Bioethics education: challenges in the teachers' training

Paulo Fraga da Silva

Abstract This article presents a study focusing on the initial formation of science and biology teachers, in which it analyzed, under the graduating teachers' point of view, the implications of their role in the students' ethic and moral formation. It sought specifically to identify the most relevant topics that they considered as relevant, capable to arise ethical discussions with their future students. In addition, it was raised some of the difficulties in dealing with these topics, according to interviewees. The methodological path went through analysis of answers given by the graduating teachers, who belong to three higher education institutions from the municipality of Sao Paulo. Such analysis, based in bioethics, in the perspective of protection and the studies of psychology of the moral development, identified topics related to repetitive and emergent situations, to the environment and school situations. The identification by graduating teachers of topics traditionally approached by bioethics sets forth the challenge of their insertion in the basic education, being a major instrument for the conquest of active citizenship.

Key words: Bioethics. Education primary and secondary. Sciences. Teaching. Science, technology and society. Faculty.

CEP Approval no. **1334/03/11**

Paulo Fraga da Silva
Bachelor and licensee in Biological Sciences, doctorate in Education (Teaching Sciences) at the Universidade de São Paulo (USP), expert in Bioethics by USP, Deputy professor at the Sciences and Humanities Center of the Universidade Presbiteriana Mackenzie (UPM) and co-leader of the ethics and bioethics at UPM, Sao Paulo, Brazil

The advances of techno science have been subject of discussions that result in social change, mainly due to their ethical and social implications. The scientific and technological production is subject to the forces that govern society, the economic, political, social, moral and ethical interests, that is, inserted into the process of building social values. Therefore, the reflection on the values that guide scientific production should be part of the repertoire of science teaching.

Taking the scientific community as an autonomous sphere of social life and therefore consider it capable of judging itself, can result in adverse effect to the training of professionals from various branches of science, since it coats science with the authority of being (single) legitimate locus of knowledge production.

This authority and power induce professionals dedicated to science (and society in general) to fall victims to a trap that hinders or prevents the exercise of democratic criticism, which should be permanent both in academic circles and among the various segments of society, when the objective is to achieve full citizenship for all.

However, problems in the implementation of clinical trials, published in the media, and the repeated complaints from patients regarding respect to their values in the treatment situation, lead to the inference that science education has not produced satisfactory results, especially in the preparation of learners to make decisions. There is also strong resistance in the academy to consider the whole of society as a participant in the development of a science [1]. Thus, one realizes the importance to engage in research aimed at identifying the perceptions and concerns of the teachers that train students in science, or even raise your opinion about the preparation they receive during the training to deal with issues in the classroom dilemmas.

In this context, this paper considers bioethics an important instrument for the socialization of the debate on techno sciences capable of stimulating ethical reflection on science teaching in triggering process of pedagogy focused on interdisciplinary, appropriate, therefore, to favor a pluralistic view on discussion of latent and controversial topics.

Possible relations between techno science and society

It is necessary, before embarking on the research topic, to identify the relationships that science provides to society - currently the scope of bioethics, especially the perspectives developed in Brazil. One way to identify how science relates or interacts with society is proposed by Habermas [2], which classifies this relationship in three distinct groups: which classifies this relationship in three distinct groups: *technocratic*, *decisionistic*, and the *pragmatic-political* interactions. It should be noted that these three ways of seeing never exist in pure form, in the case of conceptual models that allow a representation of reality.

In the *technocratic model* of social organization one tends to seek for experts when making any decision. One expects their choices to be neutral, dictated solely by scientific rationality. In this model, *experts* or scientists determine the policies to be followed, i.e. the population or society delegates to them the decision-making power. This model is widespread in our society, evidenced in the speech of those who put in science the real hope for solving the problems of humanity. This speech is observed in school, from the early grades, and endorsed in discussions or comments on news related to scientific or products of science [1]. Ferraz cites work by Krasilchik [3], *Prática de ensino de biologia*,

which mentions that this attitude stems from the presentation of science in elementary schools and secondary schools, which still reflect the worldview prevalent in post-war, a historical moment of great scientific development especially the 50 and 60.

