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CURRICULUM DEVELOPMENT AND ASSESSMENT

Teaching in an Era of Generative Artificial Intelligence

Navigating the frontier of AI-assisted student assignments: challenges, skills, and solutions

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Abstract

The rise of artificial intelligence (AI) is transforming educational practices, particularly in assessment. While AI may support the students in idea generation and summarization of source materials, it also introduces challenges related to content validity, academic integrity, and the development of critical thinking skills. Educators need strategies to navigate these complexities and maintain rigorous, ethical assessments that promote higher order cognitive skills. This article provides practical guidance for educators on designing take-home assessments (e.g. research-based assignments) in the AI era. This guidance was developed through a collaborative, consensus-driven process involving a consortium of three educators with diverse academic backgrounds, career stages, and perspectives on AI in education. Members, holding experience in higher education across the United Kingdom, United States of America, Australia, and Middle East and North Africa regions, brought varied insights into AI's role in education. The team engaged in an iterative process of refining recommendations through biweekly virtual meetings and offline discussions. Four key recommendations are presented *1*) codeveloping AI literacy among students and educators, *2*) designing assessments that prioritize process over output, *3*) validating learning through AI-free assessments, and *4*) preparing students for AI-enhanced workplaces by developing AI communication skills and promoting human-AI collaboration. These strategies emphasize ethical AI use, personalized feedback, and creativity. By adopting these approaches, educators can balance the benefits and risks of AI in assessments, fostering authentic learning while preparing students for the challenges of an AI-driven world.

NEW & NOTEWORTHY This paper presents a framework to effectively design take-home assessments in the generative artificial intelligence (AI) era with four key recommendations to navigate the challenges and opportunities posed by generative AI. From codeveloping AI literacy to fostering human-AI collaboration, the strategies empower educators to promote authentic learning, critical thinking, and ethical AI use. Adaptable to various contexts, these insights help prepare students for an AI-driven future while maintaining academic rigor and integrity.

artificial intelligence; assessment; education; essays; take-home assignments

INTRODUCTION

As artificial intelligence (AI) becomes an integral part of modern education, it is crucial for students to develop the skills to use AI effectively and ethically, particularly in the context of research-based assignments and take-home assessments. These types of assignments have long been valued for their ability to promote critical thinking, deep learning, and the synthesis of knowledge: skills that are foundational for success in both academia and the workplace (1, 2). While some educators may consider eliminating these types of assignments due to concerns over AI misuse, it is important to highlight that they were originally designed to engage students in higher order cognitive processes and prepare them for real-world applications of their learning.

AI tools, particularly large language models (LLMs), can streamline research, summarize content, and offer writing suggestions. However, these tools also pose risks to academic integrity by potentially replacing key cognitive processes such as analysis and synthesis, leading to superficial engagement with the material. By relying on AI, students may bypass critical thinking, problem-solving, and the effort required to engage deeply with academic sources (3).

At the same time, AI can enhance learning by improving written communication and providing real-time feedback on

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clarity, structure, and argument flow. However, for this to be effective as a learning experience, students must engage actively with the feedback rather than passively adopting it. Research projects and take-home assignments are particularly valuable in encouraging active learning (2), where students take the time to engage deeply with the content, integrate new knowledge, and apply it to complex problems.

In the workforce, AI will play an increasingly central role. However, students still need to develop the ability to critically evaluate AI-generated information, use it responsibly, and apply it to their professional practice. The question is, then, how to adapt research-based assignments or take-home assessments to ensure that students are empowered to thrive in an AI-enhanced environment while preserving the authenticity and rigor of their work.

This article offers 12 practical strategies to help educators design assignments that navigate these challenges and opportunities, ensuring assessments are both ethically sound and effective in fostering true academic growth.

METHODOLOGY

This guidance was developed through a collaborative, consensus-driven process involving three educators with diverse academic backgrounds (medicine, physiology, and immunology), career stages (ranging from 16 to 42 yr of experience in higher education), and perspectives on AI in education. The consortium members, selected for their expertise and varied geographical and cultural contexts [UK, US, Australia, and Middle East and North Africa (MENA) regions], spanned midcareer to senior academic positions, ensuring a range of insights on AI's role in education. This diversity provided a rich foundation for developing a comprehensive framework for AI use in assessment.

