 theoretical hours and 10 practical hours), in which conceptual competencies of some topics such as thinking, intelligence and cognitive processes were considered; procedural skills (speaking and writing clearly and precisely, reading comprehension and analysis, and synthesis of information), and, finally, attitudinal skills (empathy with others and openness to dialogue, understanding and tolerance of diversity, as well as participation in teamwork).

The course combined the principles of intelligence theory from a constructivist perspective, with emphasis on thought processes, the use of knowledge and previous experience as an activator of significant learning. The course focused on basic skills related to cognitive processes that, through practice, are expected to be strengthened, such as observation and classification, ordering, hierarchical classification, analogies, analysis and synthesis, and spatial reasoning, among others.

It was also based on the theoretical perspective of the construction of significant knowledge, in which each student is responsible for constructing their own knowledge, in a dynamic, self-regulated and autonomous way. Likewise, metacognition was promoted, guiding students in the search for self-recognition and strengthening of skills. In short, the course sought to activate mental processes related to learning in students, so that they can apply higher-order intellectual skills that allow them to apply critical thinking related to problem solving and the acquisition of knowledge in their career.

Course objective

Promote the development of cognitive and metacognitive skills in students through the management of theoretical-practical elements that lead them to reformulate their own thinking, through knowledge of basic processes aimed at problem solving , self-management of learning and learning. significant, with exercises that allow them to apply the acquired knowledge in an experiential way.

Thematic content

Unit I. Thought

1.1 Definition

1.2 Elements

1.3 Types

1.4 Cognitive functions of the mental act

1.5 Cognition

1.6 Metacognition.

1.7 Basic cognitive skills.

Unit II. The intelligence

2.1 Jean Piagett

2.2 Lev Semyonovich Vygotsky

2.3 Howard Gardner

2.4 Robert Sternberg

Unit III. Cognitive processes and abilities

2.1 Basic thought processes

2.2 Attention

2.3 Observation

2.4 Sensory perception

2.5 Memory

2.6 Comparison relationship

2.7 Classification

2.8 Analysis and Synthesis

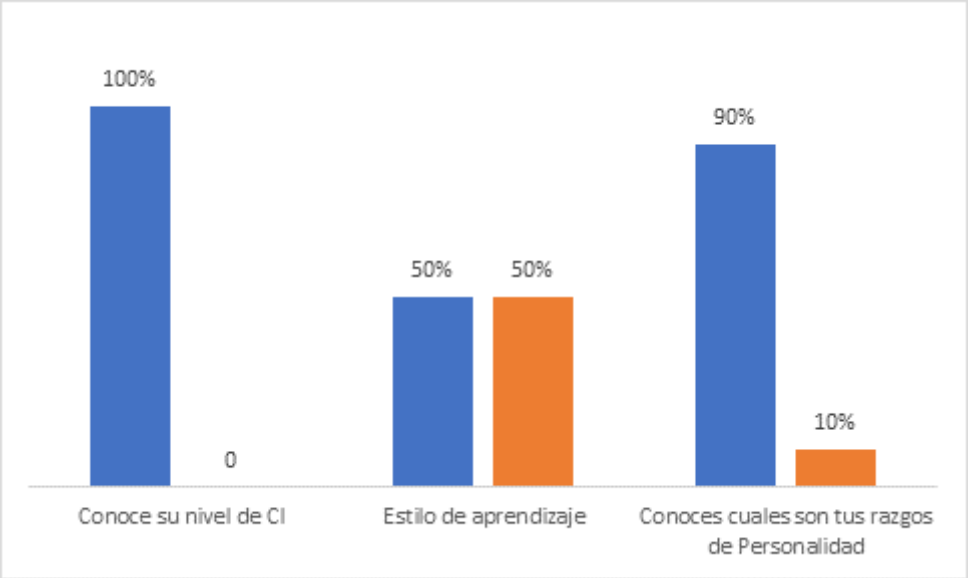
2.9 Intelligence

2.10 Creativity

Results

Below are the results of the diagnostic instruments used in phase 2 of the project, as well as those found in the delivery of the course-workshop.