The decisionistic model, instead, distinguishes between ends and means, and the ends (or goals) should be determined by free decisions, independently of science, while experts determine the means. This model, therefore, distinguishes between those making the decision and technicians. Some seek to determine the purposes and others the specific public policy, the means to implement it. This model reduces the dependence on the technical, since the individuals themselves decide their goals.

A decisionistic society considers that political institutions are to determine the objectives pursued by it. The technicians are to find the means to achieve them. According to this theory, the goals cannot be determined rationally; their choices are for the decision makers, guided by their values. The place of rationality would then be restricted to the determination of means and ends concerning the determination of the realm of pure freedom [4].

Finally, in the *pragmatic-political model* of interaction between society and science, that which is privileged is the perpetual discussion and negotiation between the *technician* and *non-experts*. It assumes a constant debate between those decision-makers, in which techno-scientific knowledge and socio-political negotiations are taken into consideration.

This model emphasizes the fact that the means chosen may change the goals, and reference is therefore to negotiations, the reason why it is considered in addition to pragmatic, too political. Finally, it is the model that creates more conditions for the exercise of citizenship, as permanent open space for discussion, debate and reflection. One can even say that it stimulates the society (or citizens) to decision-making and the development of skills, attitudes and values related to such situations.

Education in bioethics, education for citizenship

The education and training in bioethics is, first of all, a training process focused on the development of values associated with citizenship. And there's no denying that the individual will spend in the school their first experience of exercising their citizenship. Canivez [5] shows that active citizenship rests on an education of the capacity to judge. Thus, the citizen should know how to think, beyond the mere expression of his personal interests, access to a universal point of view, considering the problems facing the community's interest as a whole. The author emphasizes the important role of the teacher in providing the means, taste and habit of participation for their students, establishing a relationship of dialogue, giving thus a moral and political meaning to their teaching - emphasizing that they were trained for this practice.

Unesco [6], in a work entitled *Science for the XXI century – a new vision and a basis for action*, inspired in the *Santo Domingo Declaration on Science and the*

Use of Scientific Knowledge, states that from the globalization that connects inseparably the fate of all human beings, it is essential to discuss publicly ethics in scientific research. According to the document, science should serve the improvement and not the degradation of the human condition and, therefore, it should reduce and not increase social inequalities. The statement shows considerable sensitivity about the ethical dimension of science and technology and it emphasizes that continued access to education from childhood is a human right, and that scientific education is essential for human development. In this sense, the document points out that the reformulation of science education by of formal and informal means, should aim to get the public to understand it as integral part of the culture.

From those recommendations in the *Declaration of Santo Domingo* can be seen that the basic and permanent professors training should be more related to production environments and knowledge of diverse areas of science, given that the primary task of educators is to teach a dynamic science, i.e., incomplete and constantly changing, and directed to the real interests of humanity.

The ethical concern with regard to science teaching can be evidenced also in the *Universal Declaration on Bioethics and Human Rights*. In its Article 23, about information, training and education, in bioethics, it suggests that *to achieve a better understanding of the ethical implications of scientific and technological advances, especially for young people, States should make efforts to promote training and education in bioethics at all levels and stimulate programs for disseminating information and knowledge on bioethics* [7]. It is necessary, therefore, to invest in training teachers to meet this demand, so that education fosters the students to evaluate critically the impact of technology on society and are prepared to make decisions. Without deification or obscurantism.

Some authors discussed the recognition of the ethical dimension in science learning. From the analysis of the curriculum for the teaching of biology in the State of Sao Paulo, Ferraz [8] highlights the importance of bioethics at the high school curriculum The author points out that this inclusion has an important role in stimulating the exercise of citizenship, enabling students to be more critical regarding the study of the subject. Oliveira[9], one of the pioneers in questioning this discussion, also supports the inclusion of bioethics in the high school curriculum, because at this stage, the youngsters have gained a certain maturity and such teaching, combined with the knowledge gained in biology, would be able to increase their decision-making ability and arising, therefore, an ethical awareness that prioritizes the recovery of the social function in the biological sciences.

