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ARTICLE

MEMES IN NATURAL SCIENCE TESTS

JOZÉLIO AGOSTINHO LOPES[1]
ORCID: https://orcid.org/0000-0002-1579-4654
<jozelio_lopes@hotmail.com>
BRUNO SILVA LEITE[1]
ORCID: https://orcid.org/0000-0002-9402-936X
<brunoleite@ufrpe.br>

[1] Federal Rural University of Pernambuco (UFRPE). Recife, Pernambuco (PE), Brazil.

ABSTRACT: The present study aimed to investigate how the multimodal meme genre has been mobilized in tests in the area of Natural Sciences (Chemistry, Physics, and Biology), using as material for analysis the traditional and serial entrance exams of state and federal public universities applied in the recent years (from 2001 to 2021), using the Revised Bloom's Taxonomy. This is a qualitative-quantitative, documentary-type research, perfomed through data collection and analysis. The results show that only five memes were present in the tests analyzed and that three of the identified memes presented the dimension of effective/factual knowledge, while the other two, in turn, expressed conceptual knowledge. The dimensions of the perceived cognitive processes concern the first three levels: remember (level 1), understand (level 2), and, finally, apply (level 3) through problematization, in a humorous way. Regarding the content covered in the memes, four are from Chemistry (acids and bases; general characteristics of the liquid state; periodic properties; covalent bonds), and one is from Biology (cytology: cytoplasmic organelles). We did not find any memes focused on the area of Physics. The study also revealed an initial number of memes in the entrance exams of the universities analyzed, thus pointing to the need for a more comprehensive promotion and investigation of this digital culture artifact.

Keywords: Natural Sciences, multimodal genres, memes, revised Bloom's taxonomy.

A PRESENÇA DE MEMES EM PROVAS DE CIÊNCIAS DA NATUREZA

RESUMO: O presente estudo objetivou investigar como o gênero multimodal meme tem sido mobilizado em provas da área de Ciências da Natureza (Química, Física e Biologia), tendo como material de análise as provas de vestibulares tradicionais e seriados das universidades públicas estaduais e federais aplicadas nos últimos vinte anos (de 2001 a 2021), fazendo uso, para isso, da Taxonomia de Bloom Revisada. Trata-se de uma pesquisa quali-quantitativa, do tipo documental, realizada por meio de levantamento e análise dos dados. Os resultados mostram que apenas cinco memes estavam presentes nas provas analisadas e que três dos memes identificados apresentavam a dimensão do conhecimento efetivo/factual, enquanto os outros dois, por sua vez, manifestavam conhecimento conceitual. Já as

dimensões dos processos cognitivos percebidas dizem respeito aos três primeiros níveis, sendo eles: lembrar (nível 1), entender (nível 2) e, por fim, aplicar (nível 3), mediante a problematização, de forma humorada. Em relação aos conteúdos abordados nos memes, quatro são da Química (ácidos e bases; características gerais do estado líquido; propriedades periódicas; ligações covalentes) e um da Biologia (citologia: organelas citoplasmáticas). Não foram encontrados memes voltados para a área da Física. O estudo relevou, também, um número incipiente de memes nos vestibulares das universidades analisadas, apontando, com isso, para a necessidade de uma maior promoção e investigação deste artefato da cultura digital.

Palavras-chave: Ciências da Natureza, gêneros multimodais, memes, taxonomia de Bloom revisada.

LA PRESENCIA DE LOS MEMES EN LAS PRUEBAS DE CIENCIAS DE LA NATURALEZA

RESUMEN: El estudio tuvo como objetivo investigar cómo el género meme multimodal ha sido movilizado en pruebas del área de Ciencias Naturales (Química, Física y Biología), utilizando como material de análisis las pruebas de los vestibulares tradicionales y seriados de las universidades públicas estaduales y federales aplicadas en los últimos 20 años (de 2001 a 2021), haciendo uso, para ello, de la Taxonomía de Bloom Revisada. Se trata de una investigación cualitativa y cuantitativa, de tipo documental, realizada a través de la recolección y análisis de datos. Los resultados muestran que solo cinco memes estaban presentes en las pruebas analizadas y que tres de los memes identificados presentaban la dimensión del conocimiento efectivo/factual, mientras que los otros dos, por su parte, manifiestan conocimiento conceptual. Ya las dimensiones de los procesos cognitivos percibidos se refieren a los tres primeros niveles, a saber: recordar (nivel 1), comprender (nivel 2) y, finalmente, aplicar (nivel 3), mediante la problematización, de forma humorística. En relación a los contenidos abordados en los memes, cuatro son de Química (ácidos y bases; características generales del estado líquido; propiedades periódicas; enlaces covalentes) y uno de Biología (citología: organelas citoplásmaticas). No se encontraron memes enfocados en el área de Física. El estudio reveló, también, un número incipiente de memes en los vestibulares de las universidades analizadas, apuntando, con ello, a la necesidad de una mayor promoción e investigación de este artefacto de la cultura digital.

Palabras clave: Ciencias de la Naturaliza, géneros multimodales, memes, taxonomía de Bloom revisada.

INTRODUCTION

Over the last few decades, research in the area of Natural Sciences (Chemistry, Physics and Biology) has demonstrated concerns about the teaching offered in school spaces (Alves et al., 2021; Simplício et al., 2020) and the way in which the contents have been addressed in entrance exams in higher education (Hernandes; Martins, 2013; Schneider; Scheid; Boer, 2021). These studies reinforce the need to reflect and discuss teaching and learning processes that provide the opportunity for the development of "[...] thinking capabilities, in order to acquire knowledge to understand scientific debates, issues related to technology, and understanding the complex interactions involving Science and Society" (Teixeira, 2019, p. 851).

Therefore, the strategies used in Natural Sciences classes must promote the construction of scientific knowledge, based on contextualized and interdisciplinary teaching, which leads students to understand the world. Based on this scenario, it is noticeable:

> [...] in the field of Science Teaching, attempts to break with the traditional teaching model. These attempts are manifested through the development and application of teaching methodologies and so-called differentiated work strategies, which aim, among others, to place students in an active and leading position, aiming at the development of skills and abilities, collaborating, in

> ultimately, for the development of autonomy in the search for the reconstruction of their knowledge (Martins; Salgado, 2018, p. 224).