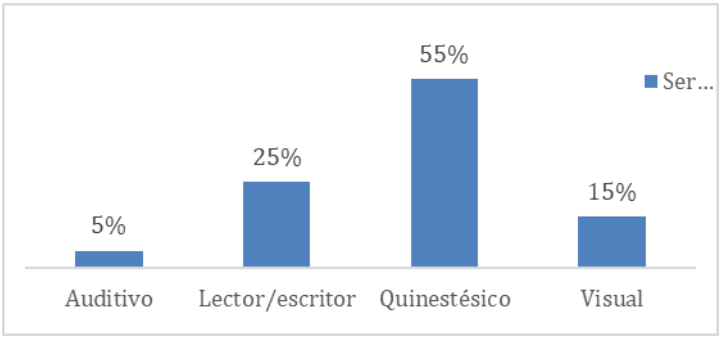
Figure 2 . Self appraisal



Source: Own elaboration based on ITJMMPYH data

Regarding the diagnostic evaluation of the 20 students, 100% stated that they do not know their IQ level, 50% do not know their learning style and 90% do not know their personality traits, which can be seen in the figure. 2. This information demonstrates the lack of knowledge in the three key factors of the designed program.

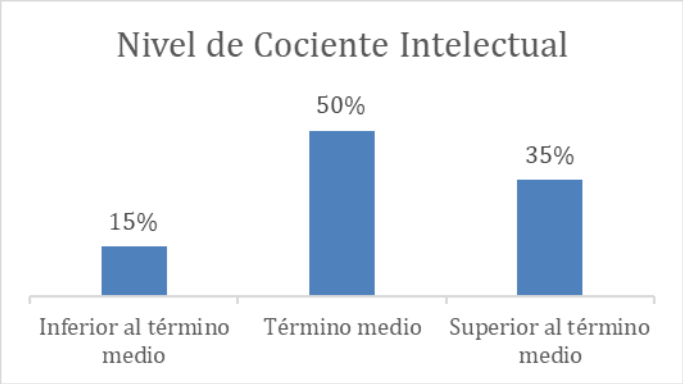
Figure 3. Learning styles results



Source: Own elaboration based on ITJMMPYH data

Figure 3 presents the results of the VARK learning styles test. It can be seen that the predominant learning style was kinesthetic with 55%, followed by 25% reader/writer, 15% visual and 5% auditory. This information allows us to design teaching-learning strategies for students.

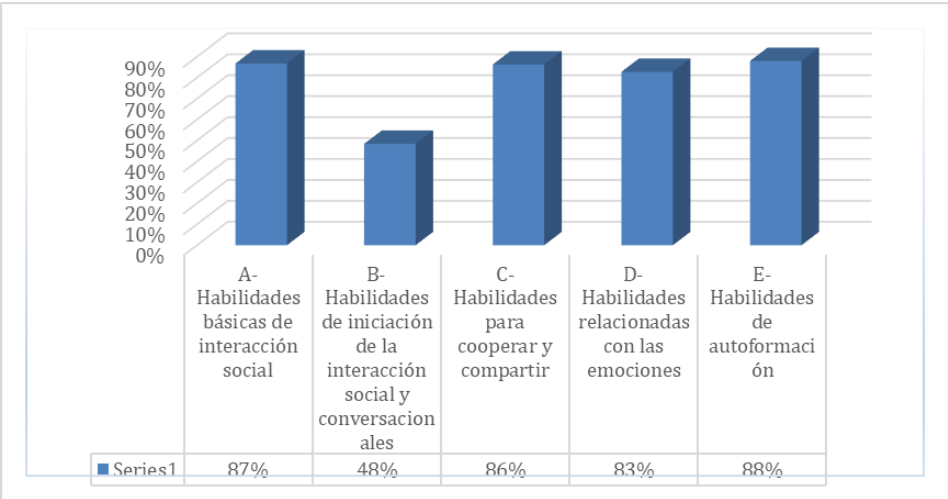
Figure 4. IQ level results



Source: Own elaboration based on ITJMMPYH data

In relation to the intellectual quotient, using the Raven test it was obtained that, of the 20 students who participated in the course, 50% have an average IQ, followed by 35% with an IQ above the average and, finally, 15% have an IQ lower than the average (see figure 4). This information is important data to describe the students' abilities, since the IQ is related to skills for the use of language and logical and mathematical reasoning, essential qualities for some subjects.

