



Ethics in Science Education Research: Analysis of the Brazilian Journals' Editorial Policy

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Abstract

We present the analysis results of the editorial policy of 32 Brazilian journals indexed in the area of Science Education regarding the ethical principles followed by authors. The policies were analyzed according to the ethical precepts in the guidelines for authors; the ways ethical aspects of articles should be communicated to editors; the procedures for cases of scientific misconduct and retractions to authors, editors and reviewers. The obtained data indicated that (a) 40.6% of the journals do not mention any ethical precept in their editorial policy; (b) 31.2% of journals report that ethical aspects must be included in the text submitted to editors, 3.1% by sending a signed document, 25% by presenting a copy of the institution's Research Ethics Committee approval and/or the Free and Informed Consent Form, 12.5% imply that the study was carried out within the norms, standards or ethical principles without requiring any type of information and 43.8% did not present any reference to the authors; (c) 34.4% do not include considerations about scientific misconduct and (d) only 15% of the journals have a topic that explains the retractions for cases of misconduct. The importance of including in their editorial policies the aspects related to good scientific practices is discussed in this work. Such aspects include investigations carried out with the collaboration of human beings, as well as the expansion of the debate on ethical issues in teaching and research institutions, aiming the ethical training of future professionals and researchers.

Keywords: ethics, science education research, brazilian journals

Ética na Pesquisa em Educação em Ciências: Análise da Política Editorial de Periódicos Brasileiros

Resumo

Apresentamos os resultados da análise da política editorial de 32 periódicos brasileiros indexados da área de Educação em Ciências quanto aos princípios éticos a serem seguidos pelos autores de artigos. As políticas foram analisadas de acordo com os preceitos éticos contidos nas diretrizes aos autores; as maneiras pelas quais os aspectos éticos dos artigos devem ser informados aos editores; os procedimentos para casos de más condutas científicas; e as retratações para autores, editores e pareceristas. Os dados obtidos indicaram que: (a) 40,6% dos periódicos não citam qualquer preceito ético na política editorial; (b) 31,2% das revistas informam que os aspectos éticos devem ser incluídos no texto submetido aos editores, 3,1% por meio do envio de documento assinado, 25% mediante cópia de aprovação do Comitê de Ética em Pesquisa (CEP) da instituição e/ou do Termo de Consentimento Livre e Esclarecido (TCLE) aprovado, 12,5% deixa subtendido que o estudo foi realizado dentro das normas, padrões ou princípios éticos, sem a exigência de qualquer tipo de informação, e 43,8% não apresentam nenhuma referência aos autores; (c) 34,4% não inclui considerações sobre as más condutas científicas; e (d) apenas 15% das revistas apresentam algum tópico que explicita as retratações para os casos de má conduta. Argumentamos acerca da importância de os periódicos incluírem, em suas políticas editoriais, aspectos relativos às boas práticas científicas, o que inclui as investigações realizadas com a colaboração de seres humanos, bem como da ampliação do debate acerca das questões éticas nas instituições de ensino e pesquisa, com vistas a uma formação ética dos futuros profissionais e pesquisadores.

Palavras-chave: ética, pesquisa em educação em ciências, periódicos brasileiros

Introduction

The concept of ethics can be considered plural and vary according to the author who seeks to define it. For Muralidhar (2019), ethics mean a system of accepted beliefs that control human behavior based on their morals, which is a set of personal and social standards for good and bad behavior. In this view, ethics go hand in hand with human morality, i.e., with the knowledge of right and wrong. For Fagiani and França (2015), ethics develop in the field of each person's values, determined by the social relations of production or communication between men. Thus, ethics are directly related to relationships and interactions between people, which would not be different when dealing with research involving human beings. In this type of research, there is an interaction between the participant and the researcher. This relationship between the two needs to be ethical so that the subject involved — or study collaborator — does not feel violated or, in a certain way, dehumanized.

Brooks et al. (2017) argue that research ethics concern the relationship between the researcher and the participant and the quality of the research to be carried out, from its design to its dissemination. Therefore, it requires knowing the meaning of ethics for the elaboration of research that does not infringe on the participants' rights in research involving human beings.

Ethical issues permeate the entire research process, from the choice of theme to the instruments used for data collection, not to mention the relationship between the researcher and the participants. This requires an ethical attention from the researcher, which also occurs in disseminating the research results since disclosing personal data about the participants must be omitted. Fiorentini and Lorenzato (2009) clarify that:

[...] in the specific case of the research, ethical questions concern, among others, interviewees' rights, respect and well-being of the participants, preservation of the identity of the people involved, uses and abuses of information and citations from other authors, reliability of the information, and social and political implications of the research. (Fiorentini & Lorenzato, 2009, p. 196)

From the beginning of their project, researchers must follow the ethical issues established in the country where the research will be developed and in their area of expertise. Furthermore, the researchers, as ethical subjects, must understand their intervention in the world and their responsibility in the impact of their actions on other people, "participants" of the research, and, thus, consider the universes of moral values and customs, nor always convergent, during the research period. (Carvalho, 2018)

Ethical precepts are not limited to issues involved in research with human beings. The media constantly inform us about falsification, data fabrication, and plagiarism as scientific misconduct. Barbastafano and Souza (2007), based on specialized literature, point out several causes for the occurrence of plagiarism, including (a) ease of access to information; (b) lack of ability to paraphrase; (c) little importance given to the text itself; (d) lack of appreciation of the works and confusion regarding ownership on the

internet; (e) encouraged plagiarism in Basic Education; and (f) easy access to language translation programs and unfamiliarity with standards.

Ethical principles in research development and the preparation and submission of journal articles are of increasing concern to researchers, research funding agencies, and journal editors in different countries. We focus on the indexed journals in the area of Science Education. We aimed to understand how national journals indexed in the Science Education area address ethical issues in their editorial policies.

There are important policies and principles that funding agencies, researchers, and journal editors must follow to ensure the integrity of research developed and published. Kleinert and Wager (2011), when commenting on the international standards to be followed by editors of scientific journals, argue that:

As guardians and caretakers of research publications, editors should encourage authors to seek and adhere to the highest ethical standards in publication. In addition, editors are uniquely positioned to encourage responsible research through their policies and processes indirectly. All editors should adhere to universal standards and best practices to achieve maximum effect within the scientific community. (Kleinert & Wager, 2011, p. 208)

For this to happen, the authors point out that editors must consider themselves part of a broad professional editorial community, keep up to date on relevant policies and improvements, and ensure that their editorial team is trained and informed on pertinent issues (Kleinert & Wager, 2011). Sardenberg et al. (1999), more than two decades ago, argued that:

In the last two decades, there has been, among editors of international scientific journals, a constant concern to establish standardized guidelines for the preparation of manuscripts to be submitted for analysis, aiming at publication. (Sardenberg et al., 1999, p. 296)

At this point, it is up to us to ask: how are these guidelines present in the context of scientific journals edited in Brazil?