The methodology was grounded in participatory principles, prioritizing the inclusion of multiple perspectives in the development of recommendations. Over 6 months, the team engaged in an iterative process of refining recommendations through biweekly virtual meetings and offline discussions, emphasizing reflective practice and collective input to address real-world challenges. The resulting recommendations were shaped by expert consensus, making them applicable to a wide range of educational settings.

RESULTS/DISCUSSION

Recommendation 1: Codeveloping AI Literacy

This part suggests hosting a collaborative workshop to address *tips 1* to *4*, with each new intake of students, where students and educators jointly explore AI's role in education. Students can cocreate resources explaining how AI works, its limitations, and its impacts on learning.

Developing AI literacy is essential for both educators and students. It involves not only understanding what AI can do and the skills needed to harness its benefits but also recognizing its limitations, ethical implications, and the foundations of the underlying technology (4). Understanding AI's potential biases is also crucial. AI systems can perpetuate biases present in their training data, leading to biased, inaccurate, or marginalizing information (5). If uncorrected, these errors could propagate through educational materials and student assignments, reinforcing harmful stereotypes (6). This is particularly concerning in fields like healthcare, where it could impact professional practice.

Understanding AI's role in education requires active involvement from students, not just a top-down approach from educators. Engaging students as partners in the learning process fosters a deeper understanding and shared responsibility regarding AI's potential, limitations, and ethical considerations (7).

Tip 1: identify the meaning of "artificial intelligence" and the need for skepticism about its outputs.

Discussion points are as follows:

- How do generative large language models (LLMs) produce responses to human-generated prompts?
- How does AI-generated information reflect underlying biases?
- What are "AI hallucinations" and how commonly might they happen?
- Who is responsible for the information created by AI?

Tip 2: explore the fitness for purpose of different GPT platforms and embedded AI tools.

Discussion points are as follows:

- How do different GPT platforms align with specific use cases or tasks in your organization, and which unique features make one platform better suited than another?
- What are the key ethical, security, and bias-related considerations you would prioritize when choosing an AI tool, and how do different platforms address these concerns?

Tip 3: identify the potential impacts of AI on learning.

Discussion points are as follows:

- How does AI use in assessment benefit and detract from learning?
- Does using AI bypass important steps in cognitive processes, such as deductive reasoning and iterative thinking?
- To what extent, if any, should AI be integrated into evaluating student work?
- What are the ethical and pedagogical boundaries for educators in incorporating AI into assessment practices?

Tip 4: codevelop a student learning agreement for AI use aligned with an honor code system.

Creating a student learning agreement aligned with an honor code fosters responsibility for one's work. By involving students in policy development, institutions can promote academic honesty and empower students to be accountable. Research suggests that involving students in creating honor codes strengthens their commitment and understanding of academic integrity (8, 9).

Discussion points are as follows:

- What is permissible for students—clarifying tasks, generating ideas, and receiving feedback?
- When does AI feedback cross the boundary of academic integrity?

Recommendation 2: Designing Assessments That Prioritize Process over Output

Shifting from output-based to process-based assessment is critical for fostering deeper learning, especially in an AI-enhanced environment. This approach emphasizes the development of critical process skills over merely evaluating the final product. This part presents three complementary tips that collectively support a shift from an output-based to a process-oriented approach. *Tip 1* focuses on the overarching design of staged assignments that emphasize skill development throughout the process. *Tip 2* highlights the role of instructor oversight in guiding student engagement and ensuring critical feedback integration. Finally, *tip 3* centers on student reflections, encouraging learners to evaluate their use of AI feedback and develop self-regulatory skills. Together, these tips ensure that assessments prioritize meaningful growth and learning beyond the final output.

Tip 1: dynamic assessment through staged assignments.

Dynamic assessment (DA) is a key concept in this shift, as it focuses on students' growth through interactive, supportive learning experiences (10, 11). DA assesses not only students' current knowledge but also their potential for development with appropriate support, reducing superficial learning and fostering deeper engagement (12).

Suggested design. One practical design involves staged assignments: students submit outlines, drafts, and revisions, with feedback provided at each stage. These submissions should be accompanied by reflections on the changes made and insights gained. This structure allows educators to track progress over time, providing ongoing feedback that supports growth. Peer assessments can also be incorporated to share the workload and foster collaborative learning (13).

Tip 2: AI-Driven Feedback with Supervisor Oversight for Deeper Engagement.

AI-powered feedback tools offer immediate, personalized responses to student work, yet ensuring that this feedback is used meaningfully requires supervisor oversight. This ensures that AI feedback is not taken at face value but is critically examined and applied with instructor guidance, maintaining academic rigor.

