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USING AI AS A DIVISIVE TOPIC TO CREATE PEDAGOGICAL OPPORTUNITIES

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Marc Watkins & Stephen Monroe

Abstract

Against the backdrop of aggressive corporate marketing that positions AI as a tool for academic shortcuts, we contend that higher education must reclaim AI as a subject of serious, civic-minded study. The essays that follow, contributed by scholars and practitioners across multiple institutions and countries, collectively model how to engage generative AI not merely as a technology to be adopted or resisted, but as a complex cultural and social phenomenon worthy of sustained classroom debate.

Keywords: *Generative AI, Pedagogy, Critical inquiry, Higher Education, Divisive Concepts, Academic Freedom, AI Literacy, Civic Education*

In 2026, American educators are facing new and disconcerting challenges, and generative AI is only one of many examples. The pandemic changed how our students attend classes. Reading is now far more challenging for students. Politicians are banning subjects and promulgating anti-intellectualism. They are passing laws based on the dubious claim that schoolteachers have been insidiously indoctrinating American students. Any one of these poses a generational challenge. All four, all at once, is simply overwhelming. Indeed, AI may be one of the least of our worries.

As of August 2025, anti-DEI laws have been enacted in 29 states and introduced as bills in many more (*Chronicle,* 2025). State and system boards are often following along without much protest or resistance. For example, regents for the entire Texas A&M System have banned the teaching of courses that "advocate" for race or gender ideology (Kepner, 2025). Teachers, administrators, and staff members are losing their jobs for breaking such laws or, in some cases, simply for contradicting the spirit of these laws (Patel and Goodman, 2025; Saul, 2025). Some politically motivated students, meanwhile, are filming lectures and filing complaints against perceived "wokeness." Teachers across higher education are understandably confused, unsettled, and often afraid.

In many states, lawmakers have broadly targeted the teaching of "divisive concepts," a rather vague and ill-defined term. As law-abiding citizens with very little power, teachers are complying by self-censoring their classroom lessons and assignments, often removing material beyond what is explicitly banned by the government. Again, the environment is confusing and unstable. What is clear is that the powerful opponents of diversity, equity, and inclusion are most concerned with issues related to race and gender. In today's America, those are the most taboo of all "divisive concepts."

Of course, this is bad news for many reasons, not the least of which is that divisive issues are often the best kinds of issues for college classrooms, where teachers want students to grapple, think, debate, and grow. Controversy stimulates young minds. Debate is essential. While effective

teachers have never prescribed a particular position, effective teachers have always prescribed civil discourse, argument, research, and independent, engaged thinking. We love it when students take a position, when they debate, when they pose arguments, and acknowledge counterarguments. Oftentimes, we need to play devil's advocate. Individual political opinions aside, effective teachers want all students to test orthodoxies in the safe and experimental space of the college classroom. Suddenly, in this new era of censorship, American teachers have fewer stimulating subjects available to us. Students have less to explore. Freedom is being replaced with caution.

The good news is that even as we lose large swaths of interesting material, a new and exciting divisive issue, one not verboten by the authorities, has suddenly emerged. Artificial intelligence is a divisive concept, one quite handy for classrooms in many disciplines and at many levels. How so?

The rise of AI is a goldmine of provocative pedagogy. It is a subject that our students need to engage, a subject that will likely define our era and have profound consequences far into the future. Almost every facet of this dynamic subject offers confusing and contested material useful to the effective teacher. The questions are myriad.

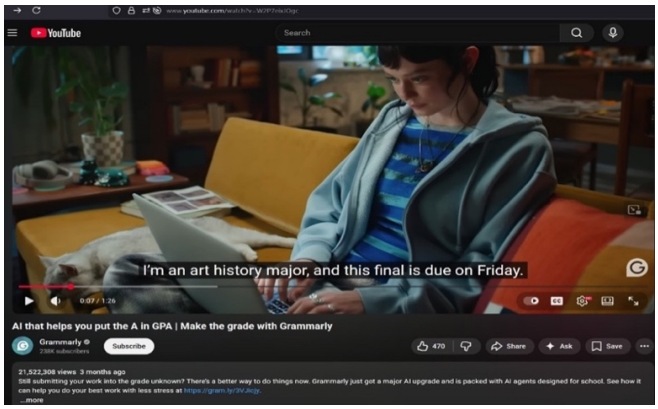
- Should governments regulate AI? If so, how?
- Does AI pose an existential threat to humanity?
- Will AI exacerbate socioeconomic gaps? Will AI create new opportunities?
- What are the gaps between corporate marketing of AI and reality? Can we trust companies like OpenAI, Google, and Anthropic?
- How will AI compromise individual privacy? Does privacy matter?
- What about linguistic diversity? Will AI move all humans toward a small set of standardized languages?
- What will AI mean for learning in K12 and beyond? Should children have access to these tools? Should colleges have policies limiting AI use?
- What ethical responsibilities should technology developers and policymakers consider when designing and regulating AI-mediated relationship bots?
- Are we adequately prepared to assess the risks of excessive reliance on AI Bots, particularly as they may contribute to social isolation, mental health challenges, or even self-harm among young adults?
- What are the environmental costs of AI data centers?
- Such data centers are proliferating across rural America and the Global South. Are local communities benefiting from their presence?
- What are the religious and/or ethical implications of AI? What do students think about AI's rising deployment in churches?
- How will AI influence geopolitical conflicts, including America's relationship to China and Russia?
- How is the federal government asserting power to control major AI companies for military and surveillance?
- Until recently, why were most computer scientists skeptical about the potential of neural nets and Large Language Models? How can an entire field of experts be caught off guard? Can orthodoxies be blinding?
- How will AI impact scientific and medical research and practice? Would students be comfortable receiving care from a non-human doctor?

- Should our society pursue AI development, even if AI will replace many human jobs?
- If AI does displace human workers, how will those people find purpose in life? How does work help to make modern lives meaningful?

These are big, exciting, and debatable questions with no clear answers. Divisiveness abounds! Indeed, college educators are already making good use of this material by teaching students practical discernment—when to use AI and when it must be avoided within the context of their learning. One example is a robust and developing project called the Two-Lane Approach from the University of Sydney (2025), replete with creative lessons and assignments that both resist and embrace this new technology. And, as for classroom reading materials, the internet and library databases are already full of insightful and provocative texts, like Karen Hao's *Empire of AI,* a book that confronts the juggernaut of OpenAI. Our point is that the novel, complicated, and ever-shifting subject of AI is perfect material for college teachers in need of debatable and divisive content. While fear and trepidation are understandable (and perhaps even reasonable), creativity and excitement are equally rational responses. Faced with the disruption of AI, teachers across higher education are creating spaces where students can passionately engage with our new reality.

Indeed, we believe that teaching *about* this new technology as a subject of critical inquiry is imperative, and that doesn't necessarily mean using AI. Whatever happens in the future, our society will need educated citizens capable of positively influencing AI policy and practice. Passive scrolling and screen-fueled consumption are the enemy. Instead, we can and should foster creative discernment. Our students are ready to learn and engage, and we certainly cannot surrender AI education to technology companies, who are frantically chasing our students as customers, selling AI products as tools of convenience.

For example, Grammarly, now part of a larger technological enterprise called Superhuman, is actively marketing their refreshed system as the "AI that helps you put the A in GPA." One of their many viral ads from the fall of 2025 sells Grammarly as AI that shortens student workloads from hours to minutes, so they can "focus on what matters most," like a weekend trip with friends. The ad's protagonist, a young college student working on an art history research project, uses Grammarly to research, write, and format her essay, then uses the Grammarly grading assistant to calculate her supposed grade before using Grammarly to revise (for a minute or two) to achieve her "dream grade." It is a stunning, disturbing advertisement that treats our students like consumers only looking for academic shortcuts; it has been viewed on YouTube more than 21 million times in the first three months.



Screenshot from 2025 Grammarly ad, targeting college students.

In the spring of 2026, Grammarly faced a class action lawsuit over one of these new features, dubbed "Expert Review." Each time a user or student clicked on the "Expert Review" tab, an AI agent would use the persona of a famous living or dead author to offer feedback based on the AI's prediction of what that author might say. Such features created questions of authorial intent, agency, and copyright. Grammarly has since removed the "Expert Review" feature, but the implications are clearly deeply concerning.

Without our intervention, the average college student will not be able to arrive at discernment to judge their own ideas or separate the advice from that of an algorithm on their own. As educators, we have a responsibility to educate students about GenAI; otherwise, this information will be done so via direct marketing, mostly by condescending promotions, which are flooding their social media feeds. In our experience, students today know very little about how AI technology works and even less about its potential consequences for our society. Thus, we must teach and inform. If ours is an age of breathless corporate development and overwhelming hype, if Silicon Valley is selling simplified and optimistic half-truths, then we as educators can and should interrupt with lessons that are complicated, fully truthful, and balanced.

For now, there seems to be no end in sight to the rapid development and deployment of AI within education. If the arms race continues (at even a fraction of the current pace), we will have fascinating material for our classrooms for decades to come. Even if the AI bubble pops in the next year or two, teachers will have ample material: the rubble of the aftermath. We should begin now, empowering our students to analyze the implications of this era's frenzied rise of articulate machines.

The writers in this volume are exactly the kind of thoughtful teachers and scholars poised to utilize the divisive material of the moment. In the following essays, they engage Generative AI as a complicated subject of study. Cynthia Gerstl-Pepin, an accomplished scholar of education and policy, tackles AI's role in disinformation, arguing that a civic-minded AI curriculum can be one antidote to burgeoning online fakery. In Dr. Gerstl-Pepin's hopeful view, the AI-informed students of today will become the engaged citizens of tomorrow—prepared by higher education to recognize conspiracy theories and ready to lead us toward a healthier, more genuinely informed democracy.

Robert Cummings, who has spent his career in composition and rhetoric advocating for the use of technology in the classroom, pivots unexpectedly toward pen and paper. GenAI caused Cummings to reinvent his classrooms as sites where "no personal technology was used, and student interaction was emphasized." His essay connects the AI disruption to the pandemic, using both global challenges to reconfigure teaching practices.

Alexandros Papaspyridis and Simon Bates explore GenAI's potential to catalyze improvements to traditional teaching and learning. They encourage institutions to promote (and support) faculty experimentation with AI. After charting various challenges and frustrations, like the rapid pace of change, Papaspyridis and Bates argue persuasively for proactive faculty development and ongoing student involvement.

Independent researcher, Eric Rubin, also sees reasons for hope, arguing that higher education should equip students for a changing workforce by teaching AI literacy as a new job skill. He makes a cogent case that employability in the future will depend, in large part, on AI upskilling, and he believes that higher education is poised to capitalize on this shift, which is already underway.

Lori Doyle and Jill Swisher focus their essay on the sudden unreliability of the traditional research paper as a trustworthy assessment tool. They begin by looking with fresh eyes at the

traditional research paper before proposing some very specific and useful revisions, including some that lean into AI and some that resist AI. In their view, teachers should purposefully and carefully integrate AI into long-form assignments, rather than ignoring or resisting its sudden ubiquity.

Andrea Arce-Trigatti, Dorota Silber-Furman, Aimee Klaschus, and Hannah Willis are similarly pragmatic and insightful. They chart many examples of how AI is currently being used in postsecondary education, openly sharing and reflecting upon "the good, the bad, and the ugly" of these early days, before proposing that all AI experiments need to place ethical behavior at the forefront. These authors view AI as a potentially powerful partner but insist on the preservation of productive human intellectual toil for students and faculty alike.

From the University of Mauritius, Chitisha Gunoo, R.K. Sungkur, and I. Tarling show how GenAI is affecting the teaching and learning of information and computer technology. Their essay reminds us that, unlike many previous technologies, GenAI has reached every corner of the globe almost simultaneously. As teachers, we are all in this together. The authors find value in recent UNESCO reports, document hopes for GenAI's power to level the playing field for students in Mauritius and other remote communities, and urge international collaborative efforts between educators, policymakers, and technology companies.

A common thread amongst these fascinating essays is the acknowledgement of GenAI's disruptive presence and the hopeful pivot toward utilizing this disruption as an opportunity. GenAI provides us with big and debatable questions. Judging from the essays in this volume, those of us in higher education are already pursuing answers.

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Generative AI, Deepfakes, & Disinformation: A Case for Fostering Civic-Minded AI Literacy

Cynthia Gerstl-Pepin

Abstract:

Social media and the internet have become significant sources for news and simultaneously effective venues through which to spread disinformation. The internet and social media play a key role in how citizens make decisions about voting. As generative AI increases the ability to easily replicate voices, images, and writing styles, it will be increasingly important to teach students and the public how to discern authentic and credible content from deepfakes and disinformation. This paper conceptualized a civic-minded AI literacy within the umbrella of media literacy education as a way to empower students to critically evaluate and navigate the increasing volumes of disinformation and fake news they encounter. It argues that media literacy standards and policies that incorporate AI literacy will be essential for preparing students to participate effectively as digital citizens. Civic-minded AI literacy as part of a robust media literacy education program across K-12 and higher education will be vital to support a healthy democracy.

Keywords: *Media Literacy Education, AI Literacy, Generative AI, Democracy and Education, Deepfakes, Digital Citizenship, Education Policy, Civic-Minded AI Literacy*

> *We are current and former employees at frontier AI companies, and we believe in the potential of AI technology to deliver unprecedented benefits to humanity. We also understand the serious risks posed by these technologies. These risks range from the further entrenchment of existing inequalities, to manipulation and misinformation, to the loss of control of autonomous AI systems potentially resulting in human extinction.* (Hilton et al., 2024)

The emergence of Generative Artificial Intelligence (GenAI) signaled alarm bells across the world as excitement about the new technology was tempered with concerns about what it might mean for society. Educators across K-12 and higher education grappled with potential issues such as AI generated plagiarism and how or whether to integrate the new technology into their teaching (Michel-Villarreal et al., 2023). Conversely, there are proponents who argue that GenAI holds much promise for personalized learning (Acar, 2024; Toner, 2024). But going beyond its potential utility for education, there are additional questions concerning its implications for democracy and existing inequities. The quote above from an open letter from AI experts alert us to some of the

more extreme dangers; highlighting the fact that confidentiality agreements (required by their employers) would restrict them from notifying the public about potential risks. It reflects emerging evidence that GenAI can be used to quickly spread and amplify disinformation and misinformation, influence politics, deepen political divides, reinforce social inequality, and undermine democracy (Bender et al., 2021; Kreps & Kriner, 2023; McQuade, 2024; Wack et al., 2025).