Our study starts from the observation of the absence, in the scientific literature in the area of Education and/or Science Education, of a study that investigates the editorial policy of indexed journals in the area of Science Education, specifically concerning questions of ethics. Therefore, we seek an answer to the following problem: **How do national scientific journals indexed in the area of Science Education insert good practice guidelines for ethical conduct and scientific misconduct in their editorial policies?**

Our research problem is relevant especially because the expected answers can support researchers concerning the necessary care for submitting articles to indexed journals in the specific case of the area of Science Education. Furthermore, it will offer subsidies to journal editors to define editorial policies for journals specialized in this area of knowledge.

We tried to answer the following guiding questions: a) What is the editorial policy of journals regarding ethical precepts to be followed by authors of articles? b) How should the ethical aspects of articles be informed to editors? c) What are the procedures for cases of scientific misconduct, and what are the retraction policies for manuscripts already published?

In the next section, we discuss some resolutions and ethical guidelines that will serve as an object of analysis in the editorial policies of the journals that will be analyzed.

A Brief Review of Ethical Resolutions and Guidelines

Ethics began to be addressed in research involving human beings in studies in medicine and biomedicine. According to Siquelli and Hayashi (2015), in the 19th century, “a code of ethics was proposed that established that a physician, when testing a new medicine, should consult their colleagues” (p. 67). On the other hand, in the 20th century, creating universal ethical parameters related to research with human beings was required in a post-war scenario. Thus, the first international document for this purpose was created, the Nuremberg Code (1947), which introduced critical ethical recommendations for research involving people.

A few years later, the World Medical Association (WMA) published the Declaration of Helsinki (1964), correcting the previous regulation’s disparities. In its last meeting, held in 2000 in Scotland, the WMA declared, in the introduction section of the document, that the well-being of the participants must “prevail over the interests of science and society” and that the consent of the subjects involved in the practice is also required in any clinical research involving human beings. (Associação Médica Mundial, 2000, pp. 1–2)

In turn, in the 1970s, the term *Bioethics* was born. According to Siquelli and Hayashi (2015), the term emerged to designate discussions about research involving human beings. Every investigation with individuals as “participants” should be sent to an ethics committee.

In 1978, the US government published the Belmont Report, consisting of three basic ethical precepts: respect for people, beneficence, and justice. Respect for people is about respecting autonomy, such as valuing opinions and protecting individuals with diminished rights. Beneficence refers to not causing harm and maximizing benefits. Finally, justice concerns the equal distribution between risks and benefits and deals with the participant’s consent, which must comprise three elements: information about the study, understanding of the information, and willingness.

In the Brazilian scenario, the first resolution containing conceptual norms on ethics in research involving human beings dates from 1988. Resolution No. 001/1988 of the National Health Council (CNS) is considered a landmark since it defined that all and any research should go through the Institutional Review Board/Independent Ethics Committee (IRB/IEC) of the institution responsible for the study. The IRB/IEC was created through the resolution mentioned above. According to Resolution No. 001/1988,

[...] Art. 5 — Research on human beings should be carried out according to the following bases: VII — Have the favorable opinion of the Ethics and Biological Safety Committee, when applicable [...]. (Conselho Nacional da Saúde, 1988, p. 1)

Like any other resolution, it needed to be revised to cover the ethical aspects better since it had some shortcomings. In 1996, the CNS published Resolution No. 196/1996, creating, in parallel with the ethics committees of each institution, an ethics committee called the National Research Ethics Committee linked to the CNS. In 2009, the Plataforma Brasil was created so that researchers could submit their projects for the ethical evaluation of an IRB/IEC.

In 2012, the CNS published Resolution No. 466, which evidences the informed assent¹ and consent² of every participant in the research that is being carried out. This resolution presents more details and a wider scope in its terms and conditions than previously published so that research with human beings can be conducted, emphasizing the “consent of the research participant and/or their legal representative.” We noticed that it is concerned with research carried out with the participation of minors, as is the case of those developed in the educational area, whose collaborators are male and female students in the classrooms. The resolution emphasizes the use of the informed consent form³ in any research carried out with human beings and, also, the assent form⁴.

Research carried out in the area of Human and Social Sciences (CHS), whose data have been obtained through the participation of human beings, are regulated by the parameters addressed in CNS Resolution No. 510/2016. It addresses the participant's rights and how to act during the research, the IRB/IEC/National Research Ethics Committee (CONEP) system, and how the researcher must behave during the study. The record of consent and assent obtaining is no longer done only in writing. It can be done by any means, format, or media, such as paper, audio, filming, electronic and digital media, which are well discussed in items XX and XXII of Art. 2 of CNS Resolution No. 510/2016.

1 II. 2 — informed assent - consent of the research participant, child, adolescent, or legally incapable, free from vices (simulation, fraud, or error), dependence, subordination, or intimidation. Such participants must be clarified about the nature of the research, its objectives, methods, anticipated benefits, potential risks, and the inconvenience that this may cause, to the extent of their understanding and respect for their singularities. (Conselho Nacional da Saúde, 2012, p. 2)

2 II. 5 — informed consent — consent of the research participant and/or their legal representative, free from vices (simulation, fraud, or error), dependence, subordination, or intimidation, after complete and detailed clarification about the nature of the research, its objectives, methods, anticipated benefits, potential risks, and the inconvenience that this may cause. (Conselho Nacional da Saúde, 2012, p. 2)

3 Document in which the informed consent of the participant and/or their legal guardian is explained in writing. It must contain all the necessary information in clear and objective language, easy to understand, for a complete clarification about the research to be which one proposes to participate [...]. (Conselho Nacional da Saúde, 2012, p. 3)

4 Document prepared in accessible language for minors or for the legally incapable, through which, after the research participants are duly clarified, they will confirm their agreement to participate in the research without prejudice to the consent of their legal guardians. (Conselho Nacional da Saúde, 2012, p. 3)

The resolution confirms the need to encourage the participation of CHS in IRBs/IECs and the creation of new ethics committees in CHS research since “[...] it would be a valid alternative to avoid the problems that have occurred in ethical review. [...]”. (Mainardes, 2017, p. 164) We agree that IRBs/IECs are still centered on the “universe of medical sciences.” (Associação Nacional de Pós-Graduação e Pesquisa em Educação, 2019, p. 31)

While this resolution was a step forward, there is a long way to go when it comes to research with human beings in the educational area or the area of Science Education since “[...] it reveals that the current ethical review process in Brazil is highly bureaucratic, utilitarian, and firmly based on the biomedical model. Thus, the ethical review carried out in the IRB/IEC of some institutions is inadequate for researchers in the area. [...]”. (Mainardes, 2017, p. 167)

There are no specific reference documents for the Education or Science Education areas, which are multidisciplinary and applied. Carvalho (2018) argues that research in Education involves multiple scientific methods and theories from other disciplinary areas: Psychology, Sociology, Anthropology, History, and Philosophy. As it covers a methodological variety, the ethical rules established by Resolution No. 510/2016 do not consider each project’s peculiarity. Therefore, they can bring limitations that make research development impossible.