For this purpose, the National Curricular Parameters for Secondary Education (Brazil, 2017) presents, through its second general competence, that classes stimulate the exercise of intellectual curiosity and promote the use of typical elements of science, in order to lead the students to practices of investigation, reflection, imagination, critical analysis and creativity "[...] to investigate causes, develop and test hypotheses, formulate and solve problems, and create solutions (including technological ones) based on knowledge from different areas" (Brazil, 2017, p. 9). This guiding document focuses on teaching practices, as well as the skills and competencies that students need to develop during their training process, which must happen in a guided manner.

One of the resources that have been used by Chemistry, Physics, and Biology teachers in the classroom is the multimodal genres, which aims to introduce, develop, and arrange the curricular contents that corroborate the construction of scientific knowledge and the development of critical-reflective thinking by the target audience, through verbal and non-verbal language. Such genres emerged from the advent of digital technologies, in formal and non-formal spaces, and have mobilized, in addition to written text, listening and visual aspects, with or without movement, in messages loaded with meaning and with great popular support. According to Cani (2019), the

> [...] materialization of meanings in multimodal texts, to achieve its communicative purposes, requires semiotic resources that, with digital technologies, can be images, sounds, videos, and gifs, representing the potentialities and restrictions of the use of a given object by a social convention, that is the case of emojis as a way of expressing feelings instead of words (Cani, 2019, p. 249).

Hence, multimodal genres are artifacts created from verbal language, whether oral and/or written, as well as non-verbal language, through the mobilization of visual elements, such as images. Examples of multimodal genres are comic books (Medeiros, 2021), cartoons (Linhares, 2021), newspaper cartoon (Rocha, 2011), advertisements and comic strips (Oliveira; Codinhoto, 2021), as well as memes (Cani, 2019).

In Natural Science, for example, researchers such as Alves et al. (2021) and Simplício et al. (2020) analyze the meme as a teaching resource, observing its potential for approaching topics in Chemistry and Biology, respectively. Thus, "[...] memes have increasingly demonstrated their potential as teaching resources in the teaching of different subjects and have thus consolidated themselves as an important resource in teaching practice" (Alves et al., 2021, p. 813). However, there is a lack of research addressing how multimodal genres have been used in the teaching of Natural Science (Chemistry, Physics, and Biology) and, in particular, in the entrance exams in higher education.

Given the above, the present study aimed to investigate how the multimodal meme genre has appeared in Natural Science tests, using as analysis material the notebooks of the National High School Exam (ENEM), as well as the tests of traditional and serial entrance exams of state and federal public universities applied in the last twenty years, identifying the educational objectives proposed in the Revised Bloom's Taxonomy (TBR). The taxonomy is an essential resource for teachers, whose principal idea consists of "[...] clearly defining what teachers want their students to learn, that is, educational objectives, which can be defined in a hierarchy" (Leite, 2022, p. 74). In this context, its use in the educational area can provide a more efficient action in a structured and conscious way, through the mobilization of the knowledge dimensions (effective, conceptual, procedural, metacognitive) and the cognitive process (1. remember, 2. understand, 3. apply, 4. analyze, 5. synthesize, 6. create).

THEORETICAL REFERENCE

Multimodal Genres

In contemporary times, the presence of multimodal genres in different spaces and with the most varied purposes is common. Such resources have good acceptance and repercussions among

individuals of different ages and social contexts. Its presence can be seen on various websites, newspaper pages, textbooks and paradidactics, TV channels, and social networks, among others. Therefore, it is necessary to understand what multimodal genres are and how they are structured. According to Hiippala (2014 *apud* Cani, 2019), these artifacts are characterized by:

> (a) base: usual elements physically present on the pages, such as sentences, titles, images, captions, etc.; (b) layout: structure, area and realization model together, such as paragraphs, titles, figures, list items, etc.; (c) rhetoric: details of the rhetorical relationships between the content presented by the page elements and their socio-communicative purpose; and (d) navigation: elements that contribute to navigation and access to the page, such as pointers, entries and indexes (Hiippala, 2014 *apud* Cani, 2019, p. 249).

On the other hand, the ascendancy of digital technologies catalyzed the process of elaboration, propagation, and consumption of such elements, inside and outside the school space, directly impacting the social practices of those who participate in this process. In this sense, a brief discussion is presented in this paper around some multimodal genres, namely comics, cartoons, advertisements, comic strips, and, finally, memes, emphasizing some of the aspects that characterize them.

According to Medeiros (2021), comic strips can be perceived as a genre with multimodal predominance, created through images and other elements, whose intention is to enable "[...] different communicative purposes, namely: telling stories, argue about different issues, criticize and/or re-read another text" (Medeiros, 2021, p. 21). Texts of this genre have occupied spaces in school books, social networks, newspapers, magazines, comic books, among others, being designed and created by and for a diverse audience, ranging from children to the elderly.

About the political cartoon genre, it has gained space among readers. Digital technologies, according to Linhares (2021), have contributed to cartoons reaching a greater number of consumers. The author defines the cartoon as a multimodal text of a humorous, argumentative and journalistic nature, with great repercussion in the most varied media, including in textbooks used by education systems. Furthermore, political cartoons "[...] criticizes political reality and social facts" (Linhares, 2021, p. 138). For Linhares (2021, p. 138) political, "[...] cartoons present verbal and visual elements, namely iconic or imagetic signs, understanding their signifiers". It is through criticism, humor and irony that the reader is provoked to make an in-depth reading of the iconic or imagery signs present in the newspaper and magazine cartoons, which bring up issues from the current scenario that demand attention and critical analysis.

Another genre that deserves to be highlighted is the cartoon itself. Its appearance occurred after the political cartoon and "[...] is characterized by being a humorous illustration, whether or not it contains a caricature, which narrates in little detail an anecdote, to establish political, sporting, religious or social criticism" (Rocha, 2011, p. 9). Its structure may or may not have balloons, captions, and a sequence of frames (Rocha, 2011) when transmitting a message. Currently, it is found in newspapers, magazines, and internet pages.

When it comes to the propaganda genre, its origin:

> [...] comes from the discursive advertising domain, having transmuted to the domains of school and digital media. [...] The textual genres produced in the advertising domain have as one of their striking aspects the primary function of selling products, services, and ideas, that is, leading the reading public to consume what is being proposed in texts, through procedures that promote thoughts, desires, and behaviors in readers (Salomão, 2022, p. 22).

Thus, advertisements are texts that use linguistic means to publicize and attract consumers to a specific product, service, or idea, in a scenario in which the need, interest, and consumption regarding a given product are presented and encouraged. For Lima, Nantes and Silva (2017, p. 106), multimodal advertisements have important aspects, helping "[...] in people's creative behavior, as they present new possibilities for creation, reading and re-reading, through of its most varied signs, facilitating projects, careers and people's lives in general".

