Semiotic Analysis as A Strategy for The Development of Critical Thinking in High School Students of The Virgilio Drouet Educational Unit in The Era of Artificial Intelligence

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Abstract

The rapid evolution and uncontrolled use of Artificial Intelligence (AI) imposes significant challenges in education, which raises a reflection and analysis of Artificial Intelligence and its impact on the teaching-learning process within the current educational system. For this reason, it is important to seek the necessary strategies to train students for the emerging technological environment. Semiotic analysis is presented as a potential tool to innovate and develop critical skills; because semiotics focuses on the signs and codes that structure reality, it provides the necessary skills for students to critically interpret and analyze various realities and problems while providing innovative responses. Based on semiotic analysis, this research provides a methodology that integrates intuition, argumentation, and analysis with knowledge, encouraging a critical and reflective understanding of the signs, symbols, and codes that make up reality. This research aims to promote the knowledge and use of semiotic analysis as an efficient methodology for the educational environment.

Keywords: *Semiotics, Critical Thinking, Artificial Intelligence, Codes, Signs, Reality*

INTRODUCTION

In the current context, the rapid advance of Artificial Intelligence (AI) raises significant challenges, especially in education, since a deep reflection must be made on integrating this technological advance's contributions into the educational process. This research article pays special attention to the exploration of semiotic analysis as a strategy to encourage the development of critical Thinking in students in the face of the prominent presence of AI.

Semiotics is understood as the discipline responsible for the study of signs in human communication; in this sense, it seeks to understand how these signs are created and used and how meaning is attributed to them. Semiotics helps to understand how signs work and how to interpret them. Semiotics as a strategy allows one to address the different skills that a critical thinker must have since, when addressing the understanding of the signs that make up reality, it forces the person who turns to it to decode and encode the signs and codes perceived in order to understand the reality in which a constant active dynamic is maintained. Thus, the deep signs and codes that obtain the paradigm that supports their meaning are important to understand what is desired to communicate; it can be said that whoever turns to semiotics is obliged to analyze, evaluate, argumentation, and creation.

Being able to think critically leads the student to understand the context of his or her reality, to reflect on the missing elements to raise and find solutions to the various challenges and difficulties that the environment raises. As Ortiz, Villamar, and Baldeón (2024) indicate, awareness allows us to perceive reality and search for the causes and consequences of what happens. From this perspective, this research proposes semiotic analysis in the teaching and learning process as a tool to strengthen critical Thinking in the face of the advance of artificial intelligence.

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The various educational proposals of a country generally focus on the human and professional profile that it wishes to form, so it must guarantee an education that forms the cognitive and social skills of students; thus, Ríos (2023) expresses that the COVID-19 pandemic transformed the educational system since the forced integration of ICTs to continue with the educational act led both teachers and students to use them without fully knowing the characteristics of the various tools. The easy-going culture has generated the abuse and uncontrolled use of these tools and artificial intelligence in academic activities. In this sense, Díaz (2023) highlights that when artificial intelligence is used without a review of the data that arise from it, the acquisition of knowledge and personal contribution is limited. From this perspective, artificial intelligence before being supported in learning is a factor of deterioration of academic activity. From this perspective, the need arises to enhance the student's critical attitude and aptitude; in this sense, one of the answers is semiotics as a tool in the essential development of Thinking.

Meo (2023) indicates that Peircean semiosis allows the person to question himself based on intuition. Thus, linking intuition with knowledge leads to the semiotic analysis of the skills that a critical thinker must possess, which presents itself as a solution to the problem presented.

ARTIFICIAL INTELLIGENCE

Advances and technological revolutions have given rise to Artificial Intelligence (AI), which has gained ground in different professional fields. Rouhiainen (2018) defines artificial intelligence as the ability of computers to execute various activities that regularly demand human intelligence, which is the ability to interpret and create activities without human action that AI presents. Artificial intelligence (AI). Similarly, it can be said that it is a discipline of computer science that proposes systems that perform tasks that usually demand human intelligence, among which are learning and problem-solving.

The use of AI in education poses an ethical challenge since it has not yet been possible to regulate to what extent its results will be taken as pedagogical support. The experience of current use in the academic field shows that some students take the results of their consultation as the tool gives the information without reviewing or contributing their knowledge. Likewise, it is necessary to consider the lack of education in digital tools that exists in Latin American homes; parents are excluded from the digital activity of their children, either due to a lack of training in them or due to a lack of time, which prevents them from finding space for socialization and selection of information (Palacios & Medranda, 2018).

González (2023) indicates that generative AI can be used to help students write essays and other texts. When optimizing time, one of the activities that should be promoted is the verification and analysis of information and complementing it with the student's own knowledge and the contributions of the authors and experiences discussed in the learning process to develop thought and knowledge. The use of AI challenges the task of teachers, who must be mediators between artificial intelligence and the cognitive development of students, seeking strategies that lead to the use of this powerful tool for the personalization of learning, encouraging dialogue about its results, and the generation of critical Thinking. Likewise, integrating it into the educational process must consider ethical and responsible use. AI is a tool that complements the educational process since it improves the quality of learning, but it must be taken into account that it can never replace the contribution of the human factor in teaching.

CRITICAL THINKING

Developing critical-creative Thinking in students today is urgent if we want to form autonomous beings capable of reasoning and solving problems in their daily lives. The imminent advance of technologies has influenced the autonomy of thought of adolescents to be diminished. The use of artificial intelligence is excessive, and in education, it has not yet become a solid educational support tool. In this way, the thought process has been reduced in the new generations who find everything easy within this digitalized system that has turned this century into a century of "easy-going." Jaramillo et al. (2024) maintain that "the easy-going nature of a mobile device creates a dependency on it" (p.153). This becomes a vicious cycle that could deteriorate the critical thinking of adolescents. Because of this, it is important to encourage its development from an early age.

Contemporary times require that new generations be able to identify and solve problems that affect their social dynamics in such a way that their critical Thinking has direct contact with the reality that surrounds them. Paul and Elder (2003) mention that a person capable of critical Thinking is someone who manages to "formulate questions clearly and precisely; evaluate relevant information; reach conclusions and devise solutions to complex problems" (p. 4). Thus, the education provided must be oriented toward problem-solving through analysis, reflection, and creativity.

There are various skills that a person with critical Thinking possesses. Cangalaya (2020) maintains that a critical thinker develops four fundamental skills: argumentation, analysis, problem-solving, and evaluation. These skills must be developed in the educational itinerary of students, which implies that teachers in the various subjects must work in an interdisciplinary manner. Thus, Medranda et al. (2023) indicate that critical Thinking is a complex knowledge process that requires the individual to develop logical, critical, and pragmatic skills, such that only by exercising the brain will a complete development of thought be achieved. Consequently, implementing critical Thinking in education is important because it must generate in students the skills to investigate, make decisions, solve problems, and improve conditions (Cangalaya, 2020, p.143).

Among the basic skills and expertise that teachers must develop is that of asking questions that challenge students to think reflectively about the content they are learning and, above all, how it relates to their daily lives.

The application of a model that encourages the development of these skills in students is essential in the current context. De Carvalho et al. (2021) highlight that in this context of globalization and uncertainty, education is an essential input and tool for survival. For this reason, the implementation of an educational model that encourages the development of critical thinking in students is a sine qua non condition; that is, it is an essential condition.

Implementing strategies that involve technological use integrating analysis, argumentation, and interpretation is essential in this regard. Benavides and Ruíz (2022) argue that students must use tools that lead them to solve problematic situations on their own, which fosters critical Thinking in them. From this perspective, it can be said that students must use the knowledge acquired as tools for problem-solving. In this way, the study and understanding of semiotics are presented as a solution for change.

SEMIOTICS AND CRITICAL THINKING

Before we delve into the substantial method that links semiotics with the development of critical Thinking in students, semiotics must be defined and conceptualized. Pierce (1998) mentions that semiotics is "a method that allows us to understand cultural practices that necessarily imply meanings of diverse order" (p. 7). From another perspective, semiotics is the science that, through linguistic coding and decoding, reaches an understanding of the communicative relationships that are part of a culture. Likewise, Pierce (1998) indicates that apart from "reflecting reality, signs are involved in its construction" (p. 133). Therefore, all the dynamics that the student carries out in his daily life will be given by the semiotic interpretation of what happens around him.

Within the usefulness of semiotics in everyday life, Karam (2005) establishes that semiotics act as an aid that leads to understanding the processes of the meaning of the contexts that are of interest to study. It is, therefore, understood that semiotics can carry out a study of the processes that intervene in the formation of reality, as well as of reality itself. Semiotics involves the study of icons, signs, and symbols, and the interpretation of these is what connects it with the functioning of the interpretation and construction of reality.

In this construction and interpretation, Pierce, in his semiotic theory, puts into operation the perception, rationalization, and conceptualization carried out by the brain. Santaella (2001) indicates that "Pierce conceives semiotics as a synonym of intelligence" (p. 416). In this way, semiotics can be conceived as a developer of human thought; however, if applied appropriately, it could also promote the development of critical thinking.

In her article on Pierce and the sign of his semiotics, Lucia Santaella analyzes the sign and its growth in today's society, a society that is undergoing abrupt technological growth; in her text, Braga (2023) mentions that "Unfortunately, the treatment of Peircean semiotics is often reduced to a schematic and unproductive vision

of the trichotomies of signs. This reduction does not do justice to the potential that can be extracted from Peirce's semiotics" (p. 22). Leaving a comment that indicates that the possibilities of use of Piercean semiotics must be carried out due to its feasibility of application.

Within the analysis that must be carried out to extract meanings from given signs, in one of his published interviews, Roland Barthes mentioned that "when dealing with social objects, ideological alienation is immediately found in the very existence of a full meaning" (Barthes, 1983, p.44). Using this given proposition agrees with the feasibility of applying Pierce's semiotics since, in the analysis of social elements, argumentation and evaluation are fundamental axes.

