The use of biotechnologies for enhancement: genetic engineering and social ethics

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**Persistent identifier of the Case-based Exercise**

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**Short abstract**

This case invites students to explore, debate, and find consensus on ethical aspects of biotechnologies related to enhancement. Students are provided with an overview of some ethical views on enhancement which they use as inspiration for two debates: one that focuses on questions of moral luck vs. distributive justice in deciding whether or not to pursue genetic engineering, and a second that asks if scientific progress should be subject to limitations based on its carbon emissions impact.

**Story**:

The four main areas of human enhancement are “emotional enhancement, cognitive enhancement, moral enhancement, and life extension.”[[1]](#footnote-2) Each of these have different, but overlapping ethical concerns, and whether enhancement through genetic engineering should be pursued at all is the subject of much ethical debate. Moral enhancement has the potential to create morally better people, potentially assuaging current societal problems. Can and should we use genetic enhancement to reduce the carbon footprint of future humans? Could global inequalities be alleviated by genetic enhancement, or would enhancement instead exacerbate injustice by accruing even more advantage to the well-off?

Background reading:

**1. What is enhancement?**

Currently, the “four main (that is, most widely discussed) areas of human enhancement (are): emotional enhancement, cognitive enhancement, moral enhancement, and life extension.”[[2]](#footnote-3)  Referring to all four of these types, enhancement has often been contrasted with “therapy,” or “restoration of function,” which generally fall within the goals of medicine. Andrea Vicini observes that in bioethical discourse, this dyad between medical treatment and nonmedical enhancement also has ethical implications: “…at least in most cases, therapies should not raise ethical concerns, because they aim at promoting healing and, as such, human flourishing. Enhancement, on the contrary, requires more careful discernment.”[[3]](#footnote-4) This division between enhancement vs. therapy or restoration of function traces back to the 1990s.

However, other distinctions, or ways of framing this division, have been put forward.

In 1997, Gerald P. McKennydistinguished between “frivolous” and “serious” to types of genetic engineering,[[4]](#footnote-5) and in the following year, the distinction between enhancement and therapy was made for non-genetic research.[[5]](#footnote-6) In 1999, McKenny argued for the use of the terms “therapeutic” and “nontherapeutic” instead of “enhancement” and “therapy,”[[6]](#footnote-7) while James Keenan put forth the concept of “virtuous perfection”—an even higher standard than enhancement.[[7]](#footnote-8) On the other hand, Michael Hauskeller contended that the distinction between enhancement and therapy has been dissolved because the public perception is that enhancement *is* a type of therapy.[[8]](#footnote-9) He writes, “the increasing tendency to view human enhancement as a form of therapy (which is meant to cure us from the human condition) marks a remarkable change in our normative attitude. It seems to be more and more common to believe that we deserve to be enhanced and that we have the right to be. And with good reason: if enhancement really is therapy, then it is not unreasonable at all to believe that we are entitled to be enhanced just as we are now entitled to be cured when we are ill.” [[9]](#footnote-10) Although the lines between enhancement, function, and therapy may be blurred in the mind of the average person, ethics retains these distinctions, maintaining that enhancement is ethically controversial.

This case will discuss ethical aspects of biotechnologies related to enhancement, with a focus on the ethics of genetic engineering for social ethics. Social ethics examines how actions of individuals impact larger society. Social ethics also looks at how actions and choices of industries—like health care and biotech—make society better or worse.

**2. Ethical Enhancement**

Enhancement, by definition, should be a betterment. Biotechnologies may be developed for one of the four categories (emotional enhancement, cognitive enhancement, moral enhancement, and life extension). The key focus of this case is the use of biotechnologies, like genetic engineering, for moral enhancement, that is, to make people morally better.

Better people make a better society. There are many social problems, such as sexism, racism, poverty, and climate change, that could be assuaged by moral ethical actions. Once a social problem is identified as a broad ethical issue, genetic engineering could assist in manufacturing the type of people who will act in the better interests of their society.

