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THE SCIENTIST PROFESSION AND THE PERCEPTIONS OF FUTURE TEACHERS

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ABSTRACT

Although many studies reveal the view of basic education students about scientists, there are still few studies focused on the understanding presented by future teachers. From this perspective, the present research aimed to analyze the perceptions of undergraduate students of a Biological Sciences course about the scientific profession. This research presents the qualitative approach and was carried out in the discipline Methodology for Science Teaching in a university in the state of Maranhão. For data collection, the undergraduates were asked to prepare a drawing in order to answer the following question: "What does it mean to be a scientist?" and then they explained the drawings produced orally. The results showed that most of them had stereotyped perceptions about scientists, and it was a work carried out mostly by men, with lab coats and glasses, working alone in a laboratory, surrounded by glassware and samples of living beings, for example. These results arouse reflection on the need to include, in undergraduate courses in Biological Sciences and other teacher training courses, discussions about what science and scientists are, based on didactic possibilities that can contribute to demystify such stereotypes.

Keywords: Science Teaching. Scientists. Drawing. Methodology.

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INTRODUCTION

Science is an area of knowledge intrinsically connected to human daily life, much information from our daily lives comes from the productions of this field. In this context, the scientific profession is, in general, widely recognized as essential for the development of societies, contributing significantly, for example, to the performance of various daily activities, to the increase in life expectancy, etc.

Although relevant, there is a difficulty in understanding the real characteristics that define this professional. Thus, it is often observed the prevalence of preconceived conceptions about the scientist, which do not fully correspond to the diversity and complexity of his or her practices and actions.

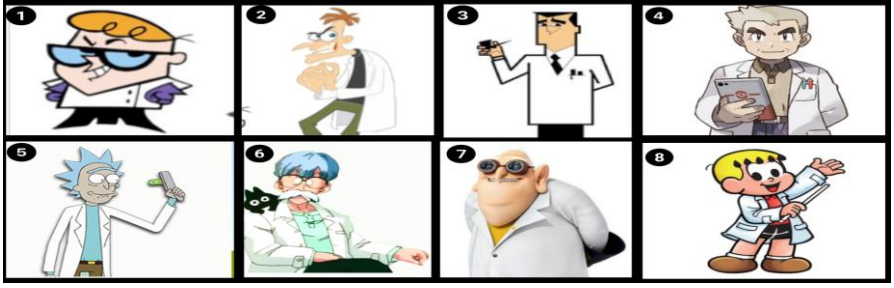
This inference created by the subjects can be impregnated by stereotypes, Penna (2021, p.30, emphasis added) highlights that these can act:

> as a form of social control and maintenance of *the status quo*, delimiting invisible boundaries between good and bad, right and wrong, better and worse. They draw between the "us" and the "them", facilitating the reunion of the former within the so-called "normal" and, consequently, excluding everything and everyone that does not fit into the frame.

Queiroz and Rocha (2021) emphasize that the stereotyped image of a scientist often disregards the diversity present in the numerous situations in which science manifests itself. Thus, when it comes to representing scientific activity, there is a marked tendency to include certain elements considered essential. Also according to the authors (2021), these representations, although recurrent, often incorporate aspects that, in practice, are not even part of scientific practice. However, the reproduction of these characteristics persists, especially when a description is required from the scientist.

In this regard, it is observed that certain characteristics that will be discussed in this text are present in animations and comic books, which can have an important influence on the construction of the popular imagination regarding the profile of scientists, as shown in Figure 1.

Figure 1 – Table of representations of scientists in animations and comic books.



Source: Compilation and editing by the authors (2025) from images extracted from the internet[5].

Figure 1 corroborates the conclusion of the existing literature, which highlights that these stereotypes are largely reinforced from an early age, through media such as movies and cartoons, but it is reiterated that they also appear in academic productions made by students at different levels of education. However, there are few studies focused on how undergraduates, future teachers, perceive the figure of the scientist and his or her activities. In this sense, this investigation aimed to analyze the perceptions of undergraduate students of a Biological Sciences course about the scientific profession.

THEORETICAL FRAMEWORK

The way different audiences perceive the profession of scientist is fundamental to understand the stereotypes and prejudices linked to science, particularly in the educational context, where such concepts can impact the training of future teachers and students. According to Penna (2021), the stereotypes associated with scientists, often reinforced by media such as films and animations, establish the limits of the "normal" and favor a restricted and excluding perspective of diversity in science.