Thus, the need to use semiotics as a method for the development of critical Thinking arises due to constant technological growth. Braga (2023) indicates that "We are surrounded by signs everywhere, and, furthermore, signs continue to grow disproportionately in the world" (p. 25). Due to this, the use of semiotics as a tool is necessary since reality continues to be constructed, and signs continue to appear constantly.

Walters Sierra uses semiotics within applied pedagogy in film analysis; in his analysis, he concludes that semiotic knowledge in the projected film analysis "favors the recognition of the implications and consequences of the characters' actions, since students analyze decisions, gestures, items of clothing and contexts in which the existence of characters is framed" (Walters, 2024, p. 81). The research shows that the analysis of signs within the film projection favored the students' ability to analyze and conceptualize the different contexts in which the characters were involved and that it is in line with what was proposed by León, who maintains that semiotics in the educational context is " a new discipline that, from its object of study, the sign, allows research and proposals for a more critical reading of the world" (León, 2014, p.34). In this way, this same process using semiotics can be used by students when interpreting their reality and then using their critical Thinking to conceptualize it and be part of it.

METHODOLOGY

This research adopts a mixed methodology, which integrates qualitative and quantitative approaches. This approach is suitable for addressing the objectives set, as it allows for a comprehensive understanding of the phenomenon studied. According to Sampieri (2006), "combining quantitative and qualitative information turns it into substantive and in-depth knowledge" (p. 1). The combination of these approaches enriches the analysis, allowing for exploring both the depth and scope of the phenomenon.

Ethnographic design is used for the qualitative part since it allows us to deeply understand the socially constructed meanings around the subject of study. As Miguélez (2005) points out, "the traditions, roles, values, and norms of the environment in which we live are gradually internalized and generate regularities that can adequately explain individual and group behavior" (p. 1). In this sense, the ethnographic design is in line with the objectives of the research, as it is linked to the semiotic analysis within specific social dynamics.

critical thinking assessment test based on semiotic analysis was used . This instrument is based on the model of Halpern's Critical Thinking Assessment Test, but was adapted to the context of this research, completely modifying its content. The test includes analysis cases based on everyday semiotic interaction, allowing the assessment of critical Thinking through the interpretation of codes formed by signs (symbols, icons and clues).

According to Chagoya (2008), "tests constitute a resource for evaluation" (p. 25), and in this particular case, the designed instrument meets the purposes of this research by evaluating critical thinking skills related to semiotics.

The test was applied to students of the private educational unit of the city of Quito, Ecuador, in the three levels of the Unified General Baccalaureate (BGU): first, second, and third. This division allows for a comparison between:

1. Students with advanced mastery of semiotic analysis (third year).

2. Students with basic knowledge in semiotics (second year).

3. Students without prior training in semiotics (first-year and new students).

The results are presented using double-entry tables to analyze the responses to each situation posed in the test. Additionally, value diagrams are used to summarise the findings. These data are interpreted and discussed, offering conclusions of educational relevance. This approach ensures a rigorous analysis that combines qualitative aspects (meanings and interpretations) with quantitative aspects (frequency and patterns in the responses).

RESULTS

The analysis and discussion of the results of the instrument is carried out situation by situation. In the same way, each question corresponding to its respective situation is analyzed and subjected to semiotic interpretation.

### Situation 1: Advertising and social networks

An ad on social media shows a group of young people enjoying a party. They are all dressed in clothes from a specific brand, and the slogan reads: "Live free, live your way."

Illustration 1: Meanings associated with the phrase "Be free, live your way."
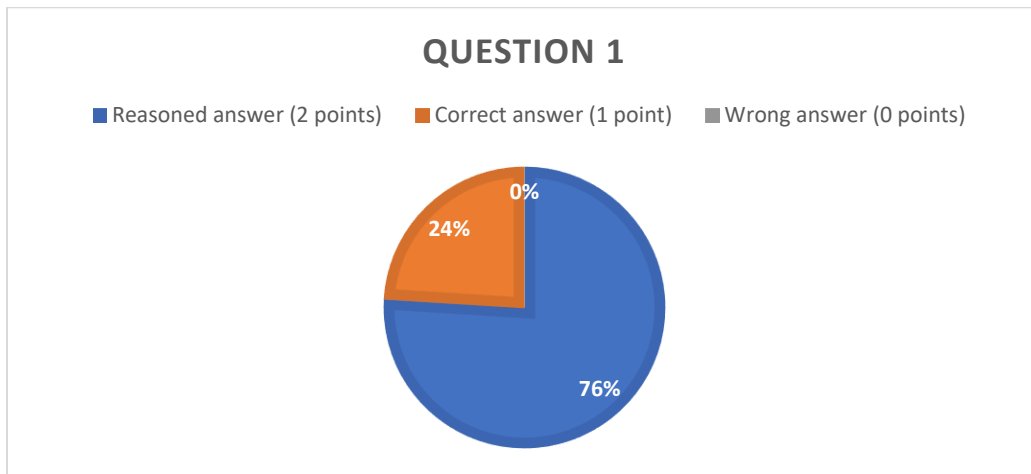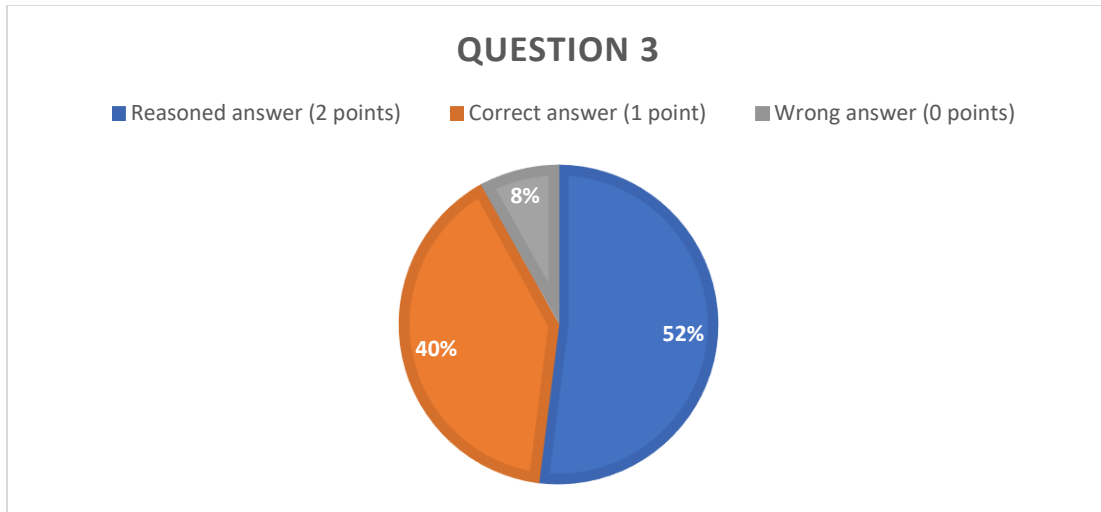

76% of the participants answered the question correctly, obtaining two out of two possible points. They carried out a complete analysis of the context and its semiotic elements and argued in a logical and well-founded manner. Their meaning was aimed at breaking down the meanings of "living free." 24% obtained one point out of two possible points, since the analysis of the context carried out was not in-depth, thus affecting the argument of their answer not being well-founded.

Illustration 2: Image **and slogan that influence young people's perception of freedom**
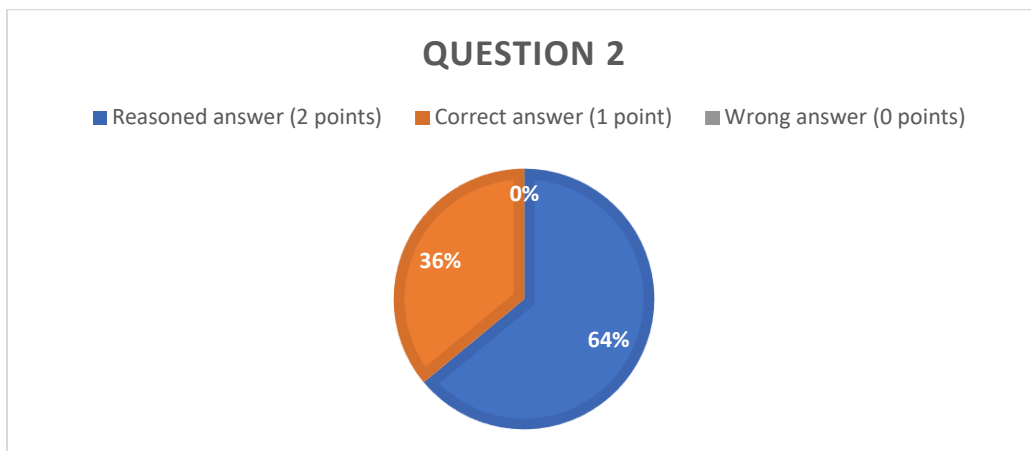
64% of the students answered the question correctly, obtaining the maximum score of two out of two. These students carried out a complete analysis of the context and its semiotic elements, which allowed them to accurately infer the possible perception of young people about freedom by observing the slogan. Meanwhile, 36% obtained a score of one out of two because their analysis of the context was superficial, which negatively impacted the foundation of their arguments.

Illustration 3: Evaluate whether this advertisement could promote unrealistic expectations about young people's social lives.

52% answered the question correctly, earning two out of two possible points. These students carried out a complete analysis of the context and its semiotic elements, arguing in a logical and well-founded manner. They also managed to evaluate the situation of freedom and the possible interpretation of adolescents regarding it, concluding that this advertisement promotes expectations that are not realistic, since they lack a direct connection with the concept of true freedom.