As explained on the first page of Resolution No. 510/2016, “[...] ethics in research imply respect for human dignity and the protection due to participants in scientific research involving human beings [...]” (Ministério da Saúde, 2016, p. 1). Thus, although the publication of the resolution may contain flaws and limitations, it constitutes an advance and a guide regarding the norms that must be followed in research involving human beings, intending to make the Science developed in Brazil more ethical.

Creating resolutions and codes of conduct was indispensable for research involving human beings. All these resolutions ensured that the participants’ rights were duly respected and everyone was treated with dignity. On the other hand, when we deal with good scientific practices, these are not restricted to the ethical precepts involved in research with the collaboration of human beings. Good practices also include ethics in academic publications.

Therefore, in 1997, the Committee on Publication Ethics (COPE) was created, an organization that helps editors and publishing companies with ethical regulations for scientific publication. The regulations of this committee serve as a basis for periodical and journal editors to ensure that the manuscript to be published is not unethical and does not contain any plagiarism and/or self-plagiarism, or conflicts of interest, among others. COPE has a Code of Conduct for Journal Editors, which was “designed to provide a set of minimum standards to which all COPE members must adhere.” (Committee on Publication Ethics, 2011, p. 1) The guidelines in the COPE code of conduct were developed from requests from editors for guidance on ethical issues. COPE regulations cover a vast section of editorial policies, including sections reserved for misconduct, helping editors deal with authors and reviewers of articles, from screening to publication in the journal.

In particular, the COPE Code of Conduct and Best-Practice Guidelines for Journal Editors (2011) —, on its seventh page, suggests that periodicals or journals, when receiving an article, make use of plagiarism detection systems (software), in case any suspicion is raised during the process. The Code also provides several flowcharts to be used in cases of misconduct.

While COPE helps maintain good practices, it is also up to the authors to be careful with disseminating their research data since, currently, the results are immortally posted in digital media. (Brooks et al., 2017) Thus, the author and the journals are responsible for the published manuscripts and the subjects involved during the investigation.

In the Brazilian context, when dealing with good scientific practices, it is worth highlighting the Report of the Research Integrity Committee of the National Council for Scientific and Technological Development (CNPq), entitled “Ethics and integrity in scientific practice” (CNPq, 2011), which presents 21 guidelines to be followed throughout the investigation.

Even with resolutions for research with human beings and guidelines for submitting articles to journals in different areas of knowledge, which ensure ethics, these are sometimes pervaded or restricted to completing and delivering forms; other times, not even this. This does not guarantee that the investigation has been carried out ethically throughout its duration.

There is a range of guidelines for ethical research to be carried out, whether with human beings or not. The guidelines ensure good conduct by the authors and the editors of the journals where the studies will be published and made available to the readers. We agreed with Sardenberg et al. (1999) when they stated that:

[...] the concern with the ethical aspects of research on human beings in Brazil, mainly concerning approval by review boards or ethics committees, suffered a significant impact with the requirement of several international scientific journals, notably those in English, for only accept for analysis and possible publication studies whose protocols have been previously approved by institutional committees. (Sardenberg et al., 1999, p. 296)

In line with the precepts already mentioned, our work has the function of dialoguing and reflecting on the ethical policies of scientific journals indexed in the area of Science Education, seeking to understand whether journals need to advance in the debate of ethical aspects concerning the studies they publish.

Reviewing the literature on this subject is a significant action to start a study. Thus, we reviewed journals in Education and Science Education to identify studies already published on the subject. Our review is not exhaustive but aims to highlight works that seem more significant to us due to our research interest.

Studies Focused on the Analysis of the Editorial Policy of Journals

The analysis of the ethical principles involved in the development of research and the preparation and submission of articles to journals, contained in the editorial policy of journals, has already been the subject of investigation in other areas of knowledge, particularly in Health Sciences. We initially reported the studies conducted at the international level and, later, those developed at the national level. Bearing in mind the broad spectrum of works performed internationally, we report those per our work's scope.

The first study we interacted with was that of Amdur and Biddle (1997). The authors analyzed whether the instructions of 102 biomedical research journals required that manuscripts submitted for publication indicate Institutional Review Board (IRB) approval when the study involved human beings. They concluded that about half of the reviewed journals did not publish guidelines indicating IRB approval as a requirement for publication. How publication requirements related to ethical standards should be presented was highly variable.

Asai and Shingu (1999) verified whether the instructions to authors of 11 English-language anesthesia journals mentioned the following ethical precepts: (a) approval of the study by an ethics committee; (b) informed consent; (c) redundant publication; (d) fraud; (e) authorship; (f) conflict of interest; and (g) protection of patient privacy. The authors identified that: (a) all journals highlighted the prevention of redundant/duplicate publications and unjustified authorship; (b) ten journals required study approval by an ethics committee and authors' signature; (c) eight journals mentioned informed consent; and (d) only seven required disclosure of conflict of interest and protection of patient privacy.

In turn, Rowan-Legg et al. (2009) compared ethical guidelines for authors of 103 English-language biomedical journals from 1995 and 2005 concerning requirements for Institutional Review Board (IRB) approval and Conflict of Interest Disclosure (COI). They found that the proportion of journals requiring IRB approval and COI disclosure increased from 42% to 76% and 75% to 94%, respectively. Therefore, they concluded that instructions to authors about ethical standards improved over time. However, some instructions remain incomplete, especially concerning the COI's scope of the disclosure.

Navaneetha (2011) analyzed the instructions to the authors of 126 dental journals regarding the Ethics Committee's approval for research with the participation of human beings and animals, the need to obtain informed consent and assent from the participants, and the obligation to conduct the research per the Declaration of Helsinki. The author found that a significant number of journals (54.77%) did not provide instructions to authors about the need to declare approval by the Ethics Committee; 69.85% did not refer to informed consent and/or assent, and, finally, 67.47% did not explain that research should be conducted per the Declaration of Helsinki.

Strech et al. (2014) assessed the ethical review and informed consent of the editorial policy of 123 psychiatric journals. The authors report that 54% and 58% of journals required ethical review and informed consent, and only 14% and 19% requested a recording of these issues in the article. The results were similar regardless of the classification by impact factor, i.e., the top ten journals evaluated performed similarly to the others.

Sardenberg et al. (1999) was the first study we identified in the Brazilian context. The authors examined the ethical norms for research with human beings present in the instructions to authors of Brazilian journals in medicine, biomedicine, nursing, dentistry, and general sciences. In total, 139 journals were analyzed, similarly to the study conducted by Amdur and Biddle (1997). They found that, in most journals, there was little concern regarding ethical aspects, and in those that referred to ethical precepts, the requests were very variable.

