

# Teaching bioethics and technoethics through modern digital technologies and artificial intelligence

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## Abstract

The cognitive subjects of bioethics and technoethics, according to declarations of international organizations and reputable scientific studies, should be taught at all educational levels, utilizing all available means, whether in-person, remotely, contemporary, or asynchronous. Nevertheless, there is no general consensus on the method and means for their appropriate teaching in modern schools. Some argue that they should be taught autonomously, while others advocate for their integration into various subjects (or even one subject) of the existing curriculum. Although fruitful dialogue on these issues is ongoing, this paper aims to examine both methodological issues related to the teaching of bioethics and technoethics, and innovative teaching practices for their more effective instruction through modern digital technologies and artificial intelligence.

**Keywords:** Education, bioethics, technoethics, innovative teaching practices, artificial intelligence

## Introduction

Twenty years after the release of the first documents by international organizations such as UNESCO, proposing the integration of the cognitive subject of bioethics into education, there is still ambiguity regarding its content, nature, and appropriate means for its proper teaching (Vidalis, 2019: 3). Some argue that the cognitive subject of bioethics should be taught autonomously in the modern school, while others suggest its integration into various subjects of the existing curriculum. However, creating an elective course would limit participation to fewer students, whereas integrating it into an existing mandatory subject would allow the participation of all students (Bishop & Szobota, 2015:19-25). For this reason, it has been proposed that the examination of bioethical and technoethical issues should take place within the framework of the mandatory subject of Religious Studies (Ladas, 2023). In any case, although the fruitful dialogue on these issues is ongoing, what is significant is that there has been consensus on the importance and usefulness of teaching bioethics and technoethics in secondary education (Vidalis, 2019: 3). In this spirit, in this article, we intend to examine both methodological issues related to the teaching of bioethics and technoethics, and innovative teaching practices for their more effective instruction through modern digital technologies and artificial intelligence.

## Education, Bioethics, and Technoethics

Teaching both the cognitive subjects of bioethics and technoethics is deemed imperative to commence within the secondary education environment. This approach enables young individuals to responsibly approach issues related to scientific and biotechnological progress and their impacts on human life and the natural environment (Araújo, Gomes, Jácomo & Pereira, 2017: 507-513). Teaching both subjects presents an opportunity for the development of critical thinking, as well as other skills, including the concepts of responsibility, democracy,

respect for others, and decision-making abilities (Araújo, Gomes, Jácomo & Pereira, 2017: 507-513).

It's a fact that high school students are particularly suitable for learning the cognitive subjects of bioethics and technoethics, as they will mature within a short timeframe. As adults, they will be called upon to make ethical decisions that may affect their health and well-being, as well as those of their communities and societies (Division of Medical Ethics High School Bioethics Project, 2024). According to Harter, many adolescents already have a clear sense of self-awareness, which can enhance their openness to ethical issues (Harter, 2012). This is also recognized by the Bioethics Committee of the Council of Europe, which has developed an educational information bulletin aimed at educating young students (Araújo, Gomes, Jácomo & Pereira, 2017: 507-513).

It has been observed that tertiary education students were inadequately prepared and unwilling to engage in discussions about the ethical implications of biotechnology and genetic engineering in various scientific fields of study (Bishop & Szobota, 2015:19-25; Chowning, Griswold, Kovarik & Collins, 2012: e36791; Harada, Kirio & Yamamoto, 2008: 14-16; Keskin-Samanci, Özer-Keskin & Arslan, 2014: 69-76; Araújo, Gomes, Jácomo & Pereira, 2017: 507-513). This fact, possibly stemming from the aforementioned ambiguity regarding the content, nature, and appropriate means for teaching bioethics and technoethics, highlights the need for proper handling of bioethical issues.

Of course, the lack of appropriate preparation may also stem from concerns both students and educators have regarding the teaching of ethical reflection issues. Sometimes, participants in discussions of ethical matters fear that their religious or cultural beliefs might be challenged (Solomon, Vannier, Chowning, Miller, & Paget, 2016: 11-18). Therefore, educators must make it clear to students that the issues they intend to examine are not aimed at changing their minds or altering their beliefs but rather at helping them formulate their opinions based on sound reasoning. In this context, it is imperative to clarify that the formulation of scientific and persuasive arguments is paramount (Solomon, Vannier, Chowning, Miller, & Paget, 2016: 11-18). For this reason, the exploration of topics that all students can engage with and the use of cooperative methods to articulate their positions, discuss, collaborate, and learn from one another is favored. After all, in the modern school, all children should participate in the educational process, and the inclusion of everyone should become a reality (Ladas, 2024a).