On the other hand, 40% of the students obtained one point out of two possible points because their analysis of the context was not deep enough, which affected the quality and foundation of their arguments. Finally, 8% obtained zero points, which shows that their reasoning and analysis were not appropriate for answering the question.

Illustration 4: Do you think this advertisement will lead the audience to a life of debauchery without principles?

QUESTION 4

■ Reasoned answer (2 points)   ■   ■ Wrong answer (0 points)
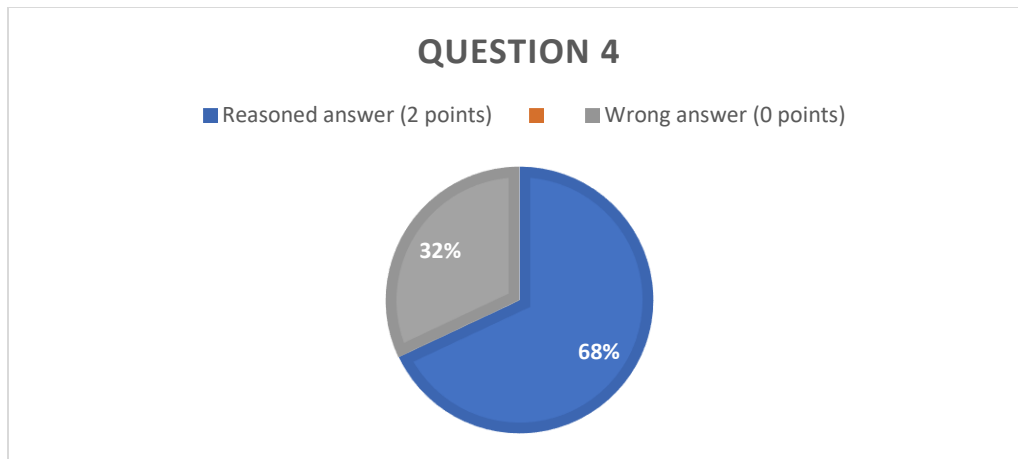
89% of respondents answered the question correctly, earning two out of two possible points, thanks to a complete analysis of the context and its elements. On the other hand, 11% received zero points, as their analysis of the context was not, and they did not achieve the expected results.

In the analysis of situation 1, 56% of students demonstrated complete mastery of critical Thinking after the semiotic analysis, obtaining eight out of eight points. Likewise, 20% of students achieved advanced mastery, with scores of seven or six out of eight. Another 20% of students showed intermediate mastery, achieving between five and four points, while 4% of students showed basic mastery, with a score of three or two points. None of the students showed low or no mastery.

Situation analysis 1

■ Total Domino
■ Advanced Domain
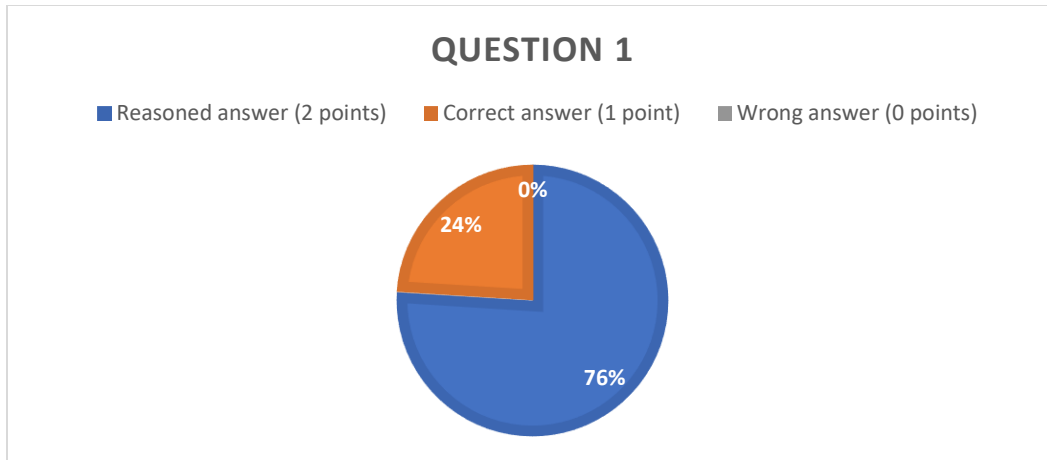■ Intermediate Domain
■ Basic Domain
■ Null Domain
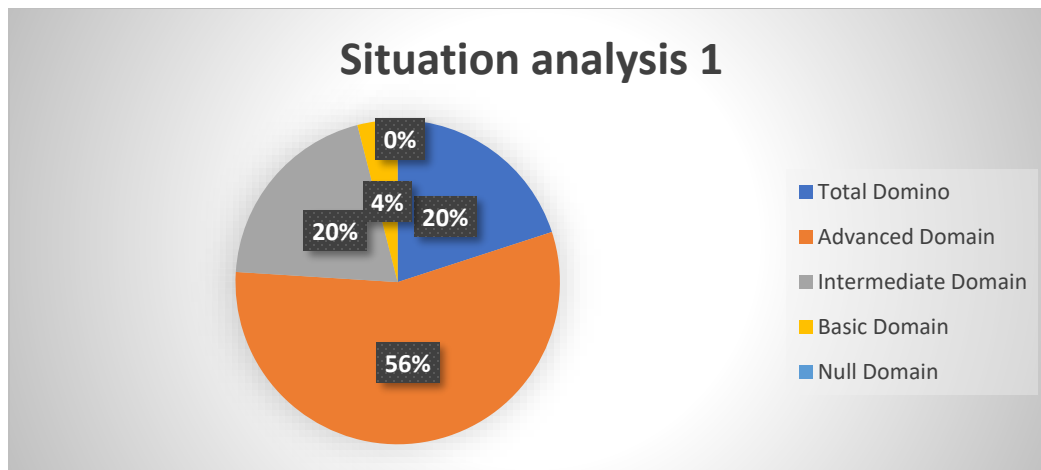
The table shows that more than half of the population evaluated in the test demonstrates an advanced command of critical Thinking through semiotic analysis. On the other hand, basic mastery corresponds to 4%, that is, only one student out of the 25 participants. The levels of intermediate and total mastery are equal.

The graph clearly shows that semiotic analysis contributes significantly to the development of critical Thinking in high school students. Furthermore, in situation 1, whose problem focuses on advertising on social networks, more than half of the students achieved an outstanding performance.

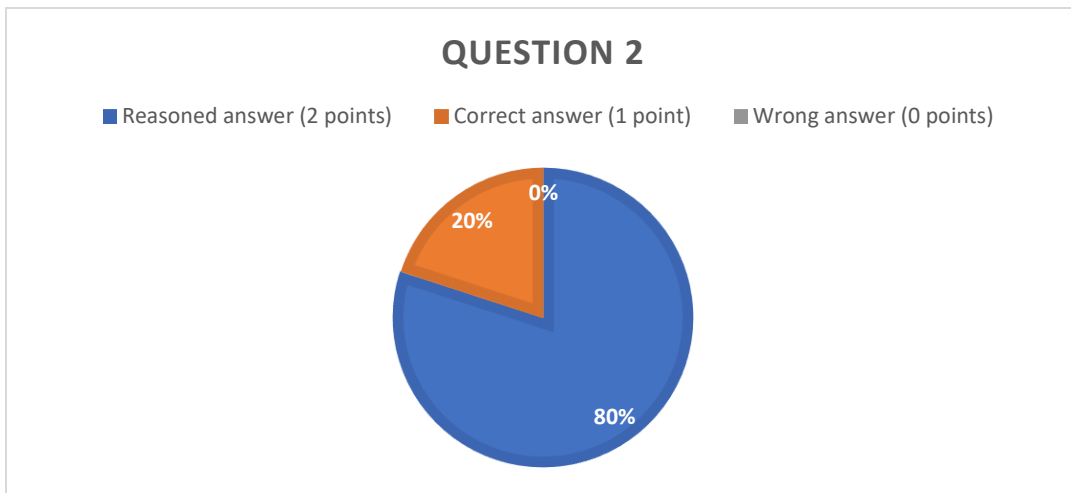**Situation 2: Symbols in Pop Culture**

A popular streaming service uses an ancient symbol (an eye inside a triangle) in several key scenes. Characters wearing this symbol are portrayed as powerful and influential.

Illustration 5: Analyze the possible meaning of the eye symbol inside the triangle in this context.

QUESTION 1

■ Reasoned answer (2 points) ■ Correct answer (1 point) ■ Wrong answer (0 points)
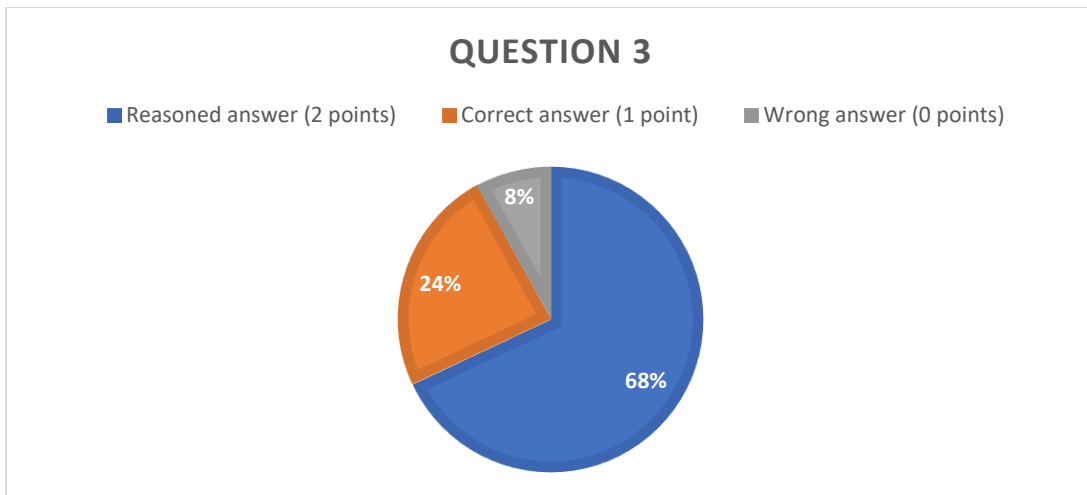
0%

24%

76%

76% answered the question correctly, earning two out of two possible points. These students carried out a complete analysis of the context and its semiotic elements, which allowed them to construct a coherent argument about the possible meaning of the eye within a triangle, pointing out that it represents control, surveillance, and power. On the other hand, 24% obtained one point out of two possible points because their analysis of the context was not deep enough, which affected the foundation of their arguments.