On the other hand, comic strips are multimodal genres based on a short sequence of comics (three or four) that make social criticism. Commonly, texts of this type portray, through humor and verbal

and visual language, "[...] everyday situations and enable the reader to reflect on their social actions, values, and customs, aiming for better interaction in society" (Azevedo, 2021, p. 44). Its presence can be observed, for example, in textbooks, entrance exams, internet pages, newspapers, and magazines.

Finally, another cyberculture phenomenon that has gained notoriety and acceptance among different agents in society is the multimodal meme genre. It has been understood as an artifact of digital culture, with repercussions on social media. For Torres (2016, p. 60), "[...] the meme is a message almost always joking or ironic in a tone that may or may not be accompanied by an image or video and which is intensely shared by users on social media".

As with the other genres already presented when transmitting a message, the memes also use visual and verbal language, with no concerns for aesthetic issues. Furthermore, it is rich in meaning and permeated by humor to enable varied content to be addressed and (re)signified in different areas of knowledge.

Memes and the Natural Science teaching

In a global and connected world, in which a significant part of the population navigates cyberspace, information has been disseminated and consumed through different means, including social networks, enabling communication to take place in a short period of time and undergo different modifications throughout the communicative process. Memes, for example, are the result of technological evolution and have given new meaning to the way people communicate. To this end, the genre in question carries important elements that end up instigating its consumers, due to the information it aims to transmit and the other aspects that structure it, such as humor, images, texts, and gifs that are propagated on the internet.

When analyzing the historical context of meme, we verify that it was created by zoologist Richard Dawkins, in 1976 through the publication of his famous book The Selfish Gene. Toledo (2017, p. 12) highlights that the term meme used by Dawkins refers to "[...] a cultural analog of the gene. A piece of information passed from one person to another person." However, this process does not happen in any way, as there is an intentionality towards the transmission of information, which can use a relaxed, humorous, simple, or complex language to deal with different issues that devastate society, being in the political field, environmental, economic, educational or cultural, among others.

Torres (2016, p. 60, emphasis added) highlights that "[...] for Dawkins, meme would be 'a unit of cultural transmission, or imitation', that is, everything that is transmitted through repetition, as habits and customs within a given culture". It is an adaptation for the internet, in particular, for social networks, which are digital environments in which memes are launched, disseminated, and consumed.

Memes originate from different sources, and for Torres (2016, p. 61), these sources can include "[...] speeches, talks, customs, refereeing errors in football, scoops, funny facts, political characters, and even economic news". Therefore, the production of this genre can take place through numerous questions that arouse the interest of users who browse the virtual space, thus enabling their creation to be appreciated and socialized on networks. Furthermore, Torres (2016) highlights other aspects that are linked to the meme, for example, the formats, as they:

> [...] also vary, from simple images, to deliberately grotesque montages, comics, and strips. Reuse is a striking characteristic of a meme, as rules, such as copyright, are not always respected. The 'misappropriation' and reinterpretation of an image from a film, a company logo, a photograph, etc. it is a fundamental part of building a meme (Torres, 2016, p. 61, emphasis added).

From this perspective, the emergence of a meme occurs spontaneously, without much concern for copyright and aesthetic issues. For Toledo (2017, p. 11), "[...] an internet meme is an image or phrase that goes viral in a social interaction program or application. One person creates it and publishes it." Some of them, whose reasons are still unclear, are replicated thousands or millions of times, thus reaching a very expressive audience, with different tastes and cultures. In view of this, memetics emerges as it appears to be the science responsible for studying how memes propagate (Toledo, 2017), which provides conditions for a greater understanding of how it happens.

In the Education field, memes have been gaining prominence through studies in the most varied areas of knowledge and on topics of relevance to the students and teachers training. An example of this is the research by Santos and Carvalho (2019), which presents investigations by different authors who deal with the meme in the areas of Portuguese, Spanish, and History, thus dealing with digital inclusion, critical literacy, critical formation, didactic potential, as well as grammar teaching. Other areas, such as Mathematics (Friske, 2020) and Geography (Bezerra, 2021), also started considering memes as learning objects for teacher and student training.

However, there is a lack of research involving memes in Science teaching, especially when considering the area of Natural Science. According to Santos *et al.* (2020, p. 6), there is a "[...] scarcity of academic productions that encourage discussions regarding the topic addressed [...]" in Chemistry teaching. On the other hand, some productions, such as those by Simplício *et al.* (2020), deal with the pedagogical potential of memes to discuss current topics, such as Coronavirus. Oliveira (2020, p. 13), collaborating with research in the area, argues that memes, in Science classes, "[...] linked to scientific dissemination, [...] can be a way of expression of a collective authorship by users in a network, connected to the displacement of the science language dissemination and popularization".

This scenario allows the teacher, through well-planned classes with defined objectives, to bring those resources inside and outside the school, to approach Chemistry, Physics, and Biology content, leading participants to discuss, problematize, and understand critically and consciously current topics, making use of reading and scientific language. In this direction, Santos *et al.* (2020) present some important considerations about this resource in Chemistry, and, to this end, they observed the existing potential, as well as the view of basic and higher education teachers who had already used this tool in their classes.

Finally, we see here a regard on the lack of studies that address the presence of memes in other educational segments, such as the ENEM tests and traditional entrance exams of public universities in the Natural Science area. The occurrence of this genre in exams for access to higher education becomes significant for its capacity to mobilize and explore, during the resolution of questions, multilingualism, multiliteracy, the construction of meanings, and cognitive and affective skills. It is a humorous and innovative way of presenting content and connecting students to reality. In addition to being rich in meaning, memes can interact with different themes and texts, thus enabling a critical and objective analysis. This context, therefore, denotes a need to promote research into this educational artifact originating from digital culture, which has gained notoriety in formal and non-formal teaching spaces.

Assumptions of Revised Bloom's Taxonomy

The concern with the organization of information generated by humanity is historic and has mobilized thousands of individuals over the centuries. According to Aquino, Carlan, and Brascher (2009), since ancient times, human beings have already sought ways to organize information, resulting in individual and collective constructions. As a result, the authors highlight that a range of "[...] models of organization and information and knowledge representation have been developed over time" (Aquino; Carlan; Brascher, 2009, p. 197), among them, taxonomies.

Taxonomy has been respected and supported in different areas of knowledge, including education, although its expression is much better known in Biology. According to Leite (2022, p. 61), taxonomy "[...] is the science of identification, [...] of classification, naming and organization of a pre-determined system and which results in a conceptual framework for discussions, analysis, and information retrieval". This scenario has provided the educational field with conditions to promote the so-called areas or domains through the development and implementation of pedagogical activities aimed at the school space.

