The AI Revolution & Higher Education: Why 21st Century Durable Skills Are Needed More Than Ever

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1 author:

Sean Hughes

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Sean Hughes

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Correspondence concerning this paper can be sent to seanhughes.academic@gmail.com

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[1] Given the rapid pace of AI development this "living document" will be continually updated to accommodate significant changes taking place at the intersection between (higher) education and AI.

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1. Introduction

Generative artificial intelligence (AI) has taken the world by storm, transforming how we relate to and interact with digital content. At its core, this class of new technology works by ingesting vast amounts of data (sometimes the entire content of the internet), and then training sophisticated machine learning algorithms such as neural networks and deep learning on that data. These systems then autonomously generate new content, such as images, text, or music, frequently producing creations that are indistinguishable from their human-generated counterparts.[2]

1.1 AI & Society

AI technologies are not only changing how we interact with digital media, but reshaping many areas of society in real time. Law firms are adopting AI for research, document review, and contract drafting, while the entertainment industry are using it to de-age older or bring deceased actors back to life, as well as optimizing their marketing and distribution strategies. Newspapers are increasingly automating mundane journalistic tasks, while the fashion world is embracing AI to enhance product development and consumer experiences.

Elsewhere, governments and corporations are harnessing AI to streamline decision-making when it comes to job hiring, social benefit eligibility, and early release from prison. Generative AI is predicted to unleash productivity gains in certain sectors, while potentially displacing jobs in many others. From industry, to governance, arts, and law, AI tools are becoming ever more entwined with our daily lives.

1.2 AI & Education

AI is also transforming the educational sector in real time. This new class of tools is reshaping how students learn, educators teach, and institutions function, requiring each of these stakeholders to grapple with both the positive and negative implications of AI in multiple domains.

One tool in particular, ChatGPT, has garnered significant attention within the educational sector. And it is no wonder why. This text-based conversational agent possesses an impressive range of capabilities, the limits of which are still being discovered. ChatGPT can instantly generate multiple assignment types, from essays, and reports, to dissertations, on a near endless range of topics. It can write code, solve mathematical problems, ace quizzes, condense and compose scientific research papers, act as a persuasive debate partner, a resourceful study companion or tutor, and even role-play as notable historical, scientific, and cultural figures.

And remarkably it's already out of date. Its successor (GPT4) is more reliable and creative, outperforming its predecessor in nearly every way. GPT4 cannot only take but also excel on

[2] A variety of terms and acronyms have been used to refer to this emerging class of technology, from AI and generative AI (GAI), to AI bots, chat bots, and so on. For the sake of simplicity and clarity, I will refer to this general class of products as “AI tools” in this report.

many different university exams, from law, and computer science, to literature, microbiology, and medicine (see Figure 1).

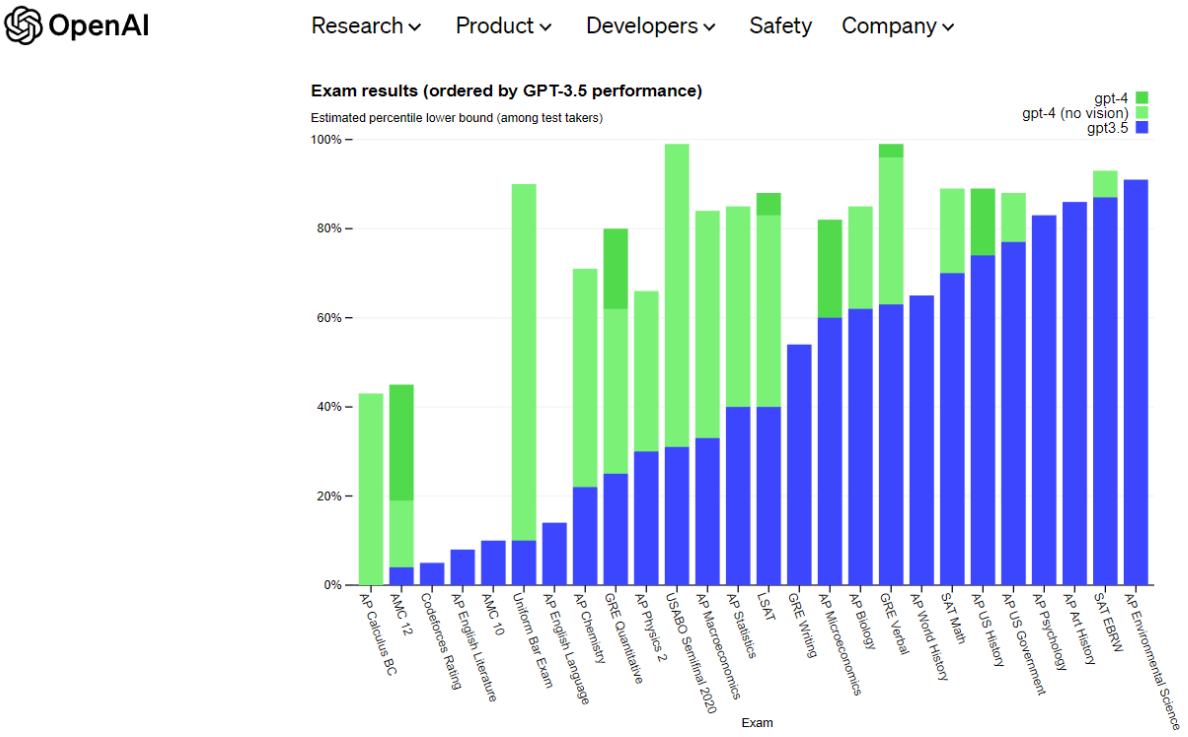

Figure 1. Comparison of exam performance of ChatGPT vs. GPT4 in multiple academic domains.

And We're Only At The Beginning…

GPT4 is just one example of a text-based agent, while text-based agents are just one of many different tools in the wider AI ecosystem (see Table 1 for an overview).

This growing array of tools is transforming teaching and learning. Students can now seamlessly convert a single sentence into an elaborate essay or research paper, or even create photo-realistic images, videos, or music compositions that rival the work of seasoned photographers, illustrators, and musicians. Various tools provide personalized, formative feedback to students when learning new concepts or developing as writers (e.g., see Grammarly, Quill, Turnitin). Others act as private tutors, offering real-time guidance on how to deliver verbal presentations and speeches. Still other tools adeptly dissect coding and mathematical problems, walking students through solution steps while nurturing their critical thinking skills. For educators, these very same technologies offer ways to streamline course and lesson design, as well as develop, evaluate, and refine teaching materials, or deliver customized feedback tailored to a given students' level and goals. [3]

[3] A number of plugins are emerging for GPT4 that allow it to access real-time information on the internet. Others such as Code Interpreter allow it to utilize a Python interpreter to do what previous versions of the tool could not (e.g., analyze and visualize data, extract text from images, and edit videos).

Table 1. Overview of generative AI tools in May 2023 with the potential to radically transform teaching and learning.

AI Type	Function	Examples
Text-Based Conversational Agents	Ask it a question and it responds based on input parameters.	GPT4 Bard Perplexity
Coding Partner	Offer real-time (in-editor) code and function suggestions when programming.	GitHub Copilot VScode Caktus
Image Generators	Capable of generating photo-realistic and art that is indistinguishable from work produced by human photographers and illustrators. Can do so on the basis of natural language prompts.	Midjourney DALL-E Stable Diffusion
Video & Animation Generators	Create realistic human avatars and animation videos from natural language prompts	BHuman Kaiber Synthesia
Music Generators	Generates high-quality music from simple natural language prompts	MusicLM Riffussion
AI Researcher	Generate a list of academic articles and sources with short summaries of each, based on a research question. Upload a pdf of an academic article and highlight passages for AI to explain to you.	Elicit Explainpaper TalktoBooks

	Ask AI a question and it will search over 100,000 books for the most relevant passages and answer.	
Plugins	Accesses (and integrates multiple) AI tools inside web browsers. Can bypass limitations of single AI tools (e.g., access real-time information from the web).	Bearly Zapier Glasp

Note: Educators eager to delve into the contemporary AI ecosystem and experience these tools firsthand should consult FuturePedia. This website categorizes and tags each tool, offers users the ability to subscribe to updates on the latest AI developments, and has a section devoted to Education AI Assistants. Also see the AI Tool Directory for another such database. [4] [5]

1.3 Worries Around AI

As is the case with any emerging technology, generative AI introduces both opportunity and challenge. There are valid and pressing concerns surrounding the use of AI tools (*see below*), leading organizations like OpenAI to publish guidelines and warnings for educators regarding the deployment of their products.

Cheating. A primary concern for many educators lies in the potential for students to utilize AI tools for plagiarism and cheating. The ability for these tools to generate human-like text raises the possibility that students will leverage such tools to write entire assignments or essays for them, making it difficult for educators to detect dishonesty, and distinguish between human and machine generated content. Students could also employ AI-generated writing or code for their assignments, submitting the material with little to no modification. Likewise, in creative courses, students might use the technology to generate music, images, or videos to similar deceitful ends.

Recent surveys have substantiated these concerns, suggesting that most students and faculty are aware of this new class of tools, with many students employing them in class and during final exams. In a Study.com survey of 200 primary and secondary school teachers, a quarter reported instances of students cheating with the assistance of ChatGPT. Similarly, in a survey involving 4,497 Stanford students, 17% admitted to using generative AI for support with assignments and exams. Among those who used AI, the majority claimed to have

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[4] A suite of paid AI tools are emerging explicitly for teachers (e.g., Education Copilot, SchoolAI, and Nolej). However, they are not free and faculty can often achieve similar outcomes with other (open source) tools with effective prompt engineering.

[5] Each of the AI tools mentioned in Table 1 can either be used individually or in interaction with one, accessed directly or via APIs. When used in interaction, many of the constraints present in one can be overcome by the other (e.g., connecting GPT4 to certain APIs allows it to access real-time information from the internet, analyze and visualize data).

employed it solely for brainstorming and outlining, while 5% confessed to submitting written material directly from ChatGPT with minimal or no edits. [6]

AI Detectors Are Not the Solution. Increasing concerns about AI-facilitated cheating and plagiarism have given rise to "AI-Detector" tools like GPTZero, Fictitious.ai, AI Writing Check, and Writer's AI Content Detector. These detectors are fundamentally similar in that they aim to estimate the likelihood that a particular text has been generated by AI.