Illustration 6: Viewers' perception of power and authority

QUESTION 2

■ Reasoned answer (2 points) ■ Correct answer (1 point) ■ Wrong answer (0 points)

0%

20%

80%

80% answered the question correctly, earning two out of two possible points. These students conducted a thorough analysis of the viewers' perception of power and authority after observing a triangle with one eye. Likewise, 20% earned one point out of two possible points because their analysis of the context was not deep enough, which affected the basis of their arguments.

Illustration 7: Alternative interpretation of the use of the symbol in the series.

QUESTION 3

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)

8%

24%

68%

In this aspect, 68% answered the question correctly, obtaining two out of two possible points. These students demonstrated an understanding of the meaning and use of the triangle, which allowed them to easily propose an alternative interpretation. Likewise, 24% obtained one point out of two possible points since their analysis of the context was superficial, which affected the basis of their arguments. Finally, 8% obtained zero points, which shows that their reasoning and analysis were not adequate.

Illustration 8: The repetition of the symbol throughout the series subconsciously affects the viewer's perception.
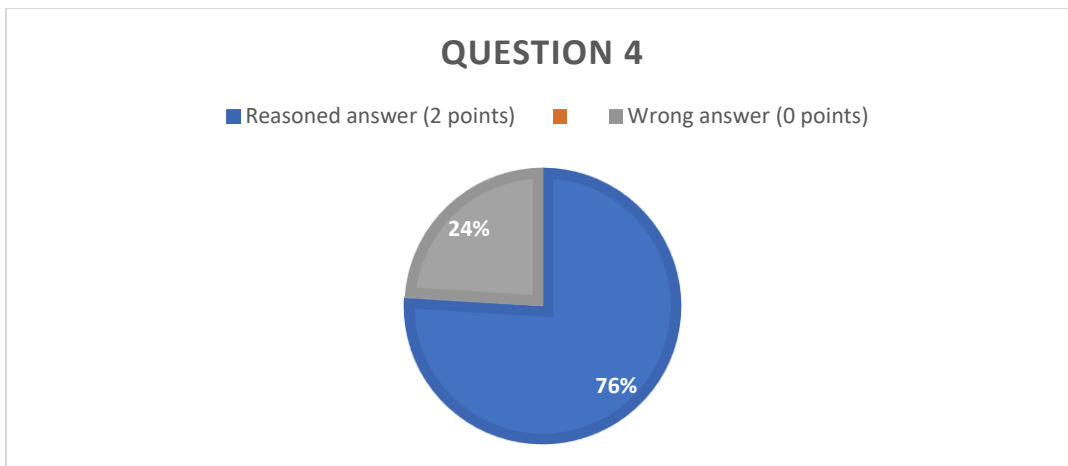
QUESTION 4

■ Reasoned answer (2 points)   ■   ■ Wrong answer (0 points)

24%

76%

76% answered the question correctly, earning two out of two possible points. These students performed a complete analysis of the context and its elements. On the other hand, 24% received zero points out of two possible points, since the analysis of the context was not adequate.

Situation analysis 2

Thirty-two percent of participants showed complete mastery of critical Thinking after the semiotic analysis, scoring eight out of eight points. Fifty-two percent achieved advanced mastery, with scores of seven or six out of eight. Eight percent showed intermediate mastery, scoring between five and four points. Another 8% showed basic mastery, with three or two points out of eight. None of the students showed low or no mastery.

Situation analysis 2
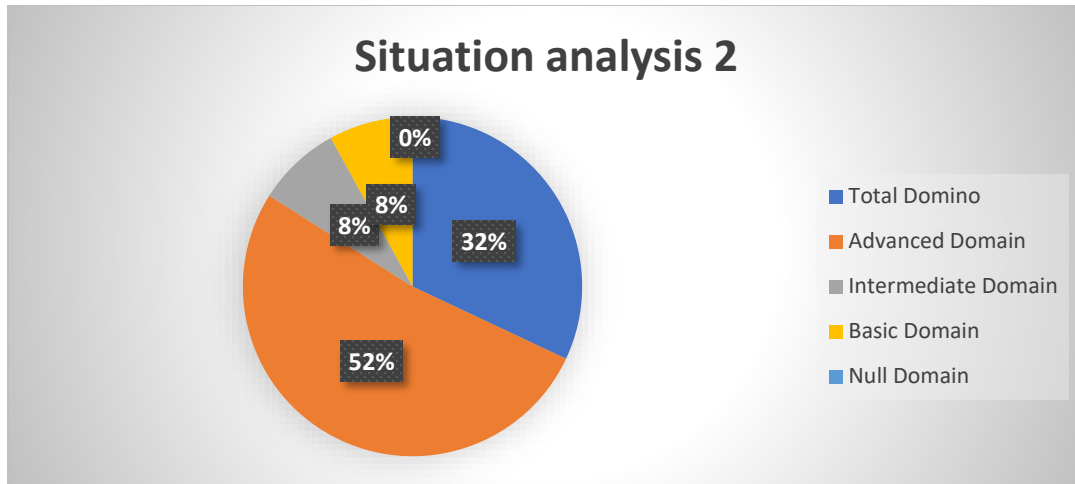
The image It reflects that 54% of the population subjected to the test have a complete command of critical Thinking through semiotic analysis, while 34% have an advanced command, these being the predominant percentages in the analysis. The intermediate command is represented by only 8%, while the basic command reaches 4%. No null command was observed.

The graph clearly shows that semiotic analysis contributes significantly to the development of critical Thinking in high school students. Furthermore, situation 2, whose problem focuses on the symbols present in pop culture, is mastered by almost all students. It is inferred that this is due to the experiential context and the approach of the population analyzed with the topic of situation 2.

Situation 3: Stereotypes in Fashion

A clothing store in the city launches a new line of clothing labeled "for him" and "for her," with designs that reinforce traditional gender stereotypes (for example, dark colors for boys and pastel colors for girls).
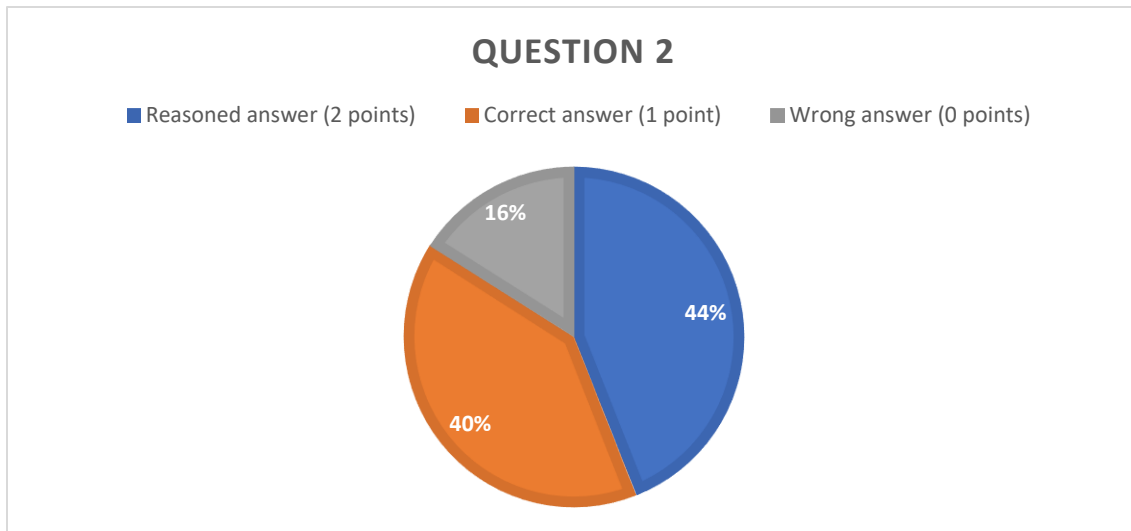
Illustration 9: Signs and symbols present in the campaign that reinforce gender stereotypes
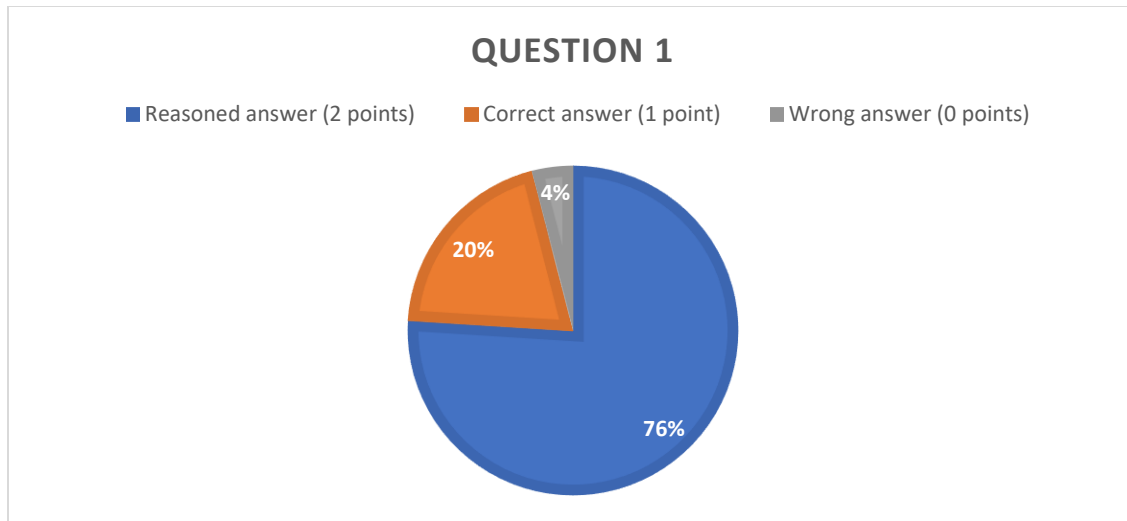
In this aspect of the test, 76% answered the question correctly, obtaining two out of two possible points. These students carried out a complete analysis of the context and its elements, such as colors and possible designs. On the other hand, 20% (5 students) obtained one point out of two possible points since the analysis of the
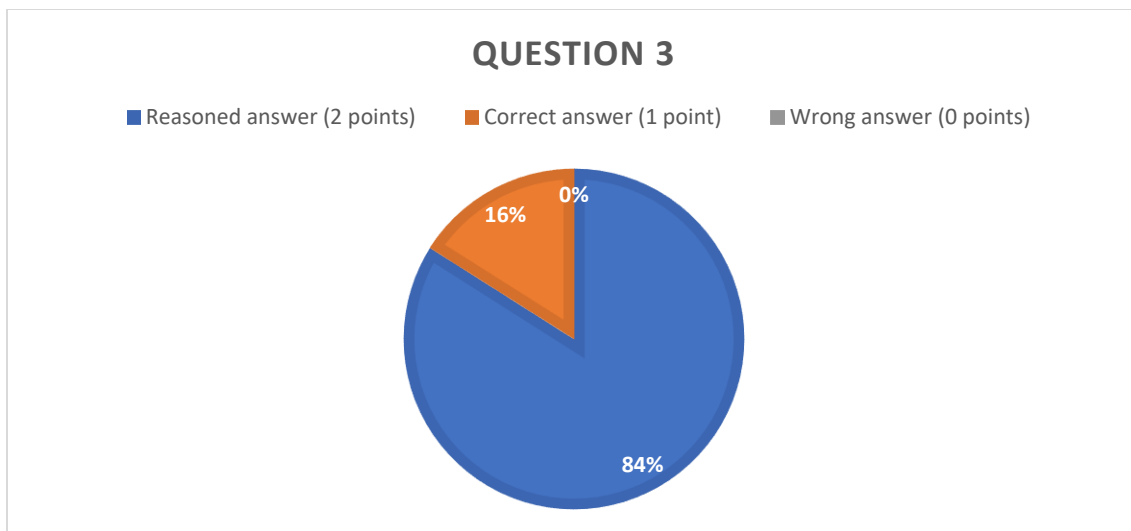
context was not sufficiently in-depth, which affected the justification of their answer. Finally, 4% obtained zero points out of two, indicating that their reasoning and analysis were not adequate.