Lippmann (2008) argues that in the dynamics of the world around us, we tend to incorporate what has already been previously shaped by our culture. Thus, our perception is often influenced by stereotypes that impose on us. This concept can be evidenced by the predominant association of the figure of the scientist with men, wearing lab coats and acting in a solitary manner in laboratories. These representations, in addition to restricting the inclusion of diverse groups, affect students' views of what science is and who is allowed to practice it (Queiroz & Rocha, 2021).

An elementary point is the impact of the media in the construction of these perceptions. Silva (2022) argues that cartoons, as cultural manifestations, have a pedagogical function that can perpetuate or contest stereotypes about gender and scientific professions.

An effective strategy to demystify such stereotypes is to employ historical and cultural references in science education (De Souza, 2025). Guerra and Moura (2022) point out that the Cultural History of Science (HCC) provides opportunities to investigate the contributions of researchers from different eras, genders, and ethnic origins, fostering a

[5] 1, 2 and 3 - Dexter, Heinz Doofenshimirtz and Professor, available at https://paralelas.wordpress.com/2014/02/13/ a-science-in-cartoons/; 4 - Professor Carvalho, available at https://victoryroad.fandom.com/ wiki/Professor_Carvalho; 5 - Rick, available at https://en.wikipedia.org/wiki/Rick_Sanchez#/media/File:Rick _Sanchez.png; 6 - Dr. Brief, available at https://dragonball.fandom.com/pt-br/wiki/Dr._Brief?file=Dr_brief _tama.png; 7 - Dr. Nefário, available in https://pt.pinterest.com/pin/276619602104682738/; 8 - Franjinha, available in https://turmadamonica.fandom.com/pt-br/wiki/Franjinha?file=Franjinha_com_seu_jaleco.png.

more inclusive and representative perspective. Correia *et al.* (2022) likewise, support this view, highlighting the use of films such as "Radioactive" to portray science as a collective activity, inserted in political and social contexts.

Regarding teacher training, research such as that by Neves and Cerdas (2024) points to the relevance of incorporating discussions about the career of scientist into undergraduate programs, so that future educators can deconstruct stereotypes with their students. This practice not only fosters more comprehensive scientific literacy, but also encourages the participation of people from diverse backgrounds in the scientific field.

It is important to emphasize that the stereotyped view of science and scientists is a worldwide phenomenon. Research such as that conducted by Joy *et al.* (2024) demonstrate that children's representations of gender and skin tone of scientists show a wide variation, reflecting cultural and educational influences. Thus, actions that encourage diversity and inclusion in the scientific area are essential to change these perceptions and establish a more representative and fair scientific field.

METHODOLOGICAL PATH

This research fits into a qualitative approach (Flick 2008). With regard to typology, it corresponds to a case study, which, according to Yin (2010), is a type of investigation that can contribute to the understanding of social processes, since its purpose is to explore and investigate in detail and in depth a certain reality.

Knowing this, it is noteworthy that the subjects participating in this research are 20 university students of the Biological Sciences Degree Course of a University in the State of Maranhão. Data collection took place in the discipline Methodology for Science Teaching, through drawings and oral communication, with the objective of investigating the perceptions of the licentiate students about the question: "What does it mean to be a scientist?". 20 drawings produced were analyzed, along with the recording of the students' verbal explanations, requested through the command: "Explain your drawing".

The choice to record the explanations was intended to contribute to the analysis of the drawings by considering them, according to Iavelberg (2013), as a 'cultivated' drawing, that is, historical and interactive that reflects the time and place where the subject lives and the cultural standards of the time. Thus, it is a conception that goes beyond the stages of cognitive development and intends to focus on looking at drawing as a language to represent situations, as the individual expresses his thoughts, his knowledge and his interpretations about a given situation experienced or imagined.

The analysis of the drawings was carried out in a descriptive and interpretative way

and the indicators adapted from the standard image of a scientist were used, which is used in *the Draw-A-Scientist-Test (DAST)* method proposed by Chambers in 1983 and also includes the last category on Sex and ethnicity created by Mason, Kahle and Gardner in 1991.