In turn, Sardenberg et al. (2002) analyzed the norms concerning research ethics with human beings in the instructions to authors of 38 orthopedics and traumatology journals. They concluded that, at that time, “most orthopedics and traumatology journals present little concern with the ethical aspects of research on human beings in the instructions to authors” (p. 15) since 52.6% did not refer to the ethical aspects.

Tavares-Neto and Azevêdo (2009) analyzed the ethical precepts in the instructions to authors of 20 national medical journals. They identified 36 ethical concerns, categorized into “Human research ethics,” “Scientific integrity,” and “Editorial policy.” The authors infer that only half of the journals required an opinion from an IRB/IEC. Furthermore, no journal clarified preventing fraud, plagiarism, and/or data fabrication. Given the results, the authors argue that the reliability of the national journals investigated was limited.

After the literature review, we could infer that the national academic production focused on analyzing editorial policies is low since we identified only three studies. We found no publications in the Brazilian scientific literature on Science Education that studied the impact and presence of ethical paradigms in editorial practice. This result, obtained from our literature review and contact with the article by Sardenberg et al. (1999), motivated us to carry out the investigation described in this text.

Study Development

First, we performed a literature review to map the studies published on the subject. The previous section presents this review. Then, we developed criteria for the selection of journals to be analyzed. As part of the study, it is appropriate to analyze the journals indexed and classified in Qualis by the Coordination for the Improvement of Higher Education Personnel (CAPES). Qualis is a classification system for scientific journals used to evaluate the bibliographic production of *stricto sensu* graduate programs (master's and doctorate).

In addition to belonging to Qualis, the journals analyzed should be indexed in at least one of the following databases: SCOPUS; Scientific Electronic Library Online (SciELO); *Web of Science*; Sumários.org; or *Red de Revistas Científicas de América Latina y El Caribe, España y Portugal* (REDALYC). They should also be registered in one of the following directories: Directory of Open Access Policies of Brazilian Scientific Journals (Diadorim); Directory of Open Access Journals (DOAJ); *Sistema Regional de Información en Línea para Revistas Científicas de América Latina, el Caribe, España y Portugal* (LATINDEX); Directory of Open Access scholarly Resources (ROAD); Dialnetou; Google Scholar; or *Red Iberoamericana de Inovación y Conocimiento Científico*.

Based on the chosen criteria, we analyzed the editorial policy of 32 journals. The selected journals were coded by publication specialty, with the following codes: (a) EB1, EB2, and so on for Biology Teaching journals; (b) EF1, EF2, and so on for Physics Teaching journals; (c) EQ1, EQ2, and so on for Chemistry Teaching journals; and (d) EC1, EC2 and so on for Science Teaching journals, which are those that publish articles from the three previous subareas and other areas such as Mathematics Education.

Next, we built charts and tables to record data/information collected — journal name, electronic address, International Standard Serial Number (ISSN), institution to which it belongs, indexes and directories, editor, editorial policy, resolutions, norms, and laws mentioned, software used to detect plagiarism, and procedures/punishments for bad scientific practices.

Then, we mapped and recorded the editorial policies through access to the journals' websites or the databases indexing them. The mapping took place between September and October 2021. After completing the mapping and registration of editorial policies, we carefully read each.

Afterward, we classified the policies mapped into analysis categories related to the type of policy, which were extracted from the literature review or constructed by the authors, namely: (a) ethical precepts contained in the guidelines to the authors; (b) how ethical aspects of articles must be communicated to editors; (c) procedures for identifying scientific misconduct (plagiarism, self-plagiarism, falsification/fabrication of data, misuse of references and citations, submission to more than one journal, number of authors beyond the allowed limit, conflict of interest, ghost names, and research already published in other media); and (d) retraction policies for cases of misconduct by authors of manuscripts, editors, and reviewers.

Regarding the ethical precepts contained in the guidelines for authors, the editorial policies were organized according to the categories developed by Amdur and Biddle (1997) and adapted by Sardenberg et al. (1999):

Review Board or Ethics Committee: policies referring to the need for approval and/or analysis of research by the institution's Review Board or Ethics Committee where the study was conducted, regardless of whether there are other recommendations;

CNS Resolution No. 510/2016: policies that make explicit reference to Resolution No. 510/2016 of the National Health Council for research in Human and Social Sciences;

Consent and/or assent of participants: policies in which the only reference to the ethical aspects of research with human beings is the request to obtain written consent from the participant or legal representatives. Policies that refer to the request for participation through various forms, be it sound or imagery, among others, were also classified in this group;

Ethical Principles/Norms/Standards: policies that generally refer to respect for ethics, principles, norms, and standards, among others. In this category, we also include policies that refer to aspects related to privacy, such as the non-reproduction of photographs/images and names or initials that could identify participants. We highlight the presence or absence of this information in the mapped policies;

No Ethical Guidance: policies that do not refer to ethical aspects of research on human beings. Journals that refer only to aspects related to the privacy of participants/collaborators were also classified into this group.

Concerning how the ethical aspects of the articles must be informed to the editors, we also used the categories proposed by Sardenberg et al. (1999):

Included in the text of the article: policies that visibly indicate that information about the ethical aspects of research involving human beings must be cited in the text of the article (reference to IRB/IEC opinion or compliance with ethical principles, indication of IRB/IEC opinion number, obligation to quote the use of the informed consent form, explanation of how the anonymity of collaborators was preserved);

Signed letter: policies that require a letter or document signed by the author(s) informing the ethical aspects of the study;

Copy of the Review Board or Ethics Committee's authorization and/or copy of the informed consent form approved by the committee: policies explaining the requirement to send a copy of the authorization from the institution's Ethics Committee where the study is conducted and/or copy of the informed consent form approved by the committee, together with the research manuscript;

Implied: journals that inform authors in the guidelines that the editor implies that the study was conducted within the ethical norms, standards, or principles, without requiring any other type of information;

No references: journals that contain no information on how the authors of manuscripts sent for publication should report on the ethical aspects of the study;

Concerning the procedures for scientific misconduct (plagiarism, self-plagiarism, falsifications, alterations, and/or data fabrication/manipulation), editorial policies were classified into:

Included in the Editorial Policy: policies that visibly indicate information about scientific misconduct and the procedures taken in case of its detection;

Implied in the Editorial Policy: policies that imply information about scientific misconduct and the procedures taken in case of its detection;

Not Included in the Editorial Policy: policies that do not refer to information about misconduct and the procedures taken in case of its detection;

Regarding retraction for misconduct cases, we identified the presence or absence of retraction policies and procedures for the request.