### **Innovative Teaching Practices for Bioethics and Technoethics**

Bioethical and technoethical issues, apart from the mentioned difficulties, also involve a range of sensitive topics. Nevertheless, they can be taught through appropriate teaching techniques, as well as through modern and valuable applications of artificial intelligence (Solomon, Vannier, Chowning, Miller, & Paget, 2016: 11-18). The question arising at this point is which teaching techniques are considered appropriate for educating students.

Bioethical issues could be introduced into the classroom through a thoughtful question, a case study, a specific unit, a guest speaker, group/individual work, an educational field trip, or by screening a film, illustrated books, interactive images, or animations/comics (Bishop & Szobota, 2015:19-25).

Active student participation enhances interest and understanding, creating an environment where education becomes tangible (Hatzioannou & Stefanis, 2023: 818-829, Willis, 2006). Converting text into visual educational tools can help adolescents comprehend and memorize arguments and perspectives on complex ethical issues such as animal experimentation, genetic enhancements, organ donation, surrogate motherhood, medically

assisted reproduction, and end-of-life issues (Division of Medical Ethics High School Bioethics Project, 2024).

Teaching bioethics using visual educational tools is an exceptionally fertile way to explain to students bioethical issues that arise throughout human life, as well as before and after it, including medical and scientific research and progress. Moreover, the concepts of bioethics and technoethics have appeared in movies and comics for more than a decade, creating a rich educational resource (Division of Medical Ethics High School Bioethics Project, 2024).

The use of comics in secondary education can help educators initiate discussions on highly sensitive topics such as life after conception, what it means to be a child of a surrogate mother, the creation of "designer babies," euthanasia, and abortion (Carney & Levin, 2002: 5-26). Moreover, visual representation, when used to accompany text, can have interpretative and transformative effects (Carney & Levin, 2002: 5-26). Visual effects aid in understanding difficult texts, enhancing memory, and overall cognitive skills. Therefore, illustrated school texts can attract students' attention and help them better understand the content (Carney & Levin, 2002: 5-26).

However, not all visual educational tools are suitable for teaching bioethics and technoethics in high school. To be deemed appropriate, film and comic producers must consider the age, race, gender, faith, and educational level of the students. Furthermore, visual tools should be free from stereotypical depictions and negative patterns, avoiding any form of targeting of any group of people, culture, race, gender, or class (Division of Medical Ethics High School Bioethics Project, 2024).

The appropriate tools, so to speak, should not present utopian or dystopian scenarios but should aim for objectivity and take into account the complexity in ethically resolving the examined issues (Division of Medical Ethics High School Bioethics Project, 2024). It is crucial for the educator, who ultimately serves as the final arbiter, the person who evaluates and selects the suitable visual tools, to have the ability to assess and decide whether they are appropriate for the students and to reject those that are deemed unsuitable (Division of Medical Ethics High School Bioethics Project, 2024). It would be useful for educational institutions to collaborate with film producers and cartoonists to produce the most appropriate educational materials (Ike & Anderson, 2018).

In the educational system of Greece, autonomous teaching of the cognitive subjects of bioethics and technoethics is not provided for in either primary or secondary education. Consequently, the only systematic and extensive exploration of basic bioethical issues, up to this point, is provided within the framework of the Religious Studies course (Pepes, 2018: 78). Therefore, at this point, we will refer to some of the techniques used to examine bioethical issues. In the textbook of the Religious Studies course for the B' High School, where the term bioethics appears six times, students' engagement with contemporary issues begins from their existing experiences and knowledge. The material is developed based on the needs of students in modern society, and its structuring aims to actively involve them in various activities, with the goal of acquiring useful and necessary knowledge, communication skills, understanding, and cooperation among themselves, as well as deepening their personal self-awareness and personal stance towards aspects of religious phenomena and fundamental issues, respecting freedom as well as the diversity of other positions and viewpoints (Religious Studies Book B' High School, Christianity and Religions, 2023).