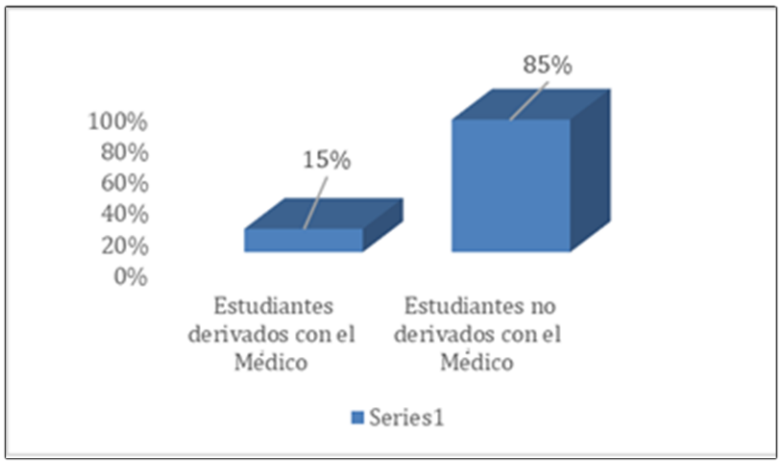
Figure 5. Results of evaluation of interpersonal relationships (CERI)



Source: Own elaboration based on ITJMMPYH data

Of the 20 students surveyed to evaluate interpersonal relationships, 88% point out the ability to self-train, followed with 87% by the basic skills of social interaction, 86% the skills to cooperate and share, 83% the skills related to emotions and, finally, 48% the initiation skills of social and conventional interaction (see figure 5).

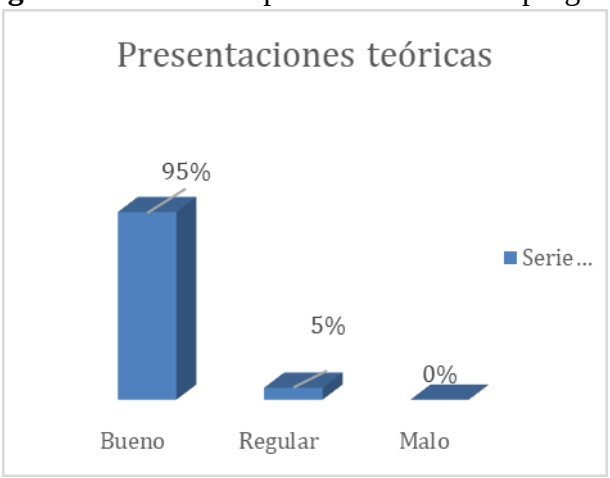
Figure 6. Clinical interview results



Source: Own elaboration based on ITJMMPYH data

From the results of the clinical interview, it was obtained that only 15% of the students were referred to the institution's medical service, who were given general guidance about their condition and the importance of following their treatment and control (see figure 6). Consequently, they agreed to go to their family medicine unit (FMU) and also made an appointment for a follow-up in a month or sooner, depending on each case.

Figure 7. Theoretical presentations of the program



Source: Own elaboration based on ITJMMPYH data

Questions were asked about satisfaction with the theoretical presentations of the course, on a scale of good, average and bad, which yielded the following results: 95% rated the theoretical part of the program as good and 5% mentioned average (see figure 7). . This information allows us to identify a high level of satisfaction in the theoretical part of the program.