Critically, there are significant limitations to these tools. Notably, none of them, even the detector developed by ChatGPT's creators, are entirely reliable. [7] They frequently yield false negatives (i.e., fail to recognize AI-generated content as AI-generated) and false positives (i.e., mislabel human-written content as AI-created). They gather and reuse student and faculty data, and can be easily bypassed by students (e.g., by altering words or phrases in the generated material). Indeed, one recent study, not yet peer reviewed, found that of 50 AI-generated essays, 40 were able to effectively evade detection by traditional plagiarism check software.

These issues are compounded by yet another problem: many detectors are limited in their scope and not designed to detect other more common forms of plagiarism (e.g., text copied from the internet or alternative sources). Just as unreliable evidence cannot be the basis for accusations in a courtroom, so too can unreliable detectors not serve as a strong basis for claims of academic misconduct or dishonesty.

Finally, policing perpetuates an arms race mentality between educational institutions and their students, with both in an ever evolving game of cat-and-mouse to identify new, and circumvent existing, detection tools.

Taking a step back, even the most precise and effective detector cannot prevent students from using AI tools, nor can it make these tools disappear. Such tools should represent just one out of many factors when making holistic judgements about academic dishonesty or plagiarism. [8] In many instances, educators will possess a deeper understanding of a student's work and progress, with human intuition potentially more reliable than AI detection alone.

Rather than police AI use, it may be better to set clear, up front expectations for students that signal what, when, and why AI tools are allowed, as well as the potential consequences of inappropriately using such tools in their own work. I will return to this topic in more detail in later sections.

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[6] For more on cheating in an AI era see Alfie Kohn's article on who's cheating whom, Marc Watkin's article, and Ditchthattextbook's thoughtful position.

[7] Each time text-based agents receive a prompt, they produce a novel piece of content, crafting a response tailored to each inquiry. The resulting content is undetected by plagiarism checker databases (given that it is different to past content). Many AI tools do not store a record of its created responses and their creators presumably have no incentive to share such data with plagiarism checkers. Even if the data were made available, the sheer amount of processing power needed to search through existing databases would make it economically unfeasible.

[8] Detectors may actually better function as conversational prompts between educators and students. For instance, if a student submits suspect work that seems AI-generated, then this may be a prime opportunity to discuss their current understanding of the subject matter, if there are obstacles preventing the student from completing the work themselves, and how that student is going to capitalize on their uniquely human abilities to complement (and not be replaced by) AI in the future.

Banning AI. If AI-detection is so unreliable, perhaps it may simply be better to ban the use of such tools altogether. Such an idea seems to resonate with certain US institutions and educational districts (e.g., New York City, Los Angeles, Baltimore) who have recently restricted AI use on school networks and devices. Italy has recently done the same. The rationale for such bans understandably stems from concerns about the negative impact that AI has on learning, as well as the safety and accuracy of AI-generated content on students themselves. As one New York City spokesperson put it, although "the tool may be able to provide quick and easy answers to questions, it does not build critical-thinking and problem-solving skills."

While these concerns are legitimate, an outright ban on AI use may be both impractical and ineffective. The sheer number of such tools is exploding and are likely the first of many to come. Trying to block each and every one would be a time-consuming and distracting exercise. Students and teachers have already adopted these tools in large numbers, and can readily access them on their personal devices, both on and off campus. These same tools are being integrated into web-browsers (Google Chrome and Microsoft Edge) and widely used software (e.g., Microsoft Office), as well as many education technology products. Banning AI would therefore require institutions to track, document, and prevent access to an ever growing spectrum of software and technologies, an approach that can instantly be circumvented by students when at home, or when using their personal smartphones and laptops. Indeed, students will always find ways to access such tools, whether it's asking AI for the answer to an exam question during a bathroom break on their personal device, copying AI-generated content when completing their assignment at home, or quietly consulting the tool under their desk during lessons.

In short, AI tools are ubiquitous and continue to grow in their capabilities and adoption. Those looking to police and ban their use are likely fighting a losing battle.

1.4 Conclusion: Adapt and Evolve Rather than Detect and Ban

The educational sector is clearly undergoing significant disruption. But it's worth remembering that technology has always disrupted the way we teach and learn. From the introduction of calculators to the advent of word processors, internet search engines, and Wikipedia, each new technology has prompted concern over its impact on education. Each time a new technology has come along educators have adapted and the education sector has evolved.

The same will be true in an AI era: the sector will need to evolve *alongside* technology or face being left behind by it. Administrators will need to resist the temptation to police or ban AI and instead guide faculty and students in its effective, ethical, and responsible use. Faculty to explore and harness the full potential of AI tools in their teaching practices to better support their learning objectives. Students taught that they are entering a new era where AI increasingly drives human decision-making and behavior for both good and ill. That they need to cultivate a deep understanding of AI's capabilities, limitations, societal and ethical implications. To use this knowledge to make AI informed decisions and become responsible stewards of its future development and implementation.

In what follows I offer a set of recommendations for the three main educational stakeholders most affected by AI: academic leadership, faculty, and students. Thereafter I argue that 21st century durable skills, acquired through active learning, evaluated via formative, authentic, and experiential assessment, and super-charged via AI, is an educational approach ideally suited to preparing students for a rapidly evolving job market and changing world.

2. Academic Leadership

The topic of AI has gained significant traction in educational circles, with a proliferation of online resources, webinars, debate and discussion taking place. Preliminary data indicates a high level of awareness surrounding these emerging technologies among both faculty and students, a general optimism and positivity around their use, educators purportedly adopting AI tools at a quicker rate than students, and widespread desire for clarity around acceptable use cases. This latter concern has stimulated many institutions to form generative AI working groups, tasked with devising guidelines and recommendations for faculty and students alike.

There are three immediate steps academic leaders can take to help prepare their institutions for an AI era (*see below*). Although these recommendations hold across institutions, their implementation will differ depending on the unique needs, existing capabilities, and timelines present in a given institution:

- The first involves drafting an AI Academic Honesty Policy that can be applied across the entire institution (and used by faculty to develop policy statements within course syllabi). Create resources to promote academic integrity, such as plagiarism prevention materials and guidelines for ethical AI usage practices.

- The second is to create faculty workshops that highlight what effective, ethical, and responsible AI usage looks like, so that faculty can better appreciate how, when, and where to use AI in their courses. Develop and facilitate workshops or training sessions on pedagogical best practices and emerging AI trends in higher education.

- Introduce a foundational AI literacy course for students that equips them with essential knowledge and skills for utilizing these technologies and critically consuming AI-output.

In what follows, I delve deeper into each of these strategies, providing a comprehensive blueprint for academic institutions to adapt and thrive in the age of AI. [9]

2.1 Craft Forward Looking (AI) Policies

The academic integrity policies of most institutions were created prior to the emergence of generative AI - and as such - do not effectively reference this new class of technology. This gap in policy leaves both students and faculty uncertain about permissible practices.

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[9] Recent AI advances have additional implications for academic leadership, from admissions, and enrollment, to student and career services, as well as higher education management. That said, in this report, I focus exclusively on the twin issues of teaching and learning.

While each institution will update their policies according to their own unique needs and timelines, several key considerations will likely need to be addressed:

- **Define and Think Carefully About Cheating & Plagiarism in an AI Era**
    - Before policies can be developed (*see below*), academic leadership will first need to determine what constitutes cheating and plagiarism in an AI era. This is because AI tools significantly blur previously established boundaries.
        - Take cheating, for example. Does the use of AI-generated content automatically equate to cheating? What if AI is used to enhance a student's initial draft, or produce an initial draft which is then edited and submitted by the student as their own? What if English is a second language for the student and AI is used to translate their original thinking? Would using AI to improve writing style or correct grammar also be considered cheating?
        - Now consider plagiarism. While copying and pasting work from online sources or other students presents clear evidence of misconduct, detecting AI-generated content is problematic for the aforementioned reasons. If an AI detector assigns a 88% probability that an essay was AI-authored, and a student denies any assistance, how should an institution proceed?
    - Certain institutions have already begun to explore these and related issues (see here and here). Their initial insights may prove useful when crafting your own AI policies.
- **Craft Future-Ready, Student-Centric AI Policies**
    - When developing policies, avoid focusing on a single AI tool (e.g., ChatGPT, which has already been superseded by GPT-4 and augmented by plugins [Code Interpreter]). Instead, recognize that text based conversational agents like GPT-4 represent just one tool in a much larger AI ecosystem that encompasses code, image, video, and sound generators.
    - Ensure policies provide clear guidance on what, when, how, and where AI tools are acceptable to use in both learning and assessment contexts. Articulate the rationale behind these choices and the consequences of policy violations.
    - Resources already exist that can help during the drafting process. Several institutions have initiated policy revisions (see here and here for useful resources for designing policies. The Sentient Syllabus Project also contains useful language when drafting policies).
    - Also recognize that students frequently avoid reading standard “academic integrity” statements. To encourage genuine adoption, create student-centric

policies that resonate with the target audience (see here for one such example).

- **Leverage Revised Policies to Establish Student Expectations**

    - Students often impulsively engage in academic dishonesty without forethought (see Burgason, Sefiha, & Briggs, 2019). The policy revision process can also serve as a catalyst for discussion with, and reflection by, students.

    - Be sure to communicate revised expectations to students. Emphasize that concealing AI use is academically dishonest, similar to hiring another person to write one's paper, take their test, or complete their assignment. Offer specific examples and candidly address their concerns (for more see here).

- **Carefully Evaluate Punitive Measures in the Absence of Clear Policy**
    - Caution is warranted when taking punitive measures against students for AI use in the absence of proper expectations and policies (especially in the absence of clear guidelines on what is and is not permissible; for a related discussion see here).

2.2. Faculty: Workshops on AI

Academic leaders have the opportunity to empower faculty by organizing workshops or sharing webinars that address the impact of AI tools on education. These sessions could cover a range of relevant topics. For instance:

- **Session 1: Navigating the Educational AI Landscape**
    - Offer an overview of the AI ecosystem.
    - Demonstrate tools poised to reshape education in the coming years.
    - Explore how students are already using these tools.
    - Explain generative AI's capabilities, using examples like GPT-4.
    - Emphasize the rapidly evolving nature of AI and the transient nature of current limitations.

- **Session 2: Addressing AI-Related Challenges and Limitations**
    - Outline current AI limits and constraints:
        - Difficulty with reasoning,
        - Truth agnostic,
        - Hallucinate: generate fake information,
        - Bias prone,
        - Copyright infringement and labor exploitation

    - Discuss implications of AI for:
        - Academic integrity (plagiarism & cheating),
        - Ethics, privacy, and data protection (AI tools collect student data),
        - Learning (misuse and overreliance undermine educational journey)

    - Discuss why AI detectors can be unreliable, and why alternative solutions are sometimes necessary (i.e., policy, setting expectations, and communicating effective use cases).