The pace at which digital technology has permeated society is breathtaking. According to the Pew Research Center (PRC) in 2000 approximately half of US adults used the internet compared to 96% who use it today (2024c). Approximately 91% of US adults now own smartphones with ownership being especially high 98% for 18-29 year olds (PRC, 2024d). The numbers are also striking for teens with approximately 95% having access to a smartphone (a 73% increase from 2014-15), 88% having access to a desktop/laptop, and 83% to a gaming console (PRC, 2025). These numbers show the extent to which digital technology has become embedded in our culture and the fabric of our democracy.

AIs, human created intelligent machines, have been around as early as the 1950s with the emergence of neural networks (Delipetrev et al., 2020; Ng et al., 2021). Contemporary AIs such as GenAI come out of deep learning–a type of machine learning that can "simulate the complex decision-making power of the human brain" (Holdsworth & Scapicchio, 2024). On a basic level, GenAI is a "machine-learning model that is trained to create new data, rather than making a prediction about a specific dataset" (Zewe, 2023). GenAI represents a shift in that it can quickly and autonomously generate images, text, video, and audio that appears to be authentic. Its ability to easily generate new realistic content is dangerous for democratic participation in that it can be used by human actors to sway political elections. For example, in the 2024 Presidential Primary, a deepfake of US President Joseph Biden's voice was used for robocalls discouraging New Hampshire residents from voting (FCC, 2024). Because the technology is so new, legislation and regulations in the US are not in place to ensure the democratic process is safeguarded.

Educating the public about GenAI is one way to counter the dangers of GenAI disinformation. In a democracy, public education has the potential to play a vital role in supporting an informed citizenry (Kahne & Bowyer, 2017; Gerstl-Pepin, 2007). Civic education (a non-partisan approach to teaching how democracy works and encouraging participation) has been seen as vital to a healthy and inclusive democracy in its potential to decrease polarization and increase broad participation (Fitzgerald et al., 2021). With the rise of GenAI's potential to influence political elections, media literacy education (a non-partisan understanding of how to assess media information credibility and accuracy) will also be vitally important. In particular, a subset of media literacy, digital literacy, which the National Association for Media Literacy (NAMLE) defines as the "knowledge, skills, and attitudes necessary to understand how digital tools interact with and impact society" (2024b, p. 5) has the potential to be helpful in countering the dangers of GenAI generated disinformation, propaganda, and misinformation (DiGiacomo et al., 2023; Kahne et al., 2016; Polizzi, 2020).

Finland has been at the forefront of teaching media literacy related to emerging technology (Salomaa & Palsa, 2019). The European Union has also enacted legislation citing the importance of media literacy but implementation across Europe is unclear (Sádaba & Salaverría, 2023). The United States and many other countries have not prioritized teaching about the dangers of these emerging technologies. Interest has been increasing in the US: Currently at least 21 states (less than half) have passed or considered bills related to media literacy education (Media Literacy Now, 2024b). However, any resulting curricular or pedagogical changes have not yet been fully assessed (DiGiacomo et al., 2023; Media Literacy Now, 2024a). Within the states that have enacted policy,

it is unclear the extent to which media literacy education is being implemented in schools and if it is being taught, how it is being taught, or whether it addresses GenAI. Research by DiGiacomo et al. (2023) indicates that media literacy policies across states are varied and inconsistent, often do not address equity issues, lack resources, training, and funding, and do not attend to "...the realities of what active citizenship looks like in today's digital age." (p. 348). Given that many states do not have legislation supporting media literacy and we lack substantive implementation information on the states that do (DiGiacomo et al., 2023), it is unclear the extent to which students in K-12 education in the U.S. are being taught media literacy. And, with the relative newness of AI, it is also unlikely widespread media literacy skills specific to AI are being taught consistently.

Considering AI threats to democracy and a lack of a coordinated effort nationally to teach media literacy, there is a growing need to educate students about GenAI and its potential role in spreading disinformation. Because the technology is so new, legislation and regulations in the US are not in place to ensure the democratic process is safeguarded. It is crucial for students and the wider public to understand how to critically evaluate information, especially in the digital age where sophisticated misleading content is easier to develop and disseminate at a rapid pace. Additionally, AI has also been shown to be biased and discriminatory across inequities such as race, gender, ability, and socioeconomic status (Bender et al., 2021; Curto et al., 2024; Ferrer et al., 2021; Lutz, 2019; Nadeem et al., 2020; Noble, 2018; Whittaker et al., 2019). AI can reflect societal divisions since it is trained on data society produces.

As GenAI tools like Claude, ChatGPT, Gemini, Llama, and Co-Pilot become more prevalent, there is a critical need for policies and guidelines that support a civic-minded AI literacy education. As GenAI's ability to replicate voices, images, and writing styles increases, it will be easier to create and spread deepfakes, fake news, and disinformation. For example, in 2025 AI generated voice and text messages impersonating US Secretary of State Marco Rubio were sent to a US governor and senator as well as at least three foreign ministers via the Signal messaging app (Shivaram, 2025). In another case, the BBC conducted a research study and found that news summaries generated by Microsoft's Co-Pilot, OpenAI's ChatGPT, Perplexity AI, and Google's Gemini AI chatbots "contained significant inaccuracies and distorted content from the BBC" (Elliott, 2025, para 7) raising concerns about AI spreading misinformation. With the rise of more complex and effective AI, citizens will need to be able to discern the credibility of digital information (Breakstone et al., 2019).

To address these issues, this article examines the potential for a nonpartisan civic-minded AI literacy education to offset the potential negative ramifications of GenAI for democracy. First, it conceptualizes how a civic-minded AI literacy can support participatory democracy. Then it examines how technological forms of disinformation, misinformation, and deepfakes threaten democracy. It then explores what a civic-minded AI literacy might encompass. The final section examines promising initiatives at both the K-12 and Higher Education levels and includes suggestions for future research and further development of civic-minded AI literacy.

Conceptualizing AI Literacy as Supporting Democracy

An informed citizenry can be seen as critical to a participatory democracy. But how does a citizenry become informed about politics and societal issues? Historically Americans were more civically engaged in their local communities via political parties, civic associations (e.g. clubrooms, committee tables), unions, churches, bowling alleys, card tables, and dinner tables (Putnam, 2020). National, international, and local news media outlets have also played a vital role

in sharing information on political and social issues. As the internet and digital forms of media have become more prominent in society, local news media have struggled to survive financially (Toff & Mathews, 2021). In-person forms of political participation have also shifted in favor of more digital forms such as social media and more global/national news outlets (Boulianne, 2020). The internet and social media now play a key role in how citizens make decisions about voting (Zhuravskaya et al., 2020).

Habermas (1991) conceptualized the public sphere as an ideal mediating space within democratic societies where citizens, the state (government), and the economy could come together as a public to engage in discourse about societal issues. The news media have long been an important source for political information and have the potential to serve a public sphere function (Garnham, 1994; Gerstl-Pepin, 2007). However, the public sphere is not immune to power inequities in society such as racism, poverty, ableism, and heteronormativity, which make it difficult for genuine dialogue to occur without inequities (Gerstl-Pepin, 2015). For example, Fraser (1994) offers the Civil Rights Movement as an example of how communication can be limited in the public sphere. It was not until violence against protesters was shown on television that citizens and politicians were persuaded to act (Bodroghkozy, 2012). So, while the news media space is limited, it is an important space for citizens to gain information about current issues.

Where citizens get their news has changed dramatically over the past decade. As of 2024, approximately 86% of U.S. adults sometimes or often consume news via a tablet, smartphone, or computer rather than traditional paper versions, with 57% saying they do it often (PRC, 2024a). In addition to traditional news media consumption happening electronically, an increasing number of adults (54%) are getting their news on social media (PRC, 2024b). These new arenas for news often lack the professional norms for fact checking and credibility of traditional, non-partisan news reporting. As a result, social media is becoming a central space for the spread of AI powered misinformation, disinformation and propaganda (Surjatmodjo et al., 2024).

At the same time, beyond their role as news sources, social media platforms lack guardrails concerning disinformation, propaganda, and fake news which make it increasingly important for digital news media consumers to identify disinformation and understand GenAI. In the US, Section 230 of the 1996 Communications Decency Act protects social media companies as forums for free speech, thus they cannot be held liable for content posted on their platforms (Moss, 2023; U.S. Department of Justice, 2020). In contrast, news organizations can be held liable for the propagation of misinformation. For example, Dominion Voting Systems was able to sue Fox News for defamation and reached a financial settlement for Fox's promotion of false conspiracy theories that Dominion rigged its voting equipment in the 2020 election in favor of Joe Biden (Bauder et al., 2023).

Social media platforms provide opportunity for communication across users via sharing, liking, or private messaging, and have the potential to be a democratizing source in society. For example, social media provided communication avenues for political movements in the 2011 Arab Spring (Frangonikolopoulos & Chapsos, 2012). However, invisible algorithms shape the content a viewer sees. This can limit the opportunity for users to see content that is different from their own political beliefs. Social media news feeds can serve as echo chambers in which the user's beliefs are reinforced (Cinelli et al., 2021). They can also serve as vehicles for spreading disinformation and limiting discussions and interactions across party lines (Cinelli et al., 2021).

Given these limitations, this paper conceptualizes these digital media forms as "thin" public spheres where communication and dialogue between citizens is restricted. They limit opportunity for discussion about issues with individuals across the political spectrum, social inequities

and power differentials can limit dialogue (Gerstl-Pepin, 2015). Within this context, a civic-minded AI literacy would acknowledge the ways in which power inequities may be embedded or operate in the digital world. So, while digital media plays an integral role in the US in terms of how citizens become informed about political issues, it is also a limited space in which power inequities may shape the news users select and receive.

How Disinformation, Deepfakes, & Misinformation Threaten Democracy

Propaganda is defined as "information, especially of a biased or misleading nature, used to promote or publicize a particular political cause or point of view" (Oxford English Dictionary, 2007). Disinformation and misinformation are key components of propaganda. Disinformation is when someone knowingly spreads false information while misinformation is when someone unknowingly spreads false information (McQuade, 2024). While propaganda has been around at least since the Ancient Greeks (Casey, 1944a), modern strategies emerged in World War 1 and World War 2. The US had an Office of Propaganda that sought to unify the country in support of war efforts using strategies such as the image of Rosie the Riveter to encourage women to work in traditionally male fields (National Archives, n.d.). The Nazis utilized the swastika as a symbol of racial purity to unify the Third Reich and support its genocide of over 6 million European Jews (O'Shaughnessy, 2009). The symbol was included on an array of items including clothing, flags, movies, and posters. In another example, the Nazis used the term "warmongers" to refer to the British Prime Minister Winston Churchill and US President Theodore Roosevelt even though it was Hitler who invaded Poland and set off WW2 (Casey, 1944b).

With the rise of the digital age, the potential for effective propaganda and citizen surveillance has greatly expanded to include an array of strategies including behavioral data collected on citizens through web tracking (data on individual internet searches), location information (e.g. where individuals are located when searching the internet), GPS tracking on smartphones or smartwatches, cross-device tracking (e.g. data across tablets, cell phones, watches), search engine optimization (e.g. digital strategies to increase internet traffic to a specific webpage or website), and digital ad buys based on behavioral data (Ghosh & Scott, 2018). In addition to the privacy issues it raises, this data collection allows for hyper-specific, targeted information campaigns. Strategies can now be coordinated and handled even more effectively and at a lower cost by GenAI.

The rise of digital news technology also coincided with shifts in the regulation of news media. The Fairness Doctrine policy of 1954 arose out of legislative concerns that broadcast networks could be used to support a specific political agenda and required that broadcast networks cover "contrasting views on issues of public importance" in news stories (National Archives, 2024). In 1987, the Federal Communications Commission (FCC) repealed the Fairness Doctrine over concerns that it limited free speech (Smith, 1999). This opened the door to partisan television and radio news coverage and ultimately to partisan news coverage such as the conservative leaning Fox News and the liberal-leaning MSNBC. Broadcast media was no longer legally obligated to provide "contrasting views" concerning issues of public interest in a democracy, leading to the further emergence in recent years of an array of partisan broadcast news outlets (Kawakami et al., 2020). Citizens have multiple ways to receive news and can select a partisan outlet if they so choose.

At the same time, the rise of the internet and digital media directly cut into the financial viability of paper-printed local and regional news sources (Hayes & Lawless, 2021). As digital online forms of traditional news media emerged, social media became a new source of news. As

noted earlier, about half of all adults reported getting some news from social media and of those, the most utilized platforms for news in 2024 were TikTok with 33%, YouTube with 32%, and Instagram with 20% (PRC, 2024b). In comparison to traditional news media sources, 'algorithmic personalization' shapes individual social media news feeds and has been shown to reinforce political polarization as it provides partisan content based on the personal data the platform collects (Chitra & Musco, 2020; Hobbs, 2020). Within this context news consumption has become both more polarized through the turn to partisan consumption by citizens, and less reliable due to the increasing popularity of nontraditional media that do not adhere to professional journalistic norms.

The 2016 US Presidential election signaled a significant shift in how social media and digital media could be used by actors external to the U.S. (foreign governments) and internally (citizens and organizations) to influence elections by spreading disinformation and increasing political polarization. For example, Russia's Internet Research Agency used trolls and bots on X (formerly Twitter) and YouTube to amplify polarizing viewpoints in support of Republican candidates (Badawy et al., 2018; Badawy et al., 2019; Golovchenko et al., 2020). Trolls are individuals who create "malicious accounts for the purpose of manipulation" (Badawy et al., 2018, p. 258) and bots (short for software robots) are automated software applications that can create content and interact "...with humans on social media, trying to emulate and possibly alter their behavior" (Ferrara et al., 2016, p. 96). During the 2016 US elections, social media platforms faced bipartisan criticism concerning bias, censorship, and misinformation as it became clear the platform's algorithms could function as "gatekeepers" of the news users would see online, fostering polarization (Calice et al., 2023).