Pires [10] also highlights the need to add bioethics to high school curriculum, considering that the new discipline could contribute to the formation of a more critical vision in the construction of more humane values and attitudes in students. This insertion is not the only solution for the proper ethical and moral training of the student, but it responds to a question of a qualitative nature, regarding the teaching of existing subjects. Similar to other cross-cutting themes, the teaching of bioethics would cut across training in disciplines focused on science, contributing to training in ethical terms. Therefore, it is essential to prioritize issues related to teacher training, to enable them to enter the discussion and reflection on ethical issues that often arise in any discipline, including science.

Interesting assessment carried out by Razera and Nardi[11] on the recent publications of research in science teaching in Brazil shows the absence of the theme of ethics and values. It indicates a recovery of cognitive aspects related to construction and development of knowledge, characterized by a large volume of papers on topics related to teaching, curriculum, and teacher training. In parallel, issues related to the construction of the student's values are neglected or omitted. This picture becomes contradictory in the extent that the sciences, particularly biology, have brought substantial changes to society, with significant ethical implications for the social whole.

Education for active citizenship, in the exercise of participation and development of argument should provide the conditions for students to have a taste for reflection and the habit of free and non-coercive discussion[5]. These conditions for genuine learning were not observed in science courses, such as point out the works of Bryce e Gray [12]. Both, in a recent study highlighted the difficulties of teachers in dealing with controversial issues. The reasons range from the discomfort of being exposed, fear of not presenting facts, but only their views, the lack of time and interest in teaching only science, because the area of Social Sciences already works with the skills of discussion, among others.

The study also reported on the perceptions of students regarding the disputes. They are unanimous in pointing out that students caused or initiated classroom discussions, from something they read in the media, and rarely or occasionally by teachers. Teachers are always neutral in students' view. For them, the discussion is as an appendage to the lesson, never integrated to it. For them, the discussion is as an appendage to the lesson, never integrated to it. It is important to stress that, despite difficulties both the teachers and students consider discussion of the ethical and social issues essential and valuable in science education, particularly those posed by biotechnology. Even considering that this study does not refer to Brazil, its results appear to relate to what happens in classrooms, also in our country.

Given this situation, a bioethical

perspective adopted in this work is the protection bioethics [13], which relies on the concept of vulnerability, and from which develops the concept of getting hurt, referring to the context of a society that *consumes* the products of biotechnology without self-criticism or caution. In this sense, the vulnerability relates to a misguided public, mainly in the Brazilian context, in which are still registered low levels of education and low educational achievement. In this circumstance, the vulnerability is a concern of bioethics, because it is easily getting hurt, considering that the absence of a process for ethics training, individuals and groups are subject to exploitation, becoming ideologically and factually violated by techno science. In face of such situation, it may be argued that the lack of appropriate training, able to stimulate critical reflection, it is morally wrong.

However, is it possible to consider our young students vulnerable? One may reply affirmatively to this proposition in as much as school or even scientific education has provided little or no instrumentation to deal ethically with humanistic values, providing greater awareness to the student. The economic and social situation highlights student's low social and economic status, which restricts the power of negotiation and discussion and, therefore, increases their vulnerability and inducing to their vulneration.

Bioethics becomes, from a problem - atization pedagogy, an important tool in the teaching-learning process. Bishop [14] offers a proposal for teaching bioethics to students in late elementary and high school. She points out that the goals of learning and teaching of bioethics would be to develop the ethical perception and analytical reasoning skills; acquire a sense of personal responsibility, and dealing with moral ambiguity. The success of this approach depends on careful class preparation and the teacher's right background to guide class discussion, so that students are driven to discover and express the issues of values for themselves: thinking about the pros and cons when facing a given situation.