It is worth noting that the categories were pre-established before the data analysis and the description was adapted through the analysis of the drawings, included in parentheses. The categories and their respective descriptions are presented in Chart 1:

Chart 1 - Categories and description for the analysis of drawings about scientists.

Categories	Description
Personal equipment	Includes the indicators: use of lab coat and use of glasses.
Facial Hair/ Hair	Indicators facial hair (beards, mustaches, and sideburns) and hair up (mad scientist).
Search Symbols	Indicator: scientific instruments (glassware, animals)
Symbols of knowledge	Indicator: source of study (books, archives, *website* and blackboard).
Technology Symbols	The "products" of science.
Relevant captions	Formulas, taxonomic classification, the "eureka"!
Gender and ethnicity	Identify the scientist's gender and ethnicity.

Source: Authors' production (2024).

From these categories indicated in the table, the results were analyzed and presented below.

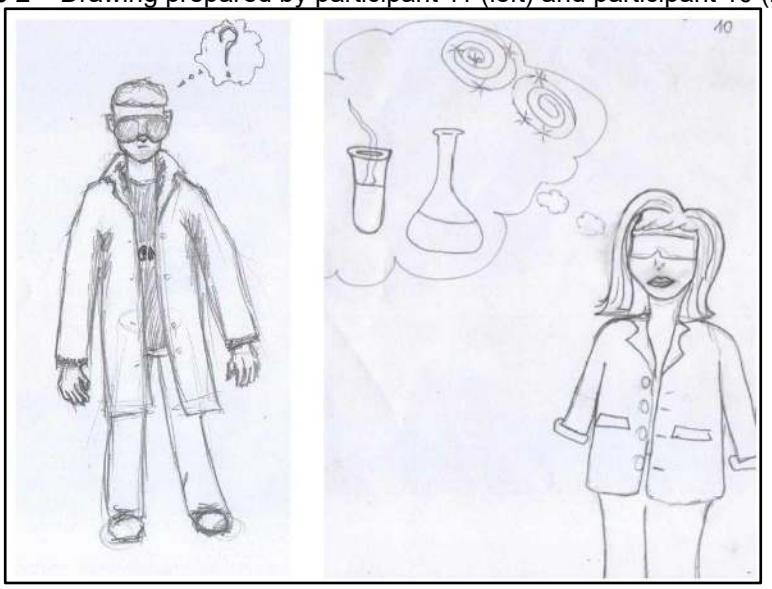
ANALYSIS AND RESULTS

The data will be exposed according to the categories described in the methodology. Regarding the "Personal Equipment" category, with regard to the use of lab coats, the presence of this item was verified in 50% of the drawings. Regarding the use of glasses, it was observed in 30% of the drawings.

In general, the drawings analyzed reflect a view verified in other studies, especially those that analyze productions made by children and adolescents, in which the lab coat is often represented as an indispensable element for the professional in this area, an item that is frequently seen in animations and comic books, as expressed in Figure 1. Penna (2021) stresses that, if it were necessary to choose a uniform for the profession of scientist based on the children's drawings, the lab coat would be the obvious choice, since 86% of the representations featured scientists wearing lab coats, and 28% show the use of protective glasses.

These personal equipment can be evidenced in the drawings below, in which scientists with long-sleeved coats and glasses are represented, Figure 2.

Figure 2 – Drawing prepared by participant 11 (left) and participant 10 (right).



Source: Survey participants (2024).

In order to assist in the interpretation of the drawings, the speech about him given by undergraduate student 11 was: "The scientist for me is just a guy, someone who questions himself to be able to start some experiment". This aspect reveals the view that science is produced through the performance of an experiment, a characteristic that is part of some research, however, it is worth mentioning in teaching situations that there is not always experiments for scientific production, because there are several ways of doing science. In line with Penna (2021), the representations involving the use of lab coats and the work developed in the laboratory with their respective instruments highlight the conception of scientist linked to the Natural Sciences.