In addition to Russian digital propaganda and disinformation strategies, the 2016 Presidential campaign signaled a shift towards a political propaganda strategy where facts reported by traditional news media were claimed to be false. The Trump presidential campaign used the disinformation strategy of presenting "alternative facts" and labeling unflattering accounts of the campaign as "fake news" to undermine and counter factual data presented by traditional news media sources (Barrera et al., 2020). "Alternative facts" is a disinformation strategy where false information is labeled true and facts are labeled as falsehoods. "Fake news" is a term used by politicians where traditional verified news stories are labeled as false as a way to undermine traditional news media reporting (Aïmeur, et al., 2023; Allcott & Gentzkow, 2017; Lee & Hosam, 2020). Additionally, due to algorithmic news curation which seeks to amplify sensational stories, these two strategies can be spread widely across partisan media platforms and social media (Calice et al., 2023). An additional challenge relates to confirmation bias, which is the tendency for individuals to believe alternative facts or fake news when it fits their own belief system (Ling, 2020). Social media and partisan news sources could then be used to spread disinformation and misinformation under the guise of free speech. This strategy also spread disinformation that mainstream media as a news source could not be trusted (Martens et al., 2018). "Fake news" as a strategy undermines factual information across the political spectrum and thus, democracy which relies on the public's trust in credible information and institutions, such as news media, to function.

The Rise of GenAI & Deepfakes

The introduction of GenAI has helped to supercharge the spread of propaganda and disinformation (Guo, 2024; Ryan-Mosley, 2023). GenAI is accessible and can be used to easily create more realistic forms of disinformation, such as deepfakes, which refer to counterfeit still images, audio recordings, or videos created with the assistance of AI (Ryan-Mosley, 2023; Chesney &

Citron, 2019; Painter, 2023). Deepfakes can be spread quickly through social media via resharing and algorithm amplification, where individuals can inadvertently spread disinformation that they think is true. Deepfakes are particularly concerning for social media. As noted earlier, due to Section 230, social media companies such as Facebook and X (formerly Twitter) are currently not liable for spreading disinformation and misinformation that may be posted by users or advertisers on their platforms (O'Donnell, 2021).

Deepfakes on social media could be used to weaken election integrity in the US and globally in multiple ways including suppressing voter turnout, misrepresenting candidates in multiple ways including their platforms, health, behavior, and background (Ranka et al., 2024). In response to the deepfake robocalls of Joe Biden in the 2024 New Hampshire primary (Bond, 2024; Swenson & Weissert, 2024), the FCC (2024) made fake AI-generated political robocalls illegal. Still, AI-generated deepfakes quickly spread on social media and can cause damage before they are recognized or halted. In another example, in the 2024 Presidential election, a Russian propaganda deepfake video smearing democratic Vice-Presidential candidate Tim Walz, made false claims that he was inappropriate with a student, and was viewed 5 million times on X (formerly Twitter) within 24 hours of its posting (Menn & Nakamura, 2024; Nazzaro, 2024). It is unclear what impact this propaganda may have had on the election outcome, but what is becoming clearer is that AI generated propaganda can be persuasive (Goldstein et al., 2024).

To call attention to the dangers of GenAI, an anonymous individual using the name NeaPaw created CounterCloud, an autonomous, uncensored disinformation system utilizing OpenAI's GenAI (the same technology utilized by ChatGPT) to highlight the potential dangers of GenAI (Knight, 2023; Thompson, 2023). NeaPaw claimed the system costs $400 per month to operate 24 hours a day, 7 days a week. NeaPaw (2023) posted a YouTube video explaining CounterCloud's purpose (to counter disinformation) by creating deepfake news articles and comments to respond to Russian disinformation about the US and the Biden Administration. CounterCloud's tactics included challenging the inaccurate facts of Russian fabricated disinformation articles, creating news articles that counter disinformation by fabricating fake historical events, fake journalists with names, bios, and photos, and fake article comments. The video states that all the disinformation produced was password protected and not released publicly (NeaPaw, 2023). The CounterCloud example has to be examined carefully, given it was produced by an anonymous source. Since the autonomous disinformation system is not open for public scrutiny, the story cannot be assumed to be factual despite *Wired* magazine's (Knight, 2023) and the Business Insider's (Thompson, 2023) coverage. Still, it suggests that knowledgeable AI developers could use open source GenAI technology to create effective disinformation systems and deepfakes at scale, potentially reaching a larger number of citizens far more quickly than human generated misinformation.

AI Tech Companies Response to Deepfake Concerns

Major technology companies have been accused of disregarding safety and disinformation. Frances Haugen, a whistleblower who used to work at Facebook, released internal company documents showing that Facebook prioritized profits over the health and safety of its users (Haugen, 2021). Although social media and AI are mostly unregulated in the US, companies feeling the pressure from congressional investigations (e.g. Disinformation Nation…, 2021; Examining Social Media Companies'..., 2019) and pressure from policymakers have made efforts in the past to address the issue of transparency and accountability by moderating content internally utilizing

human oversight and technology (Nonnecke & Carlton, 2022). These have not always been effective particularly with how quickly disinformation can spread online (Gongane et al., 2022). Additionally, there is concern that moderation of social media could be seen as censorship of free speech (Gorwa et al., 2020; West, 2018). Amid rising criticism and concern related to election integrity, in February of 2024, 27 tech companies including Meta, Google, OpenAI, TikTok, Anthropic, and X, among others signed the AI Elections Accord (2024) to protect the 2024 elections. The signers had no legal requirement to comply with what they signed. Instead, they committed to operating under 7 principal goals addressing deceptive AI election content related to 1) preventing deceptive content generation, 2) creating provenance markers to identify deceptive content, 3) detecting deceptive content, 4) quick "responsive protection" when deception is uncovered, 5) evaluation of deceptive incidents for further prevention, 6) collaborating to increase public awareness of deception via media literacy, and 7) building resilience among citizens against "Deceptive AI election Content" (AI Elections Accord, 2024, para 13).

In September of 2024 14 of the 27 companies provided updates as to steps they took to protect the 2024 elections. For example, Microsoft (2024) reported that they created a public awareness campaign reaching 350 million people globally and about 30,000 people in the US. Their 'Check. Recheck. Vote.' campaign is accessible online and is very basic. It defines the term deepfake, how it might be used, and offers an online quiz. The campaign has 5 strategies for citizens to use to combat deepfakes in elections: 1) critically consume information by checking and rechecking sources and ensure it comes from a trusted news source, 2) before sharing or commenting on sensational news check its accuracy, 3) if you suspect disinformation or deepfakes report it via reporting channels, 4) register to vote and double check what you need in order to vote in your state, 5) keep up on new technologies used in the spread of deepfakes and disinformation (Microsoft, 2024). The campaign also suggests that readers engage with the News Literacy Project (2024) to become more educated to stay abreast of changes and for further information on political disinformation. Overall, the program addresses key considerations related to a civic-minded AI literacy including utilizing critical thinking skills, focusing on differentiating credible information from disinformation, not taking sensational news stories at face value, actively participating in voting, and staying up on how AI evolves. Unfortunately, the reported reach of Microsoft's campaign in the U.S. suggests very little impact.

Eight of the companies that provided updates on their work (Adobe, ElevenLabs, LinkedIn, Meta, Nota, OpenAI, TikTok, and Truepic) cited their involvement in the work of the Coalition for Content Provenance and Authenticity (C2PA). C2PA is a collaborative with the goal of creating provenance markers in digital media to assist with the identification of GenAI created media and may help in the future identification of deepfakes. Google also reported working on its own provenance system and McAfee shared that it created its own deepfake detection system. Thirteen of the companies had not reported any actions they may have engaged in. While it is a good sign that 27 social media platforms made this commitment, the accord only covered the 2024 election and only 14 companies provided updates on steps they took. In 2025, the website was deleted, and the materials are no longer available. It is unclear whether the companies will agree to protect future elections, and it is also unclear if the commitment to securing the elections made a difference. Since these companies are opaque in terms of their internal workings it is unclear the extent to which they have publicized these tools or if they have been utilized. Tools such as C2PA and deepfake detectors do hold promise for helping identify deepfakes if they are effective and widely used.

The AI Tech Accord highlights awareness on the part of Tech companies that their platforms can support the spread of AI generated misinformation. However, the relative lack of promotion of Microsoft's 'Check, Recheck, Vote' program and the lack of public awareness or use of provenance markers, suggests these actions are not enough. And after the election, social media companies seemed to move even further away from the principles of the AI Tech Accord. In January 2025, Meta announced that to support free speech, it was ending third-party fact checking and instead instituting a community notes approach (similar to how X operates) where users are responsible for reporting concerns (Kaplan, 2025). This only underscores the critical importance of developing the ability of users to be able to distinguish fact from fiction.

This shift, along with other warning signs such as the AI Right to Warn letter (Hilton et al., 2024), and Facebook documents released by whistleblower Frances Haugen (2021) indicate that we cannot rely on profit-driven Tech companies to self-regulate. Guardrails in terms of legislation and/or regulation can keep companies in check, and media literacy education for citizens, our K-12 schools and higher education provide a way for citizens to build resilience against propaganda. The federal level has resisted regulating AI deepfakes, apart from the Take it Down Act (2025) which criminalizes the digital publication of nonconsensual intimate images including deepfakes. In this vacuum state legislatures have been active particularly in 2024 and 2025. As of July 2025, 26 states legally restrict the use of AI deepfakes in political campaigns, 24 of those restrict AI generated political advertising without a disclosure of AI use, while the other two states, Texas and Minnesota, ban the use of deepfake ads (National Conference of State Legislatures, 2025). In the absence of federal guidance, a hodgepodge of legislation is emerging across states. This leaves citizens in 24 states with no protection concerning the use of AI deepfakes in political campaigns and these laws have yet to be tested.

Despite efforts in some states, legislation has not caught up to technological innovations, and media literacy education is also uneven and uncertain. This makes the need for a civic-minded AI literacy especially crucial for supporting democracy.

Towards a Civic-Minded AI Literacy

> *Media literacy should not be limited to learning about tools and technologies, but should aim to equip citizens with the critical thinking skills required to exercise judgment, analyse [sic] complex realities and recognise[sic] the difference between opinion and fact. (Directive (EU) 2018/1808, 2018, § 59)*

Often missing from conversations about new emerging technology in the US is the critical role of media literacy education can play in supporting civic participation in our digital democracy. As the quote above shows, this has been a concern in the European Union (EU). With the rise of the digital age and the spread of disinformation and propaganda, media literacy is gaining the attention of policymakers and citizens in the US, but definitions of media literacy and its subset digital literacy are not uniform.

This paper utilizes the National Association for Media Literacy Education (NAMLE)—a national leader in media literacy education—definition of media literacy as a guide for AI literacy specifically. NAMLE (2024a) defined media as "...all electronic or digital means and print or artistic visuals used to transmit messages" and literacy as "…the ability to encode and decode symbols and to synthesize and analyze messages" (para. 3). Media literacy then is "the ability to access,

analyze, evaluate, create, and act using all forms of communication" (NAMLE, 2024a, para. 3). NAMLE's (2024b) conception of media literacy education includes four central components: 1) critical media literacy (an inquiry-based, critical thinking approach to acknowledging how power, systems, structures, representations, and ideologies may be embedded in media), 2) information literacy (finding, using, evaluating, analyzing, and reflecting on information), 3) digital literacy (understanding the interaction and impact of digital tools in society), and 4) news literacy (ascertaining the credibility of news sources including journalistic ethics and standards).

Media literacy education seeks to foster habits of inquiry and critical thinking skills that are vital to civic life. To support the democratic process media literacy must be nonpartisan. The goal is to promote critical thinking skills, not to tell students what to think.

Where Does AI Literacy Fit?

AI literacy emerged from the discipline of computer science, but it is often defined separately from media literacy education (see for example, Long & Magerko, 2020; Ng et al., 2021). AI literacy in this vein is more focused on defining AI, how it operates and how to identify it, create it, and utilize it (Laupichler et al., 2022). For example, the National Artificial Intelligence Advisory Committee's (2023) *Recommendations for Enhancing AI Literacy for the United States of America* do not mention media literacy education or connect it to civic responsibility although they do mention AI's role in disinformation and misinformation. Understanding how AI basically functions is especially important since the creators of AI do not always understand fully how it operates. However, adding the dimension of media literacy education expands AI literacy to support digital citizenship. This reconceptualizes AI literacy as an extension of digital literacy, a subset of media literacy education. A civic-minded AI literacy would then operate within the media literacy education umbrella (Kahne et al., 2016; Martens & Hobbs, 2015; Middaugh et al., 2022; NAMLE, 2023) and attend to the unique ways in which AI can be used to create and spread disinformation and misinformation.

This would extend the legacy of early propaganda education which arose out of an awareness of how the media can be manipulated to persuade its audience in one political direction or another (Hobbs & McGee, 2014). The rise of digital technology and the creation of social media and other digital forms of communication have opened new forms of communication and information sharing. These often segregate individuals, algorithmically pushing them into dialogue with mainly like-minded individuals. Algorithms may amplify false, sensational information because it attracts more attention, without journalistic standards for fact-checking. With such a large technological shift in how news is disseminated and how citizens make decisions in elections, a civic-minded AI literacy has the potential to offer a way to counter AI-generated disinformation, deepfakes, and fake news. Central to this approach would be critical thinking skills that allow individuals to discern facts and trustworthy information, and to be able to judge what is a fact versus an opinion. It should also focus on contributing to the public good.

Detecting deepfakes offers an example of a potential component of civic-minded AI literacy based on critical thinking. Deepfake detection can be challenging given how authentic they can seem, all the more as technology advances. There are at least three strategies for detecting AI generated deepfakes: 1) using AI detection technology, 2) adding provenance markers to digital content, and 3) using critical thinking strategies to assess content. All of these require human oversight to implement. As noted earlier some tech companies are developing AI detection technology

and working collaboratively to develop provenance markers such as C2PA (2024). Another strategy would educate people on how to detect politically motivated deepfake video, transcripts, and audio (Groh et al., 2024).