The questioning of values in teaching science and biology, and its contribution to student's ethical and moral training, is discussed in the literature focused on the ethical-moral education, particularly in the psychological perspective, and in the work of Piaget [15,16] and Kohlberg [17]. Even though we will not discuss in depth these perspectives hereto, it is important to highlight the concept of moral autonomy, offering support for the implementation of proposals for ethical and moral education. In this sense, identifying dilemmatic themes would be one of the first items on the formation of discussion groups about moral dilemmas, creating a relaxed atmosphere, without coercion, and ensuring the participation of all members. clash of opinions, according Kolhberg, could generate a cognitive conflict which, in turn, would lead to the

maturation of moral judgments. Thus, so that the school not only transfers content, but develops social skills, such as those arising from ethical reflection on moral values, it is necessary to conduct education in ways aimed at empowering the student, to enable him to think for himself and become, indeed, a moral agent, reducing the chance that he will be made vulnerable due to lack of training and quality critical information.

Objectives

This study sought to identify among undergraduates of Science and Biology the topics considered by them most relevant, able to raise ethical discussions with their prospective students. Furthermore, we tried to raise some of the difficulties of future teachers in dealing with these issues. This study is part of a broader research, developed in an already completed dissertation[18], which aimed at analyzing whether teachers' training contributed appropriately to the theme and construction of human values, and check their level of concern on the ethical dimension of scientific knowledge and technology.

Methodological procedures

The exploratory research, of a descriptive-explanatory type, of which this article arises, used quantitative and qualitative methodology. Based on a questionnaire administered to 106 undergraduates from three institutions of higher education in São Paulo, the fieldwork was conducted during the month of May 2007. Some questions have been supported, extracted and adapted from the works of Pires [10] e Serodio [19].

106 questionnaires were administered to undergraduates in science and biology. The criterion for inclusion of the subjects were being enrolled and attending an initial training course (Bachelor's degree in Science/Biology). Three higher education institutions (HEIs) have been chosen to implement them. The ease access and inclusion in their training centers have motivated the options, making it the selection criterion and choice of sample.

The first, called Institution I, belongs to private schools offering teacher's certificate degree and BS in Biological Sciences, among others. Forty-two questionnaires were applied on it, in the afternoon for students who were enrolled between the second and third semesters. The other institution named Institution II, also belonging to private education, offers the only undergraduate course in Biological Sciences. In this, 44 questionnaires were applied, 28 in the morning and 16 at night, most of them focusing between the third and fourth semesters. The third HEI, called institution III, belongs to the public school system and 20 questionnaires were applied to students in the night school course in biological sciences, specifically in the Faculty of Education. It should be noted that the perception of diversity, with students coming from different life stories, enriched by the analytical work. The questionnaire was

given by the researcher and the study subjects were volunteers who were willing to participate in the study by signing an instrument of consent (IC).

Data analysis resulted from the evaluation of responses to the assertions contained in the research instrument, which focused on the importance of ethical and moral training of the elementary and high school students and about teacher's role and qualifications to teach. Data collection occurred in two stages, but only data obtained in the first are presented in this work, in which undergraduates were asked to indicate the most relevant ethical issues to raise with their future students and, from there, identify the main difficulties encountered to implement these discussions.

Results and analysis

The results, grouped into units of records categorized by themes, are presented in the table provided at the end of the article. The selection of these analytical categories resulted from the process of content analysis, as proposed by Gomes [20]. According to this technique, after the recording of answers and reading to familiarize with the material the frequency of each item mentioned is computed, allowing for the preparation of the categories presented in the results. One should stress that many of the identified categories relate to issues traditionally discussed in bioethics, as well as for programs related to ethics and citizenship.

It is interesting to note the emphasis on *persistent situations* [21], that is, the most frequently mentioned belonged to the type of situation that has been observed throughout human history, reason why they were bundled by the author in this category, which emerged from the literature. This fact was revealed in the great concern of the undergraduates in focusing on aspects relevant to the context of social and economic inequality experienced by much of the population of our country. Abortion, euthanasia, prejudices (racial, gender), sexuality (teenage pregnancy, STDs, homosexuality, family planning, etc.) And drugs were the most frequently mentioned themes (*see table at the end*). In this sense, these issues could be discussed from a daily bioethics[22], in order to promote a reflection from a student's immediate environment.