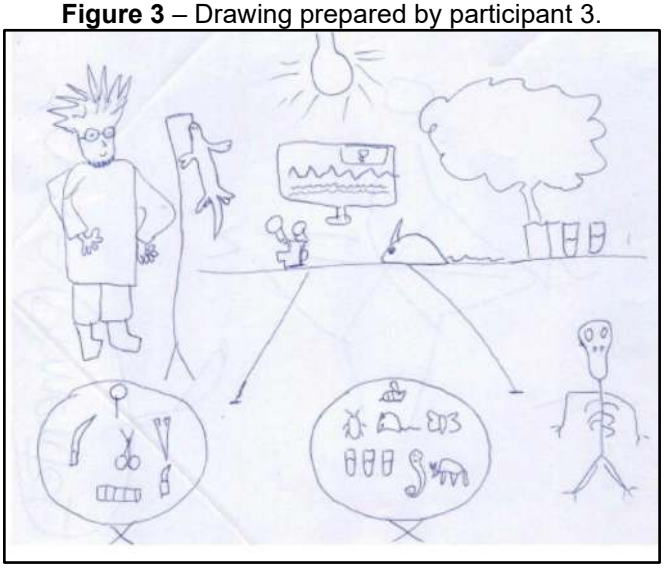
It is relevant to point out, according to Oliveira *et al.* (2024), that there are also scientists in the area of Human Sciences, working in various fields of training. These professionals are dedicated to areas that address issues related to Anthropology, Law, Economics, Philosophy, Geography, History, Psychology, Social Work, Sociology, etc.

Another characteristic observed in the two drawings above and through the speeches of some undergraduates is the fact that the scientist works in isolation. According to Brasil (2020), it is essential to discuss the diversity of this profession with basic education students, as they often associate science with solitary work in the laboratory, surrounded by foreign objects and colored liquids. The aforementioned author emphasizes that, in the current job market, including science, teamwork is increasingly valued, as well as in other areas. Regarding participant 10, she explains: "I drew a scientist and some tools from the

laboratory. Why did I draw inside a thought bubble? Because she is thinking about the questions so that we can make some discovery." In this explanation and drawing we could observe the scientist being represented by a woman, in addition, it presents a phase of research that is the questions, an important stage of the investigation method.

Regarding the category "Facial hair and hair", it was identified in 10% of the drawings with beards and/or mustaches and sideburns. Regarding the hair up (goosebumps), 20% had this characteristic, a fact seen only in men's hair. This reference to messy hair is more evident in the children's drawings than the percentage verified in this survey with university students. Hair in this way is often related to the mistaken idea that these subjects do not care about their appearance and as well as to the stereotype of the mad scientist as can be seen in the drawing below (Figure 3):

Figure 3 – Drawing prepared by participant 3.



Source: Survey participants (2024).

Participant 3's speech for his drawing was:

> "In my view, it's the people who stay inside a laboratory doing experiments and performing some activity... Here I designed a laboratory with some equipment and the scientist next to me who represents my vision as a scientist".

Regarding this description of a scientist, Melo and Rotta (2020) indicate that the conceptions that basic education students have about scientists may be a result of day-to-day situations, mainly due to the influence of the media (Figure 1). On this aspect:

> Among these media we have cartoons, audiovisual entertainment aimed mainly at children and teenagers. Understanding this media as a cultural artifact, that is, a mechanism that produces ideas, values and conducts, thus having a pedagogical character, even if indirectly. Therefore, cartoons not only have the function of

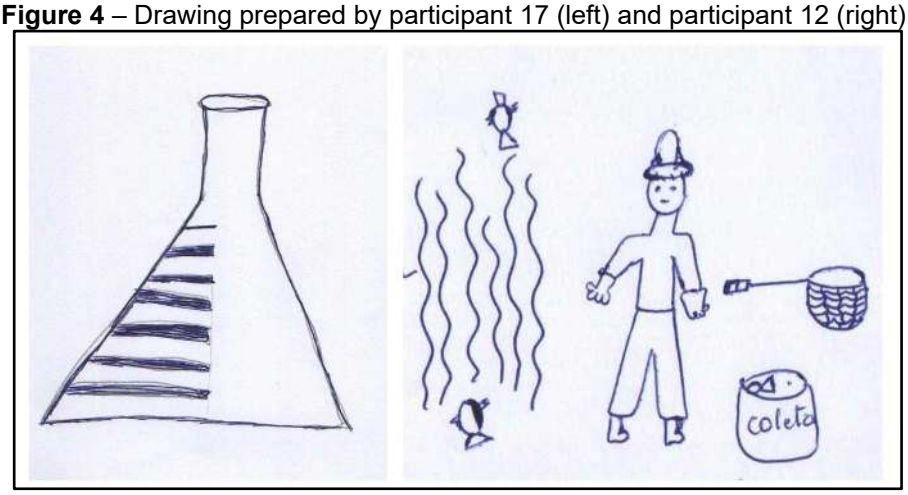
> entertainment, they can also influence, construct meanings, perpetuate or break myths about what it is to be a woman, a man and a scientist (Silva, 2022, p. 99).