Appel & Prietzel (2022) proposed a theory of human-centered deepfake detection utilizing a reasoning model that posits that developing analytical skills (e.g. critical thinking) and an interest in politics can aid in identifying deepfakes. They suggest that the same cognitive processes individuals use to spot fake news stories could be used to spot deepfakes. Their theory's components include: 1) looking for audiovisual imperfections (technical flaws), 2) examining the context (e.g. is the source credible and verified by more than one reliable source), and 3) evaluating the content (e.g. does the message seem plausible) of the potential deepfake. For example, a video of a political candidate endorsing their opponent when both are close in the polls should cause uncertainty as to the authenticity of the video. Before sharing or believing the video, a viewer might search the internet for verification of the video by reputable news outlets. In another example, Kamali et al. (2024) offer five ways to visually detect deepfakes that would include looking carefully for: 1) anatomical implausibilities (e.g. missing fingers), 2) stylistic artifacts (e.g. inconsistencies in resolution & color), 3) functional implausibilities (e.g. detail rendering such as clothing looking distorted), 4) violations of physics (e.g. a shadow not reflecting the direction of the sun), and 5) sociocultural implausibilities (e.g. a politician in a situation saying something that is not in keeping with their political agenda). This is a very limited overview of the strategies identified by Kamali et al. (2024) but highlights potential critical visual analysis skills that could be developed in deepfake education.

Because it will be increasingly difficult to spot deepfakes as the technology improves, AI literacy that supports democracy cannot be static. While early deepfakes could be easily identified by a discerning eye, such as detecting missing fingers, the technology will make detection increasingly difficult. It is also unclear whether Tech companies can create or are willing to implement effective AI detectors that can move quickly enough to address concerning content before it spreads, particularly if moderation (fact-checking) is left up to users on the platforms. The passage of legislation concerning election deepfakes across 26 states suggests that more legislation from other states or the federal government may be forthcoming, but it is unclear whether the legislation would stop the quick spread and proliferation of deepfakes. Strategies for critically assessing deepfakes will be an important component of AI literacy.

Promising Initiatives in Support of AI Literacy

While the federal level has traditionally provided funding, guidelines, and regulations for K-12 and public higher education, the states provide most funding and policies and oversee the curriculum, so implementation of media literacy education is dependent primarily upon state legislatures and State Education Agencies (SEA). Private K-12 schools determine their own curriculum. While K-12 education is decentralized, higher education is even more decentralized. The most comprehensive way to support K-12 curriculum changes related to a civic-minded AI literacy would be for state policymakers and SEAs to create policies, funding, and professional development aimed at supporting their implementation. Because of the longstanding tradition of academic freedom for both public and private higher education institutions, curriculum is primarily the purview of the faculty, with the exception of state or regional accreditors, or professional accreditation requirements for certain fields. Therefore, curricular changes in higher education would have to come from faculty and/or administrative leadership.

Promising K-12 Initiatives

As mentioned earlier, as of 2024, 21 states have or are working on formal legislation related to media literacy (Media Literacy Now, 2024b). Two of the states – Delaware and New Jersey have passed legislation addressing media literacy state-wide and across all grade levels (Media Literacy Now, 2024b). California (AB 2876, 2024) was the first state to pass legislation aimed specifically at AI literacy across K-12. Scant research exists on how states are implementing these policies (DiGiacomo, 2023; Media Literacy Now, 2024a; NAMLE, 2024b). While media literacy is starting to gain political traction in some states, except for recent AI literacy education legislation in California (AB 2876, 2024), the legislation has not kept pace with how fast GenAI has developed.

New Jersey's S. 588 legislation was passed in 2023 and requires that information literacy be taught across K-12 schools. S. 588 defines information literacy as "...a set of skills that enables an individual to recognize when information is needed and to locate, evaluate, and use effectively the needed information" (2023, para. 1). As noted earlier, in the NAMLE definition, information literacy is one of the four components of media literacy (NAMLE, 2024b). S. 588 frames information literacy as encompassing "digital, visual, media, textual, and technological literacy" (para. 6). S. 588 requires that the Commissioner of Education work with the New Jersey Librarian to create an evaluation system to determine the effectiveness of district instructional programs in information literacy. It also mandates that teacher preparation programs and programs for alternate routes to teaching are required to include information literacy in their training programs. While New Jersey's legislation uses the term information literacy, the specific language of the bill includes key concepts of media literacy.

Delaware passed one of the most well-conceived bills, S.B. 195, The Digital Citizenship Act, which asserts that media literacy education in K-12 public education is vital to supporting democracy and citizenship (Delaware Department of Education, 2024; S.B. 195, 2022). S.B. 195 defines digital citizenship as "...a diverse set of skills related to current technology and social media including the norms of appropriate, responsible, and healthy behavior" (§ 4143) The Bill also defined media literacy as, "the ability to access, analyze, evaluate, create, and take action with all forms of communication, and encompasses the foundational skills of digital citizenship…" (§ 4143). S.B. 195 explicitly identifies curricular areas such as identifying credible sources and using multiple sources of information; acceptable use and purpose of social media platforms; the dangers of technology such as privacy issues, hacking, and online bullying; how to analyze, evaluate, access, and participate in digital forms of communication; persuasion techniques; identifying misinformation and bias, points of view that are excluded and included; and how media messages can shape society and culture. Delaware appears to have one of the more comprehensive and transparent media literacy requirements with explicit standards laid out across all grade levels and linked to the International Society for Technology in Education (ISTE) standards and the American Association of School Librarian (AASL) standards.

California passed S.B. 830 in 2018 requiring the California Department of Education (CDE) to provide web resources for state school districts on media literacy including related professional development for teachers. The bill defined media literacy as "...the ability to access, analyze, evaluate, and use media and encompasses the foundational skills that lead to digital citizenship" and digital citizenship as "...a diverse set of skills related to current technology and social media, including the norms of appropriate, responsible, and healthy behavior (§ 51206.4.a). In 2010, the CDE had adopted the Model School Library Standards for K-12 curricula which included

a focus on information literacy in terms of students accessing, evaluating, using, and integrating it into lifelong learning within school libraries (CDE, 2010). Then in 2023, California A.B. 873 recommended that the CDE expand media literacy curriculum into Science, Mathematics, History-Social Science, and English language arts/English language development across the K-12 education frameworks (Berman, 2023). In 2024, California then became the first state to pass legislation that expanded media literacy to include AI literacy with A.B. Bill 2876 (2024). AB 2876 (2024) utilizes earlier definitions for digital citizenship and media literacy from S.B. 830 and adds a definition of AI Literacy as "...the knowledge, skills, and attitudes associated with how artificial intelligence works, including its principles, concepts, and applications, as well as how to use artificial intelligence, including its limitations, implications, and ethical considerations" (§ 1a). The bill adds AI literacy education across the A.B. 873 media literacy curriculum frameworks (Berman, 2024). While the California legislation looks promising, the recommendations take effect the next time the curriculum is reviewed officially and as of now, the curriculum frameworks have not been updated (CDE, 2025)

While each of these state initiatives make inroads into ensuring all students in their states are being taught media literacy even using similar definitions in keeping with NAMLE, it is still unclear the extent to which these standards have been implemented in schools and districts across states. It is also unclear the extent to which professional development and district leadership has been provided to teachers. Research conducted by Baker et al. (2021) found that media literacy education was less likely to be supported centrally by school, district, or state leadership. They also found that teachers perceived more obstacles to teaching media literacy in schools with higher levels of students living in poverty or that were majority Black or Hispanic. Still, it is very promising that three states made such strong commitments to digital citizenship.

Promising Higher Education Initiatives

Higher education curricula are even more decentralized than K-12 education. If higher education institutions address AI literacy, it will be most likely at the initiative of higher education leaders, staff, and faculty in individual institutions or systems. Given the variety in higher education focus and organization, it is less clear what disciplines would be the home to media literacy training on GenAI. Digital Humanities, Journalism/Communications, Library Sciences, and Education are disciplines that may offer media literacy training as part of the curriculum. Library Sciences have standards related to higher education information literacy that cross all states (ACRL, 2016). Since digital media literacy education is inconsistent across K-12 public education nationally, higher education cannot assume that students have had media literacy education or AI literacy.

Higher education teaching and learning centers that support teaching innovation are also playing a role in supporting faculty as they think through how to integrate or how to handle GenAI in the classroom. For example, Barnard's Center for Engaged Pedagogy (CEP) and members of its Instructional Media and Academic Technology Services (IMATS) created a framework for AI Literacy to support faculty and students (Hibbert et al., 2024). The framework is composed of 4 components that each build on each other. First comes the goal to ensure students and faculty understand AI. Then they move to learning to use and apply AI. At the next level the goal is to learn to analyze and evaluate AI. At the final level with the appropriate training the goal is to create AI (Hibbert et al., 2024). As with definitions derived from computer science, this example does not connect to media literacy components such as information literacy or digital citizenship. Media

literacy can also be embedded in general education curricula. Students at Champlain College take "Navigating your Information Landscape", a required first year course centered on information and media literacy (Champlain College, 2025). Scant research exists on how higher education may seek to incorporate AI literacy as an outgrowth of the media literacy education umbrella into the curriculum broadly.

An emerging field in higher education, Public Interest Technology (PIT), is an interdisciplinary field that can serve as a vector for teaching AI literacy. The Public Interest Technology University Network (PIT-UN) connects over 60 higher education institutions across the US and globally (2025). It supports interdisciplinary learning, research, and curriculum that seeks to "advance the public interest and promote the public good in a digital age" (McGuinness & Schank, 2021, p. ix). This initiative is particularly promising because it is interdisciplinary and connects institutions across states, so it brings together scholars and teachers with the technological understanding of AI together with disciplines with expertise in media literacy education attentive to social equity and a civic-minded public good. The main challenge to AI literacy at both the K-12 and higher education institutions is for implementation across states, schools, programs, and classrooms so that it reaches students across economic, geographic and racial and ethnic boundaries.

Conclusion

Digital media play a key role in how citizens make decisions about voting and political participation. GenAI threatens democracy by making it easy to create and amplify disinformation and misinformation, making it much harder to make informed decisions about policies and voting. Political strategies designed to spread disinformation for political goals either coming from within the US or externally have eroded trust in media, institutions, facts, and ultimately democracy. Helping citizens and future citizens understand how to differentiate between fact and opinion and between credible and unsubstantiated claims is an important component of a civic-minded AI literacy.

AI literacy approaches are still under development across K-12 and higher education and vary by state and institution. A civic-minded AI literacy has the potential to empower students to critically evaluate and navigate the increasing volumes of disinformation and deepfakes they encounter. Central components for a civic minded AI literacy would operate under the umbrella of media literacy education and encourage critical thinking skills that are nonpartisan but acknowledge how power and inequity may be embedded in AI. It would be attentive to the ways GenAI can be biased and create, amplify, and spread misinformation, propaganda, disinformation, and deepfakes via invisible algorithmic manipulation. The intent here is by no means to assert that there is one way to educate students on AI literacy, rather to make a case for its importance and the importance of its connection to media literacy education. As an emerging field, more research is needed on understanding how AI literacy, media literacy, and digital citizenship is being conceptualized and implemented across K-12 and higher education globally.

AI literacy conceptualized as part of media literacy education would include learning about the potential dangers of GenAI for civic life. Given that technology companies are primarily driven by profit rather than supporting democracy and the public interest, US policymakers and educational leaders both at the federal and state level should encourage media literacy education that incorporates AI literacy and digital citizenship. Policymakers should also take up the issue of regulating AI as California has begun to do (with legislation such as S.B. 942) to ensure provenance markers and deepfake detection systems are available to users of digital media. More states

should consider mandating media literacy and AI literacy education for K-12 education and provide resources (e.g. professional development and funding) to support the implementation and effectiveness of media literacy and AI literacy efforts. Civic-minded AI literacy as part of a robust media literacy education program across K-12 and higher education is vital for a healthy democracy.

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Teaching Naked Before the Machine

Robert E. Cummings

Abstract

Author traces journey of evolving teaching strategies in response to COVID-19 Pandemic to teaching during the early days of the proliferation of generative AI. By returning to the tenets of Composition pedagogy, the author fashions a new strategy for the writing classroom of today, based on certain principles of the Composition as expressed since the 1980's. Guidance for current classroom includes emphasizing individual identity in a learning community, timely student feedback, journaling, conferencing, reflecting, evaluating curricula in real-time, and composing as much as possible in analog formats.

Keywords*: Pandemic, artificial intelligence, composition, community, journaling, conferencing, reflection*

At first, I did not understand that I was teaching before the machine. I didn't even know I was teaching naked. I was simply teaching before the virus.

I am a career teacher of composition and have been in the writing classroom off and on since 1996. I also teach and research digital writing. My experiences with generative AI as a meaningful writing tool started in May 2022 when I watched a presentation at CHI on CoAuthor, a tool developed by Mina Lee, Percy Liang, and Qian Yang. This tool was the first instance where I could see how LLMs (GPT3, at that time) could function as a true co-author for human writers. The technology was shifting under my eyes as it moved from suggesting the completion of sentences to composing entire drafts. As a writing teacher, and a digital writing researcher, I knew that nothing would be the same.

But as I look back at 2022 and think about all the changes we have engaged in our writing classrooms, it is not the arrival of AI alone that presented the greatest challenge. It was the fact that AI was arriving at the same time we were exiting the COVID-19 Pandemic. At the very time when teachers and students were learning how to come back together into a physical classroom, so too was the greatest electronic literacy disrupter of our times arriving in our writing lives. This chapter explores the impact of this confluence, and the reality of how teaching in a world with AI is not only about responding to digital affordances, but also about reconditioning the spirit of the composition classroom as a space of individual creativity, exploration, research, and reflection, and how we can best channel the legacy of our composition teaching community to meet the current challenges.

In the fall of 2022, I was—like everyone—simply trying to "do the next right thing" and teach writing to first-year students in the wake of COVID. When the virus came for our research intensive, state university in the US South, like so many other teaching and learning communities, we taught "remotely." Remote teaching turned out to be a mass of many well-intentioned teachers with still more well-intentioned students desperately pretending to teach and learn online. Few teachers in our community knew how to teach online with skill, and fewer still would have chosen

to teach online. But when the virus first emerged in the spring of 2020, the choice was to teach remotely, or not at all. So we taught remotely.

Later, we would learn that we could teach in the classroom, but only if students and teachers agreed to social distance and wear masks. The campus functioned in a state of continual suspicion, as faculty feared that students would refuse masks or simply don them improperly. Our administration removed chairs and tables from classrooms, marked spots on the floors for new seating arrangements, constructed plexiglass shields between students and teachers, and even hired students to enforce classroom mask rules. Students who did not follow the mask requirements would be removed from class and face academic discipline. Faculty all agreed that teaching with masks was the worst of all possible worlds. Except for teaching remotely.