Suggested design. This approach emphasizes quality over quantity by focusing on fewer but more involved assessments. At key checkpoints, students should meet with their supervisor to discuss the AI-generated feedback on drafts, review their revisions, and address any areas of confusion. These meetings ensure that students are not merely applying AI suggestions but are critically engaging with them and refining their work accordingly.

Tip 3: reflection and metacognition to foster authenticity and integrity.

Embedding reflection and metacognition within AI-supported assessments is crucial for maintaining academic authenticity, rigor, and integrity. Reflection and self-assessment foster metacognitive skills, enabling students to monitor, evaluate, and adapt their learning processes: a foundation for self-directed learning and problem-solving (14–16). In an AI-enhanced environment, these skills allow students to critically assess AI's role in their learning and decision-making, helping them to differentiate between their own intellectual contributions and AI-generated insights. This mitigates potential challenges in authenticity by encouraging students to remain actively involved in their academic journey, reducing passive reliance on AI, and upholding the integrity of their work.

For effective implementation, students should submit a reflective self-assessment following each AI-assisted assignment. This could include a summary of how they used AI in their work, an analysis of AI feedback, and an exploration of how this feedback influenced their final submission. Additionally, students should reflect on their metacognitive strategies, including how they monitored and regulated their learning, and assess how AI supported or limited their understanding of the material (17). By using structured prompts to guide this process, educators can help students focus on making their reflections actionable, further strengthening students' skills in lifelong learning and self-regulation.

While there is potential for students to use AI inappropriately when completing reflective assessments, the reflective self-assessment is designed not to be evaluated in isolation but as part of an ongoing, supervised learning process. This ensures that students' reflections are linked to their overall assignments and are supported by personalized feedback from instructors. The purpose of the reflection is not only to complete the task but also to develop metacognitive awareness, track learning progress, and evaluate interactions with AI.

Furthermore, follow-up discussions with instructors are essential to monitor the authenticity of the reflections. These staged interactions provide opportunities for students to explain their process, ensuring academic integrity and offering guidance where necessary. The ongoing supervision allows instructors to detect any potential over-reliance on AI and engage students in meaningful safe conversations about academic integrity and its implications.

By integrating reflection within the broader assignment process this process is "double-guarded": while the supervisor monitors for any signs of improper use of AI, students are also motivated to engage with the reflection genuinely to receive valuable, personalized feedback.

Recommendation 3: Validation and Verification

Tip 1: oral discussions as a tool for validation and triangulation.

To ensure the authenticity of students' learning in research-based and take-home assignments in AI-assisted environments, oral assessments, particularly focused discussions or conversations, play a critical role. These assessments offer a robust method for validating the acquisition of knowledge, as they allow instructors to triangulate written work with verbal articulation, ensuring the student truly understands and can apply the concepts they have learned. Oral discussions serve as a form of "real-time validation," providing direct evidence of a student's comprehension, critical thinking, and problem-solving abilities. This format helps minimize reliance on AI-

generated content, as students must articulate their ideas and reasoning without the assistance of AI tools.

Logistical considerations. These discussions could be conducted virtually or in person and may require additional planning for larger cohorts. For scalability, small-group formats or panel-style assessments (where multiple students discuss their projects together) could be effective in larger classes, while ensuring the conversation remains focused on individual contributions. Introverted or understated students may need encouragement and opportunities to speak in the group.

Tip 2: utilize creative, human-centered modalities to validate student learning.

Nonconventional assessment methods like concept mapping, photography and other creative formats provide a powerful way to evaluate human attributes and skills that AI cannot effectively replicate or shortcut. These approaches offer more authentic assessments by emphasizing student creativity and critical thinking, which are essential for real-world competencies (18, 19) and reducing the likelihood of AI-generated content overtaking the process.

Suggested approaches. CONCEPT MAPPING AND INFOGRAPHICS. Students create visual representations of their understanding, synthesizing complex concepts and demonstrating critical connections. These projects require a deep grasp of content and are still challenging for AI tools to produce meaningfully. Personalized content is essential, ensuring the assessment reflects each student's unique thought process.

DIGITAL PORTFOLIOS. Students curate a collection of work throughout the course, including drafts, reflections, and final projects. Portfolios showcase their learning journey, critical thinking, and evolving understanding, providing a more comprehensive view of their knowledge and skills. This format fosters self-assessment and ongoing reflection, vital for long-term learning.