The program also included a practical evaluation developed in Google Forms, which consisted of a questionnaire with 14 exercises of basic skills that, through practice, were

expected to be strengthened, such as observation and classification, ordering, hierarchical classification, analogies, analysis and synthesis, and spatial reasoning.

Table 4. Percentage of the level of use of the program.

Student number	Initial evaluation average (IQ)	Final evaluation average (CF)
Student 1	90%	95%
Student 2	96%	98%
Student 3	66%	88%
Student 4	42%	76%
Student 5	48%	64%
Student 6	48%	64%
Student 7	60%	82%
Student 8	60%	70%
Student 9	60%	70%
Student 10	66%	80%
Student 11	66%	88%
Student 12	66%	75%
Student 13	70%	88%
Student 14	76%	76%
Student 15	84%	90%
Student 16	96%	98%
Student 17	60%	82%
Student 18	78%	88%
Student 19	54%	76%
Student 20	58%	80%
Average	67%	81%

Source: Own elaboration based on ITJMMPYH data

Table 4 shows the results of the practical evaluation that was carried out in a diagnostic stage and at the end of the course to have a reference and compare the results. To determine if there was a significant difference in the means of the initial (67) and final evaluation (81), a

hypothesis test was applied; Prior to selecting the statistic, the Shapiro-Wilk sample normality test was performed in SPSS, which yielded the following significance values: initial evaluation .275, and final evaluation .496 . Therefore, because the values were greater than .05 in both samples, it was concluded that the distributions fit the standard normal and are appropriate for the use of parametric statistics. From this, the Student T for related samples was selected, which was developed using SPSS *software* , with the following hypotheses:

Null hypothesis: There is no difference in the results obtained in the initial and final evaluation.

Alternative hypothesis: There is an increase in the average of the final evaluation due to the course.

Table 5. Hypothesis testing for related samples

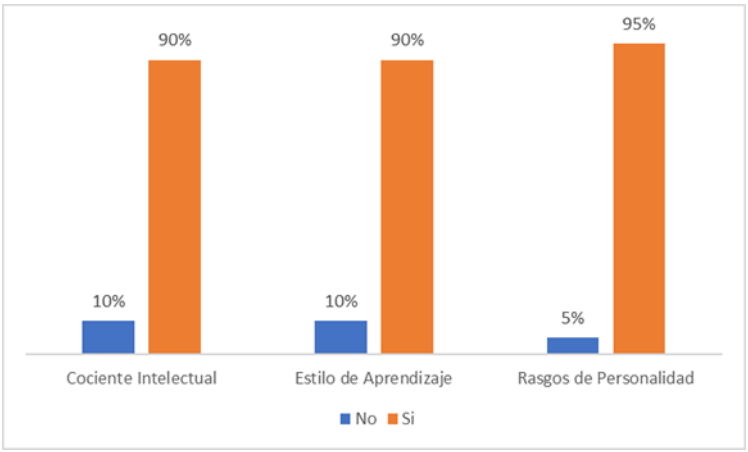
		Related differences					T	gl	Sig. (bilateral)
		Half	Typical deviation	Typical error of the average	95% Confidence interval for the difference				
					lower	Superior			
Pair 1	Initial average - Final average	-14,200	8,912	1993	-18,371	-10,029	-7,125	19	,000

Source: Own elaboration based on ITJMMPYH data

Table 5 shows the results of the hypothesis test, from which the following can be concluded: because the level of significance was less than .05, the null hypothesis is rejected, and it can be confirmed that The results of the final evaluation were significantly higher than those of the initial evaluation, and the course-workshop for the development of thinking skills had a positive effect on the achievement of the students who participated in the course-workshop.