During the pandemic, in my administrative capacity, I tried to help improve teaching and learning. Our first efforts were around resilient teaching, or designing courses so that they could be conducted by way of any given mode of instruction. The thinking was that we faculty could develop the core lesson plan in a face-to-face format, but then also add options to facilitate zoom teaching, or remote teaching. With these designs in hand, we hoped to be prepared to teach during any condition that the virus would give us: if we could teach in the classroom with masks, we would, but if the virus numbers worsened, we could pivot to teaching in a distanced format.

Many teachers and students have memories of learning during COVID. With some separation I was fortunate enough to reflect on this period with colleagues and edit a volume capturing the voices of faculty (Johinke, et al., 2023). But while emergency teaching arrangements were realistic for teaching under the erratic and deadly demands of the virus, I simply failed to see the cumulative effect it was having on my students. This all changed for me in the fall of 2022—long after the virus had subsided—when I spoke with a composition student during the early days of the semester. He had asked a question, and was participating in classroom discussion, while wearing his ear buds. We were a small class of around twenty and he seemed to have no problem indicating to all of us that he might—or might not—be participating in discussion. Later in the semester, I asked the class to not use cell phones, and most students complied. But one writer refused to surrender her phone. She readily admitted that she was simply too addicted to give it up.

While these changes in classroom decorum might not seem substantial to some, they affected me deeply. I began to understand on a new level how my students had navigated their high school education through COVID. Of course they had little faith in institutions: in high school we had relegated them to their homes with laptops and asked them to learn without any advance training or notice, ensured them no appropriate learning environment, and denied them the intramural experiences that are essential to forming social bonds and identities. And we should never forget that the political bickering and uncertainty among the adults in their lives could only underscore the idea that we adults were not in control.

Coming out of the COVID experience, I felt that my students' ability to engage each other effectively in the classroom—their abilities to learn from and with each other—had atrophied. I saw clear signs that many students were reluctant to engage with each other to discuss ideas to understand other perspectives. In many ways, their personal technology devices were constantly engaged in the classroom, providing continuous distractions of information, text conversation, and music, that were uncommon before the pandemic. I knew also that these were generalizations, and did not speak to every aspect of every student's experience. These were not independent observations based on peer-reviewed measurements: these were the signs I saw in my own classrooms. I

knew, and know, that there are many potential flaws with extending my observations and conclusions to multiple learners. However, if I based my responses on tried and true composition methodologies, then I would be shifting my class emphasis from one evidence based set of practices to another. I chose to believe that my composition training could provide answers to help my class become more useful for our current students.

Getting Started & Remembering Mentors

Prior to teaching composition in Fall 2024, I engaged in some reflective practices. In my writing and thinking, I noted the following:

- Post COVID, many students seemed more isolated.
- I am growing older, and the impact of the age gap between me and my students cannot be underestimated, but we can still teach and learn together.
- I had attempted to flatten the hierarchy of my classes in several ways over the years (writing our own textbook together) but almost nothing seemed to increase my students' sense of ownership in the class.
- Many of the digital tools we were using in the classroom (LMS, and course content developed to replace a rhetoric) felt more like obstacles to writing, rather than assets. This last point was very difficult for me to engage: I teach and I research digital writing. However, I also felt that the digital tools in our classroom – both those within and beyond my control – were creating a permanent, and alternate, reality of constant distraction that had, over time, severely diminished the quality of our face-to-face interactions.

As I reflected, I thought more about the mentors I had had in composition, and how their wisdom could be applied to this moment. These teaching mentors included people who taught me directly in the classroom, people who took the time to coach me, and people whom I never met but through their scholarship.

Patsy Hammontree (1979) worked me over like an undersized point guard in her undergraduate writing classes at the University of Tennessee. She did not write about writing: she just lived it. She taught me that none of my writing choices were above reconsideration. But because she was always, always, responding to my writing—rapidly, thoroughly, and with intensity—I knew that she believed in my work. I also knew that I had to match her writing intensity if I were to meet her expectations. Her actions told me that nothing was more important than our time together, trying to get the message right.

As a fresh Master's student at the University of Mississippi, Ben McClelland (Donovan and McClellland,1980), taught me long ago that journaling was necessary to maintain fluency and literacy in the composition classroom. I have always resisted teaching composition with journaling because it felt ancillary to the main project where I wanted writers to spend most of their time. However, I was starting to understand that my students, on the whole, had very little writing experience on a daily basis and that if they did not exercise that writing muscle before approaching a structured classroom writing, they were losing the opportunity to express themselves in a writing environment with very few drawbacks.

The scholarship of Donald Murray (1979) was one of the first voices in composition wherein I was able to identify my own practices. Student teacher conferencing was a natural environment for me in teaching writing, and although I have never taken the practice to the lengths he did, I knew that the connections I could help writers make in these conferences were essential to the writing class. Additionally, I also knew that the project of increasing student autonomy could be furthered by student-teacher conferences. At first this notion seems odd, since the power imbalance between teacher and student are laid bare in a one-on-one meeting, but if we can repeat conferences, we can help students to create their own agenda for the conferences and rebalance power dynamics toward themselves.

Christy Desmet insisted that I ruthlessly discard anything that is not working in the classroom (Finlay, W., et al., 2004). I could hear her saying "If you're not sure why something is in your class, rip it out. Now." She insisted that I continually evaluate each aspect of the class: where are students energized? What gets them writing? How does each activity further *your* writing development? Because if it is not interesting to you, it certainly won't be interesting to them.

Nancy Sommers (1982) taught me to give everyone a chance to write about something important to them. Start with writing prompts that allow each person to explore topics that are naturally appealing and appropriate and then layer ways to build on that. Further, when you are responding to writing, choose a lesson. If you approach responding as if you are grading a test, and feeling required to mark every "error" you may discover, you will overwhelm the writers, and yourself.

Although Peter Elbow was not directly my mentor, he was a source of continuing inspiration. While my partner taught in the Composition program with Elbow and Pat Belanoff at UMass, I was teaching at another program in New Hampshire. The program trainings and handouts she brought home were pure gold for me as I developed my own writing pedagogy. Elbow's creator/editor framing has stayed with me for years, and helped me to encourage my writers to respect and explore their creativity before jumping to edit their writing. His looping exercises have always been in my back pocket as a tool kit for helping writers explore their unconscious thoughts. In preparing this course, I looked specifically to his textbook *A Community of Writers* (Elbow and Belanoff, 2000).

Kathi Yancey—reflect (1998; 2016). All of our work in writing is about building the muscle to reflect on our actions in a systematic, probing, and curious manner. Allowing students to build a habit of reflection not only instills curiosity about their internal processes, but it also helps them build a sense of ownership in writing as it is attached to a continuous voice.

After reflecting on where I saw my students, and listening to the mentors in my head, I started to lay down some new principles for my new composition classroom that would enable my drive to build community in the classroom. I saw this drive for community as essential in a time where generative AI was at every turn. To combat these effects I—like many writing teachers—was turning more and more to in-class writing. But as we spent more time writing together in class, rather than outside of class, it felt less like we were "running away" from AI and more that we were returning to the foundations of composition.

Adjusting My Methods

The most important principle was that each and every activity in the classroom had to further our writing skills. Therefore, the classroom time would be built around writing. Secondly, we would learn with and from each other by engaging each other directly in our classroom. We would

respond to the work of fellow writers at all levels: exploratory drafts, mid-process drafts, and final revisions. We would be asked to speak about our projects and reflect on how we felt about them.

I also wished to continue flattening the hierarchy and turning over more and more of class control to my writers. This can be a challenge in a classroom dominated by first-semester, first-year students. When I had tried this previously, some students felt that I was evading my responsibilities as the "expert": they did not want their fellow students to read their writing but instead wished to rely on me alone. How could I build community among these writers and teach them to value the input of others?

With these notions and questions in mind, I set down these principles, and put them in the course description for my first-semester composition course, a traditional introduction to college writing:

> This course is organized around several principles.
>
> 1. Community is paramount. We can learn alone, but, writing is best learned in community. This is why when we are together for class we emphasize presence of others to focus on writing, learning from each other by reading, listening, speaking, writing, and practicing mindfulness.
> 2. This is a learning community. This concept means that students and instructor partner to make the rules for how the class will operate, in keeping with the UM Creed.
> 3. You get what you give. If you come to each class prepared to listen, think, speak, write, and respond, you will leave this semester with tremendous growth in your literacy skills.

In reviewing these principles today, I can see that several aspects were aspirational: first-semester freshmen were not really prepared to make rules for the class (not without more substantial investment from me) and I did not spend much time on practicing mindfulness. However, the ideas of community and sharing energy were evident in the workshop concepts embedded in this course structure. Students knew that they were entering a classroom where they were going to share their ideas in writing as well as share and receive feedback on those ideas.

And to enact these principles, I created the following practices for our course, laid out in our syllabus:

> 1. Because this is a learning community, you will have a role in determining how the class will operate from day to day. As instructor, I will use my best judgement to select assignments and classroom exercises to help you reach the course learning goals, but we will spend the first part of the semester learning about each other and determining the rules for how we will interact.

This was my effort to establish a learning community, and to ask students to more clearly control their role in the course. To create a learning community, our first project centered on learning about our classmates and then also introducing them to others. The strengths of this approach included the introduction of face-to-face communication in making knowledge, as well as centering other learners as subjects. Students were asked to talk about their home communities and their motivation for attending the University, which meant that they were immediate experts on the topics of this first paper. By switching roles from interviewer to interviewee, students also learned what content was needed to make for an effective paper topic. Plus, students genuinely enjoyed learning more about each other.

The shortcomings of this approach included a lack of clear guidance from me on the roles that they would assume in a learning community. I envisioned a class where they would play a role in determining our writing subjects. I did ask students to envision how they would work together as a learning community, and to explicitly report on this in their first project. However, I failed to put these necessary scaffolding in place for such a major shift away from the traditional learning environment. Plus, having just met one another, and having almost no experience working together, writers struggled to find their footing. In the end, the major accomplishment was starting the course by learning more about each other.

2. This course will emphasize face-to-face interactions. Each class will function as a workshop, where you will prepare writing and review the writing of your classmates. Because we emphasize our classroom interactions, we will minimize distractions. *This will mean no cellphones, no ear buds, no air pods, no iPods, no laptops, and no personal electronic devices will be allowed in class.*

As mentioned earlier, prioritizing our classroom interactions was to be a core tenet in the class. I wanted writers to envision the classroom time together as carved out from the stream of our otherwise electronic lives, dominated by screens in our hand and plugs in our ear canals. The first step to creating this place was to separate ourselves from the agenda of our electronic devices. Of course, I also adhered to these rules. I knew that removing our electronic devices would be a necessary, but not sufficient condition, to establish a writing community. Later in the semester I would realize that I had more work to do in order to build an effective sense of community among writers.

3. In each class, we will write short assignments that will feed into your larger projects. Also in (most) classes, you will respond to the writing of others. You will also write in-class reflections on a daily basis. *This means that for each class, you will want to have pen and paper.*

This remained the starting point for our class sessions. This first semester writing course asked students to engage four major projects and a reflective portfolio: (1) Introducing my writing community, (2) Where I am from, (3) Where I am going, and (4) What I believe. Each of these projects were further divided into introductions, conclusions, and at least three subparts. For instance, in the project "Where I'm from," class sessions focused on culling childhood sensory memories of their homes and neighborhoods, writing personal reflections that conveyed the unique characteristics of their hometown, and quantitative data that described the population, industry, geography, and culture of the place. During a class session, students would be given prompts to start addressing one of these topics that would work their way into the larger project. Writing in teams and discussion groups, the in-class work alternated between conversation and sparking thoughts on the topics, followed by time to write down first responses and start forming exploratory ideas. If the topic required outside research – such as independent data about the hometown – then students would gather some of the research before coming to class, or start their writing on the topic and integrate the outside information once they took the classroom drafts home.

4. All writing in class will be composed on paper. On most days, you will take your handwritten paper home with you and produce a word-processed document. Sometimes the

word-processed document will be verbatim of what you wrote in class, but most times you will expand on the classroom document when you are at your desk outside of class.

One issue about this aspect of the class arose quickly: how would I provide accommodations for students who were unable to write by hand? Students can have legitimate concerns about performing handwriting in the classrooms. Recognized conditions include dysgraphia, where their handwriting, and/or their ability to produce writing quickly, are impaired (Medwell, 2007). In addition, students who have been diagnosed with dyslexia can also struggle to produce legible handwriting in timed circumstances (Berninger, et al., 2008). Some researchers have gone as far as to argue that proper handwriting instruction can improve other literacy education outcomes (Young, et al., 2015). But the condition of dysgraphia and dyslexia—and many others—are protected disabilities that could require accommodations. The most common accommodation for handwriting issues in the classroom can be assistive technologies, including speech recognition software (Nelson & Reynolds, 2015). But since insisting on handwriting in the classroom was also augmented by follow up writing outside of the classroom, I relied on students to supplement their classroom efforts with external follow up. I also relied on students to self-identify. As a teacher, I realize that if a student has a learning difference, building the class on an activity that incorporates additional challenges for them only increases pressure on them needlessly. In future versions of the class I will increase outreach to help students identify if they have handwriting struggles. To date, no students have spoken to me about handwriting difficulties. Reliance on handwriting in my classroom was not originally conceived as an AI avoidance strategy, though many faculty are now adopting that approach (Alonso, 2025).

5. You will bring both the original paper and the word-processed document back to the following class. I will then collect your writing and respond to it. You will receive credit for attending the previous class when you submit your work. This also means that you will need the ability to regularly print out your work on paper.

This aspect of the new class was the biggest burden for my students. Printing out documents regularly, sometimes three times a week, was time consuming and costly. In our current learning environment, students are accustomed to submitting documents electronically via the LMS. This cost almost nothing and also offered the additional flexibility of allowing drafting right up until the deadline. Indeed, this was exactly how my class operated previously.

Shifting to a requirement for printing documents created both additional cost and inconvenience for students. As to the cost, I was very aware that if students had the means to bring a printer to their residence hall on campus, they would suffer very little cost increase. And conversely my writers without those means would face an additional cost for my decision to require printed documents. Here I was clearly adding to the income inequality burden of attending college. But during this first iteration of the course, I required no textbooks. Therefore, I told myself (and my students) that they were saving at least $90 (including the cost of printing documents) since none of the texts required for most first-year composition would be needed in my course.