**3. Genetic engineering and social ethics**

In 2012, Matthew Liao, Anders Sandberg and Rebecca Roache proposed genetic engineering to reduce the carbon footprint of future humans. Suggestions included selecting genes for meat intolerance, smaller people, and altruistic tendencies, among other measures.[[10]](#footnote-11) Since meat—particularly beef—has a high carbon footprint,[[11]](#footnote-12) big people use more resources,[[12]](#footnote-13) and self-interested people are unlikely to care about the natural environment,[[13]](#footnote-14) targeting these three areas of genetic engineering would lead to people with lower carbon footprints.

These forms of enhancement are ethically controversial. C. Ben Mitchell has actively written against using genetic technologies to create humans who will have less of an impact on climate change.[[14]](#footnote-15) While genetic engineering for trivial purposes is rightfully objected to, Mitchell has missed the opportunity to use biotechnologies to the advantage of a clean, healthy earth, and vice versa.[[15]](#footnote-16) The proposals for genetic engineering for social betterment above are somewhat hyperbolic, but they highlight the possibility of integrating social ethics into technological offerings.

**Educational instructions**

*Are the teacher and student versions different?*

Yes

**No**

**Steps of the exercise**:

Step 1: Orientation discussion (15 minutes)

Input: all students read the background reading (prior to class)

**Activity:** Instructor leads an orientation discussion to acquaint students with the concepts found in the story

1. Types of enhancement

2. Ethical Enhancement

3. Genetic engineering and social ethics

**Output**: Students receive basic information and are oriented to the subject

**Step 2:** Prepare for debate (15 minutes)

**Input:** Orientation discussion from step 1

The instructor divides students into five groups, Teams A, B, C, D, and Observers. Teams A-D should have 3-6 students in them; if there are not sufficient students, Observers can be omitted.

**Activity:**

Teams should read the relevant information for their Team in *Annex 1: Debates 1 & 2* and prepare propositions and closing statement.

Each Team will

1. Create 3 propositions that defend their position

2. Create 3 counterpoints is response to the other team

3. Create a closing statement that summarizes their position

Observers should read both sides of both debates carefully while Teams prepare and think about possible points in the debates where the sides could find consensus or agreement.

**Output:** Each Team creates 6 propositions and a closing statement; Observers know debate topics well.

**Step 3:** Debate (30-45minutes)

**Input:** Prepared propositions & closing statements from Teams; Observers’ knowledge of 2 debates

**Activity**: Teams A&B debate for 15 minutes, sharing their 6 propositions and concluding with a closing statement. Teams can respond to each other’s points but should generally stick to the propositions they’ve prepared.

Then Teams C&D repeat the same debate procedure.

When Teams are debating, Observers should record notes on places of possible ethical consensus. (These would be areas where both groups may agree, or where there is a third option, or another ethical aspect that unifies the concerns of both sides.) If there are no observers, this task should be done by Teams C&D for debate 1 and Teams A&B for debate 2.

**Output:** Completed debate and notes from Observers

**Step 4**: Consensus finding (30-45 minutes)

Input: The entire class discusses places of consensus in both debates.

Activity: The entire class creates a 1-page “position paper” for the topic. The position paper will cover both debates; students do not need to create two position papers. (A position paper describes a position on an issue and the rational for that position. The position that the student take should be based on the consensus, thus producing an ethically robust and “bipartisan” document. See the Annex 2 for instructions.)

Output: A single page position paper that identifies the points of consensus in both debates.

**Rubric sketch for the CBE:**

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Unsatisfactory | OK/Satisfactory | Excellent |
| 1 – orientation discussion | Students are not prepared from reading or orientation | Students have understanding of main ideas related to enhancement | Students are able to guide the orientation exercise themselves and are fluent in ideas from reading related to enhancement |
| 2 – prepare for debate | Students are not prepared for debates – propositions/closing statements, if written, are not adequate | Groups have prepared for debate with propositions/statement though these are not well refined | Groups’ propositions and statements are thoughtful and well-constructed |
| 3 - debate | Main points are not clearly stated and/ or presentation is unclear in the debate | Some main points are insignificant and/ or presentation is unclear in the debate | All main points are presented and are clear in the debate |
| 4 – consensus finding | Students cannot posit points of consensus in the position paper | Points of consensus are weak or too basic in the position paper | Points of consensus are strong and unify many stakeholders in the position paper |

**References**

Allhoff, Fritz, Patrick Lin, James Moor, and John Weckert. "Ethics of human enhancement: 25 questions & answers." *Studies in Ethics, Law, and Technology* 4, no. 1 (2010).