From this perspective, it is important that, in Science classes, some didactic alternatives are adopted that seek to contribute so that students can have contact with other characteristics of what it is to be a scientist. Since there are already some audiovisual options that bring together different genres of scientists, with professionals who reconcile professional and personal life, they are concerned with their own appearance, among other characteristics. It is essential to implement innovative pedagogical practices in science classes to promote a broader view of the figure of the scientist, highlighting their diversity, humanity, and multiple professional and personal dimensions (Ferreira, 2024).

Correia *et al* (2022) emphasize that the use of films such as *Radioactive,* when used as scientific dissemination material, can contribute to the teaching and learning process because, in addition to presenting the figure of a woman scientist, it also highlights science as a collective activity, entangled by political, social, and economic contexts.

With regard to the category "Research symbols", 95% of the drawings presented scientific materials or laboratory instruments, including: erlenmeyers, magnifying glasses, test tubes, swan-neck flask, syringe, scissors, tweezers and animal and animal capture net. In short, the research symbols were mostly in the laboratory environment, as in the drawing in Figure 4 (left).

Figure 4 – Drawing prepared by participant 17 (left) and participant 12 (right).



Source: Survey participants (2024).

According to Rosa and Müncher (2022), exhibiting, for example, only one glassworks, suggests a vision of science detached from human relations, in which a single object is used to represent science, scientific practice, and the scientist himself. With this characteristic, only three drawings were presented, which leads us to reflect that most undergraduate students understand that scientific work is not limited to just one item, but is

linked to human relationships.

One aspect that drew attention was that in three drawings there was an indication of research being carried out in the field, as shown in Figure 4 (right). Breunig *et al*. (2021) point out that, contrary to common sense conceptions, scientists are not necessarily men who spend long hours isolated in laboratories, surrounded by glassware and without a social life. Many excelled in different areas of science, such as Gregor Mendel, Charles Linnaeus, Robert Hooke, and Louis Pasteur. These examples can broaden students' understanding of the various areas of scientific activity, contributing to deconstruct the restricted view that the scientist's work is restricted to the laboratory. We also show that it is substantial to show examples of female scientists, including Brazilian scientists such as Bretha Lutz, Graziela Maciel Barroso, Jaqueline Goes, Ester Sabino, Márcia Barbosa, Sônia Guimarães.

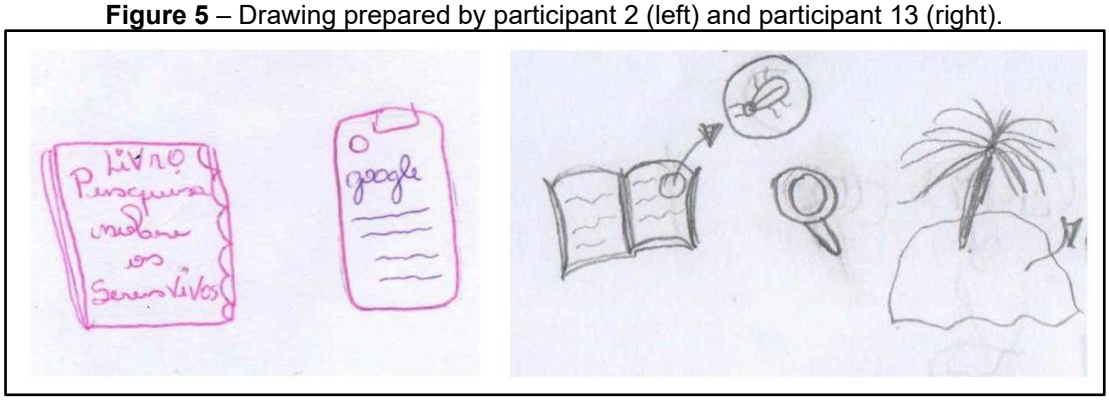
In this context, it is essential that in teacher training undergraduates are presented with information related to the History of Sciences, especially with regard to researchers and research procedures that go beyond the laboratory.