Recommendation 4: Preparing Agile Graduates Capable of Adapting to the Emerging AI-Enhanced Workplace

Tip 1: cultivate AI communication skills for enhanced employability.

In an AI-enhanced workplace, the employability of graduates will hinge on their ability to communicate effectively with AI, a skill that complements and extends beyond traditional coding and communication abilities. Unlike traditional communication skills, which focus on human interactions, this skill involves instructing and engaging with AI tools to obtain desired outcomes efficiently. Teaching students to craft precise and contextually appropriate prompts is akin to learning a new language tailored for AI systems. This approach contrasts with general communication skills and coding, as it requires understanding how to frame questions and commands that AI can process and respond to accurately. By integrating this practice into the curriculum, educators can ensure students become adept at utilizing AI as a collaborative tool, thereby enhancing their adaptability and problem-solving abilities in a technology-driven environment (20).

Suggested activities. It is suggested that engineering workshops where students practice designing and refining AI prompts should be conducted. This hands-on approach helps them learn to interact with AI efficiently, enhancing their ability to use AI tools as an extension of their capabilities (21).

Tip 2: highlight human-AI synergy in transdisciplinary learning.

In designing take-home assessments, educators can foster human-AI collaboration by creating cross-disciplinary projects that emphasize the unique strengths humans bring to AI-supported tasks. These projects allow students to develop essential skills, such as creativity, empathy, and critical thinking, which complement AI's computational abilities. By discussing how these distinctly human qualities enhance AI capabilities, educators can help students see themselves as valuable contributors to an AI-enhanced workplace (20).

Scenario-based exercises. To bring this synergy to life, engage students in scenario-based exercises where students, either individually or as part of a group, collaborate with AI to tackle complex, real-world problems. For instance, students could work to analyze a large data set, such as patient records or experimental physiology data, with AI tools. Students should bring together different disciplinary perspectives such as data analysis, biological mechanisms, and ethical considerations in patient care. AI may identify trends or generate insights, yet students would be required to use their physiological understanding to critically assess these results, considering factors like human variation and the biological mechanisms at play to interpret these results and ensure clinical relevance. Through these exercises, students refine prompt-engineering skills in practical contexts while experiencing how human insight and creativity add value in AI-supported scenarios. In group projects, AI can facilitate collaboration by organizing research findings or summarizing discussion points, but students must apply ethical judgment, negotiation, and creativity to refine their final product. This not only reinforces the importance of process-based learning but also demonstrates how thoughtful AI integration can amplify their problem-solving abilities without overshadowing their unique contributions.

By incorporating such practices, educators ensure that students are prepared for an AI-augmented workplace, where their adaptability, ethical judgment, and interpersonal skills are invaluable. This approach supports academic integrity, cultivates students' employability, and highlights the complementary role of human-AI collaboration, ultimately contributing to a well-rounded, ethically aware, and skillful workforce.

Tip 3: cultivate adaptability through collaborative exploration of AI tools.

In an AI-driven world, graduates need to be adaptable and proficient with evolving AI tools. To build this adaptability, educators can design scenario-based, collaborative exercises where students explore and apply various AI tools to address realistic challenges, gaining hands-on experience with both the technology and its ethical implications.

Suggested activities. The following are suggested activities:

- AI exploration challenges: divide students into small teams, assigning each group a different AI tool (e.g.,

machine learning, natural language processing). Teams research their tool's capabilities and limitations, then apply it to a real-world scenario, such as predicting healthcare outcomes (e.g., predicting cardiovascular risk by analyzing physiological parameters such as blood pressure, cholesterol levels, and age). Students present their findings, focusing on the tool's relevance, practical applications, and ethical considerations.

- Scenario-based problem solving: provide each team with a unique problem requiring AI application (e.g., analyzing biometric data from wearable devices, such as step count, heart rate variability, and skin temperature, to predict an individual's physical fitness level and exercise recovery needs.). Teams work together to use their assigned AI tool to develop solutions, critically evaluating both the benefits and limitations of the technology.
- Peer knowledge exchange: encourage cross-team collaboration by using a digital platform where students can share insights, challenges, and discoveries. This promotes a culture of peer learning and allows students to experience the collaborative, interdisciplinary nature of AI-enhanced workplaces.

This approach not only equips students with practical, hands-on experience but also fosters adaptability, critical thinking, and teamwork: core skills for navigating and contributing to an AI-enhanced workforce.