The existence of taxonomies in various areas of knowledge is due to studies by a group of researchers coordinated by the American psychologist and pedagogue Benjamin Samuel Bloom in the 1950s, which originated the system known as the Taxonomy of Educational Objectives (TEO). TEO can be defined as being a "[...] structure for classifying statements about what students are intended to learn as a result of instruction (considering the three domains)" (Leite, 2022, p. 62). For Ortiz and Dorneles (2018), the learning process is quite complex and has countless variables that are difficult to delimit.

However, "[...] for didactic purposes, educators and psychologists delimited three areas or domains in which learning occurs, that are: affective, cognitive and psychomotor" (Ortiz; Dorneles, 2018, p. 20), which are results of TEO.

For Ortiz and Dorneles (2018), when one is in a learning process, one or more domains are dynamically mobilized through a continuous and alternating flow. Regarding the essential characteristics that design each of these domains, Ferraz and Belhot (2010), citing the studies of Bloom (1972), Bloom *et al.* (1956), Clark (2006), Guskey (2001), and School of Education (2005), present the following summary for each of them:

> • **Cognitive**: related to learning, and mastering knowledge. It involves the acquisition of new knowledge, intellectual development, skills, and attitudes. It includes recognition of specific facts, standard procedures, and concepts that constantly stimulate intellectual development. In this domain, the objectives were grouped into six categories and are presented in a hierarchy of complexity and dependence (categories), from the simplest to the most complex. To advance to a new category, you must achieve an adequate performance in the previous one, as each one uses skills acquired at previous levels. The categories in this domain are Knowledge; Understanding; Application; Analysis; Synthesis; and Assessment; • **Affective**: related to feelings and postures. It involves categories linked to the development of the emotional and affective areas, which include behavior, attitude, responsibility, respect, emotion, and values. To advance to a new category it is necessary to achieve an adequate performance in the previous one, as each category uses capabilities acquired at previous levels to be improved. The categories in this domain are Receptivity; Response; Valuation; Organization; and Characterization; and • **Psychomotor**: related to specific physical skills. Bloom and his team did not define a taxonomy for the psychomotor area, but others did it and created six categories that include ideas linked to reflexes, perception, physical abilities, improved movements, and non-verbal communication. To advance to a new category, you must achieve an adequate performance in the previous one, as each one uses skills acquired at previous levels. The categories in this domain are Imitation; Manipulation; Articulation; and Naturalization (Ferraz; Belhot, 2010, p. 422-423, emphasis added).

About these domains, Ferraz and Belhot (2010, p. 423) highlight that "[...] the cognitive is the best known and used one. Many educators rely on the theoretical assumptions of this domain to define, in their educational planning, objectives, strategies, and evaluation systems", this domain being the focus of this investigation.

In the cognitive domain, six categories were initially proposed by TOE, widely known as Bloom's Taxonomy, namely: knowledge, understanding, application, analysis, synthesis, and, finally, evaluation. These categories were ordered from the simplest (lower order thinking skills) to the more complex (higher order thinking skills) and from concrete to abstract. In 2001, Bloom's Taxonomy (1956) underwent an important review taken by a group of experts (teachers, psychologists, specialists in curriculum, assessment, etc.) who responded to the invitation of the American Psychological Association (Costa; Martins, 2017; Ferraz; Belhot, 2010; Silva; Martins, 2014), under the supervision of the educational psychologist David Krathwohl (Anderson; Krathwohl, 2001). For Silva and Martins (2014, p. 191), the researchers involved with the new version of the taxonomy were able to relate "[...] the aspects of cognitive development, competence and ability to attribute a two-dimensional characteristic to Bloom's original taxonomy". Still according to the authors, based on the definition of two-dimensionality, it was possible to promote the combination between the knowledge to be developed by the participant, which becomes the dimension of knowledge, and the process used for this knowledge to be acquired, thus culminating in the cognitive process dimension. (Silva; Martins, 2014).

In RBT, objectives began to be described by using action verbs and nouns that seek to present the expected cognitive processes. The verbs used in the categories are: remember, understand, apply, analyze, evaluate, and create (Silva; Martins, 2014). Furthermore, based on an analysis involving the direct relationship between the verb and the noun, these should "[...] belong to separate dimensions in which the nouns would form the basis for the knowledge dimension (what) and the verb for the dimension related to cognitive aspects (how)" (Leite, 2022, p. 69). Table 1 highlights the dimension of knowledge in the Revised Bloom's Taxonomy, covering the four categories, briefly describing each, and, finally, the subcategories involved.

Chart 1 – Dimension of knowledge in Revised Bloom's Taxonomy

Category	Description	Subcategories
Efective Knowledge	It is related to the essencial content that the student must master in order to be able to conduct and solve problems based on this knowledge. In this category, facts do not need to be understood or combined, just reproduced as presented.	Knowledge of terminology; knowledge of details and specific elements.
Conceptual Knowledge	It is related to the interrelationship of essencial elements in a more elaborate context that students can discover. Some simpler elements have been addressed and now need to be connected. Schemes, structures, and models were organized and explained. At this stage, it is not the application of an important model, but the awareness of its existence.	Knowledge of classification and categorization; Knowledge of principles and generalizations; and Knowledge of theories, models, and structures.
Procedural Knowledge	It is related to the knowledge of "how to accomplish something" using methods, criteria, algorithms, and techniques. At this moment, abstract knowledge begins to be stimulated, but within a single, rather than interdisciplinary, context.	Knowledge of specific content, skills, and algorithms; knowledge of specific techniques and methods; knowledge of criteria and perception of how and when to use a particular procedure.
Metacognitive Knowledge	It is related to the recognition of cognition in general and the awareness of the breadth and depth of knowledge acquired from a given content. In contrast to procedural knowledge, this knowledge is related to interdisciplinarity. The main idea is to use previously assimilated (interdisciplinary) knowledge to solve problems and/or choose the best method, theory, or structure.	Strategic knowledge; knowledge about cognitive activities, including preferred contexts and learning situations (styles); self knowledge.

Source: Ferraz e Belhot (2010, p. 426).

On this way, Table 2 presents the dimension of the cognitive process proposed by the revised taxonomy using the two-dimensional table. In the proposal, the knowledge dimension is organized in the vertical column, having four dimensions and not just three, as was the case in the original taxonomy (Ferraz; Belhot, 2010).