In line with this statement, Guerra and Moura (2022, p. 16) describe some possibilities for using the History of Science (HCC):

> We can think of approaches that focus on analyses of life and the social context in which scientists worked. We can adopt historiographical strands, such as Global History, capable of enhancing discussions that science was produced by humans from different places and different ethnic origins. Or others, such as the HCC, which make it possible to invoke the sociology of absences and emergencies and to make visible the participation of social actors, such as the inhabitants of the colonies, black people, women, research assistants, technicians, artisans, who in the condition of others to be made invisible and thus despised, carried out work and shared knowledge, voluntarily or not, that ensured science reached the acuity and power it has today.

The category "Symbols of knowledge" was identified in 35% of the drawings, with the presence of books, internet research pages, notebooks and blackboards, as can be seen in Figures 5. Drawings such as these lead us to infer that the participants understand that in order to do science, it is essential to use references for study, such as physical books, as well as research sites on the *internet*.

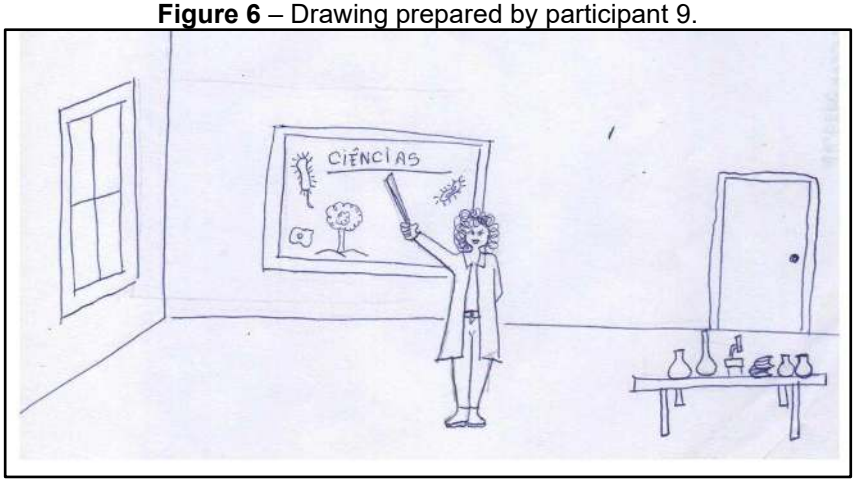
Figure 5 – Drawing prepared by participant 2 (left) and participant 13 (right).



Source: Survey participants (2024).

In one of the drawings, we can identify the blackboard as a symbol of knowledge, in which different living beings are drawn and there is the presence of a teacher (Figure 6).

Figure 6 – Drawing prepared by participant 9.



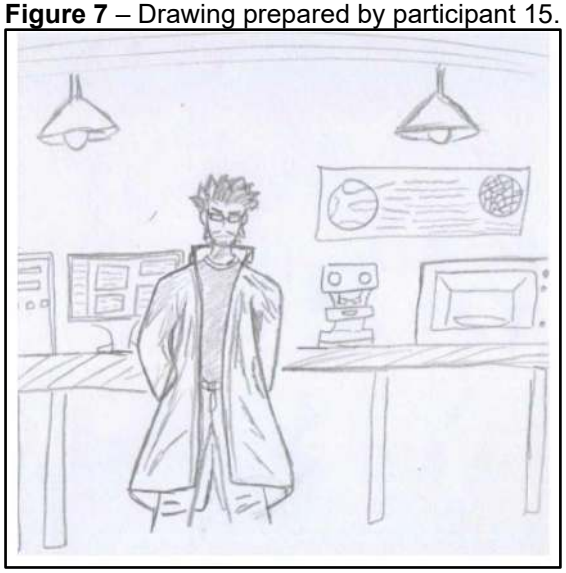
Source: Survey participants (2024).

About this drawing, the undergraduate student explained: "I designed a classroom, because in my conception being a scientist is being able to go beyond making the discovery, it is to share, to pass on knowledge, to make it accessible to students". This drawing is particularly interesting, since it represents a teacher as a scientist, from which it can be inferred that this student sees the basic education teacher as a scientist teaching Science classes.