Allhoff, Fritz, Patrick Lin, and Jesse Steinberg. "Ethics of human enhancement: an executive summary." *Science and engineering ethics* 17, no. 2 (2011): 201-212.

Bostrom, Nick. "Human genetic enhancements: a transhumanist perspective." *The Journal of value inquiry* 37, no. 4 (2003): 493-506.

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Hauskeller, Michael. "A cure for humanity: The transhumanisation of culture." *Trans-Humanities Journal* 8, no. 3 (2015): 131-147.

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Keenan, James F. "“Whose perfection is it anyway?”: A virtuous consideration of enhancement." *Christian Bioethics* 5, no. 2 (1999): 104-120.

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Roeser, Sabine, and Steffen Steinert. "Passion for the Art of Morally Responsible Technology Development." *Royal Institute of Philosophy Supplements* 85 (2019): 87-109.

Sabin, James E. "Enhancing Human Traits: Ethical and Social Implications." (2001): 807-810.

Savulescu, Julian, and Nick Bostrom, eds. *Human enhancement*. OUP Oxford, 2009.

**Meta-data**

1. **Overall learning outcomes/competencies:**

 Moral analysis skills, moral judgment skills, moral argumentation skills

1. **Theoretical frameworks used to analyse this case:** Deontology, Consequentialism, risk ethics, value ethics, responsible research and innovation.
2. **Ethical concepts:** social ethics, enhancement, values, justice
3. **Keywords**: Biotechnologies, Gene editing, enhancement, moral luck, distributive justice, carbon accounting
4. **Level of education**: master, PhD
5. **Technology domain**:

* Bio- and medical technologies keywords: Gene editing

1. **Engineering studies**:

All engineering students

1. **Type of education delivery**: synchronous, in real life /online.
2. **Resources required**: printed/ online handouts

Allhoff, Fritz, Patrick Lin, James Moor, and John Weckert. "Ethics of human enhancement: 25 questions & answers." *Studies in Ethics, Law, and Technology* 4, no. 1 (2010).

Bostrom, Nick. "Human genetic enhancements: a transhumanist perspective." *The Journal of value inquiry* 37, no. 4 (2003): 493-506.

Juengst, Eric T. "Can enhancement be distinguished from prevention in genetic medicine?." *The Journal of Medicine and Philosophy* 22, no. 2 (1997): 125-142.

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1. **Length and ECTS**: .1 ECTS

# Annex 1: Debates 1 & 2

**Debate 1: Distributive Justice and Moral Luck**

* Team A: Genetic engineering is only defensible when it is distributed justly
* Team B: Genetic engineering should be allocated wherever it is available

**Debate 2: Scientific Progress and Carbon impact**

* Team C: Genetic engineering should progress without regard to environmental cost
* Team C: Genetic engineering must be tempered until climate stabilizes

**Debate 1: Distributive Justice and Moral Luck**

Team A: Any technology must be set in the context of distributive justice. In this case, for instance, many ethicists would ask “can society or physicians condone the expenditure of limited resources for the enhancement of the few when so many in the world are impoverished, hungry, sick?”[[16]](#footnote-17) Justice in allocation of resources, and also prioritization of biotechnologies, are important considerations. Lisa Sowle Cahill points out that “practices that favor the privileged and enable their free choices and access to resources carry a negative impact for global health patterns and the resources and choices of the poor.”[[17]](#footnote-18) It would seem, on the one hand that genetic engineering should be limited until the world’s majority have access to a basic standard of care. An ethical system rooted in an awareness of others ought to determine the rank of technological developments in enhancement.