Course evaluation results

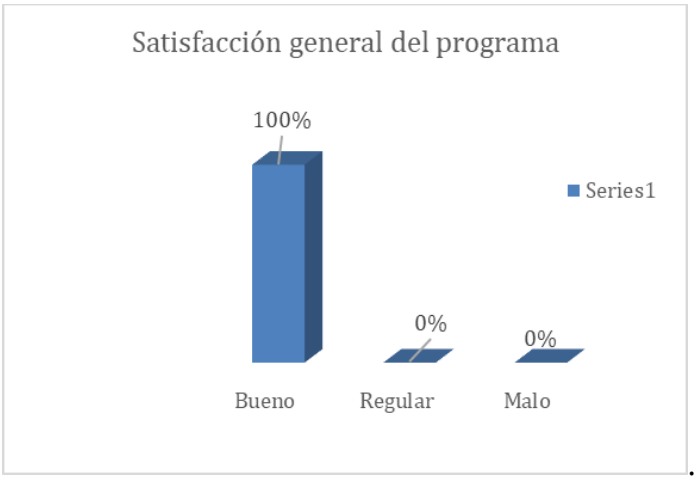
Figure 8. Final evaluation of the program



Source: Own elaboration based on ITJMMPYH data

In the results of the final evaluation of the program by the 20 students, it was found that 90% stated that they knew their IQ level, 90% indicated that they knew their learning style, and 95% indicated that they knew their personality traits. (see figure 8). This information allows us to identify that there is significant knowledge in the three key factors to be studied in the program, and that the implementation of the program had a positive impact on self-knowledge, a relevant aspect for metacognition.

Figure 9. Overall Program Satisfaction



Source: Own elaboration based on ITJMMPYH data

According to the results obtained from the 20 students surveyed in the final evaluation, on a scale of good, average and bad, 100% rated the course-workshop as good. This information allows us to identify that the students were completely satisfied with the course-workshop, as can be seen in Figure 9.

Discussion

In response to the first question about the characteristics that the course-workshop for the development of thinking skills should meet, this project presents as a strength the design of the course-workshop carried out with the support of an interdisciplinary group. This group included professionals from areas such as psychology, economic-administrative and engineering, who contributed to the development of the contents, the preparation of a teaching guide and the selection of exercises. This participation resulted in the creation of a manual that facilitates the replicability of the course by the teacher assigned to the activity.

Another positive aspect was the specific selection of students for the course-workshop, since those who, according to the conception of the project, were academically lagging due to having failed subjects, were chosen, which was expected to maximize the benefits of their participation in the program. .

In relation to the second research question, about the impact of the course-workshop on the development of thinking skills in university students, the results indicate a significant improvement in the performance of the course-workshop, which shows a positive impact on the development of thinking skills. Comparison between the results of an initial and a final evaluation, using hypothesis testing, supports this conclusion. In addition, a satisfactory level of satisfaction on the part of the students participating in the program stands out.

On the other hand, an identified disadvantage is related to the scope of this phase, which presents the program design and the pilot test, but does not allow visualization of the long-term impact on the trajectory of the students who participated in the course-workshop. Therefore, the questions that seek to investigate the impact on student lag and institutional indicators, such as failure or dropout, will be addressed in a later phase of the project.

Now, the study carried out by Ortiz-Hernández (2020) serves as a reference to compare the results obtained in this project. In their research, a pedagogical strategy was implemented in a reading and writing class at the university level, adaptable to other educational levels. The author concluded that the use of controversial topics contributes to the development of students' critical and reflective thinking, a finding similar to the results of this work, since thinking begins and is channeled from problematic questions that encourage the search for solutions. and contribute to the development of thinking skills.

Another study that serves as a reference is the one carried out by Zohas (2006), who developed a strategy for high school students in the subject of physics, aimed at developing thinking skills. Their approach included creating an environment where students could teach themselves to be creative. The author concluded that the development of thinking skills is crucial, since it allows students to learn to develop innovative projects. This study is related to

the vision of this project because it provides students with tools to regulate their learning process and foster competence in managing large amounts of information, as well as in decision-making through critical thinking.