- **Session 3: Harnessing AI to Enhance Teaching and Learning**

    - Present positive AI use cases for both instructors and students. Help both see how AI can enhance teaching and learning.
        - For concrete advice see Section 3 (*Faculty*) and Section 4 (*Students*)

    - Suggest ways to adapt assessment strategies for an AI era (i.e., increased emphasis on formative, authentic, and experiential assessment that require students to be present, think on their feet, in dynamic and interactive ways).
        - See Section 5 (*Assessment*) below for concrete recommendations.

    - Provide guidance on updating course policies, syllabi, and teaching practices for both learning and assessment.
        - See Section 3 ("*Faculty*") below for concrete strategies.

Naturally the number and content of workshops can be tailored to best meet a given institution's needs. But providing faculty with appropriate training will better prepare them for changes unfolding in their classrooms. [10]

2.3 Students: Foundational (AI & Media) Literacy Training

As AI increasingly influences human behavior and decision-making, it is reshaping the informational ecosystems and educational environments students are embedded in. They are also going to be expected to be able to use these tools once they hit the wider labor market. As such, students must learn to navigate a world where AI tools are commonplace, recognize their strengths and limitations, and to use them in effective, ethical, and responsible ways. They will also need to hone their media literacy skills to critically evaluate information generated by these systems.

To support students in these endeavors, educational institutions must prioritize AI and media literacy courses that help students appreciate that technology is a tool to expand their own thinking rather than a crutch to limit it. Training can take various forms, from pre-semester onboarding sessions, to workshops, or introductory lessons at the beginning of the academic year. Ideally, all new students would enroll in a foundational course on the topic. Several ideas will likely be important to communicate regardless of the specific approach that is adopted:

[10] Many faculty workshops have already been run in the educational sector. See Section 8 (*Resources*) for materials that can be used when building your own workshops.

AI Literacy: Critical Thinking

- Begin by asking students to examine the tools themselves. Ask questions such as who created the AI tool, what is its purpose, and how does its creator profit from its use? What data is it trained on, who is its target audience, and how is user data utilized, shared, and monetized? Students should also explore the tool's limitations as well as its (un)intended harms and benefits.

- Thereafter guide students to critically evaluate the output of AI tools. What information is presented or omitted, and how does the training data or user prompt influence the obtained output? Assess the reliability, credibility, and accuracy of generated content, and examine for potential biases. If AI tools do not provide sources to substantiate their claims, then encourage students to engage in independent fact-checking to verify the tool's suggestions.

AI-Related Limitations and Issues

Students need to be well-informed about the limitations of AI if they are to unlock the full potential of these tools for learning.[11] They will need to appreciate that, ***for now***:

- **AI Tools Do Not Think or Reason And Most Do Not Fact-Check**
    - Although AI tools are highly generated, they *currently* lack the ability to reason, think, or fact-check like human beings (for more see here).

    - These tools often accept obviously false statements without question and fail to evaluate their output against evidence or principles. In many cases they do not consult external or contemporary sources (Bing Chat is one notable exception) or run experiments against objective reality.

    - AI's limitations become evident when tackling complex coding or mathematical problems, and while their abilities in these domains are rapidly improving, they are still not yet on par with their human counterparts (e.g., see here). But again, this is quickly changing.

- **AI Tools Can Hallucinate (Generate Fake or Misleading Information)**

    - When faced with uncertainty, many AI tools may generate factually incorrect outputs rather than conceding error.

        - Consequently, AI tools can be confidently wrong in their predictions, generate reasonable sounding answers that make no sense or are simply wrong. They can distort the truth, produce false information, fabricate source names, book titles, direct quotations, citations, erroneous code and math examples.

[11] AI tools are being developed and improved at lightning pace. As such, the limitations noted above may no longer be present as new iterations of these tools emerge. That said, the general advice offered here still holds: students need to be informed of the limitations present in whatever set of AI tools they use.

- These errors, often referred to as "hallucinations," can have real-world consequences, such as providing harmful advice or leading to suboptimal decision-making (for more on this topic see here, here, here, and here).[12]

- It's crucial then that students be taught how to evaluate the trustworthiness of information using external, reliable sources (i.e., to perform a reality check against all AI-generated output). Doing so will have the additional benefit of highlighting the students' own critical thinking readiness and give them an opportunity to practice and apply those abilities.

- **Certain AI Tools Have Limited Awareness of Current Events Or Paywalled Content**

  - AI tools are constrained by the data they have been trained on, which means their knowledge is limited to historical events, facts, and concepts present in their training datasets.

  - Certain tools may not be aware of events that have occurred after their data cutoff and cannot predict future events. That said, AI models are being constantly updated, and as new tools emerge, we can increasingly expect these tools to have access to current events and information (see here).

- **AI Tools Contain Biases**

  - AI tools are trained on massive datasets of human-generated text from the internet. The output from those tools often reflect Western (rather than global) perspectives and may perpetuate the political, cultural, artistic, gender, and racial biases present in their training data.

  - Students need to be taught that these tools can produce content that is toxic, offensive, or harmful, and may negatively impact learning experiences for certain groups of students based on race, gender, sexuality, or socioeconomic status.

  - They may also generate output that fails to reflect the rich diversity in student populations or to foster equitable learning environments for underserved learners in education systems. [13]

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[12] AI tools typically fail to reason or check the veracity of their claims by design. Most are examples of large language models (LLMs) which statistically predict the most likely words to follow in a sequence, akin to auto-complete on steroids. Consequently, tools like GPT4 will not evaluate the veracity of a statement, only the likelihood that a series of words are statistically likely to 'go together'.

[13] The ability for AI tools to clarify complex concepts and offer tailored guidance can also make it a highly useful tool for students living with disabilities, struggling with writing and spelling, or learning in a second or subsequent language. For instance, if English is not a student's first language, these tools can assist in drafting or paraphrasing (or translating and explaining content back to their native language). If a student learns better via image than word, AI can generate explanations in the former rather than latter medium. For more on how AI can be used to foster accessibility and support see here and here.

- Moreover, if used for grading assignments or exams, AI tools could potentially lead to unfair grading practices by favoring certain writing styles.

Media Literacy

- **AI is Reshaping the Wider Information Ecosystem**
  - Students should be taught that an avalanche of AI powered copywriting and content-generation tools have come to market, transforming how advertising copy, blog posts, emails, social media updates, and marketing pages are created and consumed (e.g., Jasper, Moonbeam, Copy.ai, Anyword).

  - The same is true for image, video, and speech. This rapid proliferation of AI-generated content may transform the internet into what has been labeled a 'dark forest' populated more by machines than people.

  - These new tools may also accelerate the rate with which misinformation and disinformation are created and shared by aiding in the creation of text-based and video Deepfakes, fake news and automated propaganda posts shared on social media, industrial level fake product reviews, misleading statistics and data visualizations, and images.

  - To counteract this, students must develop strong media literacy skills (what has been labeled by some as their 'crap detection' abilities). Taught how to be critical consumers of media and developing skepticism towards convincing stories from questionable sources. The evaluation of source credibility and quality, cross-referencing of facts, analysis of style and bias, and thoughtful consideration before engaging with and sharing information are all essential skills.

  - While these competencies were important prior to the advent of artificial intelligence, their significance is amplified as we navigate the increasingly complex world of AI.

Ethics of AI-Use

- The development of AI tools by private, for-profit companies raises concerns about (student) privacy and data protection.

- These companies may collect, share, or sell sensitive data from students and educators to third party vendors, law enforcement, affiliates, and other users. Even if one asks for their account details to be deleted, their prompts may remain, meaning queries about sensitive or controversial topics may persist.

- Moreover, AI tools have been implicated in copyright infringement and labor exploitation, with some artists and musicians finding their work plagiarized by AI algorithms while companies such as OpenAI have paid Kenyan workers less than $2 an hour to evaluate their tools (for more see here).

- Students should be encouraged to discuss ethical questions surrounding fairness, equity, and potential harm. Taught how to navigate the complexities of AI technology in a way that upholds ethical standards and promotes positive outcomes. [14]

    - Tools such as the AI Incident Database can be used to generate case studies for those discussions. This resource tracks instances of AI implicated in potentially or actual harm (e.g., generating biased or toxic content, exploiting workers, facilitating cheating, and generating malware).

Questions of Relevance and Overreliance

Finally, students should be encouraged to explore questions related to humanity, obsolescence, and the appropriate use of AI in various contexts.

- **Humanity and AI**
    - Students should be encouraged to examine the unique aspects of humanity that set us apart from AI. By discussing when AI should or shouldn't be used, they are better placed to understand the balance between leveraging technology and preserving uniquely human values.

    - Encouraging students to reflect on their unique strengths as humans can instill a sense of purpose and self-worth in a world increasingly driven by artificial intelligence.

- **Cognitive Biases and Heuristics**
    - Students should be made aware of the cognitive biases and heuristics that can influence their adoption and belief in AI tools (e.g., automation bias, authority bias, confirmation bias, anchoring bias, availability heuristic). By acknowledging these biases, they can make more informed decisions when using AI and avoid over-reliance on these tools.

- **Over-Reliance on AI**
    - Overusing AI tools can lead to missed opportunities for personal growth and development.
    - It can also lead students to accept an AI recommendation without understanding or verifying whether the recommendation is correct.
    - By teaching students where and how to use AI systems appropriately, they can mitigate potential harm and ensure they continue to develop essential skills.

The Potential for AI to Supercharge The Educational Journey

AI holds immense potential to revolutionize students' educational journeys. These tools can offer students personalized tutoring, instant formative feedback on their written, verbal, artistic products, help when drafting assignments, and much more. When effectively and

[14] Academic leadership and faculty may be interested in reading the ethical guidelines on the use of AI and data in teaching and learning for educators produced by the EU and Jisc's summary report of AI in tertiary education.

properly applied, they can enhance their learning experience, help them cultivate critical thinking skills, and forge their own path to academic success. I dive deeper into these and related points in Section 4 below.

3. Faculty

Great educators are needed more than ever in an AI era. Yet many may be asking themselves if, and how, AI can be used to accelerate teaching and learning in their classrooms. With this in mind, a number of potential use cases are listed below. These examples are designed to highlight how AI can be used to facilitate course, lesson, and pedagogical design, student evaluation and support, faculty coaching and administration.

3.1 How AI Can Supercharge Your Teaching

Many educators are already using AI Tools to supercharge teaching in their classrooms to help with lesson planning, generating creative ideas, and building background knowledge for their classes. But AI is capable of much more. AI can help with:

- *Course and Lesson Design*:
    - Generating course syllabi, schedules, and bespoke lesson plans with clear learning objectives, streamline the evaluation and selection process for textbooks, readings, and other instructional materials (see here for additional use cases).