Chart 2 – Cognitive process in the revised taxonomy

Knowledge dimension	**Cognitive process dimension**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual						
Conceptual						
Procedural						
Metacognitive						

Source: Ferraz e Belhot (2010, p. 429).

The cognitive process, which belongs to the horizontal column, has cells ranging from 1 to 6, formed by the intersection of this process dimensions, and deals with the objectives. However, Ferraz and Belhot (2010, p. 427) note that "[...] the same objective can be inserted in more than one cell, being not necessary to fill in all consecutive cells". Furthermore, Silva and Martins (2014) argue that using this table makes it possible to verify the extent and degree of depth of the objectives that are the focus of the analysis and which others can be improved.

Still in this context, the studies by Alonso (2000), Silva and Mazé (2020) and Silva *et al.* (2021) call attention to the presence of cognitive operations (or thinking skills) related to cognitive levels of difficulty, organized into five levels ranging from 1 to 5. As the degree of difficulty involving the tasks proposed in the activity increases, which may have cognitive operations such as decoding data, memorizing, applying (level 1 – easy); summarizing, interpreting (level 2 – medium); generalizing,

comparing, classifying (level 3 – medium-difficult); organizing data, criticizing, inducing, arguing (level 4 – difficult); imagining, creating, planning, researching (level 5 – very difficult), cognitive difficulty also increases (Silva; Mazé, 2020; Silva *et al*., 2021). Thus, tasks belonging to level 1, considered "easy", have a minimum, low-order cognitive difficulty; those that demand cognitive levels ranging from medium to very difficult, that is, of higher complexity, have a cognitive level of difficulty characterized as maximum (Alonso, 2000; Silva *et al*., 2021).

METHODOLOGY

In this present study, we proposed, from a survey, to analyze the Natural Science tests of the National High School Examination (ENEM), available in the database of the National Institute of Educational Studies and Research Anísio Teixeira (INEP), as well as from traditional and serial entrance exams from public institutions (federal and state) that maintained their own assessment systems. For this, we considered the time frame of a twenty-year period of application (from 2001 to 2021).

This is a research of qualitative and quantitative approaches, considering that it allows the presentation of better information about the topic in question, using numerical and descriptive elements about the data obtained. In this context, Minayo and Sanches (1993) discuss some issues that integrate the use of quantitative and qualitative approaches, since:

> [...] both approaches are necessary, however, in many circumstances, they are insufficient to encompass the entire observed reality. Therefore, they can and should be used in such circumstances as complementary, as long as the investigation planning is in accordance (Minayo; Sanches, 1993, p. 240).

Based on this, the study proposed to use them in a complementary way, with a view to the potential existing in each of them to answer the research problem, namely: how memes have been mobilized in tests in the area of Natural Science of the National High School Exam (ENEM) and traditional entrance and serial exams of state and federal public universities that have their own assessment system, considering the educational objectives proposed by the Revised Bloom's Taxonomy (RBT)?

This is a documentary investigation, once it emerged from documents that have not yet undergone analytical treatment, in other words, from primary sources. For Sá-Silva, Almeida and Guindani (2009, p. 6), "[...] primary sources are original data, from which there is a direct relationship with the facts to be analyzed, that is, it is the (a) researcher who analyzes". Therefore, ENEM and the entrance exams in the area of Natural Science were considered primary sources, focusing on the multimodal genre meme.

In summary, this research had two principal moments. At first, we worked on the identification and survey of memes on the pages of public institutions. Therefore, the tests were accessed from the website of each institution responsible for carrying out the selection processes: INEP, Fundação Universitária do Vestibular (Fuvest), and the universities themselves. The list of public institutions considered in this study is from the survey by Montoia and Toledo (2021) on public universities that have their entrance exams. From this, we observed all applications performed in the frame time considered here (2001–2021), seeking in each file the following keywords: Physics, Chemistry, Biology, Natural Science, humor, multimodal genre, image, and, finally, meme.

In a second moment, we analyzed and discussed those artifacts, using qualitative and quantitative data, whose information was organized through tables and tables. Therefore, we analyzed the data based on RBT, observing the six categories: 1) Remember; 2) Understand; 3) Apply; 4) Analyze; 5) Evaluate; and 6) Create. Regarding these entries present in the revised version, Ortiz and Dorneles (2018, p. 22) emphasize that "[...] they were designed to create countless possibilities of use for the digital medium, increasing its application to different educational contexts". Furthermore, the four dimensions of RBT knowledge were considered (effective/factual; conceptual; procedural; metacognitive).

RESULTS AND DISCUSSION

The survey covered 35 ENEM test books applied between 2001 and 2021 – considering regular, special, and digital editions – making it possible to identify several multimodal genres, such as advertising (1), comics (3), comic strips (13), and cartoons (6). However, there was no presence of memes in the Natural Science tests. The same happened in tests with national impact, other than ENEM, where there is an absence of memes, especially when comparing them to other multimodal genres, despite being a genre widely used by teachers and students in the 21st century, both inside and outside the school context.

On the other hand, if we consider the analysis of the tests of state and federal universities that maintained their traditional or serial entrance exam, we observe that memes have permeated Natural Science questions in some of these public institutions. This scenario reinforces the potential for approaching different topics through verbal and non-verbal language. It is noteworthy that, concerning the 40 higher education investigated institutions (from 18 Brazilian states), we identified one meme at the Five Federal University of Roraima (UFRR) in the 2017 serial entrance exam; two at the University of São Paulo (USP) in 2019 and 2021 (traditional entrance exam); one at the Central-West State University (UNICENTRO) in 2021 (traditional entrance exam); and one at the State University of Rio de Janeiro (UERJ) in 2016 (traditional entrance exam). The data obtained in this research points to a recent, albeit propaedeutic, use of memes in entrance exams at four higher education institutions of national relevance.

It is relevant to mention that, during the evidence survey, we did not locate some editions on the virtual pages of 12 universities, which were not included in the analysis. The tests applied in 2021 were not available at the Federal University of Rio Grande do Sul (UFRGS), Federal University of Santa Catarina (UFSC), State University of Santa Catarina (UDESC), State University of Amazonas (UEA), State University of Maringá (UEM), State University of Montes Claros (UNIMONTES), State University of Paraná (UNESPA), State University of Health Sciences of Alagoas (UNCISAL) and State University of Southwest Bahia (UESB). Furthermore, we also could not find the 2011 and 2019 tests from the Vale do Acaraú State University (UVA) and the 2020 and 2021 tests of the State University of Bahia (UNEB) and the State University of Minas Gerais (UEMG). We believe that tests were not applied at these universities in 2020 and 2021 due to the pandemic caused by COVID-19, which modified the entrance exam calendar of several institutions, justifying the non-availability of their pages.