Finally, Báez and Onrubia (2016) developed a study from a constructivist and sociocultural perspective in which they proposed criteria for teaching thinking skills. The authors concluded that thinking, in the form of skills such as creative, critical thinking, problem solving and metacognition, is fundamental for the development of individuals in modern societies. This study serves as a reference to compare the results and approach of this work in relation to the strategy to promote metacognitive reflection processes, since it improves thinking abilities and contributes to the formation of more mature and independent students.

Conclusion

From the implementation of the thinking skills development course, it can be concluded that there was a positive impact on the students' self-knowledge, which is relevant to facilitate metacognition and planning learning strategies. Initially, most students were unaware of their intelligence quotient (IQ), and only 50% had information about their learning style and personality traits. At the end of the course, 90% said they knew their IQ, as well as their learning style, and 95% were able to identify their personality traits.

Regarding the IQ results obtained through the Raven test, it is observed that 50% of the students obtained a result of average intelligence, 35% obtained a result above the average, and 15% had a lower IQ. to the middle ground. It is relevant to highlight that a low IQ is associated with possible difficulties in areas such as mathematics or those that require higher cognitive functions for the use of language, such as reading and writing for writing academic texts. However, it is important to note that 85% of the students demonstrated average or above average intelligence. This suggests that the causes of low performance and lag in these students, for which they were selected and invited to participate in the course (having failed subjects), are due to variables other than their cognitive abilities.

It is also highlighted that as part of the course activities, a diagnosis of the health situation was carried out through a clinical interview. Under the premise of the relationship between health and consistency in school, 15 % of the students were referred to the institution's doctor for a more in-depth review. When necessary, referrals were made to public health institutions for more extensive monitoring and control of their health.

Regarding the use of the program, a diagnostic evaluation and a final evaluation of the course were carried out. The initial average was 67% and the average after the implementation of the course was 81%. To verify the difference in the results more accurately, a hypothesis test

was applied, and it was possible to verify that the thinking skills development course had a positive effect on the students' achievement. As a complement to knowing the impact of the course, a survey was applied to know the perception of the level of understanding of the course program and 89% stated that it was good, and 11% regular, which is consistent with the achievement results.

In relation to the group's satisfaction with the activities and the course program, 100% responded to have a good level of satisfaction, which indicates that the activities developed were liked by the students, coupled with the fact that there was a positive evaluation. of their contribution to the development of thinking skills.

Finally, it is worth mentioning that in higher education institutions there is a constant concern for the indicators that account for educational quality, which in turn measure the efficiency and effectiveness of the institutions, which is particularly relevant for schools belonging to the sector. government for its responsibility in the exercise of public spending and accountability. Some of these indicators are coverage, terminal efficiency and the decrease in dropouts and educational lag.

As a response to these concerns, in this work a proposal for a course to develop thinking skills was presented, from which it is concluded that it is a strategy that can contribute to better enabling students to develop academic activities, and with this also to the improvement of the aforementioned indicators. However, it is necessary to do more monitoring of this strategy to know its real impact on the aforementioned indicators (and on educational lag), since the scope of this work corresponds to the foundation, description and evaluation of the proposal from the academic point of view.

Future lines of research

From this project, two future lines of research emerge. Firstly, it is proposed to carry out medium and long-term monitoring of the academic career of the students who participated in this pilot test. The objective is to visualize if there is any favorable trend in your academic performance that can be attributed to the development of thinking skills. This monitoring will allow valuable information to be obtained about the long-term impact of the intervention and its influence on students' academic performance.

In the second instance, it is proposed to establish operational guidelines for the course-workshop so that it can be taught in a standardized way. This could be aimed at both students who are lagging behind and new students who are starting their professional careers.

Participation in a course of this nature could provide them with support tools for their professional training.

Finally, from a research perspective, it is suggested that other studies be carried out focused on the design of proposals to develop thinking skills in university students. These studies could explore the relationship between these skills and academic outcomes. In addition, longitudinal research could be carried out to analyze how these skills affect the job positioning and professional development of individuals. These approaches could be of particular relevance for higher education institutions interested in improving the comprehensive training of their students and their preparation for the workplace.

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