Afterward, we built tables for recording and analyzing the data, summarizing the results we reached, highlighting the advances and existing gaps in the policies, and systematizing the answers found for the guiding questions. We used descriptive statistics and expressed the results in percentages. We end the study with final considerations and implications for the editorial policies of Science Education journals.

Results and Discussions of the Analysis of Editorial Policies

In this section, we present the summarized results. We expose the results in tables, in which we explain the frequencies (absolute and percentage) of the presence of ethical references in editorial policies, how ethical aspects must be informed to editors, and the procedures for scientific misconduct. It is appropriate to present the indexes by publication specialty, i.e., Biology Teaching (3), Physics Teaching (4), Chemistry Teaching (4), and Science Education (21) journals.

Ethical Precepts Contained in Editorial Policies

Table 1 presents the frequencies of ethical guidelines of editorial policies.

Table 1

Absolute frequencies and percentage of ethical guidelines contained in editorial policies

Specialty	Ethical Guidelines									
	Review Board or Ethics Committee		Resolution No. 510/2016		Consent/assent of participants		Ethical Principles/ Norms/ Standards		No Guidance	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
Science Education	11	34.4	1	3.12	2	6.25	3	9.4	7	21.9
Biology Teaching	2	6.25	1	3.12	2	6.25	---	---	---	---
Physics Teaching	---	---	---	---	---	---	---	---	4	12.5
Chemistry Teaching	2	6.25	---	---	2	6.25	---	---	2	6.25
Total	15	46.8	2	6.25	6	18.7	3	9.4	13	40.6

Source: Prepared by the authors.

Table 1 allows us to state that of the 32 journals analyzed, 13 (40.6%) do not cite any ethical precept in their editorial policies. This result is similar to those found by Navaneetha (2011), Tavares-Neto and Azevêdo (2009), Sardenberg et al. (2002), Sardenberg et al. (1999), and Amdur and Biddle (1997).

In the case of Chemistry and Physics Teaching journals, this index is 50% and 100%, respectively. All Biology Teaching journals have some ethical guidelines in their editorial policies, as in the example reproduced below, extracted from the editorial policy of the EB3 journal.

The research involving the participation of human beings is recommended to comply with CNS Resolution 510/2016. In compliance with the guidelines of the Committee on Publication Ethics (COPE), which aim to encourage the identification of plagiarism, bad practices, fraud, possible violations of ethics, and opening of processes, **we inform you that the authors must access the COPE website** <http://publicationethics.org>, which contains information for authors and editors on research ethics. (EB3, emphasis added)

However, the EB3 journal leaves it up to the authors to know the ethical precepts to follow when informing them they must access the COPE website. Only two journals (6.25%) have policies that mention CNS Resolution 510/2016, one of Biology Teaching (example reproduced above) and one classified in the specialty Science Education, whose excerpt from its editorial policy is reproduced below.

[...] regarding compliance with ethical issues related to publications, it also considers the following documents: a) CNE Resolution No. 466/2012 (Ethics in research with human beings); b) CNS Resolution No. 510/2016 (Research in Human and Social Sciences involving human beings); and c) CNPq document - Ethics and integrity in scientific practice. (EC12)

Six journals (18.7%) refer to or request written consent from the participant or legal representatives for the article's publication. For example, we reproduce three excerpts from EC1, EQ1, and EC20.

Provide written proof that ethics protection has been ensured when the research involves human participants. Namely, documentary evidence that the research has been submitted to appropriate independent ethics review boards (ethics committees or institutional boards) for approval. In addition, a written statement must be provided on institution letterhead (separate statements for authors from different institutions) and signed by all authors, stating that each potential participant and/or their parents or legal guardians have been informed of the "purposes, methods, sources of funding, possible conflicts of interest, institutional affiliations of the researcher, the discomfort that this entails, and the potential benefits and risks anticipated by the study and its publication, including the risk of their possible identification in the present or the future" and gave written and signed consent to participate. (EC1)

In the case of sending images, the authors must send a copy of the Informed Consent Form signed by the subject(s) (or their guardians) authorizing the use of the image. (EQ1)

In the case of research activities involving experimentation with human beings and animals, the author(s) must observe the requirements of the National Health Council's Resolution No. 196 of December 20, 1995 [...] and that the subjects signed the Informed Consent Form. (EB1)

In the first example, we noticed the journal's care when requesting written, documentary evidence and a written statement from the institution signed by all authors, ensuring that participants and/or their parents or guardians were informed about all research items and gave consent, in writing and signed, of participation.

In the second example, we show that EQ1 restricts the informed consent form request to cases of using images by collaborating participants, implying that this document is unnecessary in other cases. In the third excerpt, EB1 mentions that the author must seek the signature of the subjects through the informed consent form and makes reference to Resolution No. 196/1996.

On the other hand, almost half of the journals (15 or 46.8%) suggest that an Review Board or Ethics Committee assess the study, which is the case, for example, of journals EC1 (previously exemplified), EC2, EC6, and EQ4.

If the article results from experimental studies involving human beings, an opinion from the Ethics Committee recognized by the National Health Council (CNS) through the *Plataforma Brasil* must be presented. (EC2)

The articles submitted to [...], which had their research submitted to the protocols of the Ethics Committees of the institution where the study was conducted, must indicate this information and provide a copy of the approval document. (EC5)

It is important that, for research involving human beings, the methodology includes the protocol and the date of approval by an ethics committee. If this is not possible or such a committee did not analyze the work, we recommend discussing how the preservation of participants and the valuation of research ethics were carried out (informed consent form, guarantee of anonymity, and respect for differences of opinion, among others). (EQ4)

In the first example, the presentation of the IRB/IEC opinion is a precondition for the studies conducted with human beings. In the second one, sending the study approval document by the IRB/IEC is restricted to studies submitted to the IRB/IEC, not extending to all studies conducted with the participation of human beings. In the last example, we highlight the suggestion of including the IRB/IEC's approval of the research in the methodology information. However, the journal presents an alternative for cases in which the research was not submitted to the committee.

How Ethical Aspects Should be Informed

Table 2 presents the frequencies of how the ethical aspects of the articles must be informed to the editors.

Table 2

Absolute and percentage frequencies of how the ethical aspects of articles must be informed to the editors

Specialty	Included in the text		Signed letter		Copy of the IRB/IEC's authorization and/or copy of the approved informed consent form		Implied		No references	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
Science Education	7	21.8	1	3.1	6	18.8	3	9.4	8	25
Biology Teaching	2	6.2	---	---	1	3.1	1	3.1	---	---
Physics Teaching	---	---	---	---	---	---	---	---	4	12.5
Chemistry Teaching	1	3.1	---	---	1	3.1	---	---	2	6.2
Total	10	31.1	1	3.1	8	25	4	12.5	14	43.8

Source: Prepared by the authors.