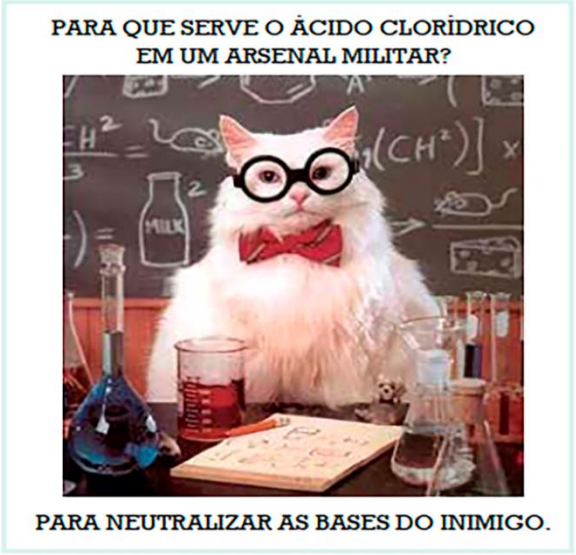
Considering this, the following subsection will discuss the dimensions of knowledge and cognitive processes covered by the memes present in the tests, not regarding, for this purpose, the contents and the degree of complexity involved in the evaluation process.

Classification of memes based on the Revised Bloom's Taxonomy

This discussion results in a classification of the five memes found from the perspective of the revised taxonomy educational objectives. To facilitate the identification, the coding meme-1, meme-2, meme-3, meme-4, and meme-5 will be used.

The first meme applied in a traditional entrance exam (Figure 1) was part of a discursive question in the second phase of the Chemistry test in the UERJ selection process, in which there is an image of a cat wearing glasses, illustrating an intellectual being, in an environment surrounded by glassware and solutions, as well as other typical representations of a Chemistry laboratory, presenting the following question: "What is hydrochloric acid for in a military arsenal?" (UERJ, 2016, p. 4), the answer to which appears just below the cat: "to neutralize the enemy's bases" (UERJ, 2016, p. 4).

Figure 1 – Meme-1 present in the 2nd phase test, of the UERJ 2016 Chemistry discursive questions exam



Considere que, no texto acima, as "bases do inimigo" correspondam, na verdade, ao hidróxido de bário.

Escreva a equação química completa e balanceada da reação de neutralização total do ácido clorídrico por essa base. Aponte, ainda, o nome do produto iônico formado na reação.

Source: UERJ (2016, p. 4).

In that statement, candidates find the information that the base inferred in meme-1 concerns barium hydroxide (Ba(OH)2), being asked to present the complete and balanced chemical equation of the total neutralization reaction of the acid hydrochloric acid through this base and, in the end, pointing out which is the ionic product resulted from that. Therefore, the objective is for the candidate to represent the chemical neutralization equation between an acid and a base to identify the products formed. From this perspective, we highlight the knowledge dimension mobilized to resolve this issue (Table 3), which is the conceptual knowledge, as there is an "[...] interrelationship of the basic elements in a more elaborate context [...]. Simpler elements have been addressed and now need to be connected" (Ferraz; Belhot, 2010, p. 426). In this process, participants use some subcategories: schemes, structures, and models, in an organized and explained way. In addition, there is the knowledge of classification.

Chart 3 – Cognitive process in the revised taxonomy for meme-1

Knowledge dimension	**Cognitive process dimension**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual						
Conceptual	x	x	x			
Procedural						
Metacognitive						

Source: Research data

The cognitive knowledge dimension levels that permeate meme-1 are the first three of the revised taxonomy, remembering that was necessary to rescue/recover concepts previously acquired to be able to follow the requested answer; secondly, understanding as information needs to be understood, which is done through a connection between the new and previously prepared knowledge; and, finally, applying, since this allows "[...] to execute or use a procedure in a specific situation and can also address the application of knowledge in a new situation" (Leite, 2022, p. 71). Considering the cognitive levels of difficulty, the question present in meme-1 delivers level 3 (medium level – difficult), as it involves higher-order cognitive skills.

In the case of the second meme (Figure 2), presented in question 8 of the 2017 UFRR entrance exam, it appears that it problematizes the origin of mitochondria in animals with sexual reproduction.

Figure 2 – Meme-2 present in the Biology test of the 1st phase of the UFRR 2017 serial entrance exam

Durante o dia das mães, é comum encontrar nas redes sociais mensagens e frases como a descrita na imagem abaixo.

(Fonte: http://piadasnerds.etc.br/dia-das-maes/)

Sobre a origem das mitocôndrias em animais com reprodução sexuada, está **CORRETO** afirmar que:

A) As mitocôndrias de animais com reprodução sexuada originam-se por geração espontânea no momento da fase embrionária do indivíduo;

B) As mitocôndrias de animais com reprodução sexuada originam-se a partir daquelas que existem no gameta masculino, pois as presentes no gameta feminino degeneram após sua fecundação;

C) As mitocôndrias de animais com reprodução sexuada originam-se a partir daquelas que existem no gameta feminino, pois as presentes no gameta masculino degeneram após a fecundação;

D) As mitocôndrias de animais com reprodução sexuada originam-se apenas a partir daquelas presentes em bactérias do trato digestivo de sua mãe;

E) As mitocôndrias de animais com reprodução sexuada originam-se igualmente a partir daquelas que existem no gameta feminino e no gameta masculino.

Source: UFRR (2017, p. 5).

Figure 2 shows the representation of mitochondria. Evolutionarily, the mitochondria "[...] would originate from phagocytosed bacteria that did not circumvent the digestion process, preserving itself in symbiosis with the primitive host cell" (Lothhammer *et al.*, 2009, n.p.), being considered, from then on, as a cellular organelle responsible for energy metabolism. Evidence of this theory is that mitochondria can self-duplicate and have their own DNA.

In this context, the dimension of knowledge covered by meme-2 concerns effective/factual knowledge, since it is related "[...] to the basic content that the student must master to be able to solve problems based on this knowledge" (Ferraz; Belhot, 2010, p. 426). Therefore, the subcategories covered by meme-2 are the knowledge of terminology and the knowledge of details and specific elements involving the referred subject. Thus, for the students to reach the correct answer, which states that "[...] the mitochondria of animals with sexual reproduction originate only from those present in bacteria from their mother's digestive tract" (UFPR, 2017, p 5), they needed to use the first knowledge dimension (Table 4).