- *Pedagogical Design*:
    - Development of innovative active learning techniques and resources, creating an engaging and effective learning experience for students.

- *Student Evaluation*:
    - Assist in the creation of formative assessment tools to measure student learning outcomes (e.g., practice tests, poll questions, multiple-choice or short-answer questions, along with sample responses and feedback).

    - Assist with the development and implementation of summative student evaluation tools, such as course evaluations and feedback surveys.

- *Student Support*:

    - Create sample assignments at different achievement levels (e.g., “pass”, “merit” and “distinction”) that help students to better comprehend expectations and differences in quality.

    - Support the integration of accessibility and inclusivity practices into course design and teaching methodologies. Faculty members can tailor their approaches to better serve diverse student populations with distinct needs.

- *Personalized Educator Coaching & Support*:
    - Many educators receive limited actionable feedback that they can use to improve their teaching practice. AI can also be used to support educators by:
        - *Simulating students*: AI tools can serve as a teachable agent for new teachers (e.g., they can simulate confusion and understanding, or asking adaptive follow-up questions).
        - *Deliver real-time feedback and suggestions*: AI can help educators refine their questioning techniques in ways that foster greater student engagement.
        - Enable faculty members remain up-to-date with the latest developments in their respective fields, as well as emerging pedagogical trends and research, by sharing relevant articles, research findings, and conference opportunities.

Important: AI should be viewed as a springboard rather than a definitive end point in the design, development, and delivery process. The outputs you obtain from AI require modification, fact-checking, and refinement to ensure their effectiveness and accuracy.

For context-specific examples, consult Table 2, which demonstrates the ways one AI tool (GPT4) can be used to support a foundational course on AI literacy for incoming first-year students.

Table 2. Overview of the different ways that just one type of generative AI (e.g., GPT4) could be used by faculty in course, lesson, and pedagogical design, as well as student feedback, and administration.

Course & Lesson Design	**Pedagogical Design**	**Student Feedback**	**Faculty Coaching**	**Administration & Support**
Design an outline of a course syllabus	Identify a set of active learning techniques that can generally be used in class	Identify student misconceptions about content	Act as a teachable agent (Tate et al., 2023)	Write emails to students
Write policy for course syllabus	Design activities that incorporate the physical classroom	Provide students with low-quality and high-quality writing examples	Provide faculty with feedback on the quality of their instruction and tips for improvement	Identify ways to accommodate students with specific learning differences in written and math activities
Design a scoring rubric for the course / assignments	Generate prompts and questions to facilitate active learning	Provide students with formative feedback on their writing		Assist with administrative issues (e.g., time management, student

	discussions			engagement)
Write outline for individual lesson plans	Provide guidance on how to incorporate experiential learning into lessons	Generate personalized study plan for student based on their in-class performance		Automate administrative tasks (e.g., answering frequently asked questions)
Specify learning objectives for the lesson	Generate think-pair (AI)-share routines	Generate personalized feedback for in class performance		

3.2 Possible Educator Applications

The aforementioned examples are only a thin slice of all the ways that text-based conversational agents can be used.[15] Educators are discovering still other creative uses. For instance, these same tools can be used to:

- Craft digital choice boards to hone students' critical media literacy skills, empowering them to scrutinize how AI-generated content portrays specific topics and to reflect on the reasons behind such portrayals.
- Generate counter arguments in Philosophy lessons, as a Buddhist monk interviewee in a Religious Studies lesson, and to make formal notes from a mind map on the whiteboard.
- Present counter arguments or simulate dialogues with historical figures, authors, scientists, and explorers.
- Create rap music about similes and metaphors, which students can then edit and set to their own beats.
- Augment the Think-Pair-Share routine by having students initially think about a prompt they would feed to AI to solve a question, discuss those ideas with a peer, run the prompt, and then share their findings with the peer or wider class.
- Challenge students to revise their prior projects by using AI to identify flaws and use that feedback to refine their initial prototypes or ideas.
- Have students feed their projects from the previous year to AI and have it find issues with their work. Then use this list of flaws to redesign the project and build a new prototype design.
- Write a choose-your-own-adventure story to interactively explain concepts to students.
- Encourage students to develop board games, prototypes, inventions based on course content, with AI assistance in the design process.
- Draft scripts for a podcast, video, infographic, meme, poster, timeline. Have students revise those drafts and then record a podcast, video presentation, or musical composition.

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[15] For more tips and recommendations on how to use AI tools to support your teaching, see here, here, here, here, here, and here.

- Remix student work, such that students submit content in one form (e.g., essay, lesson summary, video presentation) and an AI tool "remixes" that work into a different form (e.g., a rap song, poem, or book with illustrations). Seeing their work remixed can stimulate students to think about it in new ways.

While AI's text-generating capabilities are impressive, its potential extends far beyond this realm. There are many other tools in the broader AI ecosystem that educators can draw on. For instance, they can:

- Experiment with AI-generated image, video, and music generators to:
    - Develop multimedia teaching materials (e.g., creative stories, illustrations, animations, marketing and advertising strategies, podcasts, musical scores, vector logos for student created brands or companies, and much more).
    - Have students write and illustrate stories in a creative writing class, design infographics, interactive Google maps, TikTok-style videos, memes, or multimodal timelines.
    - Introduce different art styles, techniques, and themes. For instance, students could transform live-action footage into an animation with a particular artistic style (e.g., rococo) and background (e.g., cyberpunk).
    - Script custom speech for a talking avatar and use that avatar to discuss ethical and social issues surrounding deep fakes and misinformation.
    - Explore varying conversational styles in rhetoric and persuasion classes.

- Incorporate AI-generated 3D immersive experiences into virtual reality (VR) and augmented reality (AR) lessons, creating innovative learning opportunities (see here).

As AI continues to evolve, so too will its education applications, enriching the learning experience for students and educators alike.

3.3 Navigating the AI Landscape in Education: Reflections and Recommendations

Educators will need to adapt quickly and deliberately to the increasing presence of AI in education. Several recommendations are listed below that may prove useful when doing so:

- **Identify When, Where, and Why You Want Students to Use AI**

    - We cannot ban AI tools nor have students use them mindlessly or inappropriately. Rather students need to learn that there is a time, place, and a way to use them.

    - Conveying this information requires that faculty first identify when, where, and how they want students to use such tools in their courses. For instance:
        - What are the cognitive tasks students need to perform without AI assistance?
        - When and why should students rely on AI assistance?
        - How can AI enhance the learning experience?
        - Are new grading rubrics and assignment descriptions needed?

- **Craft An AI Policy Tailored to Your Course Aims**
    - Once you've identified the above, develop a course policy outlining the acceptable use of AI tools, citation requirements for AI outputs, and consequences for policy violations (for more on this see Section 2.1).
    - Communicate this new policy through multiple channels, such as course websites and syllabi.
    - Several institutions and educators have already taken such steps and their insights can provide input in your own policy design (also see here, here, here, and here).
    - Elsewhere, the Sentient Syllabus Project, argues for three principles when designing courses for an AI era: (a) AI should not be able to pass a course, (b) AI contributions must be attributed and true, and (c) the use of AI should be open and documented.
- **Conduct an "AI Audit" of Your Course and Adjust Accordingly**
    - Evaluate the current version of your course by having AI complete relevant questions and assessments.
    - If AI can generate convincing responses, consider revising your instructional and assignment design to maintain academic rigor (for advice on how to do so see Section 5 [*Assessment*]).
- **Don't Assume AI Detectors Will Help Identify or Prevent AI-Generated Work**
    - As noted in the introduction, a variety of tools exist that aim to detect AI-generated text. However, they are easily deceived, often have high false positive and negative rates, and are generally unreliable.
    - Employ them judiciously as just one of many factors when investigating academic dishonesty or plagiarism.
    - Instead, prioritize setting clear expectations for students to ensure they understand the appropriate use of AI-generated content in their work.
- **Use AI as a Catalyst for Critical Thinking In Your Classroom**

    AI tools may present educators with a challenge when it comes to student academic integrity. But those same tools can be co-opted to help students develop their analytical and problem-solving skills. For instance, educators can ask an AI tool to:

    - Write an essay and then have students critique that essay against a scoring rubric, offer feedback for improvement, and revise the content accordingly.

    - Write 10 multiple-choice questions on a topic covered during class, and then have students write critiques about whether those questions effectively address the core issues discussed in class, and evaluate the quality of the distractor items.

    - Write a short research paper or report on a historical event. Students are then asked to identify logical inconsistencies and accuracy issues in AI-generated historical reports, trace the sources used, and assess their validity. Doing so would encourage students to think about fabrications, misrepresentations, fallacies and other biases in AI output.

    - Generate code or answers to complex mathematical questions and then have students scrutinize that output for flaws.

    - Each of the above cases require students to evaluate AI-generated content, by critiquing what was produced or adding new information based on personal insight and analysis. Such an approach leverages the tendency for AI to simplify complex topics as a means for students to demonstrate their own nuanced understanding of the topic.

To enhance AI literacy, educators can also have their students:

    - Participate in the Real or Fake Text game: Test their ability to distinguish between human and AI-authored text, and use this experience as inspiration when designing their own AI-detection or evaluation tools.

    - Reflect on AI-assisted "cheating": Have students use AI tools to "cheat" on an assignment and then critically reflect on what this process taught them about the strengths, limitations, as well as societal and ethical implications of such tools.

    - Compare AI-generated art, music, or video content to human created content: Encourage debates about the future of human creativity as well as the positive and negative societal and personal consequences of AI content generation.

- **Reinforce Learning Processes Rather Than Outcomes**

    - If students are rewarded solely based on their ability to produce perfect outcomes (e.g., a perfect poll answer, written assignment, or exam) then they will naturally turn to AI tools to maximize their chances of success.

    - However, if we instead reinforce risk-taking, productive struggle, learning from failure, and far transfer of skills acquired in one context to other real-world contexts (e.g., through debating, discussion, reflection, and application) then we give students an opportunity to learn and grow from their productive struggles, and do so in a way that is AI-*supplemented* rather than AI-*dependent*.

- Educators will need to critically reflect on current course and assessment design, and pivot from high stakes formative assessments to active, authentic learning strategies that reinforce learning processes rather than outcomes (for advice on how to do so see Section 5 [*Assessment*] of this report).

- **Stay Updated on Teaching Related AI Developments**

    - The sheer speed and volume of AI developments can feel overwhelming. If you feel this way then know that many educators feel exactly the same way. Don't panic. Experiment!