Fourteen (43.8%) journals have no reference to the authors, of which 13 do not cite any ethical norm in their editorial policies. This result converges with the data obtained by Tavares-Neto and Azevêdo (2009), Sardenberg et al. (2002), and Sardenberg et al. (1999).

Only one journal (3.1%) advises authors to send a signed document indicating that they must “provide written proof that the protection of ethics was guaranteed when the research involves human participants” (EC1). Eight (25%) journals request a copy of the approval of the institution's IRB/IEC and/or the approved informed consent form. We reproduce three representative examples of policies in this category:

The editors ensure that the confidentiality of individual information is protected. They will not disclose, for example, the identity of subjects and personal data in the case of empirical research. Authors of empirical research articles will be required to guarantee that the subjects have expressed their consent, in writing, to participate in the research. [...] the editors will accept all empirical research articles without the subjects' consent as long as the publication of said articles does not harm the dignity of the subjects involved. (EB2)

Send along with the manuscript a copy of the certificate and/or statement attesting compliance with ethical research standards, including a copy of the approval of the research protocol with human beings by the Ethics Committee. Manuscripts not meeting these requirements will not be accepted for publication. (EC19)

For publication, the editorial board may request the approval of the research from an ethics committee. (EC8)

In the first example, the journal states that it will require authors to provide written consent from research participants. However, in the sequence, the journal contradicts itself by mentioning that it will accept all articles without the subjects' consent, as long as the publication does not harm the dignity of those involved. In the second one, sending a copy of the certificate and/or statement of compliance with ethical standards and a copy of the Ethics Committee's approval of the research protocol is a precondition for publication. In turn, in the last example, the request will be in charge of the editor.

Concerning the editorial policies that indicate that information on ethical aspects must be cited in the text, it occurred in ten (31.1%) journals. Representative examples of this category are:

It is important that, for research involving human beings, **the methodology includes the protocol and the date of approval by an ethics committee**. If this is not possible or such a committee did not analyze the work, we recommend discussing how the preservation of participants and the valuation of research ethics were carried out (informed consent form, guarantee of anonymity, and respect for differences of opinion, among others). (EQ4, emphasis added)

In the case of a study involving human beings, the development of the investigation followed the recommendations of the Ethics Committee, duly registered with the Ministry of Health. **In the manuscript, it is recommended to mention the approval number and the IRB/IEC** that analyzed the research project addressed in the manuscript. (EC7, emphasis added)

In the first example, the journal indicates that the methodology must include the ethical procedures performed by the authors. The second recommends that the research approval number in the IRB/IEC in which it was evaluated be included in the text.

A set of four (12.5%) journals imply that the study was conducted within ethical norms, standards, or principles without requiring any information, as in the examples below:

Pay attention to the norms of the institution's Ethics Committee, to which the research portrayed in the article is linked when dealing with the involvement of human beings. (EC15)

The research involving the participation of human beings is recommended to comply with CNS Resolution 510/2016. (EB3)

In the second example, while the journal references Resolution No. 510 of April 7, 2016, which provides ethical standards to be followed in research involving human beings, it does not discuss the ethical guidelines that authors must follow for publishing articles in the journal, implying that the author must read the resolution and follow its rules.

Procedures for Scientific Misconduct

Table 3 presents the frequencies of how scientific editorial policies address misconduct.

Table 3

Absolute and percentage frequencies of how scientific misconduct is addressed

Specialty	Included in the Editorial Policy		Implied in the Editorial Policy		Included in the Editorial Policy	
	abs.	%	abs.	%	abs.	%
Science Education	12	37.5	2	6.2	7	21.9
Biology Teaching	3	9.3	---	---	---	---
Physics Teaching	1	3.1	---	---	3	9.3
Chemistry Teaching	1	3.1	2	6.2	1	3.1
Total	17	53.1	4	12.5	11	34.4

Source: Prepared by the authors.

Eleven journals (34.4%) do not include considerations about scientific misconduct in their editorial policies. This percentage is lower than that of Tavares-Neto and Azevêdo (2009). On the other hand, more than half (17 or 53.1%) consider misconduct, especially plagiarism, self-plagiarism, falsification or fabrication of data, misuse of references or citations, duplicity, and dispute over authorship, among others. Among the considerations is the recommendation to read CNPq's basic guidelines for integrity in scientific activity and COPE Code of Conduct and Best-Practice Guidelines, as in the example below:

A [...] follows the COPE (Committee on Publication Ethics) Code of Conduct and Best-Practice Guidelines, and submissions must meet these guidelines: for knowledge of the code, consult the original text in English or its translation into Portuguese. (EB1)

Considerations about scientific misconduct are implied — or are exposed straightforwardly — in four journals (12.5%), as is the case with the following examples:

The journal editor is responsible for deciding which of the articles submitted to the journal should be published. The editor may be guided by the policies of the journal's editorial board and limited by such legal requirements as will be in effect regarding defamation, copyright infringement, and plagiarism. The editor may consult with other editors or reviewers in making this decision. (EC18)

If problems are identified in the pre-analysis, the manuscript is rejected. (EC8)

In the first example, the journal indicates that the editor is responsible for the publication, guided by the policies of the journal's editorial board. However, the journal does not explicitly mention these policies, implying that there is some guideline on misconduct, citing only plagiarism. In the second, the journal discusses the identification of problems during pre-analysis, resulting in the rejection of the manuscript. However, it does not clarify the problems, citing only plagiarism as misconduct.

A set of 12 journals mentioned they follow the principles outlined in the Code of Conduct and Best-Practice Guidelines for Journal Editors, made available by the Committee on Publication Ethics (COPE). On the other hand, some journals mention the ethical guidelines of associations and scientific societies and/or research support foundations, such as the Manual of Good Practices of the National Association of Graduate Studies and Research in Administration and the Code of Good Scientific Practices of the São Paulo Research Foundation (Fapesp). The example below is representative of this case:

This material was compiled from the Ethical Guidelines for Publication of the American Chemical Society, the Code of Good Scientific Practices of FAPESP, and the Code of Ethics for Publications of the Journal of the Brazilian Chemical Society. (EQ1)

Concerning the procedures to be adopted for cases of misconduct, the journals mention a diverse range of actions, among which we identified: (a) formal clarification on misconduct; (b) formal or editorial notice from the journal detailing the misconduct; (c) formal retraction to the author's management or funding agency; (d) impediment to submit new manuscripts; (e) formal reporting to a professional organization or higher authority for investigations and further action; (f) request of response from the subjects of misconduct; (g) if misconduct is identified, the manuscript is rejected; (h) the editorial committee will consider the retraction of publications with identified misconduct; (i) cancellation of submission, which may be followed by other measures with which the authors agree in the Declaration of Copyright; (j) refuse to receive future submissions from authors; (k) return of the manuscript to the author; (l) make the event public, informing the editors of the journals involved and any plagiarized authors.