Chart 4 – Cognitive process in the revised taxonomy for meme-2

Knowledge dimension	**Cognitive process domension**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual	x	X				
Conceptual						
Procedural						
Metacognitive						

Source: Research data

The third meme appeared in question 43 of the general knowledge test in the 2nd phase of the USP entrance exam in 2019, organized by Fuvest. Figure 4 highlights the following comment: "evidence that cats are liquids", in a context in which cats appear in different containers, of different shapes, thus associating them with liquids, since both "assume" the shape of the container in which they are inserted. Given this, the candidate was prompted to mark the alternative that matches with the humorous effect caused by the association of the title with the images used in light of the characteristics of the liquids, resulting in the alternative "b" as the correct answer since this explains that liquids "have a constant volume and variable shape, a property that cats appear to have" (Figure 3) (FUVEST, 2019, n.p.).

Figure 3 – Meme-3 present in the general knowledge test, 2nd phase of the Fuvest/USP entrance exam, 2019

Source: Fuvest (2019, n.p.).

The question applied in the 2nd phase of Fuvest, in which meme-3 is problematized and becomes the focus of the resolution, is related to the dimension of effective/factual knowledge (Table 5) of the Revised Bloom's Taxonomy, since there is the presence of basic elements that participants in the selection process needed to know to solve the problem addressed, such as "[...] terminology (technical vocabulary, symbols); knowledge of specific details and elements" (Leite, 2022, p. 73).

Chart 5 – Cognitive process in the revised taxonomy for meme-3

Knowledge dimension	**Cognitive process dimension**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual	x	X				
Conceptual						
Procedural						
Metacognitive						

Source: Research data.

When it comes to the dimension of the cognitive process, two of them are identified to solve the problem situation, remember and understand, since the students needed to recall the properties involving liquids, as well as understand and interpret the relationship between the liquid state, the volume, and the cats as they assume the varied shapes of the containers, all of this in a humorous context. Thus,

the cognitive level of difficulty of the question in which meme-3 is applied requires the student to have an average level (level 2) in their thinking ability when performing the task (Alonso, 2000; Silva; Mazé, 2020; Silva *et al.*, 2021).

The fourth meme appeared also in the general knowledge test, the first phase of the USP entrance exam, 2021 edition, whose question is number 81. In meme-4, the family's attention is drawn - this one is located in the first column of the periodic table, IA family or alkali metal family – for the presence of an impostor among them. In its statement, the question highlights that the meme genre plays with Chemistry concepts through a popular game that aims to identify the impostor among the crew of ships and space stations, problematizing the characteristics of the chemical elements of this family (Figure 4).

Figure 4 – Meme-4 present in the general knowledge test, 1st phase, of Fuvest/USP 2021 entrance exam

Disponível em: https://twitter.com/DoutorQuimica/.

O meme ao lado brinca com conceitos de química em um jogo popular, cujo objetivo é que os jogadores descubram o impostor entre os tripulantes de naves e estações espaciais. Nele um dos elementos é considerado o impostor por sua característica química diferente.

Nesse contexto, é correto afirmar que o impostor seria o elemento:

(A) H, por ser um elemento com grande tendência a fazer ligação covalente em uma família com tendência a fazer ligação iônica.
(B) Na, por ser o único que pode ser obtido em sua forma metálica, ao contrário dos demais membros da família, que formam apenas óxidos.
(C) K, por ter raio atômico atipicamente grande, sendo maior do que os elementos abaixo dele na tabela periódica.
(D) Cs, por pertencer à família 2 da tabela periódica, enquanto os demais pertencem à 1, formando cátions +2.
(E) Fr, por reagir violentamente com a água, devido ao seu pequeno raio atômico, liberando muito calor, diferentemente dos demais elementos da família.

Source: Fuvest (2021, p. 23).

Based on this, participants needed to mark the letter "a" as the correct alternative, as it presents hydrogen (H) as being "[...] an element with a great tendency to form covalent bonds in a family with a tendency to form ionic bonds" (FUVEST, 2021, p. 23), in other words, it is a nonmetal present in a family classified as metals (Figure 4), whose characteristics are different. The dimension of RBT knowledge perceived in this question concerns conceptual knowledge since there is "[...] the interrelationship between basic knowledge acquired, in a more refined context. This knowledge is evaluated in questions that require relating information presented with acquired knowledge" (Costa; Martins, 2017, p. 705). Furthermore, participants needed to use knowledge involving principles, classifications, and theories when solving the proposed problem (Table 6).

Chart 6 – Cognitive process in the revised taxonomy for meme-4

Knowledge dimension	**Cognitive process dimension**					
	1. Remember	2. Undestand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual						
Conceptual	x	x	x			
Procedural						
Metacognitive						

Source: Research data.

In the meme-4 question, students needed to recall (1. Remember) previously acquired knowledge about periodic properties, understand (2. Understand) how information about periodic properties is organized, as well as how to apply this knowledge in a new situation (3. Apply), which was the use of the content referred, relating it to a popular game, through a meme from social networks that discusses and promotes science. This scenario, therefore, points to a question of a low complexity cognitive level of difficulty, that is, an easy level (level 1). Considering this, it is appropriate to think of what is presented by Ortiz and Dorneles (2018, p. 12) when they argue that educational actions need to follow the current scenario, as they require "[...] more fluid, dynamic processes and interactive, and these actions require adaptation to new technologies, especially those in the digital environment with which we have the emergence of new challenges". In this way, the school has a fundamental role in making this process happen, starting to consider the presented technological scenario and not ignoring the urgency of developing skills in this field, as advocated by the BNCC (Brazil, 2017).

The fifth and last meme observed in the analyzed tests appeared on the first day of the UNICENTRO entrance exam, 2021. The digital resource (Figure 5) focuses on ionic bonds through the problematization between the chemical elements aluminum, with atomic number 13, and chlorine, with atomic number 17, being metal and nonmetal, respectively.

Figure 5 – Meme-5 in the Chemistry test, on the 1st day of the UNICENTRO entrance exam, 2021.

2 O "meme" a seguir, utilizado especialmente nas redes sociais, representa uma possível ligação entre átomos de alumínio e cloro.

(Disponível em: <https://www.facebook.com/quimicocomico/photos/a.680857565358642/1794119354032452>. Acesso em: 28 out. 2020.)

Sabendo que o número atômico do alumínio é 13 e o do cloro é 17, assinale a alternativa que apresenta, corretamente, a fórmula do composto formado.

a) Al_3Cl b) Al_2Cl_3 c) $AlCl$ d) $AlCl_2$ e) $AlCl_3$

Source: UNICENTRO (2021, p. 31).