Illustration 10: Potential impact of stereotypes on young people shopping at this store

QUESTION 2

■ Reasoned answer (2 points) ■ Correct answer (1 point) ■ Wrong answer (0 points)

- 16%
- 44%
- 40%

44 % answered the question correctly, earning two out of two possible points. These students performed a thorough analysis of the context based on their semiotic interpretation and discovered the potential impact of these stereotypes on the consumer psyche, arguing that they can perpetuate these stereotypes from generation to generation. On the other hand, 40% obtained one point out of two possible points since the analysis of the context carried out was not sufficiently in-depth, which affected the justification of their answer. And finally, 16% obtained zero points out of two, indicating that their reasoning and analysis were not adequate.

Illustration 11: Campaign to avoid reinforcing gender stereotypes.

QUESTION 3

■ Reasoned answer (2 points) ■ Correct answer (1 point) ■ Wrong answer (0 points)

- 0%
- 16%
- 84%

In this test element, 84% answered the question correctly, obtaining two out of two possible points. These students wrote efficient proposals that could avoid reinforcing gender stereotypes, such as eliminating labels and cuts in clothing. On the other hand, 16% obtained one point out of two possible points since the analysis of the context carried out was not sufficiently in-depth, which affected the justification of their answer.

Illustration 12: Color differentiation according to gender

QUESTION 4

■ Reasoned answer (2 points)　　■ Wrong answer (0 points)
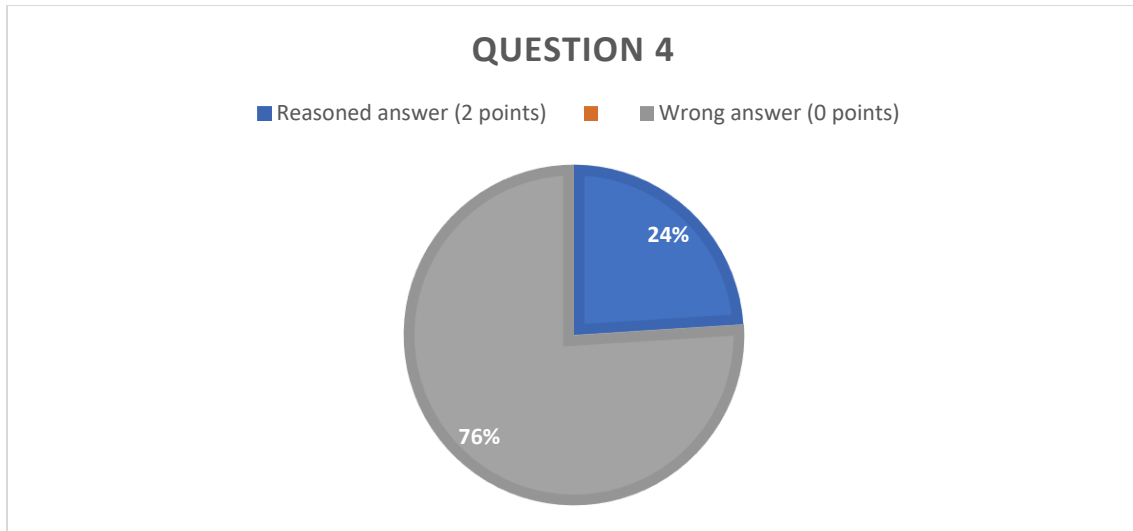
24% of students answered the question correctly, earning two out of two possible points, as they had carried out a complete analysis of the context and its elements. On the other hand, 76% of students obtained zero points out of two possible points, because the analysis of the context was not adequate.

Analysis of Situation 3

8% of the students demonstrated a complete mastery of critical Thinking after the semiotic analysis, obtaining eight out of eight points. 48% achieved an advanced mastery, obtaining seven or six points out of eight. 40% presented an intermediate mastery, with five or four points out of eight. None of the students showed a basic mastery, that is, three or two points out of eight, and 4% presented a low or no mastery.

Situation analysis 3

■ Total Domino
■ Advanced Domain
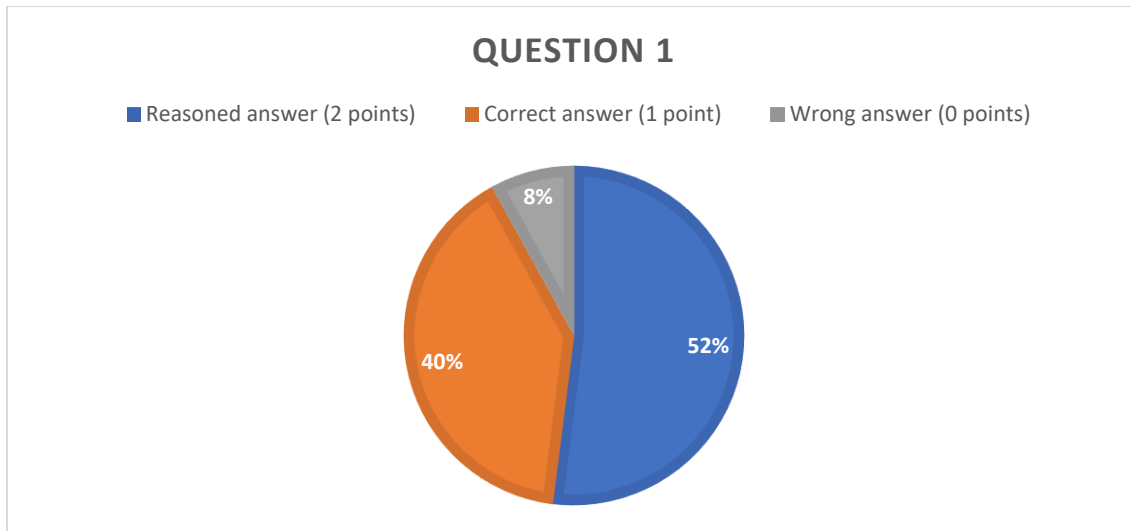■ Intermediate Domain
■ Basic Domain
■ Null Domain
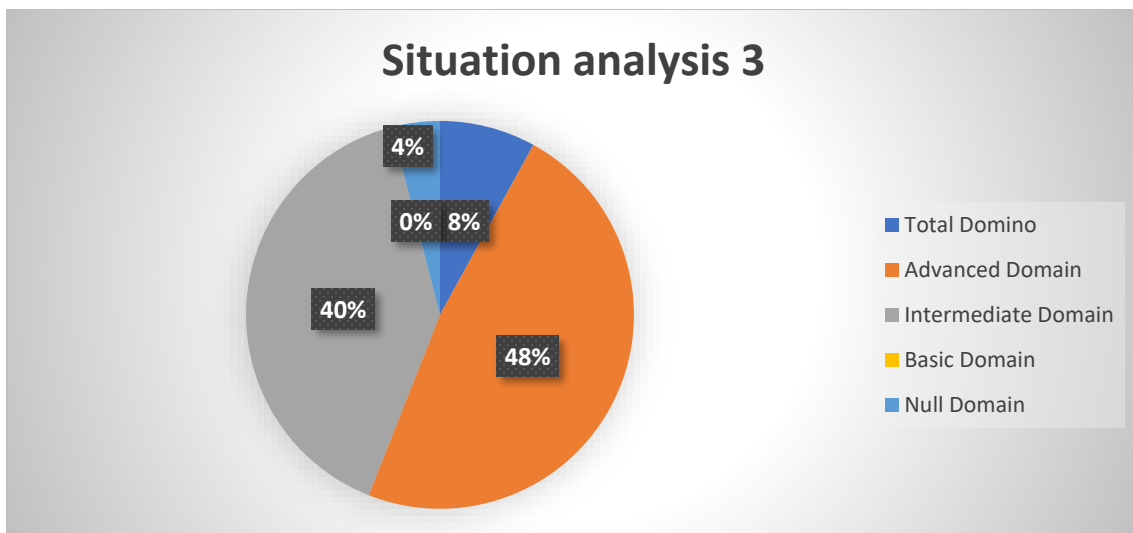
The table shows that only 8% of the population tested demonstrates a complete mastery of critical Thinking through semiotic analysis, while 48% show an advanced mastery. 40% are at an intermediate level, and the corresponding 4% show no mastery. The graph shows that semiotic analysis contributes to the development of critical Thinking in high school students. However, this situation also shows a high percentage of students with an intermediate mastery and a significant percentage without mastery of critical Thinking. It should be