In addition, my requirement to bring printed drafts to class also created a time and labor burden. It is admittedly more inconvenient to print out a document and carry it to class than to simply upload an electronic version of the same document into our LMS. Additionally, my late night writers would be unable to submit the document until they arrived in class. For these writers, it might be necessary to print out the documents in the writing center, which opened at 07:30 AM

just down the hall from our classroom. In sum, the requirement to print documents introduced a new workflow that was out of step with most other classes which allowed for digital uploads.

Many colleagues have asked how would I ensure that once a draft was taken home, students would not replace their text with AI-generated text? While there is no absolute insurance policy to prohibit writers from substituting generative AI sludge for their own prose, this course gave me at least two comforts: the genre of our writing topics and the drafting format. As noted previously, most of the focus in the writing topics involved students exploring their classmate interactions, their past experiences, their current study plans, and their personal beliefs. Writers would start the topics with handwritten thoughts in the classroom and then revise them on a word processor before printing them out. It is indeed possible that students would use generative AI during the editing process, especially if they were looking for outside sources to bolster their personal memories or beliefs. But since students submitted both handwritten and revised, printed documents, I was able to read their in-class work and their out-of-class work, and compare the two versions. This allowed me to see if outside voices were dominating or radically shifting the inertia of their thinking.

6. You cannot submit work for credit from a class that you did not attend. You can certainly complete that writing assignment as part of reaching the goal of completing the larger project, but, it will not count toward your participation grade.

Attendance and participation have long been a principle in my composition courses. In this version of the course, participation was defined as arriving at class with your work completed. If the course was to function as a workshop, or a space where writers actively viewed and responded to the work of other writers, then it was essential that writers show up with that work. But participation grading in college courses is a practice that is fraught with opportunities for bias and subjectivity. As John Bean and Dean Peterson write "most professors determine participation grades impressionistically using class participation largely as a fudge factor in computing final course grades" (p. 33). Further, they quote Jacobs and Chase (1992) to categorize the most frequent problems with participation grading:

> [P]rofessors generally don't provide instruction on how to improve participation; interpretation of student behavior is difficult and subjective; participation often depends on a student's personality thus disadvantaging shy or introverted students; record-keeping is problematic: participation scores for a given individual are hard to justify if challenged. (p. 195)

Given my awareness of these problems, based not only on the literature but also years of experience with grade appeals and teaching conferences, I was indeed hesitant to include any form of participation grading in my course.

But I wanted to emphasize the importance of participating in a writing workshop, and arriving for each class prepared to share your writing and to read the writing of others. If students do not arrive at class with their writing, then it is simply impossible to operate a writing workshop in a composition classroom.

The writing workshop model is borrowed from our colleague in teaching creative writing, where it remains a staple in their pedagogy—though not without substantial debate. In his chapter "Its fine, I gess': Problems with the Workshop Model in College Composition Courses" writer Colin Irvine works through many of the benefits and disadvantages of importing this practice to

the composition class. Irvine (2010) notes that the most common failures of the workshop model include:

> passive but important gestures and comments as coming to class without a draft on the day set aside for peer review, arriving with an incomplete or insufficient essay, leading into activity by distancing one's self from the work ('Here's my paper. It's terrible […]'.) providing platitudes and empty comments in place of constructive feedback ("This is a good paper . . .' 'Maybe add some sources . . .'), focusing on surface level issues rather than holistic ones [. . .] and, in the end, turning to the teacher after the peer review feedback for "real" feedback. (p. 131)

Although Irvine includes many reasons to support the workshop model in the composition class, I think it is important to address how our class avoided many of these potential setbacks.

First, note that the writing workshop Irvine describes is circa 2010. At this point in the development of personal technology, smart phones were available, but not quite as common as they are today: roughly 14% of the US population had smartphones in 2010, though college students might have had a higher percentage (PR Newswire, 2010). So if a teacher wanted to teach a workshop model in 2010 with less technology, texting on flip phones might have been the main distraction, whereas in 2025 the number of electronic distractions had multiplied greatly due to convenient internet usage on a cell phone.

While my class did suffer from students arriving without completed work, it was not a major issue. In fact, since a student who arrived in class without a draft could not receive participation credit, I took it as a sign of engagement that a number of students arrived at 08:00 AM without a draft, knowing that they would receive no credit, and did so anyway. Our workshops did suffer from poor quality in-class comments, however, they were not predominant for several reasons. First, students modeled effective feedback early in the class through specific in-class sessions. When I asked students to comment on the work of a peer, they were also given specific questions for use in evaluating that writing. These questions reinforced the purpose of the assignment, and in each class they also served as a basis for expressing a writer's own challenges in drafting the assignment, providing a natural transition to a follow-on discussion. However, I will agree that last problem identified by Irvine—being too reliant on my feedback as the teacher of the classroom—remained a persistent problem. Encouraging first semester freshmen to find and exercise autonomy remains a persistent challenge.

7. The overall structure of the course is that we work each day on smaller writing tasks that each writer can assemble into a larger project. If you participate on a daily basis, you should never be in a place where you will be trying to write 1,000 words the night before the project is due.

For writing teachers, there is nothing new here. While this articulation is little more than a repurposing of process writing theory (Flower and Hayes 1981; Perl, ed., 1994; Foster 2007; Faigley 1986). However, as we will see in the student comments below, even though I believed that all of our in-class activities were focused on contributing to our final drafts, not all students agreed.

8. Because I will also not be using technology during our class meetings, this class will not use Blackboard (Bb requires 2FA, which would require me to use my phone to log in). Therefore, all of our communications outside of class will be over email. *It is imperative that you check your email daily.*

Here, too, I did not foresee the most mentioned impact of removing the LMS from the class: students uniformly wanted to be able to access their grades on the LMS. I knew that my students had been likely using some form of LMS since middle school. I knew also that they were accustomed to seeing grade information almost instantly. My plan to accommodate grade viewing was to make sure that at the end of each project (five times during the semester) students would receive their current course grade along with their project grade. I will admit, however, that I did not always hit that mark, and at least twice I did not include the current course grade with the project grade (though students could calculate their course grade by using the syllabus and their returned projects). In the next iteration of the course, I will ensure that I return completed projects with both their project grades and their current course grades.

9. There are no required textbooks for this class. There will be handouts, and I will distribute most readings during class. Again, you will need to routinely print documents, and to staple them. (Printing is offered in the library and the writing centers.) So bring a stapler!

I do believe that students were able to save money under this configuration. However, I struggled without a rhetoric, and found using online sites a poor comparison to a true handbook, e.g., *A Writer's Reference.*

10. Last, please know that you don't have to be an extrovert to do well in this class. Introverts can do just fine. There will be times when you need to speak, but they are not excessive. Also, I will respect all learning differences, so if you have an accommodation request, please let me know and I will work with you to make sure that you can succeed in our class.

While the class was based on a lot of speaking and listening, it was not always before the entire class. Students spent much of their time writing alone, working in pairs, and working in small groups, before reporting back as a class. And although I did not encounter any reported issues with handwriting, it is always possible that students did struggle and did not consult me about these challenges.

Results

My fall 2024 section of our first-semester, first-year course (Writing 101) designed to prepare students for a range of higher education writing contexts had 20 enrolled students. That semester, our Department of Writing and Rhetoric taught 2,983 students Writing 101 across 67 sections in both face-to-face and online formats. The targeted cap on these sections is 21 students. In practice, during fall semester 2024 those 67 sections of writing 101 contained a maximum of 21 students, a median of 19 students, and a mode 20 students.

The most direct measure I have of the success or failure of the approach described above is the student evaluations of teaching. While ethical considerations prevent me from describing recorded student opinions of the class that would reveal identities, I can describe in a general way the themes identified in the student evaluation report.

Our student evaluation of teaching questionnaire asks 11 multiple choice questions and four open-response questions (there is a set of rotating special interest questions I exclude from consideration here). The first ten multiple choice questions are generic and used in most classes at the university, regardless of subject or class size. These questions address student impressions of:

- Overall amount of learning
- Effort put forth by students
- The effectiveness of course activities for learning
- Change in appreciation of subject matter
- Accuracy of assessments in measuring learning
- Usefulness of faculty feedback for student learning
- Faculty responsiveness
- Faculty availability beyond classroom
- Usefulness of course materials
- Challenge of this course, when compared to other courses of the same level.

Unfortunately, because the institution had revised our student teaching of evaluation in fall 2024, I cannot compare scores on these 10 questions to prior versions of Writing 101 taught by me. I can state that the average score was above 4.0 in each category (on a five-point scale) and therefore there is not a significant opportunity for investigation in this inquiry.

The eleventh multiple choice question is “How would you rate the instructor’s overall effectiveness in this course?" and within our system is considered the best overall marker of how students feel about an instructor’s performance. Unlike our other multiple-choice questions, this question had been carried over from prior versions of the student evaluation of teaching form, making it possible to compare the fall 2024 section results to prior Writing 101 courses I had taught. For the modified section of Writing 101 I taught in fall 2024, I received the lowest score I had received for Writing 101 since 2012, down roughly a tenth of a point on a five-point scale. Although the score was not significantly lower than other scores I had received for Writing 101, the downward trend—after placing so much effort into revising the course and providing timely feedback, definitely got my attention.

So I turned my focus to our four open response questions to learn more about student reactions to the course. The four open response questions in fall 2024 were:

- What are some positive characteristics or strengths of the course and/or instructor?
- What are some negative characteristics or weaknesses of the course and/or instructor?
- What do you want your instructor to know about your experience in this class?
- What do you want other students to know about your experience in this class?

In summary, here is what I can offer about student comments to this revised version of the class. In terms of positive characteristics, students mentioned that the instructor was positive, gave valuable feedback, and that working on paper allowed them to spend time away from computers.

Students also mentioned that they enjoyed working in groups, and that they felt that their writing skills improved.

Negative characteristics included having to print documents, not being able to see grades in the LMS, and a feeling that in-class activities were not always helpful for the overall project. Several students also mentioned the need for "work days."

In terms of what students wanted the instructor to know about the course, many mentioned that they learned a lot and felt that the class had made writing "easy." Here too students mentioned a desire for "work days" in class where they could use their laptops. Additionally, these writers wanted other students to know that the class was well-structured, positive, helpful for your writing process, and straight to the point. And—worth noting—our class met at 08:00 AM, which was not popular!

Overall, student evaluations indicated that the class was useful and beneficial for developing writing skills. Students did not spend much, if any time, commenting on the hallmarks of this class—the fact that the technology for the course was moved out of the classroom and that while in the classroom no personal technology was used and student interaction was emphasized.

Relevant Literature

At some point near the middle of the semester, a fellow faculty member reached out to me at a department meeting and said, "I heard you were teaching naked; tell me about your class!" I must confess, I had not then read *Teaching Naked* by José Antonio Bowen (2012). I wish I had. Although Bowen's subtitle is "How moving technology out of your classroom will improve student learning," Bowen does not argue to remove all technology from classrooms; instead he intends this phrase in the literal sense. He wishes for faculty to make the physical classroom a zone free from technology and then to actively use technology outside of the classroom to reinforce learning and build community.

Bowen (2012) is up front about his thesis when he writes in his preface:

> technology can be harnessed to enhance the widely desired goals of increased student engagement and faculty-student interaction but it is most powerfully used outside of the classroom as a way to increase naked, non-technological interaction with students inside of the classroom. (p. x)

Bowen is writing in 2012, so at that point he is not addressing generative AI (he does this later with C. Edward Watson in 2024). But although I was ignorant of his work, my classroom redesign was in keeping with his premises. Bowen's later chapters articulate more ideas about an active learning classroom. While focusing mainly on content courses, the composition course I redesigned was in keeping with Bowen's articulation of active learning: "Students learn by doing…Students learn from each other" (pp. 192-3). Bowen's use of classroom-expelled technology in 2012 was largely to support and reinforce classroom learning by way of justifying assignments, and explaining to student the value of the work. Bowen's advice is never too far from the imagined student asking "Why do we need to do this?" In fact, in *Teaching with AI*, he and Watson provide a chart of implied student motivational questions and strategies for addressing them (pp. 187-188).

But when a composition classroom is redesigned for a world with generative AI, and use of technology has been removed from the classroom, then we have also placed students' engagement with AI outside of the classroom. And here we encounter the other side of the balanced

scales, or the dipping of the see-saw. Students in this revised composition class start smaller writing project in class by answering directed writing prompts with shorter questions, and then discussing formative ideas with other students. Then they take these kernels of thought home with them to expand them and produce them on the printed page. Will they use generative AI when they are revising this work outside of the classroom? Most certainly. Therefore, it is incumbent on the composition teacher to engage the best practices of generative AI usage during the classroom time. Doing so will subtract from direct classroom writing, but, if we fail to articulate how we wish for students to use and cite generative AI, then we leave them to make up the rules themselves.

If we have banished technology from the classroom, how do we model the best usage of AI? How do we show students the potential pitfalls of generative AI usage, including relying on "hallucinations," plagiarism, losing their voices, bias, and more? For my class, I addressed this by using the DEER framework (Cummings, et al., 2024). In this approach our class discusses how we might use generative AI in an assignment, and for what purposes we would rely on the technology—pre-writing, drafting, finding counter arguments, identifying additional sources, etc. Once we have decided on the specific purpose of the AI tool , we then evaluate what AI tools we might want to use: what are the relative strengths and weaknesses of these tools? Then, we hopefully arrive at a consensus on both the writing purpose for introducing an AI tool as well as the tool we will use. We review the methods for citing the tool (in general, we use the latest guidance from APA). Last, we also reflect on the use of that tool during unit-level reflective assignments. If students wish to deviate from this plan and use tools they have identified themselves, they are able to do so, as long as they are providing appropriate references.

Has this approach been perfect? And can I apply it with absolutely no technology in the classroom? No. There are always writers who seek to have AI do their thinking for them. And there is not a meaningful way to introduce an AI tool without using audiovisual technology in the classroom. However, by examining the potential generative AI tools together as a class, these tools remain a technique and not a strategy (Bowen 2012, xiv). Also, the students are introduced to the necessity of identifying and evaluating AI tools before deploying them. Last, we can learn and practice the methods for citation with generative AI tools—still a very imprecise art.