    - You will need to play around with these new tools and techniques if you want to truly grasp their potential and utility. This hands-on experience will provide you with invaluable insights into how students may interact and learn from such innovations.

        - For instance, a social studies teacher could employ GPT4 to explore and write about a topic they are passionate about. Doing so will help them appreciate that certain AI tools are really helpful when sourcing information (Elicit), others with summarizing (Explainpaper) or visualizing data and refining the end product (GPT4).

    - Educators will find themselves learning about these tools simultaneously with their students. By embracing a co-learning approach, they can embark on a journey of discovery alongside their students, exploring new tools and techniques as collaborative partners. This mindset will foster an environment of open learning and experimentation, where both educators and students benefit from one another's perspectives and experiences.
        - See Section 8 (*Resources*) for a wealth of such materials.

- **Master The Art of 'Prompt Engineering'**
    - Today, most AI tools require humans to ask them a question (i.e., provide them with a 'prompt') which they then provide an answer to.

    - What is quickly becoming apparent is that the quality and content of an AI's answer depends heavily on how those prompts are phrased.

    - Being able to effectively phrase one's prompts (i.e., 'prompt engineering') will have a marked impact on the output obtained from the AI, and allow you and your students to get the most of this new technology.
        - For more info on how you can learn how to effectively prompt engineer, see here, here, and here.

- **Be Mindful of Student's Privacy and Data Protection**
    - As noted previously, AI tools may harvest, monetize, and retain user data. Consequently, educators may want to think carefully about requiring students to use these tools.

- One alternative may involve students submitting their prompts to educators who then submit those prompts to the AI tool. Another would be for educators to use custom interfaces (APIs) that only provide them with access to student data. Or to have students use open source AI tools or complete data-collection opt-out forms.
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4. Students

Earlier sections of this report have touched on many student relevant issues, from concerns about AI fuelled academic dishonesty, the need for foundational AI and media literacy training, clear academic guidelines surrounding AI use, and potential use cases. Alongside these points, students will also need to understand that there are two distinct ways in which AI can be employed.

The first involves misusing and over-relying on AI tools, submitting machine-generated work instead of their own. This involves sacrificing the *process* of learning for the fleeting success of a passing grade, ultimately leaving them ill-prepared for a shifting job market and a rapidly changing world.

The second involves using AI to enrich their educational journey. Recognizing that these tools can act as personalized tutors, assessing their current abilities, customizing content and teaching methods to suit their needs, thereby offering more targeted and effective support. Tools that they can use to hone their critical thinking, communication, and transfer of knowledge skills, improve their self-testing capabilities, and unleash their creative potential. In what follows I consider several ways that students can draw on AI in effective, ethical, and responsible ways. [16]

4.1 Personalized Learning Co-Pilot

Personalized learning is a pedagogical approach in which educators adapt the pace, content, and instructional methods to suit each student's unique needs, abilities, and learning styles. By doing so, students benefit from increased opportunities to ask questions, seek clarification, and receive customized feedback on their progress.

Although effective, the time, effort, and scalability of this approach has long represented constraints in its wide-spread adoption. AI tools have the potential to address these limitations, functioning as personalized AI tutors with a range of capabilities, such as:

- **Clarify & Communicate Complex Concepts**
    - AI can assist students struggling with specific concepts by summarizing and explaining those ideas in ways that align with the student's current readiness level. It can generate flashcards, personalized learning plans, quiz questions and other strategies to facilitate revision (self-testing).

[16] For more on how AI can enhance student learning see here and here.

    - AI can help students practice how to adapt their arguments for different audiences. For instance, students could be tasked with creating a policy proposal, such as encouraging a small community to reduce water consumption during summer months. Thereafter an AI tool could be prompted to modify the students' proposal so it is persuasive for different stakeholders (e.g., citizens, politicians, and farmers). Students could then evaluate the effectiveness of these tailored messages and identify ways to enhance them further.

- **Act as a Debate Partner**

    - Students, either individually or in groups, can engage in debates with an AI tool on a wide array of topics:
        - They could simulate mock or real-life legal cases where they or AI take the role of lawyers, witnesses, or judges to argue and defend a case.
        - Policy debates where the pros and cons of different public or private policy positions are considered.
        - Academic debates around recent theories or research findings.
        - Ethical and social debates on issues such as human rights, cultural diversity, or climate change.
        - International relations debates centered on contemporary issues in international politics, diplomacy, international law, or global governance.

    - AI debates can take place before, after, or during class, allowing students to prepare for upcoming lessons or reflect on previous ones. In-class debates can also begin with students practicing their points against AI before engaging with their peers.

    - By adjusting the rules, time limits, and specific roles, AI tools can be used to help students develop quick thinking, organization, and adaptability skills. Additionally, they offer students low-stakes practice in refining their debating abilities, encouraging them to reflect on their current understanding, identify missed points, and recognize areas for improvement.

- **Act as a Socratic Tutor**

    - Socratic Tutors do not provide students with an answer to their question. Instead they pose thought-provoking questions, encouraging students to think deeply, analyze information, and formulate well-reasoned responses. Learners can engage with Socratic AI tutors at their own pace and on their own terms, asking questions about class concepts, receiving feedback, and participating in reflective conversations, thereby sharpening their analytical and argumentative abilities.

        - *Example*: while reading a text or solving a coding problem, an AI tool can generate questions that challenge students to clarify their

understanding, consider alternative perspectives, or identify underlying assumptions.

- By analyzing the student's responses to Socratic-style questions AI tools can provide tailored feedback based on the answers they receive. They can use this information to highlight strengths and weaknesses in the student's reasoning, provide additional guidance, and prompt further reflection.

- These tools can be particularly beneficial for students without immediate access to human feedback or those with disabilities or diverse learning needs, as they provide tailored support. [17]

- **Foster Critical & Creative Thinking**

  - **Critique & Improve AI-Output**. Students could prompt AI tools to generate output. They could ask it to generate writing ideas, suggest improvements, or entire essays in writing classes. Code or mathematical solutions in computer science or math classes; argumentation ideas in debate classes; negotiation strategies in business classes, or animations, music, and illustrations in art classes.

  - Educators can then provide students with a scoring rubric, asking them to analyze, give feedback, and grade that AI output. What was correct, problematic, or missing from that output, and how it could be improved. Students could do so individually using track changes in Google Docs, collectively using social annotation tools, or via short explanatory videos or audio.

  - Doing so would require students to critically reflect on the assignment, the grading process, and prepare them for future peer review or self-assessment tasks. [18]

  - **Anticipate AI-Output**. AI can also be used to stimulate retrieval of previously learned information. At the end of individual lessons (or when synthesizing entire units or courses) educators can tell students that they are going to ask an AI tool to summarize a key concept or idea. Students then predict what the AI will and won't say, making sure to explain their reasoning. In doing so, they

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[17] "Socratic" AI tools face many of the same limitations as previously outlined, from issues with context-awareness, nuance, and empathy, all key components of the Socratic method. Educators must therefore provide students with guidance and oversight so that they can effectively deploy this tool.

[18] Dual Assignments could be used to similar effect. Here students are offered a choice between two versions of the same assignment: one utilizing AI tools and another without. In the AI-assisted version, students have to submit their AI prompts and AI-generated output, and to indicate where they have improved upon the AI output and added their own perspective. In the traditional version, students complete the assignment and sign a statement confirming that no AI was used. In both cases, students are assessed based on how well they have demonstrated depth of knowledge, either through their changes and improvements to AI-generated content or via their own original writing.

are not only prompted to recall knowledge from memory but also reflect on the importance of that information and justify their reasoning.

- **Intentional Mistake Correction**. Students can ask an AI tool to explain a concept and to intentionally embed errors in that content. Their task is to identify these mistakes and compare their findings with the AI's list of intended errors. This exercise can also include identifying unintentional mistakes made by the AI, promoting critical thinking and error detection skills.

- **Foster Creative Thinking**. AI tools can stimulate student creativity in several ways. They can help students to identify and visualize hidden patterns in data (thereby stimulating new ideas and hypotheses), or guide their experimentation (by predicting outcomes and sidestepping unfruitful research avenues). AI tools can also remix existing content and generate entirely content, opening up new artistic directions. In short, current AI tools can bootstrap student creativity by producing novel outputs that they could not, or likely would not have, arrived at on their own (for more see here, here, and here).

4.2. Many More Student Applications

The aforementioned examples are only a thin slice of all the ways that AI tools can be used. Students can use those same tools to:

- **Summarize Background Information.** Certain AI tools can be used to identify, summarize, extract, or even explain information contained in books, research papers, pdfs, and other written sources. This can enable students to quickly synthesize large amounts of data and automate their research workflows. Still other tools can be used to simulate the persona of famous authors, or even written work itself, allowing students to engage in dialogue and debate with both.

- **Generate Ideas.** AI tools can prove invaluable for students during the ideation process, especially for those new to, or grappling with, the early stages of a project. The “regenerate response” feature of certain tools allows students to generate multiple answers to the same prompt, extract the best elements from each, and produce a robust list of ideas. AI can help categorize and prioritize those ideas, and provide an initial assessment of their feasibility, relevance, and potential impact given the project’s goals. It can also encourage students to consider alternative perspectives and approaches, and help generate visual cues (e.g., mind maps) that visually represent the students' thinking, potentially revealing unseen connections and new areas for exploration.

- **Obtain Feedback.** AI tools can be used to evaluate a student’s initial ideas or to make novel suggestions of its own. It can be prompted to evaluate the quality of the output, suggest improvements in content, structure, clarity and style, even add missing material. It can be used to consider the same topic from an alternative perspective (e.g., historical, economic, social).

AI tools can also be used to optimize study habits, create practice tests, prepare research papers and literature reviews, improve their language skills, and much more.

Teach Students How to Effectively Interact With AI

Academic leaders and educators face the question of whether and how AI tools should be used in their institutions and classes. If they opt for AI adoption, then it will become essential to train students on how to effectively interact with those tools. Prompt engineering, a skill crucial to extracting optimal content from AI, should be a key area of focus in early training programs (for more on this topic see here, here, and here).

Without proper training, students will likely resort to teaching themselves by exploring websites containing examples of text and image prompts generated by others, or prompt marketplaces that allow them to buy tailored prompts for their individual needs. Such an outcome may disproportionately favor wealthy or technologically sophisticated students over others.