noted that during the data collection, a hyper contextualization was observed in situation 3, related to fashionable stereotypes, which resulted in responses that did not comply with the necessary analysis.
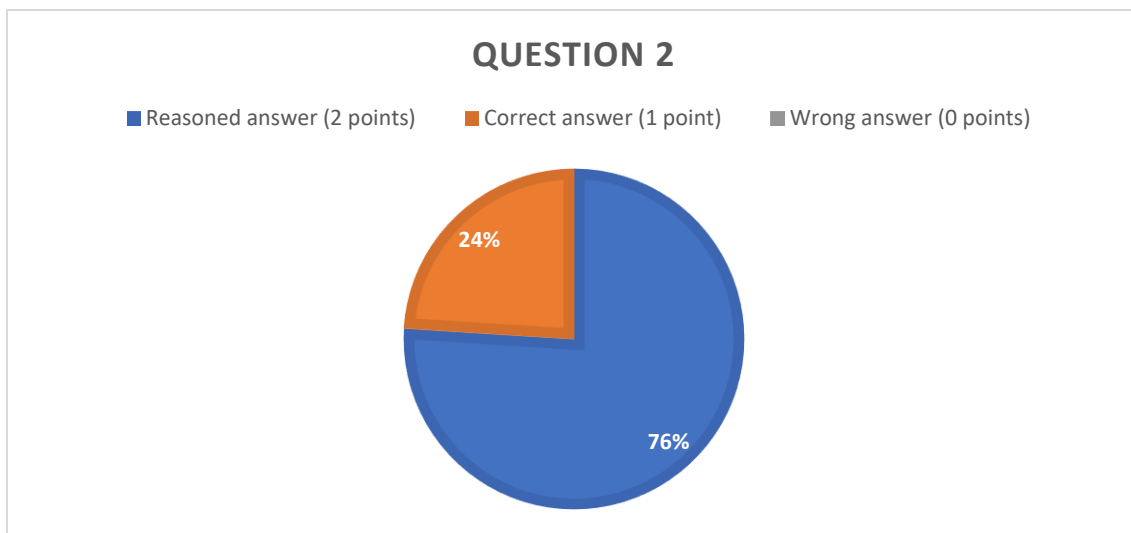
Situation 4: Symbols in the Urban Environment

In Ecuador's capital, a modern sculpture has been installed in one of the busiest spots in the city. The sculpture depicts Batman sitting, distracted by his cell phone. Some people find the sculpture inspiring, while others consider it irreverent and disconnected from the essence of the capital's citizens.

Illustration 13: Semiotic factors (shape, location, materials) could be influencing the different interpretations of the sculpture

QUESTION 1

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)

8% / 52% / 40%

52% answered the question adequately, scoring two out of two possible points, by carrying out a thorough analysis of the context and its elements, such as location, material, and structural components. 40% scored one point out of two possible points, as their analysis of the context was not deep enough, which affected the argumentation of their answers. Finally, 8% scored zero points out of two, indicating that their reasoning and analysis were not appropriate.

Illustration 14: Urban environment

QUESTION 2

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)

24% / 76%

In this element, 76% answered the question correctly, obtaining two out of two possible points by carrying out a complete analysis of the different contexts in which the sculpture can be located. 24% obtained one point out
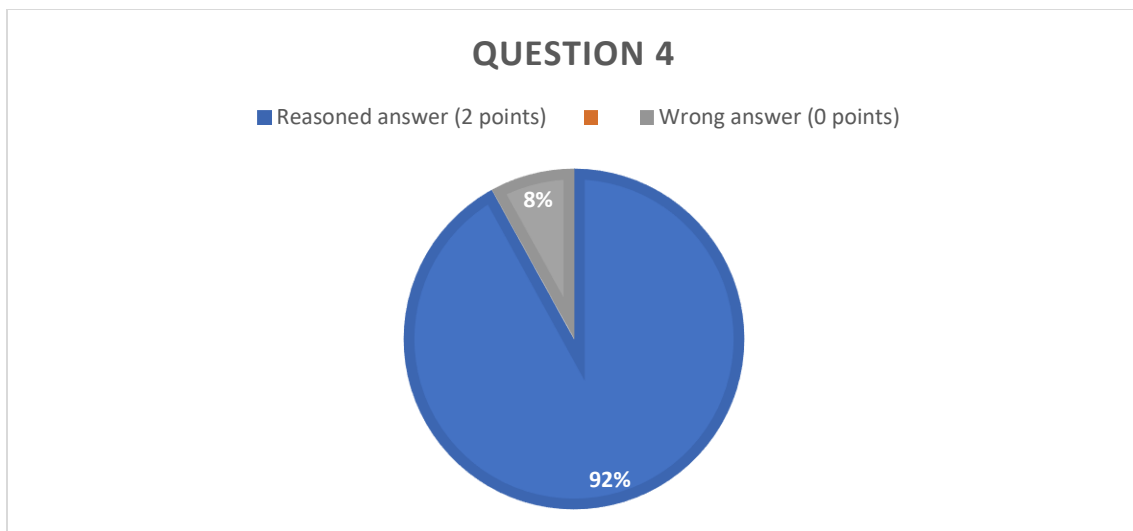
of two possible points, since the analysis of the context was not sufficiently in-depth, which affected the justification of the argument in their answers.

Illustration 15: Ways in which local government could help the community understand and appreciate the sculpture.

QUESTION 3

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)

40%

60%
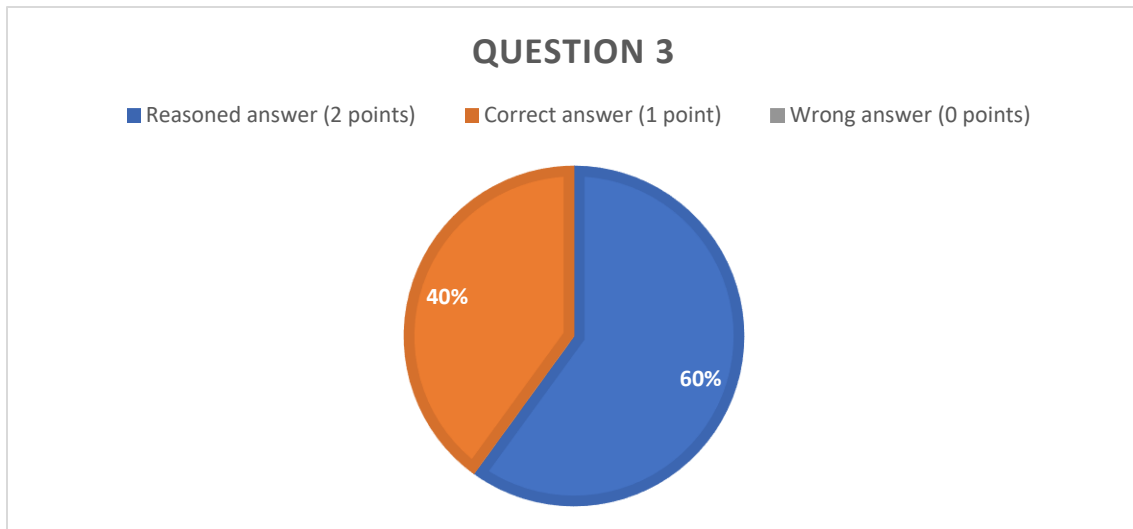
60% of the participants answered the question correctly, earning two out of two possible points. These students were able to effectively suggest various ways in which the government could carry out an awareness campaign about the sculpture and its implications. 40% earned one point out of two possible points, as the analysis of the context was not deep enough, which affected the substantiation of the argument in their answers.

Illustration 16: Influence on the way it is perceived by the community

QUESTION 4

■ Reasoned answer (2 points)   ■   ■ Wrong answer (0 points)

8%

92%

In this aspect, 92% answered the question correctly, obtaining two out of two possible points by carrying out a complete analysis of the context and its elements. 8% obtained zero points out of two possible points, since the analysis of the context was not adequate.

