

Activity 2

Thoughts on cloning

By **Lucie Bolduc** and **Josée Bolduc**

Activity developed at
Collège de Sherbrooke and Collège Laflèche

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They are also available in Word format in the “Trésors pédagogiques” (Teaching treasures) section of the Saut quantique Web site (<http://www.apsq.org/sautquantique>). Instructional analyses of these activities are also available on this site.

The authors authorize the use of this text and the appendices for instructional purposes, provided the source is mentioned.

Adherence to these recommendations will encourage authors to share their findings.

If you have any questions or comments, feel free to contact the authors at the following addresses: luciebolduc@hotmail.com and joseebolduc25@hotmail.com.

Activity 2

Thoughts on cloning

Introduction

The activity presented in this document leads participants to reflect on the topical subject of cloning, while enabling them to learn about some of the technical and theoretical elements surrounding the subject.

The introduction to this activity features the fictitious story of a woman, Mrs. Genolac, who wants to have one of her organs cloned in order to fight a disease. A text in the form of a newspaper article is given to students in an effort to give the case a real-life dimension.

Once they have read the text, the students consider the issue, take a stand, work in teams, read articles on cloning and do research on the Internet in order to be able to participate in discussions based on well-structured arguments. Each team of students must defend the point of view of a specific sector of society that is involved in the debate on cloning.¹ They must develop solid arguments on the basis of their reading, questions and discussions with the teacher.

The teacher must guide the students in their learning. He or she must verify the students' previous knowledge by asking them questions, distributing sources of information, pointing out other resources, helping them develop good work methods—research methods for example—, etc.

¹The teams will take on the following roles: scientists and/or doctors (for), Mrs. Genolac's family (for), industry representatives (for), scientists and/or doctors (against), representatives of the Church or pro-life groups (against) and psychologists (against).

This activity is intended for students in any science program that, at some point, presents the various biotechnologies that humans are faced with today. To verify the relevance of this activity, it has been included in the Natural Science program as part of the Physiology of Living Things course. The activity requires three hours of class time (over two periods) and is designed for a group of approximately 30 students. It can also be carried out with a greater or smaller number of students by increasing or decreasing the number of teams or the number of participants in each team. In our case, the activity was carried out successfully. The students were motivated and involved, and really enjoyed this approach to learning.

The aim of this activity is to help develop well-informed citizens. Although this goal cannot be achieved with just one activity, the students will have had some exposure to a new way of approaching science. Most students may not have had the opportunity to reflect on topics that lead to debate. If they are open to this approach, they can recognize the importance of their point of view and the need to be well informed in order to be able to adequately fulfil their role as active members of society.

As college science teachers, we recognized that we also have a role to play in society and that our work has a definite impact on society. Since we are primarily responsible for helping develop citizens with critical thinking skills who are able to make well-informed decisions on a variety of topics, we believe that this activity on cloning will provide students with an entire new view on the subject and on science in general.

We also wanted to introduce the multidisciplinary aspect of the world of science. Although the activity focuses on a biology application, we wanted students to understand that, given its different aspects, cloning deals with a number of areas. We wanted the students to understand that such an important topic affects all of society and that, consequently, everyone has the right and the obligation to become involved.

In addition, we believe that this activity is extremely relevant, since it deals with a very topical subject: biotechnology. In the past few years, this field has evolved considerably. Indeed, it has evolved to such a degree that it is more and more difficult to fully understand new technologies and their implications. Since more and more people with a science background are called upon to work in this very promising field, it is important for students who have chosen to pursue studies in science to become familiar with the different concepts related to biotechnology. This activity also provides students with an interesting and different way of becoming actively involved in their cognitive development. The activity offers them a new way to view and approach science.

Educational objectives

This activity enables students to achieve other educational objectives. First, students are introduced to cloning, more particularly human cloning, since this area of biotechnology is very controversial and misunderstood. In fact, when asked what they thought of cloning, most people said that they didn't know what it was exactly. Given the image of cloning that is conveyed through the various media sources, they think only of Dolly the sheep, and they associate cloning with "photocopying".

Students will have to critically examine this area of biotechnology in order to identify the essential elements and pinpoint its advantages and disadvantages. They will therefore have to collect new information and present it to their colleagues clearly and accurately. They will improve their intellectual abilities, while developing their sense of responsibility and organizational skills.

They will also have to learn to work in teams, communicate their ideas verbally and adopt positive attitudes: openness toward others, respect, listening skills, the ability to share, etc.