This representation of the figure of a scientist as a high school teacher was observed in the investigation carried out by Silva, Macêdo, and Brasil (2019), in which nine out of a total of 67 students made this type of drawing. According to these students, the professor had recently returned from her Master's leave and was considered a scientist due to conducting research that inspired them to pursue an academic career.

The Technology Symbols category was presented in 20% of the drawings with computers and monitors as in Figure 7:

Figure 7 – Drawing prepared by participant 15.



Source: Survey participants (2024).

The presence of these symbols helps us reflect that some of the participants in this research present a broader view on the diversity of devices and also roles that scientists play. On the other hand, in the research carried out by Joy *et al.* (2024), none of the children drew any symbol related to technology. This result suggests that the participating children associate the image of a scientist more with laboratories and biological/chemical sciences.

The category "Relevant Legends" was not identified in the analyzed drawings. Despite the category 'Sex and ethnicity', it was possible to verify only 50% of the drawings, since they drew human beings, of these, 40% are presented as men and 15% as women. In one of the drawings there was a male and a female scientist, so 15%. These results reinforce the persistence of gender stereotypes in science, since Silva and Rotta (2024) indicate a minimal representation of women scientists in the media, in films, series, and books, which reinforces gender stereotypes, perpetuating prejudices about science as a mostly male activity.

As pointed out in the research carried out by Moura and Cunha (2018), with students in the 6th year of Elementary School, the authors recognize that, despite the social transformations related to the greater insertion of women in the labor market, the perception of many students still links science to male figures. Also according to the researchers, such a scenario highlights the urgency of pedagogical initiatives that promote the recognition of female competence in scientific activities, as an indispensable strategy to combat gender inequality.

Eduardo and Moraes (2023) revealed that children in the 3rd year of Elementary School drew mostly male scientists. The characteristics attributed by the students reflect a

view of science influenced, to a large extent, by stereotyped representations present in textbooks and cartoons, as can be seen in the eight examples presented in Figure 1.

In general, although these distorted views still prevail in common sense, it is essential to reflect and promote adjustments for teacher training that provides the opportunity to overcome these perceptions. Only in this way will it be possible to ensure that scientific literacy is achieved in schools (Neves and Cerdas, 2024). In addition, Penna (2021) highlights the importance of research focused on the training of teachers in Media and Information Literacy (AMI), since these professionals can also contribute to the construction of perceptions by students.

In this sense, the present study highlights the importance of including, in teacher training courses, in-depth discussions about the scientist profession, as well as about MIL. This is justified, as the school space may not be primarily responsible for the creation of stereotyped conceptions, but it plays a relevant role as an ally in their deconstruction (Santos, 2022).

These preconceptions appear in the celebrations, in visual images, and in students' perceptions of content, objects, people, or disciplines (Brasil, 2020). However, it is precisely in school that efforts should be promoted to deconstruct these views, creating a more inclusive and prejudice-free environment, promoting "discussions and activities for access to teaching and a curriculum free of stereotypes, thus demystifying this cultural baggage acquired by society" (idem, p. 2). From this perspective, activities can be provided in the school environment in order to promote students' criticality about what it means to be a scientist.

FINAL CONSIDERATIONS

This research revealed that, in general, the perceptions of future teachers about what it means to be a scientist remain marked by stereotyped aspects. Most participants presented scientists as men wearing lab coats and glasses, in laboratories and working in isolation. These characteristics reflect a view influenced by images widely disseminated by the media, which reinforces the importance of reflections on the training of future teachers.

Among the positive characteristics highlighted, it was observed that 95% of the drawings included some symbol of knowledge, evidencing an understanding that science is an investigative process. However, it was identified in a few drawings the reference that scientific practice also requires deepening theoretical productions through books, for the development of scientific research.

Another pertinent point was the observation that the drawings, in combination with the participants' oral explanations, are configured as research sources capable of revealing significant information about the students' perceptions of the scientists.

In summary, demystifying stereotypes and expanding the understanding of the diversity present in scientific practice are fundamental steps for a global perception of scientists. At this juncture, it is essential that undergraduates, still in initial training, study these aspects and are encouraged to plan didactic activities that confront these perceptions and encourage their future students to build a broad and inclusive view of scientific practice.

Therefore, through initial training with a critical and inclusive bias, it will be possible to engage individuals from different backgrounds, regardless of gender, ethnicity, or any characteristics that have been historically marginalized, in the construction of a more diverse and representative scientific field.

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