Team B: On the other hand, it has been argued that if a technology is available, people should not suffer without it simply because it is not accessible to all. The idea of moral luck and moral responsibility state that we are not responsible for things out of our control.[[18]](#footnote-19) Therefore, if we were born in the Netherlands or Spain, and have great access to health care technologies, we should not be restricted in their use. It may be ethically problematic if technology was intentionally withheld from those in the developing world. It would actually be unethical to restrict or limit technological developments like genetic engineering, particularly since this form of genetic engineering could benefit many.

**Debate 2: Scientific Progress and Carbon Impact**

Team C: All biotechnologies have a carbon footprint.[[19]](#footnote-20) Carbon dioxide emissions contribute to climate change, climate-change related health hazards, and international suffering.[[20]](#footnote-21) In recognition of this, some healthcare industries, all forms of biotech need to be evaluated for carbon use and healthcare industries should be required to reduce their carbon emissions like the legally binding carbon reduction measures the UK has adopted.[[21]](#footnote-22) While health care is a human right, and genetic engineering may meet a medical need, genetic engineering for social ethics is not a medical requirement. It is a form of enhancement.[[22]](#footnote-23) Even in cases where enhancement is offered as a means to environmental conservation,[[23]](#footnote-24) it should not be assumed that more medical consumption is a solution to climate change.

Team D: On the other hand, genetic engineering undoubtedly has a carbon impact, but science and scientists have a higher obligation to the pursuit of knowledge for the betterment of society. When GE is used for social purposes, it ought to be explored in full without reference to environmental impact. In no other area of science—from aerospace to botany—would we restrain progress simply because there are environmental problems. When we envision the future of society, genetic engineering is a huge benefit.

# Annex 2: Format of the position papers

**Writing Position Papers[[24]](#footnote-25)**

A position paper describes a position on an issue and the rationale for that position. Many institutions use them for social issues like racism (e.g., BLM), medical developments (e.g., euthanasia), or political considerations (e.g., referendums).

**Write a position paper to:**

* Organize and outline your viewpoint on an issue
* Formally inform others of your position  
  as a foundation to build resolution to difficult problems
* Present a unique solution or a unique approach to solving a problem
* Guide you in being consistent in maintaining your position in negotiation

**Guidelines:**

* Include topic, date, purpose, etc., and should readily identify you as the author
* If the paper represents a group, organization, committee, do not write in the first person (not I, my, mine, etc. but rather we, our, etc.)
* Limit yourself to two pages following the format established by previous successful position papers

**Research:**

* Identify the issues and prejudices keeping in mind your audience  
  List these as appropriate and anticipate counterclaims
* Assume familiarity with basic concepts, but define unfamiliar terms/concepts or state meanings that define your point of departure
* Refer to those who agree with your position to assist you in developing your argument

**Format of the position paper**

**Introduction:**

Consider your audience.   
start with a topic sentence or two that attracts attention and summarizes the issue  
Inform the reader of your point of view

**Development:**

Focus on three main points to develop.   
Each topic is developed with

* a general statement of the position
* an elaboration that references documents and source data
* past experiences and authoritative testimony
* conclusion restating the position

**Establish flow from paragraph to paragraph**

* Quote sources to establish authority
* Stay focused on your point of view throughout the essay
* Focus on logical arguments

**Conclusion**

* Summarize, then conclude, your argument
* Refer to the first paragraph/opening statementsas well as the main points
  + does the conclusion restate the main ideas?
  + reflect the succession and importance of the arguments?
  + logically conclude their development?