Cloning will therefore serve as a means of encouraging students to develop critical thinking skills and help them improve their ability to discuss, debate, critique, take a stand on an issue, etc.

Links to the program

This activity was created for students enrolled in the Physiology of Living Things course in the Natural Science program. The links mentioned below reflect this choice. The activity could very well be offered at the end of the first biology course entitled Evolution and Diversity of Living Things. It would therefore reach a greater number of people, since this is the only biology course that is compulsory for all science students.

Although this activity achieves several objectives mentioned in the course outline, it is primarily designed to enable students to achieve the following objectives:

- To establish links between science, technology and daily life.
- To identify the expected advantages and disadvantages in terms of the reconciliation of technology and scientific ethics.

In addition, the activity on cloning takes account of the general aims of the Natural Science program, since it:

- contributes to the acquisition and understanding of concepts and principles that are transferable and usable;
- makes it possible to develop the ability to reflect on the relationships between science, technology and society;
- uses the scientific method;
- allows for the integration of knowledge from a disciplinary and interdisciplinary standpoint.

This activity enables students to establish links with the other courses in the program. To begin,

the concepts explored in the students' first biology course, Evolution and Diversity of Living Things, are essential to understanding cloning. An explanation of cloning techniques also makes use of the elements of certain physics and chemistry courses.

It is important to remember that the progress made in biology in recent years is both fascinating and worrisome. This activity enables students to develop their judgment and critical thinking skills, which will help them make well founded and sound decisions in many areas of human activity.

Educational support

The teacher has a very important role to play at each stage of the activity. This role is discussed in detail in the section entitled Procedure. There is one point that the teacher should bear in mind at all times: he or she must remain neutral and not suggest to students what they should say or think. The students are responsible for developing their own arguments. Since the aim of the activity is to enable students to develop their ability to defend their point of view, it is important to let them be guided by their own principles. Moreover, since the students may have to defend a point of view that is not their own, they may explore other avenues in an effort to strengthen that point of view. It is therefore important that the students not be influenced by their teacher and that they correctly interpret the documentation consulted.

Procedure

Part I (1 hour)

Introduction to the topic and initial vote (5-8 minutes)

- The teacher asks the students: "Are you for or against cloning?" without giving any explanations.

- The students answer individually on a specially prepared ballot (Appendix P.1).
- The teacher takes no specific action at this time.

Team discussion during which students share their point of view (10 minutes)

- Makes it possible to start the discussion calmly, in teams of four or five students.
- Allows students to discover other points of view that they may not have considered and that may support or change their position.
- The teacher must ensure that the discussions run smoothly, without intervening. At this stage, the students have not been given any official information.

Individual verification of each student's position and second vote (2 minutes)

- Following this short stage, the students restate their position in writing (whether it has changed or not) on a second ballot identical to the first. After a preliminary discussion, it is important for students to reexamine their point of view, since their perceptions may have changed with the new information provided.

Presentation of the case of Mrs. Genolac (25 minutes)

- The case study helps the students begin the critical thought process.
- The case study is presented in the form of a newspaper article (Appendix E.1) and is the focus of the activity.
- At this stage, the teacher gives a 15- to 20-minute presentation on the different types of cloning (therapeutic and reproductive).

Formation of teams and distribution of roles
(10 minutes)

- The students are placed in teams of four or five and each team is assigned a specific role for the following week.

The roles are as follows:

For	Against
Mrs. Genolac's family	Psychologists
Private-sector Representatives	Representatives of the Church and/or pro-life groups
Doctors and/or Scientists	Doctors and/or scientists

- They are asked to build a solid argument to defend their position.
- The teams choose their preferred roles. If students have too much difficulty choosing their roles, they can be distributed at random.
- The teacher explains what each role represents and ensures that the distribution of roles is carried out smoothly.

Distribution of reading material (5 minutes)

- Each student is given one or two articles so that they all have a basic knowledge of the subject (see Appendix E.2).
- Each team is given two or three more specific articles that support their position to help them get started with their research. These articles are not given to the other teams.
- The teacher distributes a list of Web sites to consult (see Appendix E.3).
- The teacher mentions to the students that they will have some time during the following week to finalize their arguments. Each student is nevertheless required to do research in order to find material to help make

their arguments more convincing. Since the students already know what group they belong to, they can more specifically target their research.