Another set of themes that emerged from analysis of the material presented by teachers as subject to be questioned in the classroom can be bundled in what Garrafa called *emergent situation* [21], or situations that arise from techno-scientific advances. In this case, the present themes were stem cells, cloning, transgenic, animal research, and research involving humans. Clearly such issues, presented and served continuously by the media, carry a load of deep ethical reflection, hence the emphasis by the participants. Issues related to the *environment* also deserved emphasis, especially environmental conservation. It is important to recognize

the complex relationship between man and nature must be addressed in themes about the values that govern human action, demanding an ethical reflection that challenges the anthropocentrism.

We should emphasize the identification, by undergraduates, of *school* situations. Both the form adopted by the teacher for education and interpersonal relations are permeated with ethical components. In the latter, the undergraduate teachers perceive that the dynamics of the relationship between teacher/student and student/student can (and should) be discussed. Much of the same concerns the recognition of others as a social being endowed with rights and duties.

We emphasize the emergence of another item related to *topics specific to the teaching of science and biology*. A significant portion of them have strong ethical content and reflection of values that should be taken into account in planning for teaching these subjects, to be approached and developed. The previous study [1] showed that, when arguing, students often are motivated by purely personal reasons - ranging from religious beliefs, socio-cultural and situational issues up close to their daily life, the universe of their interpersonal relationships, that whether or not acting as explicit factors exerts strong influence on the positioning of students when confronted with new situations. Neglecting this would increase the distance between the individual and the knowledge presented to him, that is, totally devoid of values or, in other words, *dehumanized* .

Final considerations

The survey identified issues raised by undergraduates, some traditionally addressed by bioethics. The challenge is their inclusion in basic education, to contribute to the achievement of active citizenship.

It is inevitable to consider the fragility of the preparation or training for future teachers with regard to dealing with attitudinal content, for they are not explicitly addressed in its path through the course or, when present, occur unintentionally, in a not prescribed way [17]. It is worth noting that if there is no prioritization of these aspects in teacher training, poor condition he will have to handle or deal with controversial issues in his professional tasks. The emphasis given during the training of teachers to the information aspects, especially the intellectual capacity has not been enough to confront the problems faced. As future professionals - and why not say teachers? - college students need support to learn to think objectively about controversial subjects. If it doesn't occur, they will be unable to stimulate this ability in their future students.

Therefore, bioethics, which has an interdisciplinary character and is not restricted to a delimited field, connects on a higher plane with various forms of knowledge and becomes a rich methodological tool for the teaching of scientific disciplines and mobilization of the contents of a conceptual and procedural type, but mainly attitudinal.

Resumen

Educaciónen bioética: desafíos en la formación de profesores

El estudio analiza la formación de profesores de Ciencias y Biología. A partir de la óptica de los estudiantes universitarios busca evaluar cuánto tal formación influye en el pensamiento ético y moral de los alumnos. Intentó identificar los temas más relevantes y que susciten discusiones éticas con sus futuros alumnos, así como algunas dificultades en trabajar esos temas. La metodología consistió en plantear cuestiones a los estudiantes de tres instituciones de enseñanza superior del municipio de São Paulo y analizar sus respuestas bajo el punto de vista de la bioética y de los estudios de la psicología del desarrollo moral. Los temas se reparten en *los persistentes*, *los del momento o del noticiario*, *los del medio ambiente* y *los de interés escolar*. Así, al hacerse que los futuros profesores reconozcan los temas tradicionales de la bioética se hace también que tales temas sean discutidos en las clases de educación primaria y secundaria, constituyéndose importante instrumento de conquista de la ciudadanía.

Palabras-clave: Bioética. Educación primaria y secundaria. Ciencias. Enseñanza. Ciencia, tecnologia y sociedad. Docentes.