A more equitable approach would involve student workshops that showcase effective prompt engineering through interactive activities. Students could create and compare weak, mediocre, and strong prompts to see the vastly different outputs they occasion from AI tools. They could participate in "prompt competitions" where they collaborate (in pairs or small teams) to develop criteria for building strong prompts and then use those criteria to judge the prompts and associated responses of other teams. They could also be introduced to resources such as Prompt Box, which enables them to download, back up, and share their prompts with both professors and their peers. Such tools would encourage collaboration when mastering AI interaction and could also be used in both classroom and later assessment.

5. Assessment

Traditional teaching practices in many institutions still hinge on the lecture format, where a large group of students passively listen to a lengthy lesson delivered by a single professor. While this approach may be resource efficient for both professor and institution, it is an especially poor method for encouraging student learning. Likewise, traditional assessment practice often relies on high stakes summative assessments which demand rote memorization, retrieval, and application at a single point in time (e.g., quizzes, end of course exams, single-draft essays). Although efficient for evaluating large numbers of students, these methods are suboptimal for promoting retention of concepts and skills, as information which is not consistently reinforced is typically forgotten.

Such practices were ill-suited before advances in AI and they are especially inadequate in the AI era. If AI tools allow students to learn in highly personalized ways, tailored to their readiness level, whenever and however they want, then students will increasingly question the value and high cost of lectures, degrees, curricula, and courses centered on passive knowledge transmission.

Similarly, in a world where AI can comfortably solve multiple-choice and short answer questions, craft essays, and write reports, students may be tempted to misuse or over-rely on such tools in the hunt for a better grade. When students inappropriately submit AI-generated content as their own, educators find themselves in the frustrating situation of evaluating machines rather than humans. This dilemma has led many to transition from digital to analogue assessment, opting for handwritten essays completed during class, or high-stakes, in-person oral and written exams at the end of courses.

Taken together, one thing is certain: the educational sector must fundamentally re-evaluate its approach to assessing student learning in the AI era. The focus should be on devising improved methods for measuring the acquisition and application of skills and concepts over time and across various contexts, while simultaneously preparing students for workplaces that require AI proficiency.

5.1 AI Resilient Assessment

Educators seeking assessment methods entirely resistant to mindless or inappropriate AI use by students may face significant challenges. With access to the internet, real-time data, and the ability to generate content, AI can yield responses to almost any question, including highly personalized, localized, and contemporary topics.

Consequently, educators have two alternatives. Their first option is to modify teaching and assessment in ways that make mindless or inappropriate AI use difficult or problematic. This requires that they place an emphasis on teaching students methods which require real-time interactivity, adaptability, and critical reflection, and also create conditions where relying on AI-generated content is suboptimal due to speed of the activity and/or the nature of the response that is required. In short, educators should:

- **Have Students Show Up and Interact**
    - Meeting with students synchronously, either online or offline, allows educators to actually see students complete a given piece of work. By requiring students to meaningfully interact with one another in live contexts, educators can leverage social learning in ways that undermine mindless reliance on AI. Examples of activities they can use include:
    - **Two-Stage Assessment**
        - Students first complete and submit an assessment individually (e.g., pre-class work, poll question, quiz) then come together as a group to tackle novel, more challenging questions. This method encourages peer-to-peer learning and the application of acquired skills and concepts.
        - Although AI may assist in the first stage, its limitations become evident in the second stage, where human interaction and cooperation are essential. By assigning greater weight to the collaborative component, educators can emphasize the importance of real-time learning.

- **In-Class Presentations**
  - Students prepare and deliver a presentation during class, with faculty and their peers asking questions about different aspects of that presentation. This requires students to “think on their feet” and demonstrate the depth of their understanding in real-time.

- **Debates**
  - Students are presented with a “Big Question” or challenge relevant to the course and required to explore or defend a certain position, while adjusting to incoming questions and remarks. Although AI tools might be used during preparation, students are ultimately responsible for responding to questions and remarks during the debate itself.

- **Discussion**
  - Educators can also facilitate discussions by presenting a topic and require students to share their opinions or respond to their peers' comments. This method encourages active listening and thoughtful reflection on real-time information.

- **‘Teach Back’**
  - This communication technique, often used in healthcare settings, involves asking patients to explain, in their own words, the information they have just received. This allows healthcare professionals to identify gaps or misconceptions in patient understanding and provide clarification as needed. This same method can be adapted to the classroom, with students verbally restating key concepts, ideas, or instructions from a lesson or discussion in their own words.

- **Interviews, Simulations, and Role-Play**.
  - Students are faced with highly structured, semistructured, or unstructured interview contexts (e.g., job interview, news anchor interviews). They are tasked with applying skills or concepts discussed during the lesson or course in that interview, reflect on their performance, and think about ways to improve in similar (future) situations.

  - Simulations and role-playing activities (e.g., boardroom negotiations; policy discussions; mock trial of historical, political, or cultural figures) would also require fast paced, dynamic interactions where over-reliance on AI may prove difficult. [19]

- **Writing Sprints**
  - These short, timed exercises help students develop their writing skills and receive immediate feedback. Students can summarize class discussions, connect learning goals to their lives, or draft upcoming assignments. Alternatively, students could be asked to take two

[19] For still other strategies see here and here.

concepts covered during the lesson and highlight the relationship between those concepts.

- **Media & Performance-Based Assignments**
    - Incorporating media into classes and assignments would require students to extend beyond AI-generated text and think about creative and critical ways of communicating information to others.
    - Students might create images (drawing, poster, infographic), videos (animations), or audio (podcast, speech) to explain a concept covered in class or in a course, either individually or in groups.
    - In place of written essays, stories, or reports, they could generate long or short form videos (e.g., YouTube or Instagram videos) or audio recordings (podcasts) to share their knowledge. They could do so inside or outside of class, with or without the help of AI.

The common thread linking these teaching and assessment methods is their shared focus on real-time interactivity, adaptability, and critical thinking. By engaging in spontaneous discussions, debates, presentations, and performances, students are encouraged to think on their feet and respond to probing questions or requests for relevant examples. Such high speed, dynamic, activities leverage the weaknesses of AI (i.e., the requirement to pause, input a prompt to an AI tool, wait for a response, and then share it) and challenge students to demonstrate their understanding through real-time, social interaction.

The second option available to educators is to lean into AI tools in teaching and assessment. Rather than simply avoiding AI use entirely, or trying to catch students misusing them, educators can actively encourage students to draw on AI tools (*where appropriate*). For instance, students could use AI to help them prepare for in-class presentations, debates, discussions, interviews, simulations, and role-playing activities. To provide them with inspiration for writing sprints, media, and performance-based assignments; personalized feedback and suggestions for iterative assessments; or potential solutions to the challenges faced in their authentic assessments. Critically, students would need to acknowledge and cite AI use, analyze the information provided, and carefully evaluate if and where to utilize it.

- **Assess Learning Processes Not (Just) Learning Products**
    - AI tools may be highly effective in generating essays and reports. But they are still poor at iteratively reflecting on, and revising, past work in ways that involve evaluating and updating sources, or building complex, coherent argumentation.
    - These weaknesses can and should be exploited by educators. Doing so will require a shift in traditional assessment. One that focuses on learning processes rather than end-products, and which emphasizes the ability to reflect, revise, and improve ideas across time and context. And one which reinforces risk-taking, productive struggle, learning from failure, and the

transfer of skills to real-world situations. In short, a transition from a heavy reliance on high stakes, summative assessment towards:

- **Iterative Assessment (Explain Your Thinking)**
  - In math or coding classes, students are required to demonstrate not only the outcome but also the process by which they arrived at that outcome.
  - This concept can be extended to other courses, with students required to document and explain the process by which they generated an end-product (e.g., an essay, video, podcast).
  - Students would submit brief reports at each stage, documenting their updated logic and thinking relative to their previously submitted report. They could do so using tools such as track changes in Google Docs or Word, or alternatively, short explanatory videos (Microsoft Flip, Canvas Studio) or audio.
  - These reports could be evaluated by faculty, peers [20], or even the students themselves. Grading criteria could focus on how well students incorporate prior feedback, update their thinking, or reflect on future possible directions. This approach places emphasis on the learning process rather than the final product, evaluating ideas from development to submission. [21]

- **Leverage Human Uniqueness**
  - Humans have the ability to craft rich and detailed stories based on their personal histories, contexts, and cultures. In contrast, AI tools struggle to achieve similar levels of depth or authenticity. They will hedge their responses, omit details, and struggle to maintain a coherent sense of self across paragraphs. Without extensive prompt engineering they produce content that seems comprehensive, but is in fact generic, never insightful nor original.
  - One way to increase the chances that output is student rather than AI-generated is to leverage human uniqueness in your assessments:

[20] For instance, a peer assessment approach could be used where students are required to provide comments on their classmates output (and vice-versa) using social annotation tools such as Hypothes.is or Perusall. These tools allow students to respond to one another's annotations and ask questions that can further discussion around the topic.

[21] This idea is akin to a “portfolio of thinking”. In the same way a graphic design student may compile a portfolio of their designs to demonstrate their growth and proficiency, so too can students in other courses compile a portfolio of ideas and reflections on topics relevant to their own studies.

- Allow (or require) students to relate the academic topic to an area of personal interest:
    - Students can be asked to reflect on the implications of academic topics for themselves and those they care about. By exploring the direct and indirect consequences of societal issues in their own lives, students may develop deeper connections to the subject matter and produce work that requires them to go beyond AI-generated content.
    - *Important*: AI tools can be made to hallucinate highly personal writing or to answer questions related to a student's most memorable moments, the biggest challenges they personally overcame, or their lived experience.
    - To limit such AI misuse, it may be necessary to focus on events that occurred in class or other situations they can personally verify (e.g., have them offer their personal reflections on a guest speaker, campus event, or class excursion).
- Another way to exploit AI's limitations is by focusing on hyperlocal issues (e.g., friends or family who are real but not famous, a new school rule or issue, their local community, or niche interests).
    - AI training datasets are *typically* weak in hyper-local issues like those noted above, making it challenging (although not impossible) for students to pass AI-generated content as their own.
- Early AI tools lacked real-time internet access. However, recent updates now enable students to use these tools to write about contemporary issues. Consequently, assessments requiring current references or materials may no longer effectively deter AI misuse. [22]
- There are also many political, cultural, artistic, and racial biases present in AI training datasets. Assessment could directly reference these biases, or seek sources and inspirations that extend beyond biased training datasets.

- AI tools are also currently limited in their ability to *synthesize* patterns across multiple sources such as books, blogs, media narratives, conversations, podcasts, lived experiences, and market trends. Humans are able to observe

[22] Once again a better strategy may be to allow students to draw on AI tools where appropriate. For instance, they could be encouraged to write about contemporary topics and/or compare them to related historical events with the aid of AI tools.

and analyze a wide range of real time inputs, and this ability can be capitalized on to design more insightful assessments.