In sum, while I think that teaching naked before the machine means that we need to think very carefully about how teachers of composition utilize classroom time, I believe that the reflection demanded by teaching in a time of AI is consistent with the approach intentional engagement with classroom technology (Bruff, 2019).

Conclusion

What happens with too much nakedness? My cousins lived in Portland, Oregon, where a "naked bike ride" is held on an annual basis (Plante 2025). Perhaps a prude, I asked in a phone call over my barely stifled laughter if they had planned on participating. I could not understand why grown adults would want to ride around naked on bicycles. (I later learned that the event was conceived as a way to protest our reliance on carbon emissions.) My cousin's husband, who was initially enthusiastic about the idea, ultimately conceded that as a prominent academic physician in the community (and a man in his early sixties) none of his students or patients wished to see him pushing pedals in the nude.

It amazed me to think of where ego could take otherwise sober and wise people. And yet, when thinking back on this class, I must admit that my own ego played a key role in undermining my goal of helping students find their own voices. I was disappointed that writers in this class did

not exercise greater autonomy. I specifically structured the assignments of this course so that students could explore their own histories, their biographies, their hopes and values, and their goals, while placing those discussions in context with other voices.

But, with the best of intentions, I also responded to student writing like never before in my teaching career. I read and responded to every jot and tittle my students wrote in this class. Before students submitted a final draft, they composed three to four partial essays, and two complete essays to which I responded. On most every evening of the semester, I was reading student writing that I returned to students in 24–48 hours. For this one class over the length of the semester I read and responded to roughly 320 drafts and 100 final documents. Additionally, I held 21 student-teacher conferences. It was some of the most intense and timely responding that I have offered in my teaching career.

Why did I respond so much, and so often? I have long believed that a truth in writing programs is that writers need frequent and caring feedback. The feedback needs to be frequent so that the advice is received by the writer before too much time passes from the event of composing. The origins of responding methodology in composition studies are long and deep, but Steven Schreiner got it right for me when he framed it this way: "[t]he students I began teaching were to be treated as writers, entitled to self-expression, capable of inspiring and being inspired, and interested in writing about themselves for an audience larger than their teacher" (p.86). Simply put, as I writer, I want my feedback to be fast and accurate. I need it to be fast so that I can apply the advice while I can still recall the writerly choices I was facing at the moment of composing; writing feedback has a very short shelf life.

When we are talking about "nakedness" in the classroom, it is, of course, our own nakedness we are discussing. Even though we are discussing nakedness as an analogy for making intentional decisions about the use of technology in the writing classroom and reducing the use of technology generally, the analogy remains focused on the teacher. I will not argue for mutual nakedness, but I must acknowledge that our students have very informed and considered decisions about their use and (over)reliance on technology. Starting next semester, I hope to bring them into the conversation about how we build our mutual course writing practices, shaped by their own understandings of the proper role on technology in the classroom.

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Towards Driving Systemic Change in Higher Education with Generative AI: What Have We Learned Thus Far? [1]

Alexandros Papaspyridis & Simon Bates[2]

Abstract

This article explores the potential of generative artificial intelligence (genAI) to catalyse innovation in higher education, emphasizing the current state of adoption together with systemic changes needed for successful integration. Despite the historical slow adoption of technological innovations within Higher Education, the sudden emergence of genAI tools like ChatGPT has significantly challenged traditional teaching, learning, and assessment paradigms. Through a survey of early adopters and the introduction of a novel Capability Maturity Model, this study identifies key challenges and opportunities in embedding genAI, focusing on academic integrity, pedagogical innovation, and the evolving roles of faculty and students. Institutions are encouraged to foster a culture of experimentation and continuous learning, supported by a framework for adoption and use. The active involvement of students as stakeholders and co-creators in the adoption process is emphasized to realize potential benefits. We suggest that a balanced approach, combining top-down strategic leadership with grassroots initiatives, is critical to harnessing genAI's full potential in enhancing educational quality. The article contributes to the ongoing discourse on digital transformation in higher education by outlining actionable pathways for institutions navigating the complexities of integrating genAI tools.

Keywords: *higher education, generative AI, institutional strategy, technology adoption, capability maturity model, student involvement*

Challenges to Traditional HEI Innovation in T&L

When we consider technology innovation in higher education, such as the Personal Computer (PC) or the Internet and the World Wide Web (WWW) and the combination of the two together

1. The authors would like to thank the staff of the APRU Secretariat under the leadership of Prof. Thomas Schneider and acknowledge their help in distributing the survey to its members.

2. The authors have used genAI tools (ChatGPT, Claude) in this paper as follows: to categorize and summarize emerging themes in the free text responses in the surveys; to provide feedback on the manuscript using the editors' suggestions; to identify and summarize specific topics on the references; to create and import references from URLs to Microsoft Word; and, to create a chart of key survey results. All final decisions and content remain the authors' responsibility.

with ubiquitous mobile broadband connectivity, both technological progress and technology adoption have been slow taking many years to be adopted by most of the stakeholders in Higher Education Institutions (HEIs). Research has found that "the average time between adoption of an innovation by the first institution and its adoption by half of them was more than 25 years" (Siegfried, Getz, & Anderson, 1995).

Generative AI (hence genAI), along with the steam engine, the internal combustion engine, electrification, electric motors, as well as semiconductors, personal computers, and the Internet are examples of General Purpose Technologies (GPTs) which "are characterized by pervasiveness (they are used as inputs by many downstream sectors), inherent potential for technical improvements, and innovational complementarities, meaning that the productivity of R&D in downstream sectors increases as a consequence of innovation in the GPT" (Bresnahan & Trajtenberg, 1992). However, several factors suggest that genAI adoption will proceed faster than previous technologies. Unlike hardware-based innovations requiring significant capital investment, such as building electricity or railway networks, genAI rely on cloud infrastructure personal devices, such as laptops or smartphones and Internet connectivity that students and faculty already have at their disposal. This led to ChatGPT reaching 100 million monthly active users in just 2 months (CIO Daily Updates, 2023) which made it the fastest-growing consumer app.

Most critically, both faculty and students gained access simultaneously, removing the supply bottlenecks that historically slowed adoption. Current data supports this acceleration: 92% of UK undergraduates now use AI, and 86% of education organizations report the highest AI adoption rates among all industries (Josh Freeman, 2025). Students were also early Internet adopters (74% used internet 4+ hours/week by 2008) (Jones, Johnson–Yale, Millermaier, & Pérez, 2009), but institutional change remained slow as adoption alone is a necessary but not sufficient condition for systemic transformation.

Setting aside (but not underestimating the importance of) digital equity issues, most HEI stakeholders now have access to a personal computer, and access to email and the World Wide Web. The impact in teaching & learning has been in two broad domains: wide availability of *online multimedia teaching material* including high quality and free of charge ones, such as the ones offered by Massively Open Online Course (MOOC) platforms and *personal work productivity*, such as Word Processors, and email software clients. MOOCs introduced the promise of much expanded access to Higher Education; however, they have not been integrated in mainstream Teaching and Learning in HEIs, nor expanded access through hybrid education modes.

And while we moved from the blackboard to the overhead and/or slide projector and now to presentation software, such as PowerPoint and Learning Management Systems, the teaching process remains largely the same, the lecture and the presentation content, while assessment approaches have not substantially changed either.

Siegfried et al (ibid) attribute the slow adoption of technological innovation to HEIs being "insulated from many competitive pressures" and the "the academic tradition of collegial decision making". Systemic change in higher education refers to comprehensive transformations that affect the entire institution or system rather than just isolated programs or initiatives. Research indicates that "the system requires powerful reasons for change" (İpek & Karaman, 2021) and what is different now is that there are three key factors creating a perfect storm. First, widespread adoption by students, faculty and the workplace; second, disruption of the assessment process; and third, the student adoption of AI tools in the Teaching and Learning process. Recently, Anthropic introduced Claude for Education (Introducing Claude for Education, 2025) with Learning Mode that

guides students' reasoning process rather than providing answers, while OpenAI introduced study mode (Introducing study mode, 2025) which guides students step-by-step.

While there have been longstanding barriers to innovation in higher education which paint the background context on the canvas of system change in HEIs, more recent events fill the foreground, notably the disruption to teaching and learning following the one caused by the global COVID-19 pandemic.

Prior context: What Brought Us Here

In November 2022, when ChatGPT (GPT3.5) became readily available for large-scale public use, HEIs were emerging from a period of significant change, challenge and disruption brought about by the global COVID-19 pandemic. Over a period lasting two or more academic years starting in March 2020, institutions were required to very rapidly adopt technological and pedagogical change at scale, with varying levels of preparedness and success. The initial "pivot" to emergency remote instruction was characterized by doing what was possible in very short timeframes to ensure continuity of learning for students. This was subsequently replaced by a period of largely, if not fully, online instruction and a direct transfer of existing methods to a new modality. Not only were new skills and proficiency in new tools for presentation, collaboration and discussion needed (such as Zoom and MS Teams), design, delivery and assessment of courses needed to be re-imagined in a modality far different from that for which most of them were originally designed.

Challenges were significant for both faculty and students and distributed unevenly across different groups. Learning support staff mobilized to offer pedagogical and technological support at a scale at which few of their units were resourced to offer. Studies of the impact on student learning indicated that online learning during the pandemic had both positive and negative effects on students' learning experiences. On the one hand, it allowed for greater flexibility and autonomy, but on the other hand, it also led to feelings of isolation and disconnection from peers (Pokhrel & Chhetri, 2021). Learning achievement is not simply driven by cognitive processes but is also heavily influenced by affective components such as motivation, resilience, well-being and a sense of belonging. Similar studies of school students found that students' mental health and overall well-being declined significantly during the pandemic, which negatively impacted their academic performance. The study also highlighted the importance of social support from family and friends in maintaining students' emotional resilience (Cortés-Albornoz, Ramírez-Guerrero, García-Guáqueta, Vélez-Van-Meerbeke, & Talero-Gutiérrez, 2023).

As HEIs emerged from the disruptions brought about by the pandemic, into a state of "new normal" for the sector, it is clear that the predominant lasting changes have been those of evolution, not revolution. Most institutions reverted to in-person instruction and assessments, with added blended or hybrid elements to capture some of the affordances of online. The changes, overall, can be characterized as "additions to" rather than significant "re-modelling of." At the same time, there was a clear sense of a "long-tail effect" of COVID-19, whether evidenced through concerns around student engagement and participation or faculty appetite for further innovation and change. It was into this post-COVID environment that ChatGPT was released.

The Generative AI Disruption to HEIs

The release of OpenAI's ChatGPT in November 2022 catalysed adoption patterns unprecedented in higher education history. By 2025, 92% of UK undergraduates report using AI tools, with 88% incorporating genAI into assessments—a 26 percentage point increase within just twelve months (Josh Freeman, 2025). Multi-institutional research across 19 universities confirms this

rapid integration, finding "experimentation with generative AI is widespread, from those who are responding to keep up with their students, to those who are genuinely excited about how AI might positively transform teaching, learning, and research" (Baytas & Ruediger, 2025).

Primary concerns from the academic community centred around the threats posed by these tools to the integrity of assessments, even though early indicators showed that students leveraged this much more broadly (Cu & Hochman, 2023). These initial concerns around academic integrity have generated wide-ranging debates around potential solutions to the problem, from more effective policing writing with detection tools, redesigning assessments to either mitigate or embrace the tools, and reconceptualizing what plagiarism actually is in a world where AI-capability is increasingly built into the majority of digital tools in widespread use. There is an ever-increasing number of tools claiming to be able to reliably and accurately detect AI-generated text, though many developer and vendor claims do not live up to close scrutiny (Weber-Wulff, et al., 2023) when rigorously tested, and are further undermined when simple obfuscation techniques are used. Thus, the early dialogue around developing use of genAI tools was framed negatively: issues of plagiarism, scope for rampant misconduct and the imperative for detection dominated the emerging discourse.

As an alternative approach to detection, assessment redesign is a call to action for HEIs to fundamentally consider how they construct the opportunities for students to demonstrate achievement and mastery of intended learning outcomes, whether that is through mitigating AI use, or ways to leverage genAI in assessment design. Institutional teaching and learning centres are focal points for sourcing, curating and disseminating how to put different approaches into practice (UBC, 2024). Finally, scholars working at the interface of "AI and AI"—artificial intelligence and how it relates to academic integrity—have suggested that we need a different conceptualization of what plagiarism actually means for writing in an age of artificial intelligence, where writing will increasingly be a human-AI hybrid (Eaton, 2021).

Many institutions formed working groups, committees or task forces to create institutional position statements, principles and guidelines around the balance of opportunity and risks. Collation and curation of these shows many key similarities (HESA, 2024). Key themes that are universally present include emphasizing the importance of academic honesty, pedagogical integrations, ethical use and the need for faculty and student training and support. Many institutions have supported innovation and pilot studies into ways to incorporate genAI tools into teaching and learning, capturing case studies of promising practice and experimentation. Our own involvement with the Association of Pacific Rim Universities (APRU) project to explore genAI's impact on Higher Education is surfacing individual and institutional approaches. Bringing together 60 institutions from across the Pacific Rim region, it has also highlighted the importance of context and culture at many scales: regional / geographical, institutional and disciplinary.

Issues such as AI-generated misinformation, copyright infringement, and the potential for biased outputs have led to calls for more robust ethical guidelines and regulatory oversight. HEI academic governance and pedagogical innovation processes generally operate across much slower timescales than these advances. We return to this issue later in this article when we consider adoption pathways.

What is the genAI technology that we should be thinking about?

The pace of change in this space represents a significant challenge to HEIs. The past thirty months have seen significant enhancements across many dimensions. Looking forward to understanding the changes that will be coming, it is best to understand the progress that has been made and some of the issues that are under debate.