Resumo

Educação em bioética: desafios na formação de professores

O presente artigo apresenta estudo que teve por foco a formação inicial de professores de Ciências e Biologia, no qual se procurou analisar, sob a ótica dos próprios licenciandos, as implicações do seu papel na formação ético-moral dos estudantes. Especificamente buscou-se identificar temas por eles considerados relevantes, capazes de suscitar discussões éticas com seus futuros alunos. Foram também levantadas algumas dificuldades em lidar com esses temas, segundo os entrevistados. O percurso metodológico passou pela análise de respostas às assertivas apresentadas aos licenciandos, os quais pertencem a três instituições de ensino superior do município de São Paulo. A análise, a partir da bioética na perspectiva de proteção, e os estudos da psicologia do desenvolvimento moral identificaram temas relacionados às *situações persistentes*, às *situações emergentes*, ao *meio ambiente* e às *situações escolares*. A identificação, pelos licenciandos, de temas tradicionalmente abordados pela bioética traz o desafio de sua inserção na educação básica, constituindo importante instrumento para a conquista da cidadania ativa.

Palavras-chave: Bioética. Ensino fundamental e médio. Ciência. Ciência, tecnologia e sociedade. Docentes.

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Received: 1.6.11 Approved: 3.30.11 Final approval: 3.31.11

Contact

Paulo Fraga da Silva - *paulofragadasilva@gmail.com*
Universidade Presbiteriana Mackenzie, Rua da Consolação, 896, Prédio 12, CCH - Centro de Ciências e Humanidades, CEP 01302-907. São Paulo/SP, Brasil.

Table. Issues raised by undergraduate teachers to raise ethical discussions with their prospective students

Category	Total quotes	Themes – parentheses indicate total number of repetitions
Persistent situations	117	Abortion (41) Euthanasia (14) Prejudices (racial, gender) (14) Sexuality (early pregnancy, STD, homosexuality, family planning etc.) (13) Drugs (11) Politics (incoherence) (4) Education in the country (3) Corruption(3) Criminal legal age (2) Quotas in university (2) Industrialization Interest Political movement Misery Death sentence Alcoholism Violence Economic inequality Strikes Globalization
Emerging situations	80	Stem Cells (23) Cloning (15) Transgenic (14) Animal research (11) Research with humans (5) Biotechnology (5) Human Genome Project Genetic engineering Avian Flu Practical classes with animals Gene therapy Physician-patient relationship Transplantation

Environment	33	Environmental Conservation (6) Global warming (4) Environment (3) Degradation (2) Deforestation (2) Sustainable development (2) Environmental pollution (2) Lack of awareness Biopiracy Water shortage Ice thawing Future (greed) Preservation x human dwelling Global Warming x economic Nuclear energy Wastewater treatment River transposition Recycling Hydroelectric x Environmental Protection
Everyday school situations	27	Bullying (3) Indiscipline (2) Disrespect student/student and student/teacher (2) Heritage destruction (2) Cleansing of the study environment (environmental awareness) Verbal attack colleagues Physical aggressions Student lies (work submission) Group organization (socialization) Learn to behave Intolerance Lack of respect Cooperation Conflicts among students Teachers who stigmatize students Disrespect with students Fights in physical education Incoherence of the teacher (theory and practice) Lack of content from teacher Non valuation students' prior knowledge Discussion on subject topics/Low class level

Human rights principles and values	14	Individual and collective rights (2) Moral values (2) Lack of respect for others (2) Respect for opinions Respect for the individual The Self in Society Arrogance Respecting difference Bioethics Changing moral character Value of life
Specific topics on Science and Biology teaching	16	Evolution (5) Evolution x creationism (2) Church's influence in science Materialism x spirituality Creationism (respect for others' ideas) Fact x possibility Reason x logical belief Science x dogma Freedom of science Limit of science (momentum) Conception of the human body (biology)
Behavior	12	Religion (5) News Start of life Sex before marriage Explicit sex on TV Soap operas Daily life Cursing

Source: Silva PF. Bioethics and values: a study on the training of science and biology teachers. Sao Paulo [thesis]. Sao Paulo; Feusp, 2008.