Situation analysis 4

In this situation, **16%** achieved full mastery of critical Thinking after the semiotic analysis, obtaining the maximum score of 8 out of 8. **76%** demonstrated advanced mastery, with scores of 7 or 6 out of 8, while **8%** presented intermediate mastery, with scores of 5 or 4 out of 8. No student obtained a basic level (3 or 2 out of 8) or a low or null mastery.
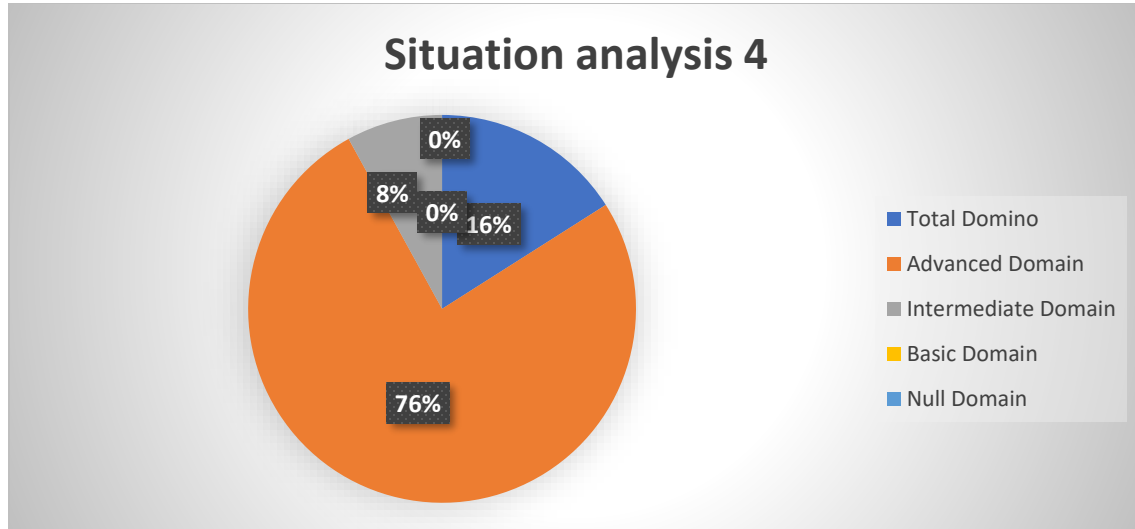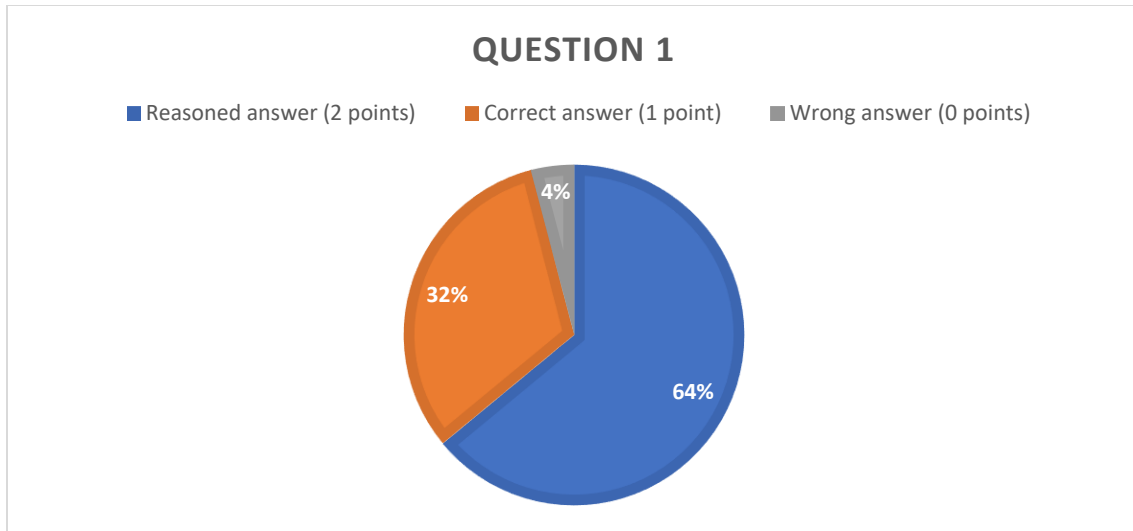

The table shows that **16%** of the students taking the test achieved complete mastery of critical Thinking through semiotic analysis, while **76%** showed advanced mastery, these being the predominant percentages in the analysis. **8%** showed intermediate mastery, while the levels of basic and null mastery were non-existent.

The graph clearly shows that semiotic analysis contributes significantly to the development of critical Thinking in high school students. In particular, situation 4, whose problem focuses on the urban environment, was addressed by the students in a direct and concrete way. During this process, they evaluated, argued, and presented viable solutions after carrying out the respective semiotic analysis, which allowed them to apply their critical Thinking to solve the test. It is inferred that this result is related to the daily contact that students have with the urban environment, which facilitates their understanding and approach to this problem.
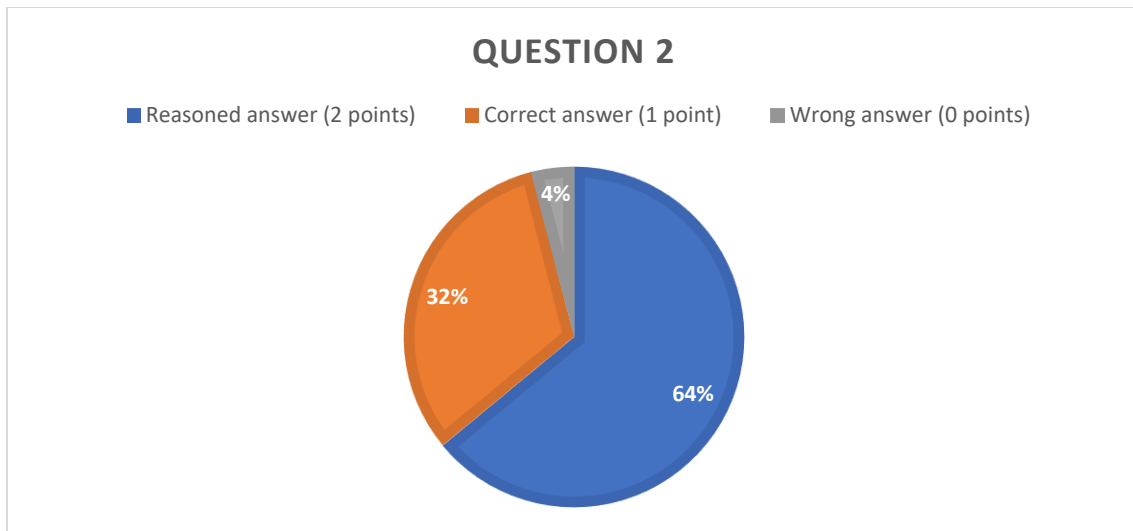
Situation 5: Political Campaign

During an election campaign, a candidate uses a logo with a stylized national flag and a slogan that reads "Unity for a better future." Banners show the candidate surrounded by citizens of different ethnic backgrounds and ages, all smiling and united.

Question 1: Are semiotic elements (colors, symbols, images) used in this campaign to promote an image of unity and hope?

QUESTION 1

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)
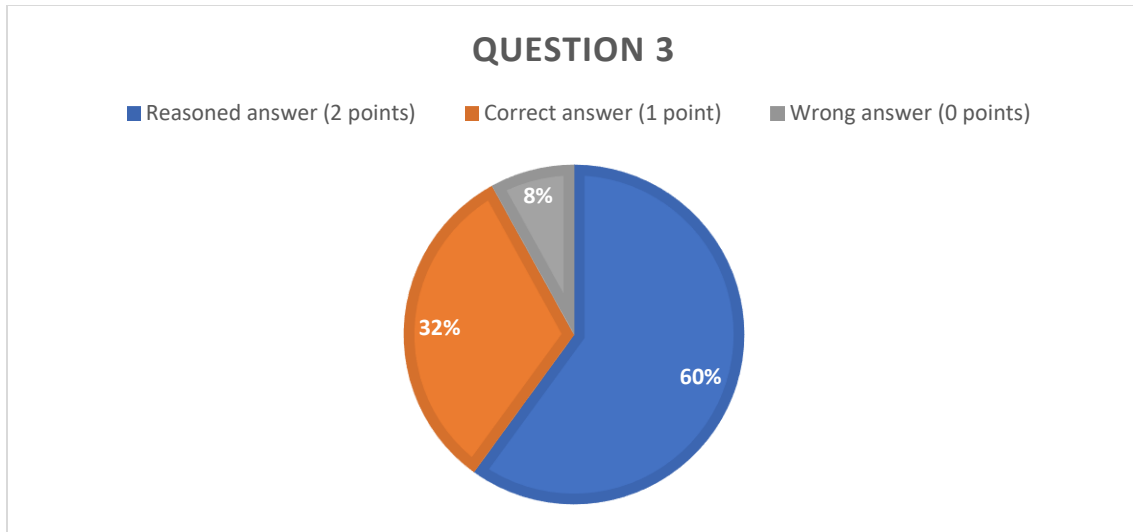
4%

32%

64%

64 **%** answered the question correctly, earning the maximum score of 2 out of 2. These students performed a thorough analysis of the context and its elements, including symbols such as the flag and the representation of citizens of different ethnic origins. On the other hand, **32%** obtained 1 point out of 2 possible because the analysis of the context was superficial, which affected the foundation of their arguments. Finally, **4%** achieved 0 points out of 2, indicating that their reasoning and analysis were not appropriate to answer the question.

Question 2: Does using the national flag in the logo affect public perception of the candidate?