If the identification of misconduct occurs after publication, the appropriate measures that we have identified in the set of journals are: a) the article will be excluded from the volume in which it was published, and a file may be published explaining to readers the reason for the exclusion of the original file; b) be withdrawn from circulation in the journal; c) update of the already published article with additional data, corrections, errata, retractions, or with its complete withdrawal. Furthermore, some journals warn authors about the consequences described in the Penal Code (Article 184) and in the Copyright Law (Article 7, 3rd paragraph of Law No. 9610, of February 19, 1998 — see Law No. 12.853 of 2013).

On the other hand, regarding the standards of misconduct by editors and reviewers, they are still deficient. Of the 32 journals that were part of the study, only one refers to the treatment of misconduct cases, based on its editors and evaluators, not explaining what these misconducts are. We reproduce, as an example, some excerpts from policies that point out the measures taken in that case.

If plagiarism and/or self-plagiarism is detected during the submission process, the journal's editors will contact the author(s), request clarification, and, when necessary, inform that the manuscript is archived, even before it is forwarded to the evaluators. If the manuscript is published and, subsequently, plagiarism and/or self-plagiarism is detected by the journal's readers, authors, or evaluators, coming to the attention of the editors, [...] the appropriate measures will be taken: 1) contact the author(s) and inform them of the violation; 2) request clarification on the fact pointed out; 3) after analyzing the clarifications, they will make the decision and inform the author(s) about the procedures for excluding the published manuscript. (EC19)

In case of verification of misconduct by authors, editors, and evaluators, the article will be removed from the evaluation process. As per the editorial board's decision, this journal may refuse to receive future submissions from the author(s). When one or more editors carry out misconduct, they will be removed from their attributions in the journal. If ad hoc reviewers commit misconduct, they will not make new contributions to the journal, and their function as evaluators will be deactivated. In case of detection/suspicion before or after publishing the manuscript, [...] editors will take measures according to the guidelines recommended by the Committee on Publication Ethics (COPE). (EC19)

Identifying any misconduct by the authors (e.g., plagiarism, self-plagiarism, or simultaneous submission to more than one journal) is grounds for cancellation of the submission, and this action may be followed by other measures with which the authors agree in the Declaration of Copyright. If misconduct is identified after publication, the article will be deleted from the volume in which it was published. In its place, a file will be published explaining to readers why the original file was deleted. (EC13)

For the detection of plagiarism, the journals (14, 43.75%) mention using appropriate software for this purpose, among which are cited: (a) CopySpider[®]; (b) Plagiarism[®]; and (c) iThenticate. On the other hand, some journals disclaim any responsibility for issues of misconduct that may be identified in the authors' texts, noting that they will be subject to all legal penalties provided for by law and onus for the irregularities committed.

If plagiarism is proven in any published work, [...] is exempt from any liability, and the author(s) must bear all the penalties provided for by law. When images

are used, all procedures must be adopted by the author(s). [...] is exempt from any illegality committed, the onus of possible irregularity being assumed by the author(s). (EB1)

We believe that journals should share the responsibility for what they publish since, when faced with cases of misconduct identified after publication, the journal also has responsibility for the manuscript, given the copyright granted before submission of the article, as can be seen in the example reproduced below, extracted from EB1.

I transfer the copyright of this work to the journal [...] as soon as it is accepted for electronic publication. Copyright includes the right to reproduce, in whole or in part by any means, and distribute this article, including figures, photos, and translations. (EB1)

In the EB1 policy, the author must transfer the manuscript's copyright to the journal. However, as noted earlier, EB1 "is exempt from any illegality committed, the onus of possible irregularity being assumed by the author(s)."

In addition to the misconduct mentioned so far, other behaviors are pointed out by the journals as unethical, among which we mapped: falsifying/fabricating data; submitting an article with more authors than the number allowed by the journal; submitting the article to more than one journal simultaneously; submit articles already published in another journal or other forms of dissemination (congress proceedings or book chapter); misuse of references and citations; conflict of interest⁵; and include "ghost" names. We reproduce four examples of this misconduct present in policies:

The committee will consider retracting a publication if: **there is clear evidence that the results are unreliable, either as a result of misconduct (e.g., data fabrication)** or honest error (e.g., miscalculation or experimental error). (EC11, emphasis added)

Articles submitted for publication must be unpublished and **cannot be under review in another journal**. They may have originated from academic papers and papers presented at scientific conferences, but the text may never be (in whole or part) like these. In the case of conference papers, the submitted text must clearly expand the initial work. Any submission identified as previously published in another medium or whose text corresponds to the work presented at a scientific congress – i.e., that can be characterized as self-plagiarism – will not be forwarded for evaluation. (EC2, emphasis added)

The corresponding author must inform the editor, at the time of submission, **that there is no conflict of interest to declare or must disclose the potential conflicts of interest that will be recognized in the published article**. (EQ1, emphasis added)

⁵ According to Thompson (1993), "a conflict of interest is a set of conditions under which professional judgment regarding a primary interest (such as patient welfare or research validity) tends to be unduly influenced by a secondary interest (such as financial gain)." (p. 573)

Collaboration between professors and students must follow the same criteria. Supervisors should be careful not to include students with little or no contribution to the authorship or exclude those who actually participated in the work. **Ghost authorship in Science is ethically unacceptable.** (EC19, emphasis added)

Table 4 presents the absolute values and percentages of misconduct mapped in the journals' editorial policies by specialty area.

Table 4

Absolute and percentage frequencies of misconduct mapped by specialty area

	Category									
	Science Education		Biology Teaching		Physics Teaching		Chemistry Teaching		Total	
Misconduct	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
Plagiarism	14	43.8	3	9.4	1	3.1	3	9.4	21	65.6
Self-plagiarism	7	21.9	2	6.2	---	---	2	6.2	11	34.4
Falsify/fabricate data	6	18.75	---	---	---	---	1	3.1	7	21.9
Misuse of references and citations	5	15.6	1	3.1	1	3.1	---	---	7	21.9
Submitted to more than one journal	14	42.8	3	9.4	3	9.4	4	12.5	24	75
No. of authors beyond the allowed	11	34.4	2	6.2	---	---	1	3.1	14	43.8
Conflict of interest	8	25	2	6.2	---	---	1	3.1	11	34.4
Ghost names	2	6.2	---	---	---	---	---	---	2	6.2
Already published	7	21.9	1	3.1	---	---	---	---	8	25

Source: Prepared by the authors.