CONCLUSIONS

The 12 tips presented in this article aim to guide educators in designing take-home assessments that embrace the opportunities and challenges of the AI era. These tips are not prescriptive but serve as a flexible framework that educators can adapt to their unique teaching contexts. By incorporating as many tips as are relevant and modifying the suggested approaches to suit specific learning environments, educators can create assessment strategies that promote academic integrity, skill development, and preparedness for an AI-enhanced workforce.

To illustrate the application of these tips, we implemented the recommendations in the *Pathogenesis of Human Disease* course (Semester 2, 2024). Specifically, the capstone research assignment required students to critically evaluate a research paper relevant to the course learning outcomes. The assignment rubric was modified to reflect AI's role in research synthesis and critical evaluation, ensuring a balance between AI-assisted learning and independent critical thinking. A representative version of the updated rubric is provided in APPENDIX A.

Ultimately, these tips are intended to inform decision-making, offering practical insights to foster ethical AI use, critical thinking, and personalized feedback in student learning. By leveraging these recommendations, educators can ensure their assessment practices remain effective, equitable, and aligned with the evolving demands of education in the AI era.

APPENDIX A

The modified assignment rubric that reflects AI's role in research synthesis and critical evaluation is shown in Table A1.

Table A1. *Updated assignment rubric, modified to reflect AI's role in research synthesis and critical evaluation*

Criteria	Excellent (4)	Good (3)	Fair (2)	Poor (1)
Understanding of the paper	Demonstrates a thorough understanding of the paper's content, context, and implications. Provides insightful analysis and interpretation.	Shows a clear understanding of the paper, including its main points and implications. Offers meaningful analysis.	Displays a basic understanding of the paper's content but lacks depth in analysis and interpretation.	Fails to demonstrate an understanding of the paper's content or relevance.
Clarity of methodology/methods explanation	Presents explanations with exceptional clarity, coherence, and organization. Ideas are logically structured and effectively communicated.	Provides explanations that are clear and well-organized, facilitating understanding.	Presents explanations that are somewhat unclear or disorganized, hindering comprehension.	Explanations are unclear, disorganized, or difficult to follow.
Depth of critique	Offers nuanced and insightful criticisms of the paper, identifying strengths and weaknesses with precision. Supports critiques with evidence and reasoning.	Provides thoughtful criticisms of the paper, highlighting strengths and weaknesses with supporting evidence.	Offers basic critiques of the paper but lacks depth or specificity.	Criticisms are superficial or lacking in supporting evidence and analysis.
Integration of external sources	Integrates relevant external sources effectively to support explanations and criticisms, demonstrating a breadth of knowledge.	Incorporates external sources to support explanations and criticisms, enhancing the depth of analysis.	Attempts to incorporate external sources but does so inconsistently or without clear relevance.	Fails to integrate external sources or relies on sources that are irrelevant or unreliable.
Writing mechanics and presentation	Writing is polished, articulate, and free of errors. Ideas are expressed fluently, and the paper is professionally presented.	Writing is clear and mostly free of errors, though some minor issues may be present.	Writing is generally clear but may contain noticeable errors or awkward phrasing.	Writing is unclear, contains numerous errors, or lacks coherence and professionalism.
Evidence of process and engagement	Provides thorough documentation of the research and writing process, including drafts, notes, and reflections. Actively engages with feedback and revisions.	Documents the research and writing process with drafts and notes. Shows engagement with feedback.	Shows limited documentation of the process and minimal engagement with feedback.	Lacks documentation of the research and writing process, with little to no engagement with feedback.
In-class contributions and presentations	Actively participates in class discussions, presenting insights and critiques effectively. Demonstrates deep engagement with the material.	Participates in class discussions and presentations, contributing relevant insights.	Occasionally participates in discussions and presentations, with basic contributions.	Rarely participates in class discussions or presentations, with minimal contribution.
Ethical use of AI tools	Demonstrates a clear and ethical use of AI tools, with explicit attribution and reflection on how AI tools were used to aid understanding.	Shows appropriate use of AI tools with some attribution and reflection on their use.	Uses AI tools with minimal attribution or reflection on their role in the analysis.	Uses AI tools unethically or without attribution, relying heavily on AI-generated content.

AI, artificial intelligence.

DATA AVAILABILITY

Data will be made available upon reasonable request.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

S.E., D.K., and H.J.W. conceived and designed research; S.E. drafted manuscript; S.E., D.K., and H.J.W. edited and revised manuscript; S.E., D.K., and H.J.W. approved final version of manuscript.

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