In the relevant teaching books, there are notable activities. For example:

1. in the second-grade high school book, after references to issues of respect/disregard for life, students are urged to divide into groups and study a case of ethical dilemma concerning life or death. Then, based on the text "In the Head of Dead Natasha," they

- must write a brief article presenting the criteria for organ donation. Once completed, they should read it aloud to the entire class and, if feasible, publish it on the school's website or on an educational/student blog (Religious Education Book B' High School, Christianity and Religions, 2023: 29-31),
2. in the third-grade high school book, the subunit "1.3 Applications of Genetics" is identified, which refers to the ethical dilemmas arising from the applications of Genetic Engineering. Initially, with the help of a text, students learn a few things about genetic engineering and the new prospects that arise. Then, they are encouraged, if space permits, to divide into two equal groups, forming two concentric circles. In this context, those in the inner circle will represent a parent who, in a scene from the near future, receives a proposal from a specialized doctor to proceed with prenatal selection of the future child's basic characteristics (e.g., gender, external characteristics, life expectancy, mental abilities, etc.). Those in the outer circle express the conscience of the parent and prepare a sentence to say to help them decide. In the first phase, those in the inner circle close their eyes and prepare to listen to the voices of conscience. The outer circle walks around. Everyone repeats the prepared sentence, choosing the way they repeat it (tone, intensity, etc.), so that it is heard many times. After this is done for a while, in a second phase, they switch roles. The two circles change position so that everyone can "converse" with the conscience. Upon completion, they discuss the ethical dilemmas arising in similar cases (Religious Education Book C' High School, Christianity and the modern world: 14),
  3. subsequently, the subunit turns to "Ethics in the Age of Genetic Engineering" and "Recombinant DNA Technology." In this context, students are called upon to read an excerpt from the Oviedo Convention on Human Rights and Biomedicine (1997) and to note all the concepts related to the protection of human rights in relation to the applications of Genetic Engineering. Then, in groups or pairs, after writing on a sheet of paper within a framework as the central concept the phrase: "Human Rights and Biomedicine," they should place the concepts they previously noted on a (conceptual) map, utilizing lines and branches and adding additional concepts related to the main theme. The aim is to classify the concepts as appropriately as possible, always in relation to the central concept. Upon completion, they must examine the maps they have prepared and evaluate them based on accuracy, scope of content, and organization. Subsequently, students are called upon in pairs or groups to read about the Christian positions regarding Genetic Engineering and to record three questions regarding the possible boundaries in the exploitation of genetic science, the potential concerns arising in relation to the human person, or the role that bioethics is called upon to play today. Upon completion, each group will present its questions to the entire class and attempt to provide possible answers, analyzing and justifying their positions (Religious Education Book C' High School, Christianity and the modern world: 15),
  4. in the same book, the subunit "1.4 Ecotheology" is identified, which deals with the natural environment and ecological destruction. Initially, students are asked to observe certain photographs and formulate questions about them. To facilitate this, some prompts are provided. For example, they can use some of the following indicative types: Why... or for what reasons...? What would happen if...? For what purpose...? What would be the difference if...? Suppose that... What would happen if we knew that...? What would change if...? After formulating these questions, they are

- called upon to select some of them and discuss them for a few minutes (Religious Education Book C' High School, Christianity and the modern world: 19),
5. in the same unit, students are asked to read texts from the Holy Scriptures and, based on them, try to interpret the terms "work" and "unemployment" from a Christian perspective. Then, they are asked to explain how the Holy Scriptures perceive the meaning of work. Furthermore, they should try to discover the key points and concepts in a text referring to the Christian ethical framework regarding labor issues. In this context, they are asked to highlight the key points and to mark the key concepts with a colored marker. Finally, they should present, discuss, and justify their choices with the whole class (Religious Education Book C' High School, Christianity and the modern world: 31-32).

## Conclusion

Bioeducation is of vital importance in equipping students with the necessary means and knowledge to make informed decisions on bioethical dilemmas, whether it concerns the decision to donate organs from a brain-dead relative, the choice of the best method of medically assisted reproduction, or the decision of a family regarding the provision of palliative care to a patient when treatment is no longer feasible (Kriari, 2023: 3).

The introduction of the cognitive subjects of bioethics and technoethics in Secondary Education is an undeniable necessity, recognized both by international organizations and by specialized scientists. However, the teaching of both cognitive subjects requires special pedagogical methods that actively engage students in participatory activities. For this reason, the use of innovative teaching practices, multipath methods, and applications of artificial intelligence is advocated and deemed suitable, which will involve all students in the modern school.

The establishment of a national or even international pedagogical repository with useful and suggested material would be very promising. A national or international bank of resources, educational aids, and materials for students and educators would facilitate the work of both and guide those involved in finding suitable visual and auditory tools.

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