- Lastly, AI tools lack access to the specific materials and experiences occurring in the classroom and cannot access pay-walled sources. AI resilient assessment would require students to integrate and reflect on in-class discussions, as well as resources and materials unavailable outside the course or classroom.

- **Require Reflection**

  - As noted above, AI tools currently struggle with connecting ideas, evaluating and integrating sources, and developing complex coherent argumentation. These weaknesses can be leveraged when redesigning assessment.

    - Requiring students to reflect on their current understanding of a topic being discussed in class or across a course, identify areas for improvement, discuss open questions, and propose future directions.

    - Similarly, most AI tools require humans to ask them a question (i.e., provide them with a 'prompt') which they then provide an answer to. "Reflective" phrasing of assessment questions (e.g., "*Connect what you learned in the first half of the lesson to the main ideas covered in the second*") represent poor prompts that are difficult for AI to answer. Using reflective phrasing across assessment types can help reduce students' mindless reliance on AI.
      - *Note*: such questions can easily be circumvented by students with appropriate prompt engineering.

- **Incorporate Authentic Assessment**

  - Authentic assessment aims to immerse students in real-world challenges that reflect situations they may face in their personal lives, future careers, or civil society. Rather than focusing on memorization and reproduction of content in high-stakes contexts, such as end-of-course exams or essays, this approach evaluates students' ability to efficiently and effectively apply skills acquired inside the classroom to solve complex, practical problems in real-world settings.

  - Authentic assessment can take many forms.
    - Business students may collaborate with community groups, NGOs, start-ups, or established companies to tackle genuine organizational challenges.
    - Social innovation students could curate an art exhibition in a local gallery to address pressing social issues, while environmental science students might develop a sustainable community garden.

        - Psychology students could maintain a reflective journal during internships, and music or dance students may perform solo or ensemble pieces in recitals.

        - In each case, students repeatedly apply classroom-acquired skills to real-world problems, seek feedback from peers, educators, or relevant partners, and iteratively refine their approach to discover more effective solutions and behaviors (see here for additional applications in the context of AI).

    - Research shows that authentic assessment offers numerous benefits for both students and employers. Furthermore, it serves as a powerful strategy to mitigate over-reliance on AI, as it requires students to reflect on how they applied *their specific* skills to address a *specific contemporary* challenge faced by a *specific* (*local*) partner.[23]

    - By emphasizing learning processes rather than outcomes and focusing on complex, multifaceted questions that lack a single correct answer, authentic assessment cultivates core skills that today's generation of AI tools currently struggle to perform.

- **Carefully Weigh the Pros and Cons of Analog Assessment**

    - Several educational institutions have reverted to traditional analog (pen-and-paper) assessments as a means of ensuring that the work being evaluated is generated by students rather than machines. This involves students completing essays during class, written exams, or oral presentations after courses.

    - The rationale behind this approach is that without access to laptops, smart devices, or the internet, student performance during synchronous sessions cannot be AI-driven. Some institutions have also opted for high-stakes oral exams for similar reasons.

    - While analog assessment has its merits, such as being an easy way for educators to prevent students from using technology during assessment, it also has significant drawbacks:

        - Students may still use AI when preparing for written exams, which means there is no guarantee that the assessment truly evaluates their unique perspective. Only their ability to remember and reproduce material in a single high stakes session.

        - Relying on students to cram information into short-term memory, only to forget much of it soon after the exam, provides a limited snapshot of performance rather than a comprehensive view of student learning.

[23] For more on authentic assessment in an AI era see here, here, here and here.

This is especially true when compared to the benefits of formative (authentic) assessment.

- Analog assessments may disadvantage students with disabilities or specific educational needs.

- Oral exams face issues with scalability, time efficiency, and demand high effort from both educators and students, particularly at larger institutions.[24]

5.2 AI-Enhanced Assessment

So far I have mainly focused on how assessment can be redesigned to mitigate against misuse or over-reliance on AI by students. But - as can be seen from the other sections of this report - AI can also help educators enhance their existing assessment practices or even to develop entirely novel practices. For instance, AI can provide educators with inspiration when creating many of the aforementioned assignments, while ensuring those assessments are accessible for the diverse and specific needs of their students. It can provide students with formative feedback during iterative and authentic assessment, and help them with information gathering, ideation, initial drafting and revisions of their assessments as well.

In short, curricular and assessment redesign to mitigate against mindless AI use, combined with intentional integration of AI into teaching and assessment may be a more pragmatic solution that attempts to build AI resistant assessment or removing technology from the assessment process entirely.

6. Education Fit for an AI Era

AI is transforming the job market that graduates will soon step into. Advances in automation are creating jobs for some while making many others redundant, with machines substituting humans in sectors where their skills can be easily replicated. Elsewhere, AI is mastering abilities once thought unique to highly-educated professions such as financial analysis, web design, legal research, and journalism. [25] And it's getting better each day. [26]

Institutional leaders and educators who are serious about preparing their students for an AI-powered workplace will need to reflect on several points. First, upon graduating, students will enter a workplace that increasingly expects them to be proficient in the use of various AI

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[24] For additional discussion around the merit of such an approach see here.
[25] Recent research suggests that around 80% of the U.S. workforce could have at least 10% of their work tasks affected by the introduction of AI tools, while approximately 19% of workers may see at least 50% of their tasks impacted.
[26] The prospect of human workers being replaced by new technology has always been a source of anxiety. Debate currently rages on whether the doom and gloom around AI is similarly overblown or appropriate given the unique features that AI possesses. For more on trends in discourse around this topic also see here.

tools (e.g., to automate and increase the efficiency of research, ideation, writing, visualization, analysis, and other activities). If they want to succeed, they need to have sufficient training in those tools, and also possess goal-setting, decision-making, and moral reasoning capacities which allow them to recognize when those tools should and should not be used or their content trusted.

Second, students are going to require a strong understanding of their professional options in a job market which is increasingly mediated by AI tools and systems. Institutional services such as student advising and professional development will need to engage in honest dialogue with students as well as highlight steps they can take now to prepare themselves for a rapidly changing job market.

Finally, graduates entering the employment market will soon find that their value no longer lies in how much specialized knowledge they possess upon leaving university, or their ability to brainstorm, plan, conduct research, translate languages, generate content, or automate tasks. AI can instantly access the accumulated information present on the Internet, and perform the aforementioned functions far more efficiently than any human can. Rather a graduate will find that their value is increasingly determined by their ability to do what machines and AI cannot. In the years to come, success will belong to those with 21st-century durable skills.

6.1 What Are 21st Century Durable Skills?

Broadly speaking, the skills students leave university with can be divided into three categories. The first are *perishable skills*. These refer to abilities, knowledge, or concepts that have a relatively short half-life (i.e., the amount of time which elapses before half of one's skills are superseded or become obsolete). Examples include the ability to code in a specific programming language or use a certain software tool, network security or encryption method, marketing strategy, or negotiation technique. Such skills quickly lose their value as technology, industry trends, or professional requirements change over time.

The second category involves *semi-durable skills*. These are not based on individual techniques or methods but rather on the more general frameworks that underpin such technologies, processes, and tools. A semi-durable skill would involve training students to understand programming *paradigms*, grasping design principles, or comprehending business management theories. Although these skills possess greater longevity and importance than perishable skills, they are also subject to replacement as a field progresses, expands, and evolves.

Educational models based on perishable or semi-durable skills were already facing problems prior to AI. The half-life of such skills has seen a sharp decline over the past decade, meaning that many graduates find their skills are not matched to changing job market demands. AI further compounds these issues. If AI tools allow one to extract, summarize, explain, and communicate information, learn in highly personalized ways, whenever and however they want, then students will increasingly question the value and high cost of degrees, curricula, and courses centered on knowledge transmission. Upon leaving university, they will also find themselves competing with tools that already possess instantaneous access to, and mastery of, a vast range of techniques, methods, and

strategies (*perishable skills*), along with the general frameworks which underpin them (*semi-durable skills*).

Clearly another approach is needed. This leads us to the third, and arguably most vital, category of skills - *durable skills*. In contrast to perishable and semi-durable skills, which teach students "what to think" (i.e., a specific technique or its underlying framework), durable skills educate students on "how to think." And unlike perishable and semi-durable skills, these skills are highly transferable across domain and context, and resilient in the face of technological and sectoral evolution. Examples include the ability to think critically and creatively, solve problems, communicate effectively, exhibit emotional intelligence, and successfully collaborate with as well as lead others. [27]

Students in possession of durable skills are already highly sought after by employers, able to move at ease within or between industries, and have a relatively “AI-proof” skill set that is currently beyond the reach of such tools, and likely to remain so for time to come.

6.2 How To Equip Students With 21st Century Durable Skills

An educational approach centered on durable skill acquisition requires a radical rethink in circular design, teaching, and assessment. [28] Such an undertaking requires institutions to:

- **Construct a Hierarchical Learning Taxonomy**
    - To equip students with durable skills, it is essential to first identify and define what those skills are. This necessitates the creation of a hierarchical learning taxonomy composed of *learning outcomes* (specific skills that can be practiced and assessed individually), nestled within *sub-competencies* (groups of complementary skills), which together form a broader set of overall *competencies* (areas of related skills utilizing similar cognitive and behavioral aptitudes). All three components in the taxonomy need to align with the institution's core mission and objectives while remaining responsive to wider market forces and employer demands.
        - *Example*: if the objective is to teach a competency such as critical thinking, it will be necessary to deconstruct it into more specific sub-competencies such as reasoning and decision making. These sub-competencies need to be further divided into a collection of measurable learning outcomes that can be both trained and assessed (e.g., deduction, induction, bias mitigation, and source quality).

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[27] Although I place strong emphasis on the importance of durable skills, I also recognize that students also require technical or specialized knowledge in many fields. Therefore a tree-shaped model may be an appropriate way to visualize skill development, with durable skills forming the roots and trunk of the skills tree, semi-durable skills its branches, and perishable skills the leaves that come and go with changes in technological and sectorial demands.

[28] What follows is a concise, simplified vision of pedagogy centered around 21st century durable skill acquisition. See here for a more detailed and nuanced treatment on durable skills.