Regarding RBT (Chart 7), meme-5 privileges the effective/factual knowledge dimension, as it comprises a simple question, with a low degree of complexity, regarding which the target audience needs to master basic elements about the content of covalent bonds to reach the expected result, which is alternative "e", that is, the compound formed is aluminum chloride (AlCl3).

Chart 7 – Cognitive process in the revised taxonomy for meme-5

Knowledge dimension	**Dimensão do processo cognitivo**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Efetive/factual	x	x	x			
Conceptual						
Procedural						
Metacognitive						

Source: Research data.

The cognitive processes covered by this question are *remember* (level 1), considering that each student needed to recall and search for information already memorized about the content, *understand* (level 2), and *apply* (level 3), since it demands the use of a procedure in a specific situation that allows finding the formula of the compound formed from the chemical bond between one aluminum atom and three chlorine atoms. Therefore, the thinking skills that permeate meme-5 demonstrate a cognitive level of easy difficulty (level 1); in other words, of low complexity (Alonso, 2000; Silva et al., 2021).

In short, the five memes featured in this research required, through objective and discursive questions, the presence of the first three levels of RBT's cognitive processes: remember, representing the simplest of the levels and the most recurrent; understand; and, finally, apply (chart 8). This means that college students worked on recognizing, reproducing and memorizing information (level 1); with the connection between new knowledge and that already acquired (level 2); and also, with the execution of procedures in specific situations, whether new or not (level 3) (Costa; Martins, 2017). For this, they used basic knowledge involving the area of Natural Science in an interrelated way, using, among other things, models, terminologies, theories, structures, and classification (Costa; Martins, 2017) to obtain success in the proposed issues.

Chart 8 – Cognitive process in the revised taxonomy of analyzed memes

Knowledge Dimension	**Cognitive Process Dimension (cognitive operations)**					
	1. Remember	2. Understand	3. Apply	4. Analize	5. Synthesize	6. Create
Effective/factual	meme-2 meme-3 meme-5	meme-2 meme-3 meme-5	meme-5			
Conceptual	meme-1 meme-4	meme-1 meme-4	meme-1 meme-4			
Procedural						
Metacognitive						

Source: Research data.

However, it is necessary to talk about the non-contemplation of the last three cognitive operations of RBT, *analyze*, which is a cognitive process "[...] related to dividing information into relevant and irrelevant, important and less important and understand the interrelationship between the parts" (Ferraz; Belhot, 2010, p. 429); *evaluate*, which is associated with making "[...] judgments based on qualitative and quantitative criteria and standards or efficiency and effectiveness" (Ferraz; Belhot, 2010, p. 429); and *create*, which proposes "[...] putting elements together to create a new vision, a new solution, structure or model using previously acquired knowledge and skills" (Ferraz; Belhot, 2010, p. 429). Furthermore, we did not perceive two knowledge dimensions in this investigation at any of the levels of cognition: the procedural and the metacognitive ones, both of higher complexity domains. In other words, the issues surrounding the multimodal meme genre did not present complex cognitive levels, which points to the existence of a demand that needs to be considered by the institutions responsible for selection processes. At the same time, judging the potential and possibilities of memes, it is possible and necessary to consider such hierarchical levels. The scenario, therefore, requires an improvement in basic education on offer so that students can master more in-depth skills, as well as a reformulation of the entrance exam reference document.

Regarding the content covered by the analyzed memes, the Natural Science tests did not include any content of Physics. The identified memes only dealt with content related to Chemistry, these being the majority (four memes) and Biology (one meme) (Chart 9).

Chart 9 – Content covered by the analyzed memes

Meme	Identified content	Discipline covered
Meme-1	Acids and bases	Chemistry
Meme-2	Cytology: cytoplasmic organelles.	Biology
Meme-3	General characteristics of the liquid state	Chemistry
Meme-4	Periodic properties	Chemistry
Meme-5	Covalent bond	Chemistry

Source: Research data.

Such considerations denote that memes can enable the introduction and problematization of different contents in the area of Natural Science in a humorous, contextualized, and playful way, thereby calling the participants' attention to the meanings involved. Due to this reality, the potential that permeates this genre of digital culture cannot be ignored, as it is becoming more popular in classrooms, on social media and in exams for access to higher education. Furthermore, RBT allowed us to identify the necessary dimensions of knowledge to resolve the issues presented here, in addition to the cognitive processes dimensions, considering the three perceived levels. According to Silva and Martins (2014, p. 193), "[...] it is understood that, by understanding the taxonomic levels required in the questions, it is possible to choose appropriate strategies for the teaching and learning [...]" of subjects such as Physics, Chemistry, and Biology, and this requires a change in the current teaching practices at school spaces.

FINAL CONSIDERATIONS

This article aimed to investigate how the multimodal meme genre has been mobilized in tests in the area of Natural Science, using as analysis material the National High School Exam (ENEM) test books, as well as traditional entrance exams of the state and federal public universities applied in the last twenty years (from 2001 to 2021), making use of the Revised Bloom's Taxonomy.

Following this, five memes were identified based on an analysis realized in entrance exam test books from 40 higher education institutions. ENEM did not present any meme in its Natural Science questions in the interval considered. With this information, and in light of the RBT, we verify the presence of knowledge dimensions that candidates needed to use to answer the proposed questions, which are the effective/factual knowledge, and the conceptual knowledge, that is the first two dimensions of RBT. On the other hand, we observed three dimensions of the cognitive process that permeated the five memes analyzed: remember, understand, and apply. Furthermore, of the six existing dimensions, the three identified in this research are considered to have a simple degree of complexity. When it comes to perceived cognitive levels of difficulty, the first three stand out, being low-order and higher-order cognitive skills, whose complexity varied between easy and medium-difficult

Finally, the investigated scenario points to a timid use of memes in tests with national repercussions, when considering serial and traditional entrance exams; but, when looking at the ENEM tests, it is noted that this multimodal genre, unlike others (strips, cartoons, cartoons, advertisements, and comics), has not appeared, which reveals an emerging need to incorporate this genre in these exams. It is, therefore, necessary to consider the potentialities that permeate this genre of humor, since they are rich in meanings, use verbal and non-verbal language to approach different themes in the current scenario and collaborate with scientific dissemination in a new and attractive.

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Author 2 – Project administration, methodology, supervision, validation, and review of the final writing.

CONFLICT OF INTEREST DECLARATION

The authors declare that there is no conflict of interest with this article.