Bioprinting-Related Bioethics Discussion Board Prompts

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Introduction to the Learning Activity

This educational resource provides example discussion board prompts designed to facilitate interactive, peer-to-peer discussions on ethical, legal, and social implications (ELSI) of bioprinting technologies. By exploring the ELSI dimensions of bioprinting technologies through interactive discussions, students can deepen their understanding of the challenges and opportunities with these emerging biomedical innovations. Peer-to-peer discussion is an important aspect of bioethics education as it helps learners reflect and challenge their own ethical beliefs, consider alternative perspectives and approaches, and develop critical thinking skills in a collaborative, respectful setting. The example discussion board prompts are intended for an online experience but can be adapted to in-person classroom experiences as well.

**Discussion Board Prompt #1**

* Topic: Bioethics Issues Anticipated with Bioprinting
* Prompt instructions:

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| **Step one:**Prepare an original contribution to the discussion board answering the following questions: 1. What do you think is the most pressing bioethical issue or challenge raised by bioprinting technologies or their various applications in society?
2. Why do you think that particular issue or challenge is so vexing?

**Step Two:**After you submit your original contribution, review those posted by your classmates and reply to at least two of those posts. 1. How (if at all) are the issue(s) identified by your classmate more complicated than the issue you identified in your own post?
2. Who do you think might be in a position to address or resolve that issue?

**Step Three:**After a classmate has replied to your original contribution and after you’ve had a chance to weigh in on some of your classmate’s contributions, answer the following questions on your thread:1. Do you still think that the issue you originally identified is the most pressing issue or challenge raised by bioprinting?
2. If not, how or why has your view changed?
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**Discussion Board Prompt #2**

* Topic: Clinical Trials for Bioprinting
* Prompt instructions:

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| **Step One:**Consider this hypothetical scenario for your original discussion board contribution: You have been tasked with helping a team design a clinical trial for a groundbreaking bioprinted material, tissue, or organ. 1. Identify and describe a specific use case, noting one specific bioprinted material, tissue, or organ and the condition or disease it is meant to address (e.g., 3D-printed skin grafts to treat severe burns).
2. Discuss at least three key factors that the researchers should address during the informed consent process to ensure the human participants who enroll in the clinical trial are adequately protected during and after the trial.
3. Make a recommendation for how researchers might address each of the three factors you identified, highlighting any unique aspects that the bioprinting technology raises for the clinical trial.

**Step Two:**After you submit your original contribution, review those posted by your classmates and reply to at least two of them. In your replies, please use the “3C+Q” approach, offering one Compliment, Comment, and Connection before asking a relevant Question.*Tip for your review/reply posts:* You might consider how the use case and factors described by your classmate compares or contrasts with the use case that you discussed in your original post. You might also consider different clinical trial phases (recognizing that there are four clinical trial phases, each with a different purpose for ensuring scientific innovations are safe and effective).  |

**Discussion Board Prompt #3**

* Topic: Sale of Bioprinted Human Organs and Tissues
* Prompt instructions:

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| There are a wide variety of ethical and legal considerations that prohibit the sale of human organs and restrict or regulate the commercialization or commodification of other human tissues, fluids, and body parts (such as blood, plasma, bone marrow, hair, stool, sperm, eggs, breast milk, etc.). The advancement of bioprinting technologies invites the question as to whether there should be a ban on the sale of bioprinted human organs and tissues. **Step One:**Take a position in this debate (pro, con, or undecided) and share your thoughts about the advantages and disadvantages that a ban on bioprinted organs and/or tissues might have for society. **Step Two:**After you submit your original contribution, review those posted by your classmates and reply to at least two of them. Go beyond simply indicating “I agree” or “I disagree” to consider how the classmates’ contributions have bolstered or challenged the original position you expressed. |

**Discussion Board Prompt #4**

* Topic: FDA Oversight of Bioprinting
* Prompt instructions:

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| The Food and Drug Administration (FDA) has two offices—the Center for Devices and Radiological Health (CDRH) and the Center for Biologics Evaluation and Research (CBER) (with its Office of Therapeutic Products) that could be involved with regulatory oversight of bioprinting technologies. While research for research and development of bioprinting technologies has been advancing rapidly and applications to the FDA for approval or clearance of bioprinting innovations has been expected to rise, as of January 2025 the FDA had no bioprinting-specific regulations and has been forced to rely upon traditional FDA regulatory pathways and classifications. Meanwhile, in February 2025 dramatic changes to the FDA had been proposed, including extensive cuts to the FDA workforce and budget. Governmental agencies like the FDA often have difficulties recruiting and retaining elite, established scientists and engineers with expertise necessary for performing effective regulatory oversight tasks, as private sector jobs often bring higher salaries and more prestige. Sudden or unexpected leadership changes, staffing shortages, uncertain or shrinking operating budgets, and communication restrictions could disrupt regulatory oversight of emerging biomedical innovations (including 3D bioprinting). Given this context, share your perspectives on at least one of the following questions:1. How might current staffing levels and ongoing recruitment efforts at the FDA impact the quality and timeliness of reviews for bioprinting technologies, devices, and products?
2. What potential benefits and drawbacks do you see in the FDA’s organizational structure for handling complex and rapidly evolving technologies like bioprinting technologies, devices, and products? How might you restructure the FDA to better handle bioprinting?
3. Considering the challenges in recruiting and retaining staff with specialized expertise, what strategies would you propose to ensure the FDA maintains high-quality reviews of bioprinting technologies?
4. How do you think the balance between expediting reviews and ensuring thorough evaluation of safety and effectiveness should be managed for bioprinting technologies in 2025 and in the future? Should certain bioprinting applications be prioritized for review over others? If so, what should be the criteria for prioritization?

Provide your own thoughts and engage respectfully with your classmates’ responses, considering both the implications of FDA staff shortages, FDA application demands for review, and potential impacts on innovation in the bioprinting field and public health and safety. Be sure to explain your positions and cite relevant resources (scholarly literature, popular media, news reports, etc.) that support your position.  |

**Discussion Board Prompt #5**

* Topic: Impact of Bioprinting on the Patient-Clinician Relationship
* Prompt instructions:

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| Bioprinting technologies hold tremendous potential for addressing organ transplantation problems (such as reducing the extent of unmet transplant organ needs in the population and increasing the likelihood of organ transplant success for individual patients). When bioprinted organs become available in the future for transplantation, they won’t immediately or perhaps even permanently displace organ donations from living and non-living donors. The current organ donation system involves the Organ Procurement and Transplantation Network or OPTN, and it is managed by the United Network for Organ Sharing (UNOS). Despite all of their promise, the integration of bioprinted organs into the US healthcare system might be messy. After all, bioprinted organs involve more than individuals (a recipient and donor): they involve biotech companies that create them. **Step One:**Think about how the eventual availability of FDA-approved bioprinted organs might be integrated into the healthcare system for organ transplantation. Consider the stakeholders that will likely be involved (or who should be involved in your view), and outline a process for managing the “transplant journey” that involves bioprinted organs rather than those from an organ donor. After you outline the process, answer one of the following two questions:1. How might patients who need a transplant decide with their clinicians whether to seek an engineered bioprinted organ, a xenotransplantation organ, or a natural organ from a human donor? What factors will be relevant to the decision? Who could/should help ensure these decisions are informed, and how might that be advanced?
2. How might the availability of bioprinted organs affect patients’ and clinicians’ expectations for treatment options and outcomes? What should be the respective roles and responsibilities of various interested parties for managing those expectations? Which public or private entities might offer policy and practice guidance?

**Step Two:**Review your classmates’ posts and respond to at least two of them. In your replies, be sure to go beyond simple agreement or disagreement with their suggested transplant journeys and/or answers to the selected question.  |