Retraction Policies for Cases of Misconduct

In line with the policies of good scientific practices, there are retraction measures on the part of journals when suspicions or evidence of misconduct arise on the part of authors of manuscripts already published. Only five journals have a topic that explains retractions, corrections, clarifications, and apologies when necessary, in addition to the types of appeal mechanisms against measures taken by the editorial committee. We reproduce some excerpts from retraction policies as examples:

Ensure that authors have an appeal mechanism against editorial decisions and always be willing to publish corrections, clarifications, retractions, and apologies when necessary and to justify any major deviation from the described review processes. (EC1)

Whenever necessary, the editors will be willing to publish corrections, clarifications, and retractions and present apologies to the authors and/or readers. (EB2)

In the first example, the journal clarifies that editors must ensure that the author has some appeal mechanism against decisions made by the editorial committee. This excerpt is present in the duties of the journal's editors, not having a specific topic to explain these measures. In the second, the journal exposes actions that the editors are willing to take, not commenting on anything else, much fewer policies for the author to request a retraction on decisions taken by the editorial committee.

None of these five journals clarifies how the retraction procedure is performed nor explains how authors can request a retraction. Therefore, we question why journals do not include credits for authors who request a retraction in their policies. Furthermore, concerning the retraction of editors and reviewers, the journals mentioned above have no procedures or processes by the editorial committee when their professionals commit misconduct.

Nassi-Calò (2014), commenting on the challenges of retraction, argues that “misconduct in scientific publication must be corrected as soon as possible. However, there are several ethical, moral, legal, and reputational implications for journals and researchers in the retraction process” (online). Still, according to her:

When an author or group of authors becomes aware of an error in the results or their interpretation of a previously published article, it is their responsibility to contact the journal's editor and submit a retraction. Such an act shows a strong sense of rigor and ethics since the consequences of a retraction for the researcher, the institution, and the journal itself are not entirely positive. Fearing such consequences, many prefer to abstain and let the article fall into oblivion. However, when it comes to admitting an honest mistake, the act of recanting should give credit to the author. (Nassi-Calò, 2014, online)

Spinak (2014) also argues that “although plagiarism is always a lack of ethics, it does not mean that the article contains poor quality research or invalid results; it is only a warning that should be investigated” (online). Given this, isn't it the case for journals to review their punishments for some misconduct cases and give credit to authors who request retractions?

Final Considerations

Ethics in scientific research and the publication of articles are relevant topics on the agenda of researchers in Science Education. There is a worldwide tendency to consider high ethical standards in carrying out scientific studies and submitting articles for publication of research results. Therefore, we analyzed the editorial policy of 32 indexed Brazilian journals, in the area of Science Education, concerning the guidelines of good practices for ethical conduct and scientific misconduct to contribute to researchers in what refers to care for submitting articles to indexed journals and also to journal editors.

The absolute or percentage results identified enabled us to answer the guiding questions and conclude that our objective has been achieved. In this sense, the first question we propose to answer dealt with the editorial policy of journals regarding the ethical precepts to be followed by article authors. The results indicate that the percentage of journals that present ethical norms in their editorial policies (59.4%) is higher than those that do not make any reference (40.6%). However, only 6.25% of them refer to Resolution No. 510/2016 of the National Health Council (CNS). On the other hand, 18.7% of the journals refer to or request written consent from the participant or legal representatives for publication, and 46.8% suggest that an Review Board or Ethics Committee assess the study.

The second guiding question dealt with how ethical aspects should be informed to editors. The results show that 43.8% of the journals do not reference the authors. However, 25% of the journals request an approval copy from the institution's IRB/IEC and/or the approved informed consent form, and 31.1% inform that information on ethical aspects must be cited in the text.

Based on the results obtained, we argue about the importance of journals including, in their editorial policies, aspects related to good scientific practices, which include investigations carried out with the collaboration of human beings. It seems significant to us that the means of disseminating research results ask authors/researchers for records proving that the projects — responsible for generating the publications — were submitted to the appropriate review boards or ethics committees. In addition, they request records of the Informed Consent Form, with proof that the participants, parents, or legal guardians were informed about the procedures performed in the research.

The third research question addressed procedures for cases of scientific misconduct and retraction policies for already published manuscripts. The results show that 34.4% of the journals do not include considerations about scientific misconduct in their editorial policies, while 53.1% address such considerations. Only five journals specify retractions, corrections, clarifications, and mechanisms for contesting measures taken by the editorial committee.

We emphasize that one of the researchers' responsibilities is to maintain ethical conduct before, during, and after the research with those involved in the investigation. In addition, the journal editors are to analyze it ethically, ensuring that the conduct was maintained in the study to be published and in the evaluation and publication process.

On the other hand, there are no immutable ethical norms. They are transitory since they undergo modifications. Furthermore, new norms are instituted according to the imposed needs. For example, since 2020, with the pandemic of the new Coronavirus SARS-CoV-2 and with social isolation rules, virtual environments have become the most appropriate means for the development of research with the collaboration of human beings, while until then, they were carried out face-to-face. Therefore, the National Research Ethics Commission (CONEP) published on March 3, 2021, Circular Letter No. 1⁶, with procedure guidelines in research involving contact with human participants, with any step in a virtual environment.

Due to social distancing, many people had to quickly adapt and change their daily routines, which generated challenging changes. Likewise, journal editors had little time to adapt editorial policies per CONEP Circular Letter No. 1 since none of the journals mentions the letter in their editorial policy.

It is worth highlighting that research in Science Education is subordinated to the National Health Council (CNS) and that the rules established by this body may limit or even prevent the development of a study. This picture may change with the institution of ethical guidelines for research in Science Education. The dialogue for this to take effect can be initiated through scientific associations in the area.

Duarte (2017) presents a chronology of the struggle for specific Human and Social Science regulations to evaluate research ethics in Brazil. In addition, in 2017, the Human, Social, and Applied Social Sciences Forum (CHSSA), created in 2013, published the document entitled “For an alternative system of ethical evaluation of research/CHSSA,”⁷ which presents the importance of building an alternative ethical review system for research in these fields.

Finally, we defend broadening the debate about ethical issues in teaching and research institutions, aiming at the ethical training of future professionals and researchers. We agree with De La Fare (2019) about the “[...] need to rescue the discussion on ethics as a training content, especially considering the predominance of spaces in which research and training activities are concomitantly developed, whether initial (Undergraduate Research projects or disciplines) or advanced (Graduate Programs)” (p. 119).

When inserted in training, this debate can construct and propagate a solid ethical culture of respect for humanity within the scientific community. Ethics are not only about following the precepts present in current resolutions but deal with more than the concerns about following norms and procedures. Ethics are reflexive and arise from principles and relationships traced throughout the investigation with the participants. The researcher and participant must walk side by side throughout the process.

6 http://conselho.saude.gov.br/images/comissoes/conep/documentos/CARTAS/Carta_Circular_01.2021.pdf

7 <https://anppom.org.br/wp-content/uploads/2020/03/FCHSSA-Propoe-saida-Conep-e-criacao-de-sistema-alternativo.pdf>

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No potential conflict of interest was reported by the authors.

Compliance with Ethical Standards

The authors declare this study was conducted following ethical principles.