- **Engage in Intentional Curricular Redesign**
    - A durable skills-based educational approach demands that every aspect of curricular design be dedicated to introducing skills, practicing them repeatedly in diverse contexts, and making sure students can transfer those skills to novel situations. This process of deliberate practice over time is essential for rooting the skill within the student's mind, ensuring it becomes enduring and transferable to both their professional and personal lives.
        - *Example*: if a university wants students to be able to analyze complex systems, it must first teach them to define the system and its components (e.g., agents, attributes, behaviors, interactions). If a student only does this once, in a single course, they will find it difficult to transfer that skill. By having them repeatedly practice complex systems analysis on different types of systems (e.g., social media networks, ecosystems, immune systems, the brain) within and between courses, they are better positioned to apply that same skill in new and unfamiliar workplace and life situations.
    - What quickly becomes clear is that a skills-based approach necessitates highly student-centric instructional methods. Traditional lectures must give way to an active learning and experiential approach focused on helping students to attain skills mastery. Durable skills also tend to cut across intellectual domains and necessitates a transition away from traditional academic silos and towards an interdisciplinary approach.
- **Create a Scaffolded Curriculum**
    - A curricular model centered around a hierarchical learning taxonomy will tend to start by training students in a core set of foundational skills that can be talked about using a common language. These foundational concepts serve as the bedrock upon which increasingly complex skills are built, which are similarly practiced and applied in various situations and contexts. In this way, curricular design is scaffolded around skills acquisition, starting simple and building towards complexity. Although students gain specialized knowledge (*perishable skills*) and become familiar with generalized frameworks (*semi-durable skills*) along the way, such concepts serve as a method to continually hone durable skills, rather than serving as an end point unto themselves.
- **Assess in Formative, Authentic, & Skill-Based Ways**
    - A skills based approach not only requires that we radically rethink how we teach but also how we assess learning. Standard assessment practice involves evaluating students' on their acquisition and retention of specialized knowledge, and relies on infrequent and high-stakes assignments such as essays, exams, and quizzes. These assessments, intended to offer insights

into prior performance, often leave students without actionable feedback on how to iterate and improve future performance.

- In contrast, a skills based approach requires a pivot away from measuring information retention and reproduction, and towards evaluating ongoing skill mastery. Formative, low-stakes assessments become the metric of choice as they offer educators the opportunity to provide iterative feedback, empowering students to hone their abilities both within and beyond the classroom. Learning outcomes – the foundational unit of any skill – formatively assessed in context, via clear scoring rubrics applied consistently across the scaffolded curriculum. A strong emphasis is also placed on authentic, experiential projects across the semester which allow students to apply their newly-acquired skills to real-world challenges.

6.3 An Educational Approach Fit For an AI Era

Education centered around the transmission of increasingly specialized knowledge (*perishable skills*) which is evaluated using high-stakes, summative assessment (e.g., essays, exams, and quizzes), was already a fundamentally flawed model prior to advances in AI. The emergence of such technologies only serves to magnify these inherent shortcomings even more.

By evaluating students on their ability to acquire and summatively reproduce information, emphasis is directed away from the learning *process* itself and towards the end-point of that process - namely - learning *products* (e.g., exams, essays, and quizzes). This strongly incentivizes students to misuse or over-rely on AI tools, which can effortlessly generate learning products, thereby guaranteeing high grades without the need for risk-taking, productive struggle, and learning through failure. It relegates those same students to the role of passive consumers of AI-generated content and endows them with perishable skills with a short half-life. Graduates may increasingly find that AI tools can duplicate their skillset at much lower cost and with increased efficiency, making them surplus to requirement.

In contrast, education centered on 21st century (durable) skills differs in nearly every way. By making the acquisition and repeated application of durable skills across time and context, both inside and outside of the classroom, the central aim, several important consequences follow.

First, the learning *process* itself is elevated to center stage. Students need to show up and interact, critically reflect, productively struggle, and leverage their human uniqueness to solve authentic, experiential, real-world problems. These are all areas where AI demonstrates weaknesses. Second, the purpose and method of assessment shifts from summative to formative, from evaluating students through singular scores or grades at the end of courses, to providing them with iterative feedback on how to continue mastering durable skills. When students are evaluated based on how well they creatively and critically “think on their feet” during synchronous, real-time activities such as debate, discussion, performance, or presentations, their ability to misuse or over-rely on AI is drastically reduced. This is also true when they are evaluated on their ability to take skills acquired in the classroom and apply them to personal, local, and contemporary issues faced by their

real-world communities. AI can certainly provide inspiration and suggestions in such cases, but it cannot be mindlessly applied to solve such problems.

Finally, graduates entering the job market who are able to critically and creatively think, effectively communicate, lead and collaborate with others, will find that they possess skills that AI (and many other graduates) lack. Skills in high demand by employers and which enable them to move easily within and between sectors.

7. Conclusions

The rapid explosion of generative AI tools has brought with it wildly diverging perspectives on the technology and its implications for higher education. Opinions swing from the extremely pessimistic (AI heralding an educational apocalypse, a surge in cheating, and the collapse of traditional education as we know it) to the wildly optimistic (AI as the great equalizer, granting each student a tailor-made learning tutor capable of transforming them from ordinary to extraordinary).

As is often the case, the truth likely lies somewhere in between. It's true that past technologies (such as calculators, Google, and Wikipedia) were met with similar levels of panic and skepticism. Yet AI tools have the potential to be far more potent and disruptive than their predecessors. Present-day AI tools can craft persuasive essays and dissertations, excel in university exams, and grapple with increasingly complex math and coding problems. The forthcoming generation of tools will showcase even greater creativity and capabilities. They will be underpinned by a host of APIs that allow users to instantly analyze and visualize data; work with multimedia input and output; connect to real-time information from the internet, and much more. In all likelihood, what we're witnessing now is likely just the first, tentative step on a much longer journey towards increasingly sophisticated AI adoption in higher education and beyond.

The sheer scale of educational transformation needed to respond to AI tools is substantial and certainly won't happen overnight. It also presents academic leaders, faculty members, and students with a complementary, albeit distinct, set of priorities to tackle.

For academic leaders, it will be vital to steer clear of short-term thinking focused on policing or banning AI as a means to address academic dishonesty. Instead, their efforts would be better directed towards devising progressive AI policies, equipping faculty with training on harnessing AI for teaching and learning, and exploring methods to provide students with essential training in AI and media literacy. Doing so will allow their students to safely engage with these tools and critically reflect on the information they produce.

To enrich their teaching methods, content, and processes, faculty members must actively experiment with these novel tools and techniques. This exploration will not only reveal AI's potential to automate routine aspects of teaching, but also uncover innovative strategies that promote rich, equitable learning for their diverse students. By embracing a co-learning

approach, educators and students can collaboratively delve into new technologies, fostering an environment of open learning and experimentation. This collaborative mindset empowers educators to more efficiently guide their students in discerning the strengths and limitations of AI tools, as well as understanding when and how to employ them in the context of their broader learning goals and objectives.

Academic leaders and educators will both need to carefully re-examine how students are assessed, and in particular, shift their focus away from learning products and towards assessing the learning process itself. Greater emphasis will need to be placed on synchronous, active-learning exercises that have students show up and interact, as well as critically think and reflect on those experiences. Authentic, experiential assessments that capitalize on human uniqueness should direct students towards tackling challenging, real-world problems that are relevant, personalized, and of immediate concern.

For their part, students will need to be taught how to use AI tools ethically, effectively, and responsibly, in ways that accelerate their learning rather than undermine it. That responsibility lies with them to ensure that AI-generated content is accurate, tailored to audience and purpose, and reflective of their own voices and perspectives. They will also need to learn that, when used appropriately, AI tools can serve as a positive force to support and enhance their learning (e.g., by acting as a personalized co-pilot that can clarify and communicate complex concepts, summarize information, generate ideas, and provide tailored feedback to their level and needs). A tool that can act as a socratic tutor or debate partner, driving the development of critical and creative thinking, rather than impeding it.

In closing, what is abundantly clear is that certain educational models are well positioned to tackle the challenges of the AI era, while others are not. Traditional models, centered around acquiring and testing perishable skills through summative assessments, inadvertently encourage students to misuse or over-rely on AI to demonstrate learning, and send them into the wider job market with skills that rapidly lose their value. In contrast, models which instill 21st-century durable skills and emphasize practicing and applying these skills through authentic, experiential methods, while utilizing assessment as a means of providing formative feedback on skill mastery, prove more resilient to inappropriate AI use. This approach benefits both students and their future employers, ensuring they remain well-equipped and adaptable in our rapidly evolving world.

8. Resources

Below are a set of resources for those looking to learn more about developments in AI, new teaching examples:

AI Tools

- FuturePedia is highly recommended for those looking to explore the current AI ecosystem and try those tools out for themselves. Each tool is categorized and tagged (including an Education Assistant category), and you can subscribe to updates if you wish (also see AI Tool Directory).
- The AI Incident Database tracks examples of AI tools and vendors, including OpenAI, being implicated in doing or potentially doing harm, such as generating biased and toxic content, exploiting workers, facilitating cheating, and generating malware.
- A number of AI tools offer more open and ethical options (e.g., see here for a list of open source AI models such as Open Assistant and LlamaIndex).

Resources for Educators

Creating a AI-Ready Syllabus

- The Sentient Syllabus is "an initiative by academics for academics to navigate the uncharted waters of the era of Artificial Intelligence."

Learning More About Generative AI

- AI Text Generators and Teaching Writing: Starting Points for Inquiry
- AI: A Discussion for Educators
- What to Do About AI Text Generators?
- Northern Illinois – ChatGPT & Education
- Critical AI

Examples of AI Generated Content

- Experimental essays created with ChatGPT

Preparing Your Own Workshop

- Workshopping AI and Writing

Practical Suggestions for Educators on AI Use Cases

- *Ideas for Using ChatGPT in Education*
- ChatGPT Time-Savers
- Think-Pair-ChatGPT-Pair-Share (modification of Think-Pair-Share routine)
- Act as a Learning Designer — Getting ChatGPT to Generate an Online Module.
- ChatGPT through an Education lens slide deck

Assessment Implications and Suggestions for AI

- Designing Assignments in the ChatGPT Era

Resource Databases

- AI in Education Resource Directory
- ChatGPT References: a list of teaching and Classroom Resources on AI
- Resources on language models, learning, and teaching
- Questions for writing teachers to consider
- Strategies for mitigating harm associated with language models and writing
- Teaching and Classroom Resources on AI
- AI in Education
- Resources for exploring ChatGPT and higher education
- Twitter Thread compilation of resources
- SFCC Library LibGuide for ChatGPT
- A Small Collection of ChatGPT Articles and Resources
- School Libraries ChatGPT
- Generative AI (ChatGPT) Resources
- Unlocking the Power of Generative AI for Higher Education,
- The ABCs of ChatGPT for Learning.

Social Media Spaces for Learning

- Higher Ed Discussions of AI Writing