1. Michael Hauskeller, “A Cure for Humanity: the Transhumanisation of Culture,” presented to 2nd International Conference on Medical Imaging and Philosophy: Medical Images and Medical Narratives in Late Modern Popular Culture, (Ulm, Germany, 12 September 2014) page 8 of pdf, at <https://www.academia.edu/9517910/A_Cure_for_Humanity_The_Transhumanisation_of_Culture> [↑](#footnote-ref-2)
2. Ibid. [↑](#footnote-ref-3)
3. Andrea Vicini, “Is Transhumanism a Helpful Answer to Contemporary Bioethical Challenges?,”Presented to *Ethics Grand Rounds* at the University of Texas Southwestern Medical Center, Dallas, TX. (11 March 2014), 21. [↑](#footnote-ref-4)
4. Gerald P. McKenny*, To Relieve the Human Condition: Bioethics, Technology, and the Body* (Albany: State University of New York Press, 1997), 73. [↑](#footnote-ref-5)
5. Erik Parens, “Is Better Always Good? The Enhancement Project,” in *Enhancing Human Traits: Ethical and Social Implications*, ed. Erik Parens (Washington, DC: Georgetown University Press, 1998), 1-28. [↑](#footnote-ref-6)
6. Gerald P. McKenny, “Enhancements and the Quest for Perfection,” *Christian Bioethics* 5, no. 2 (1999): 99-103, at 102. [↑](#footnote-ref-7)
7. James Keenan, “’Whose Perfection is it Anyway?’: A Virtuous Consideration of Enhancement,” *Christian Bioethics* 5, no. 2 (1999):104-120. [↑](#footnote-ref-8)
8. Hauskeller, “A Cure for Humanity,” page 2 of pdf. [↑](#footnote-ref-9)
9. Ibid, page 15 of pdf. [↑](#footnote-ref-10)
10. #### Matthew Liao, Anders Sandberg, and Rebecca Roache, “Human Engineering and Climate Change,” Ethics, Policy and the Environment 15, no. 2 (2012): 206-221.

    [↑](#footnote-ref-11)
11. Christel Cederberg, U. Martin Persson, Kristian Neovius, Sverker Molander, and Roland Clift, “Including Carbon Emissions from Deforestation in the Carbon Footprint of Brazilian Beef,” no. 45 (2011): 1773-1779. [↑](#footnote-ref-12)
12. Boyd A. Swinburn, et al., “The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission Report,” *The Lancet* 393, no. 10173 (2019): 791-846. [↑](#footnote-ref-13)
13. Saleem H. Ali, *Treasures of the Earth: Need, Greed, and a Sustainable Future* (New Haven: Yale University Press, 2009). [↑](#footnote-ref-14)
14. C. Ben Mitchell, “Tiny, Happy People,” *First Things,* April 10, 2012. Accessed August 26, 2020 at <https://www.firstthings.com/web-exclusives/2012/04/tiny-happy-people>. [↑](#footnote-ref-15)
15. Cristina Richie, “Medical Technologies, Environmental Conservation, and Health Care,” *Medicina e Morale* 65, no. 6 (2016): 759–72. [↑](#footnote-ref-16)
16. C. Ben Mitchell, Edmund D. Pellegrino, Jean Bethke Elstain, John G. Kilner, and Scott B. Rae, *Biotechnology and the Human Good* (Washington, DC: Georgetown University Press, 2007), 125. [↑](#footnote-ref-17)
17. Lisa Sowle Cahill, *Theological Bioethics: Participation, Justice and Change* (Georgetown University Press, 2005), 3. [↑](#footnote-ref-18)
18. Williams Bernard, *Moral Luck: Philosophical Papers 1973-1980* (Cambridge University Press, 1981). [↑](#footnote-ref-19)
19. P. Pichler, et al., “International Comparison of Health Care Carbon Footprints,” *Environmental Research Letters* 14, no. 6 (2019): 064004. [↑](#footnote-ref-20)
20. A. Costello, et al., “Managing the Health Effects of Climate Change,” *Lancet* 373,no. 9676 (2009): 1693-1733. [↑](#footnote-ref-21)
21. National Health Services Sustainable Development Unit, *Saving Carbon, Improving Health: NHS Carbon Reduction Strategy for England* (London: NHS Sustainable Development Unit, 2009). [↑](#footnote-ref-22)
22. Pichler, et al., “International Comparison.” [↑](#footnote-ref-23)
23. Liao, Sandberg, and RRoache, “Human Engineering.” [↑](#footnote-ref-24)
24. Adapted from Study Guides and Strategies, “Writing Position Papers,” at <http://www.studygs.net/wrtstr9.htm> [↑](#footnote-ref-25)