QUESTION 2

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)
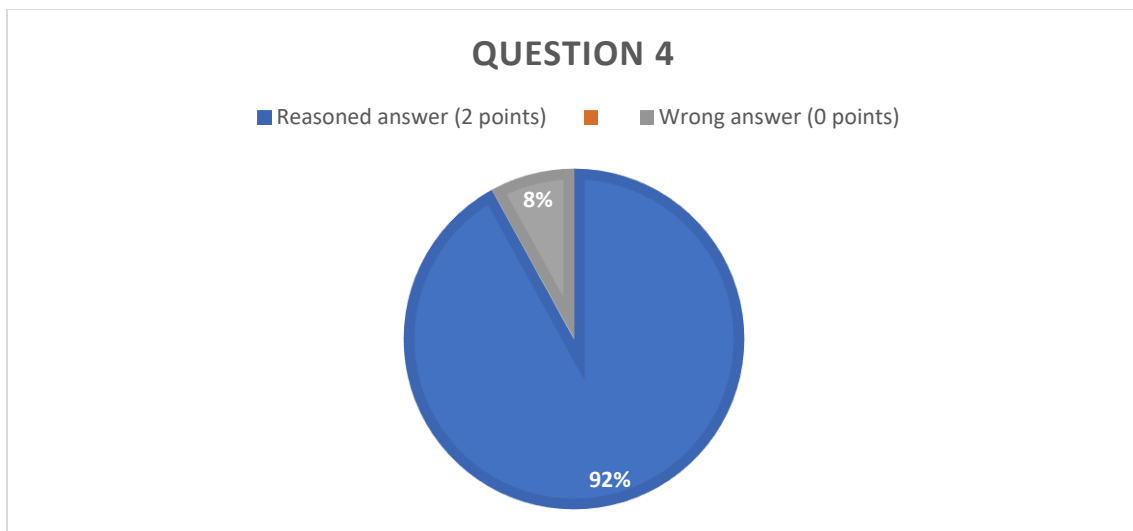
4%

32%

64%

In this aspect, 68% answered the question correctly, obtaining the maximum score of 2 out of 2. These students carried out a complete analysis in which they inferred that the use of the national symbol has a direct impact on the candidate's political image. Likewise, 24% obtained 1 point out of 2 possible because their analysis of the context was not sufficiently in-depth, which affected the foundation of their arguments, and 8% scored 0 out of 2 points, which shows that their reasoning and analysis were not adequate to answer the question.

Question 3: Analyze whether this campaign can be seen as a strategy to appeal to a broad range of voters or whether it could be seen as an oversimplification of social problems.

QUESTION 3

■ Reasoned answer (2 points)   ■ Correct answer (1 point)   ■ Wrong answer (0 points)

8%

32%

60%

In this question, 60% of participants answered the question correctly, obtaining the maximum score of 2 out of 2. These students were able to identify that the strategy analyzed was aimed at attracting more voters, carrying out a complete and well-founded analysis of the context. Likewise, 32% obtained 1 point out of 2 possible since their analysis of the context was superficial, which weakened the foundation of their arguments. Likewise, 8% obtained 0 points out of 2, which indicates that their reasoning and analysis were not adequate to answer the question.

Question 4: Do you think the use of images representing ethnic and generational diversity in the campaign is effective in attracting different groups of voters?

QUESTION 4

■ Reasoned answer (2 points)   ■   ■ Wrong answer (0 points)

8%

92%

92 **%** of students who took the test answered the question correctly, obtaining the maximum score of 2 out of 2. These students carried out a complete analysis of the context and its elements, demonstrating solid and well-founded reasoning. Likewise, 8% obtained 0 points out of 2 possible, which shows that the analysis of the context was not adequate and lacked the necessary elements to answer correctly.

Situation analysis 5

Of the 25 students surveyed, 28% achieved full mastery of critical Thinking after the semiotic analysis, obtaining the maximum score of 8 out of 8. 52% showed advanced mastery, with scores of 7 or 6 out of 8. 16% showed intermediate mastery, achieving scores of 5 or 4 out of 8.

On the other hand, 4% presented a basic command, with scores of 3 or 2 out of 8. It should be noted that no student obtained a low or null command.
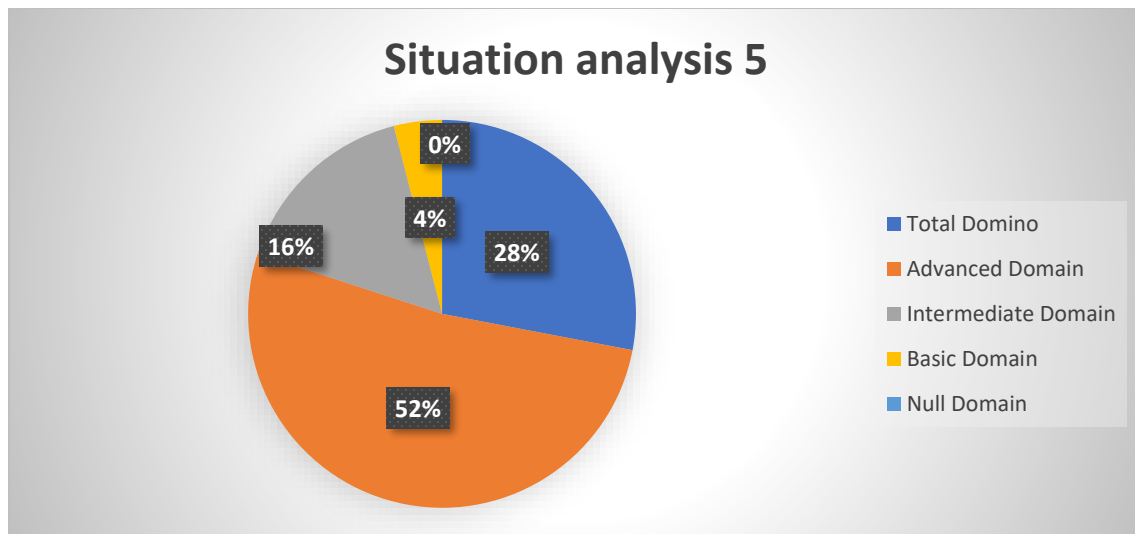
The analysis of the results shows that 52% of the students evaluated showed complete mastery of critical Thinking through semiotic analysis, while 28 **%** showed advanced mastery. These two levels represent the highest percentages in the study.

Sixteen **percent** of students achieved intermediate proficiency, **4% achieved basic proficiency, and no cases of zero proficiency were recorded. These data show that semiotic analysis contributes significantly to the development of critical Thinking** in students. In particular, situation 3, focused on political campaigns, required students to consider the signs associated with national emblems during the analysis. The understanding of this issue was adequate for most students, evidencing their ability to relate semiotic elements to the current political context. This suggests that the contemporary political environment acts as a facilitating factor for the development of these critical skills.

DISCUSSION

The research on semiotic analysis as a tool for the development of critical thinking in high school students was applied to five situations, which show its impact on the development of critical Thinking. This approach allowed students to interpret and argue different symbolic, discursive, and contextual elements that arise in everyday activities. Through the situations studied, which in this case were advertising on social networks, symbols used in pop culture, stereotypes in fashion, symbols in the urban environment, and in political campaigns, the levels of mastery of critical Thinking were analyzed, as well as the limitations identified in each of the aforementioned areas. The results detailed in the previous section reveal the potential and contribution of this methodology to promote critical Thinking, in addition to indicating the urgency of adapting educational strategies to address weaknesses found in the study.

Thus, in situations that consider family contexts, pop culture symbols, and political campaigns, a representative sample of more than 50% of students reached critical mastery levels, which demonstrates mastery of the skills to interpret and argue about semiotic elements. Likewise, the study shows that in situations of greater complexity, such as stereotypes in fashion, areas are identified that require the implementation of improvements since there is a significant percentage of students at intermediate or basic levels, making it essential to reinforce analysis and argumentation.

Likewise, the results reflect that to the extent that the topics are close and familiar to the context of the students, the deepening and application of critical thinking are facilitated, but in the face of problems that are not close or are unknown to the students, complementary educational strategies are required. Therefore, innovative,

active methodologies that are based on real problems must be integrated into the educational process. From the above, it can be said that semiotic analysis in the educational curriculum fulfills an essential function since it contributes to comprehensive, reflective, and critical training because it integrates and adapts important elements that must be considered in the face of the needs of a complex and changing social environment.

CONCLUSIONS

The emergence of artificial intelligence has radically transformed interaction in various social fields, raising the urgent need to foster the development of critical Thinking in students as an essential skill to navigate and understand the challenges of an increasingly complex world. In this context, semiotic analysis emerges as an effective and viable tool to strengthen these skills in the classroom.

The theoretical analysis and the results obtained from the applied test confirm that semiotics contribute significantly to the development of critical Thinking. The students did not present negative results, which demonstrates their ability to decode and recode signs through fundamental skills of critical Thinking, such as evaluation, argumentation, comprehension and creation. These skills allowed them to interpret and give meaning to their communicative reality, showing that they make comprehensive use of their critical Thinking in real social situations.

The results highlight that, despite the uncontrolled growth in the use of artificial intelligence in school activities, students demonstrated independence from these tools when taking their assessment tests. This suggests that when a reflective and critical approach is encouraged, students are able to find meaning in signs and generate coherent solutions to the semiotic situations posed. However, the controlled and moderate integration of artificial intelligence in the classroom is proposed as a complement to this process.

Understanding semiotics can be an ally since students can use prompts that are based on semiotic characteristics. This reverse approach would strengthen both the understanding and the creative application of semiotics, promoting the harmonious integration between technology and critical Thinking.

It is important to note that the analysis and interpretation of codes, signs, and symbols are practices that foster multiple skills of the critical thinker. Argumentation is evident in constructing coherent and logical interpretations of the elements analyzed; analysis, in the decomposition of the signifier and the meaning, as well as in the identification of referents and paradigms that provide meaning; and evaluation, in the critical judgment of the meaning of a sign in specific contexts. Thus, **creation** emerges as a key skill in the resolution of interpretive problems, demonstrating that semiotics not only fosters critical Thinking but also the ability to generate new ideas.

Critical Thinking and semiotics come together naturally, consolidating themselves as a powerful tool to enhance students' analytical and reflective skills. This relationship not only strengthens their ability to face the challenges of their social reality, but also prepares them to interact more effectively in a world transformed by technology and new communicative languages.

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