

Redesigning an Online Introductory Biology Course in the Age of Artificial Intelligence: Adapting Exams and Free-Response Questions to Support or Limit AI Use

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When I first began teaching *Genetics and Society* in an online asynchronous format, I employed a variety of readings, assignments, videos, and discussions to engage students and demonstrate the relevance of genetics, particularly for non-science majors. However, with the growing accessibility of artificial intelligence (AI), it became apparent that some students were relying on AI to complete assignments and exams, rather than engaging with the course material. As I adapted my teaching to this new reality, I found it increasingly difficult to determine whether students were truly achieving the learning outcomes or if AI was doing the work for them. To be honest, I found this incredibly frustrating and disheartening. But now, I am trying to use this as an opportunity to rethink and refresh my class.

As AI and other technologies continue to evolve and make information more readily available, I am rethinking the value of simply “knowing” content and shifting my focus toward helping students “apply” what they learn. This shift, however, has proven challenging in an introductory-level course. I wish I could say I have found the perfect model for an online asynchronous course that promotes appropriate AI use while ensuring student understanding of course information, but the truth is, it is still a work in progress. In this article, I will share the challenges I have faced and the steps I have taken as I navigate teaching in the age of AI.

Let me begin with AI policies. I want my students to be prepared for the workforce, and that now includes becoming familiar with AI and learning how to use it ethically. The first step I took in adapting my course was to emphasize overall academic integrity and clarify my specific AI policies. Since AI policies vary across faculty and courses, I empathize with students who must keep track of different expectations. To underscore the importance of academic integrity, students in my class read both the university’s policy and my course’s policy on academic dishonesty, and they are assessed on their understanding. To reinforce my AI policy, I ask students to rewrite it in their own words. For each course assignment, I clearly indicate which questions allow AI use and which do not. By having these policies repeated throughout the course, I feel more confident enforcing the policies because I have given the students plenty of notice of my expectations. I have now incorporated these assignments into all my courses as I find them helpful in promoting academic integrity.

To hold students accountable for complying with these policies, I began embedding “ghost questions” into my weekly or biweekly assessments. These questions are written in white font, rendering them invisible unless a student highlights the text within the course management system. If a student copies and pastes the entire question into an AI tool without first reading it, the AI will generate responses to these hidden prompts. Then when students submit those AI-generated answers, it becomes clear they did not carefully read the original question. I have found pairing “ghost questions” with prompts that require students to extract specific information from assigned videos to be a helpful, although not foolproof, strategy for identifying students who may be using AI inappropriately.

When I suspect a student is misusing AI, I reach out to the student to discuss their approach to the assignment. These conversations help me assess their understanding of the material and determine whether they are adhering to course policies, allowing for more targeted support and guidance. These discussions open the door for a broader dialogue about reliable sources, proper citation, academic expectations, and the value of academic integrity. These exchanges also help me build personal connections with students and reassure non-biology majors that I do not expect graduate-level mastery. In several cases, students have shared why they felt compelled to use AI, citing time constraints, lack of interest, or confusion about assignment expectations, which has allowed me to offer additional clarification and resources.

Assessing whether students have met learning outcomes in an online asynchronous course presents ongoing challenges, especially with the increasing availability of AI tools. In this freshman-level course, I cover foundational genetics concepts through written assignments, quizzes, and discussion boards. These formats are vulnerable to academic dishonesty and lack face-to-face interactions that help verify student understanding. To address this, I have begun incorporating process-based and reflective questions that are more difficult for AI to answer effectively.

I was inspired by a colleague’s assignment in which students create a video explaining how they solved a math problem, and I have begun adapting this approach for my own course. Now, students produce videos where they walk through the process of solving a genetics problem, using handwritten work and verbal explanations. This shifts the emphasis from simply arriving at the correct answer to clearly demonstrating their reasoning and problem-solving approach. I have been impressed with the quality of the submissions. Some students have come to office hours specifically for help with this assignment, while others have gone beyond the requirements by researching the genetic conditions mentioned in the problems and including brief summaries in their videos. Several students have shared that it took them multiple attempts to perfect their videos, and that they felt confident in their final explanations. Overall, I have been pleased with the level of engagement this assignment has generated, and I plan to continue using it in future semesters.

I also have added weekly reflection questions that prompt students to consider what topics were covered, which ones were challenging, how their perspectives have changed, and how they might apply the information in the future. Many students have shared that they enjoy these reflections

because they encourage them to review and appreciate their learning progress. Others choose not to complete them, as they require more in-depth writing. Still, I find these reflections valuable as they help students connect course content to their own lives, which is especially important in a general education course where students may not initially see the relevance of the material.

The last step I have taken to address AI use in class is to instruct students to use AI to answer genetic-based questions. I am not an expert in AI, but I want to introduce my students to its use, as it will likely play a role in their personal and professional lives. This is the course modification that I am least comfortable with. I have started incorporating questions where students are allowed to use AI, but I am still experimenting with how to make these assignments into a more meaningful learning experience. My goal is to help students understand when AI can be a helpful and appropriate tool, while also highlighting situations where it may provide incorrect or misleading answers, especially with more nuanced topics. I want these assignments to clearly demonstrate both the potential and the limitations of AI, and I have not achieved this yet.

I keep coming back to a fundamental question: in an online asynchronous class, how can I be sure that students have truly achieved the learning outcomes? I still do not have a clear answer. Last semester, I used timed exams. This semester, I have implemented an exam proctoring system, and I am considering offering face-to-face exams to help address this challenge. These changes are, in part, a response to the increasing use of AI tools by students. While I want to encourage ethical and thoughtful AI use, I also need to ensure that students are developing their own understanding of the course material. To support this, I continue to include questions that require students to explain how they solved genetics problems and to reflect on what they have learned, tasks that are harder to out-source to AI. I do not have all the answers yet, but I am encouraged by the progress I have made toward creating an online course that embraces new technologies while maintaining a clear focus on student learning and academic integrity.