Part II (2 hours)

This second part is the core of the activity during which students develop and present solid arguments on the topic of human cloning. Each team must take on the role assigned to them in the first part of the activity and find arguments for or against in the case of Mrs. Genolac. Students should imagine that they are in court, where they have to defend their position. The aim is to make them aware of the importance of a topic once considered purely scientific. The number of different people playing different roles in the debate and presenting a variety of arguments will help the students realize just how many people are involved in debates of this nature.

Preparation of team arguments (20-25 minutes)

- The students pool the information collected during the week in order to create a list of convincing arguments to be presented during the debate.
- The “for” groups (doctors and/or scientists, Mrs. Genolac's family, industry representatives) and the “against” groups (doctors and/or scientists, the Church and/or pro-life groups, psychologists) develop their arguments. The students must agree on the arguments before presenting them to the rest of the class.
- Each team will have approximately eight minutes to do their presentation (six minutes to present their arguments and two minutes for questions). If a team takes less than five minutes overall, the teacher will ask more questions. Teams should therefore be well prepared.
- The teacher serves merely as a guide for the students. The discussions that take place within the team are based on what the students think and know. Students may, how-

ever, reach an impasse in their arguments. In such cases, the teacher can give the students some ideas to help them continue their work.

The debate (60-75 minutes)

- The teams defend their positions one at a time. They also answer questions from other groups. The students will probably become aware of the difficulty of defending a position that may contradict their own values.
- The teacher's role is to ensure that the presentations and question periods run smoothly. He or she also ensures that the students do not stray from the topic. The teacher must never reveal his or her own beliefs and remain neutral at all times.

Individual verification of each student's positions and third vote (2 minutes)

- A third vote takes place using ballots similar to those used in the first two votes. It is important for students to verify whether their opinions on the issue have changed. Their point of view may have changed with the new information provided.

Conclusion (15-20 minutes)

- The teacher wraps up with a short conclusion on the importance of being well informed when adopting a position on a subject. This is all the more important with a controversial topic like human cloning. Moreover, it is always possible (depending on the time available) to review the basic theory on cloning. This ensures that students have the correct information that they can use in other, similar situations. This is a good opportunity to do a synopsis of the activity with the students.

Material

Teacher's documents:

- Appendix P.1: *Ballots*

- Appendix P.2: Correction key for written assignment

Documents to be handed out to students:

- Appendix E.1: Text on Mrs. Genolac: Cloning Could Save Her Life
- Appendix E.2: List of articles on cloning
- Appendix E.3: List of Web sites on cloning

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Video entitled *Le Clonage ou l'art de se faire doubler* by Louise Vandelac and Karl Parent (2000)

This video can be especially interesting for students playing the role of the psychologists since psychiatrists and philosophers discuss ethics, values that should be adopted and possible forms of abuse at various levels following the legalization of cloning. Students playing the role of the psychologists must take into account the elements mentioned in the video when developing their arguments.

It could be interesting and relevant for all the students to watch the video since it raises a major concern: the relative lack of legislation regarding cloning in many countries, including Canada. This poses a serious risk of abuse, a point illustrated with the example of Raël. In addition, this video helps students strengthen their arguments, while making them aware of various ethical questions and the various opinions and points of view of philosophers, psychologists, researchers, people wanting to have themselves cloned, etc.

Suggested evaluation

Since this activity is designed to have students critically examine cloning and verify theoretical concepts, it cannot easily be evaluated by means of an examination. The teacher can ask the students to list the advantages and disadvantages of cloning and to explain the various effects short- or long-term effects. He or she can also ask questions on the technical aspects of cloning. The aim of the activity is, however, to enable students to develop an opinion on the issue of cloning. An examination is therefore not the best way to evaluate their learning.

The students' short presentation can be evaluated. Such an evaluation may, however, hamper discussions, since students are apt to feel more pressure and constraint. The aim is to maximize student participation and involvement. Students should ask questions and discuss freely out of interest and concern for the topic, not because they are being marked.

A written assignment is a more effective way of evaluating this activity (see suggested evaluation

criteria in Appendix P.2). Each student chooses a particular problem or advantage related to cloning and does an in-depth analysis. The assignment counts for 10% of the semester mark. This assignment enables the teacher to verify whether the students have correctly understood the concepts of cloning, as well as the consequences and implications of cloning, etc. It also enables the teacher to determine how the students' opinions have evolved. It will also enable students to freely express their opinions on a controversial topic, to verify whether they have understood the concepts presented, to express what they have gained from the activity and to develop their critical thinking skills.

References

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Vandelac, L., and K. Parent (2000). *Le Clonage ou l'art de se faire doubler*, National Film Board, VHS videocassette, 51 min, colour.