Since ChatGPT appeared in November 2022, there has been significant evolution in Large Language Model (LLM) technology. As of the time of writing, and with less than 3 years since LLMs came into the limelight, we now have LLMs offered by multiple technology vendors, which now differentiate themselves in terms of operational characteristics mainly on:

- Task Performance, as captured by several tests that have emerged, such as MMLU (Hendrycks, et al., 2021) or the LMSYS Chatbot Arena Leaderboard (Chat with Open Large Language Models, n.d.), (Chiang, et al., 2024), (BRACAI, 2024). GPT-3.5 scored approximately 70% on the MMLU, while the top 7 models now score between 83.7% and 88.7% (BRACAI, 2024)
- Multimodal Capability, to handle beyond text, images, video, speech (listening and talking), which expands user interaction modality beyond text and allowing a more seamless exchange.
- Multilingual Capability that allows communications across different languages.
- Size of context window**,** which refers to the amount of data that the LLM will take as input from the user to respond to a query. A large context window allows the user to have several documents as input. Gemini 1.5 Pro has a 2 million token context window that allows a complete collection of papers to be input to respond to a query.
- Latency and Throughput**:** the original models would produce output at a rate that was reminiscent of teletype machines, while now we have much faster output.
- Cost is a key factor to scale deployments organization wide to tens of thousands of students and faculty. Cost of closed source systems is measured as $/(million) tokens, while for hybrid infrastructure it is the cost of cloud computing infrastructure. Significant progress has been made there. As an example, “the cost per token of [OpenAI’s] GPT-4o mini has dropped by 99% since text-davinci-003 … introduced in 2022” (OpenAI, 2024).

There are several other characteristics that we have seen progress and choice, including the number of parameters & model size, the hardware platform they run, whether they are open or closed source, etc. For current leaderboards, please refer to (Klu, Inc., 2024) and (Chat with Open Large Language Models, n.d.). The above characteristics are just a fraction of the overall metrics used to evaluate the capabilities of LLMs as described in (Nucci, n.d.), (Quinn & Lecker, 2024) and (Karzhev, 2024).

Where do we go from here? When looking ahead to plan, we should think about future capabilities, but what would these look like? Is the future better performance on the road to Artificial General Intelligence (AGI), but how much and how quickly? This is a subject which is hotly contested by researchers, with some arguing that performance scaling laws project that exponential change will continue and all we need during training is more computational power, bigger data

sets and bigger models (Kaplan, et al., 2020). Others, however, dispute this inevitability of continuous exponential change arguing that we need different architectures to achieve AGI, or that scaling laws are not correlated with emergent capabilities of LLMs (Narayanan & Kapoor, 2024).

In a rapidly evolving technological landscape, doing nothing is not an option. Students and faculty are already using genAI tools regularly (Microsoft Education, 2024), and this trend will only continue as these technologies become more integrated into both education and the workforce. Half of the students surveyed are regular users of genAI (Shaw, et al., 2023) and will continue to use it when students transition to employment (Microsoft and LinkedIn, 2024). To harness the potential of genAI for positive change in higher education, institutions must take proactive steps.

It's essential to recognize that waiting for the technology to stabilize is also not feasible. Instead, institutions should focus on understanding current trends, experimenting with new tools, and preparing for continuous change. By doing so, they can better equip themselves to adapt to the fast pace of technological advancements.

One approach is to apply Strategic Foresight, as employed by the APRU's Working Group on genAI. APRU used this methodology to map long-term future scenarios for HEI with genAI being widely adopted which is outside the scope of the current paper and will be presented in a separate paper. To understand the technological changes, we scan the current state and look back at the progress since the introduction of ChatGPT. Future potential scenarios, not intended as definitive predictors of the future, but rather possible future paths, provide a basis for interrogation of what an institution would need to consider, stop doing, start doing and do differently if that future were desirable and/or considered likely. Exploring the implications of further progress in emergent properties of LLMs with scaling laws, or emerging trends, such as voice output and agentic AI, can be factored in as "early signals" into planning different scenarios for the genAI future and its impact on Teaching and Learning as part of the Strategic Foresight approach. The reality, of course, is that different future pathways emerge from different contexts and to some extent the choices that institutions make.

Student Involvement in HEI adoption

Students are key stakeholders in how HEIs adapt to and adopt genAI tools. They bring distinctive experience, a diversity of perspective and high motivation to engage with this topic. Students have been early adopters with an informal poll at Stanford showed that in the Fall Quarter 2022 (ChatGPT appeared in the last month of the academic term) the key use case of genAI was for brainstorming, outlining, and forming ideas, while help with assessment was a distant second use case (Cu & Hochman, 2023). Further studies have shown that the majority of students at the University of Michigan and University of Edinburgh are using genAI (Duraisamy, et al., 2023), (Ferguson, 2023). Furthermore, in a new poll conducted by Impact Research (Rosenbaum, 2024), 82% of US undergraduates use genAI at least once in a while, with 49% on a weekly basis.

Students' surveys are showing a positive attitude towards genAI. A survey of undergraduate and postgraduate students from various disciplines of six universities in Hong Kong showed that students have a positive attitude toward genAI technologies (Chan & Hu, 2023). Similar positive attitude and acceptance towards genAI was shown in a survey in Morocco (Ismail, Khalifa, Laddaoui, & Sefiyaoui, 2024).

The survey in Hong Kong indicated that students have a clear view of where genAI is useful to them primarily on personalized learning, writing and brainstorming and research. Students are demanding from their institutions more AI skills in conjunction with critical thinking (e.g. assessing trustworthiness) and understanding the impact on academic integrity (Attewell, 2024). Jisc, the UK's digital, data and technology agency focused on tertiary education, research and innovation, ran student discussion forums (Jisc, 2024) with over 200 students across colleges and universities to understand student/learner perceptions of genAI and changes with respect to a prior survey (Jisc, 2023). One of the key findings is that learners are increasingly seeing these tools as having the role of collaborative coach to support critical thinking and learning, rather than purely as "answer providers".

These themes are echoed in the results of a comprehensive survey of 4000 students across 16 countries (DEC, 2024). These results show high adoption (24% of respondents using tools on a daily basis) with information retrieval and summarizing being the most common use tasks. Interestingly, a significant fraction of students (approximately half) does not feel they have sufficient knowledge or skills with genAI tools, nor feel prepared for a workplace where such tools are present. There was strong agreement from students that their institutions should be providing more training and experimentation opportunities, both for them and their professors.

Prior to the release of ChatGPT, a study (Glass & Kang, 2020) showed an increasing number of students year by year up to roughly half of the class, who were answering questions through look-up. This group exhibited lower performance at exams than the group who did their homework to produce the answer. As genAI can do both based on the instructions it is provided and given its pervasiveness to students, it is important that we provide students with genAI tools—and the skills to use them effectively—that will help the long-term effectiveness of their study and not undermine it.

It is clear that students are familiar with genAI, understand its benefits, use cases (Webb, 2024), recognize the value to them in their current and future endeavours, and have a range of viewpoints and concerns. Students do not have the full pedagogical viewpoint as indicated by the aforementioned study, nor are they ignorant as to their learning and the application of genAI technology. We should treat students as equals in the teaching and learning process, and also possibly more tech savvy than the faculty. Students are not consumers of pedagogical methods but have agency as to how they learn and what they need, when presented with data driven viewpoints. Moreover, the unprecedented rate of change necessitates that we adopt a growth mindset, and we shift from "Professor-as-sole-source-of-knowledge" to embracing uncertainty and experimentation. This is a seismic change for Higher Education, but also an opportunity for Higher Education students to assume agency over their learning as active participants and collaborators in forming, developing, evaluating, and improving genAI initiatives and not simply involved just for satisfaction surveys after the fact. Moreover, institutions should actively be in dialogue with students to understand their expectations and concerns. Students should be a primary and active stakeholder in genAI adoption at HEIs, a point to which we return below.

Moving Beyond Principles: Pathways to Adoption & Competency Development

A large number of institutions have created and published principles or position statements to guide AI exploration and adoption, arising as outputs from initial periods of dialogue and exploration of tools' capabilities and challenges. Institutions are now engaged in the complex processes of enabling access to these tools, supporting literacy and competency development in their

effective use in HE settings, and mitigating some of the known concerns and limitations. It is clear that these efforts need to be a mixture of top-down and bottom-up approaches: a clear institutional vision for how these tools are going to feature within the academic landscape (even if the tools themselves continue to evolve at pace), augmented by local experimentation that aligns with pedagogical practice within the disciplines. It will be imperative to recognize the autonomy of instructors in design of learning experiences for students, and the oversight of academic Departments in designing programs of study as a whole.

Top of mind in such considerations will be the need to ensure ethical use of such tools in educationally effective ways. Here, HEIs need not re-invent the wheel: several broad ethical frameworks for use of AI currently exist and can be used as organizing structures into which institutions plan their own strategies and actions. These include the UNESCO framework for ethical AI (UNESCO, 2023), OpenAI's usage guidelines (OpenAI, 2024), Microsoft's (Microsoft, n.d.) or Google's (Google, n.d.) Responsible AI principles. There is much common ground across all of these, and articulation of such a framework will enable building of trust amongst HEI stakeholders (including faculty, staff and students). Amongst HEI networks, Australia's TEQSA focuses on academic integrity and assessment (Helen Gniel, n.d.) and (TEQSA, n.d.) and UK's Russell Group has developed a set of principles (Russel Group, n.d.). These frameworks, or a synthesis of them, provided guard rails for how activities take shape.

Context and culture play critical roles in determining what institutions will choose to do and how they might go about implementing it. We would suggest that at a minimum, institutions need to provide three types of spaces: those in which to experiment, those in which to learn and those in which they listen. Experimentation needs environments and venues for real deployment in taught courses, with appropriate technical guidance, to learn what works and what does not, and why. A space for learning will build skills, confidence and digital literacies for effective use and early adopters can serve as focal points for further discussion and activity within their home academic units. Finally, listening to the needs, concerns and fears of stakeholders (faculty, staff and students) will ensure that institutions keep sight of current and emerging critical issues (as it is certain that new issues will emerge as we adopt and deploy these tools more broadly).

Operationally, deployment of these tools represents a very different implementation model than other educational technologies. This is not the traditional enterprise deployment of software (e.g. desktop services, email, etc.). Nor is it, we would argue, quite the same as installation of a new Learning Management System (LMS) which requires both technical and pedagogical support to realize benefits to learners. With genAI tools, there is an additional opportunity to build new tools on top of existing LLMs that support particular pedagogical goals an instructor may have. A current example is the technique of Retrieval-Augmented Generation (RAG). The core idea is to enhance the generative process by first retrieving relevant information from a specified knowledge base, then using that information as a guide for generating content. This approach can help mitigate some limitations of generative models, such as producing factually inaccurate or irrelevant responses. Supporting faculty in how to build, train and deploy these tools is critical, so that they can focus on the pedagogical purpose, and hopefully, effectiveness of the deployment.

Finally, in terms of pathways to adoption, we would advocate again for this being a critically important opportunity to consider students as partners in navigating the challenges and changes that these tools will bring, building on the broad body of literature around this as an approach to recognize students as active contributors of their own educational experiences, rather than passive recipients (Cook-Sather, Bovill, & Felten, 2014), (Healey, Flint, & Harrington, 2016). Student use of these tools and their perceptions around them is continuing to evolve and see the

potential of these tools and their importance in their future careers and lives, yet at the same time are cognizant of exactly the same challenges that have been articulated by Faculty with regard to equity of access, ethical use, potential for bias etc. Their active inclusion in institutional approaches to embedding these tools in courses and curricula will bring a unique perspective and active engagement in creating an environment in which all students can realize the benefits genAI tools have to offer for their education.

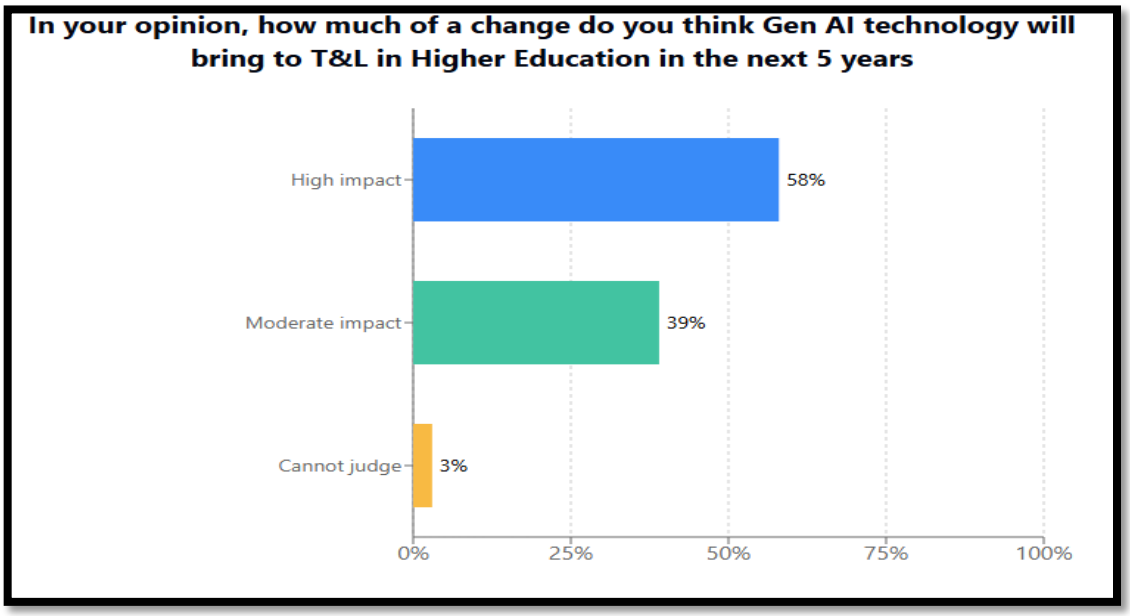
Perspectives from Early Adopters on Institutional Approaches

We sought insights from early adopters on how their respective institutions have approached genAI tools and their use, as well as their perspectives on what has worked and what needs to be improved. As part of our respective roles in the APRU project on the impact of Generative AI in Higher Education (APRU, 2023), we convened a two-day in-person workshop in June 2024, bringing together participants from across the 60 member institutions of APRU who had previously submitted case study examples of early innovation in the adoption of genAI tools in the HEI context. We collected 31 responses from 15 different APRU member institutions, in faculty and professional staff roles. Respondents completed an anonymous online survey, comprising a mixture of Likert-style questions and free text responses.

Our findings align with broader institutional research. Concurrent studies across 19 universities in the US and Canada found "familiarity and adoption levels among instructors and researchers are varied but rising," with widespread experimentation from faculty "responding to keep up with their students" to those "genuinely excited about how AI might positively transform teaching, learning, and research" (Baytas & Ruediger, 2025). This validates our survey's identification of institutional mobilization primarily at the exploration stage.

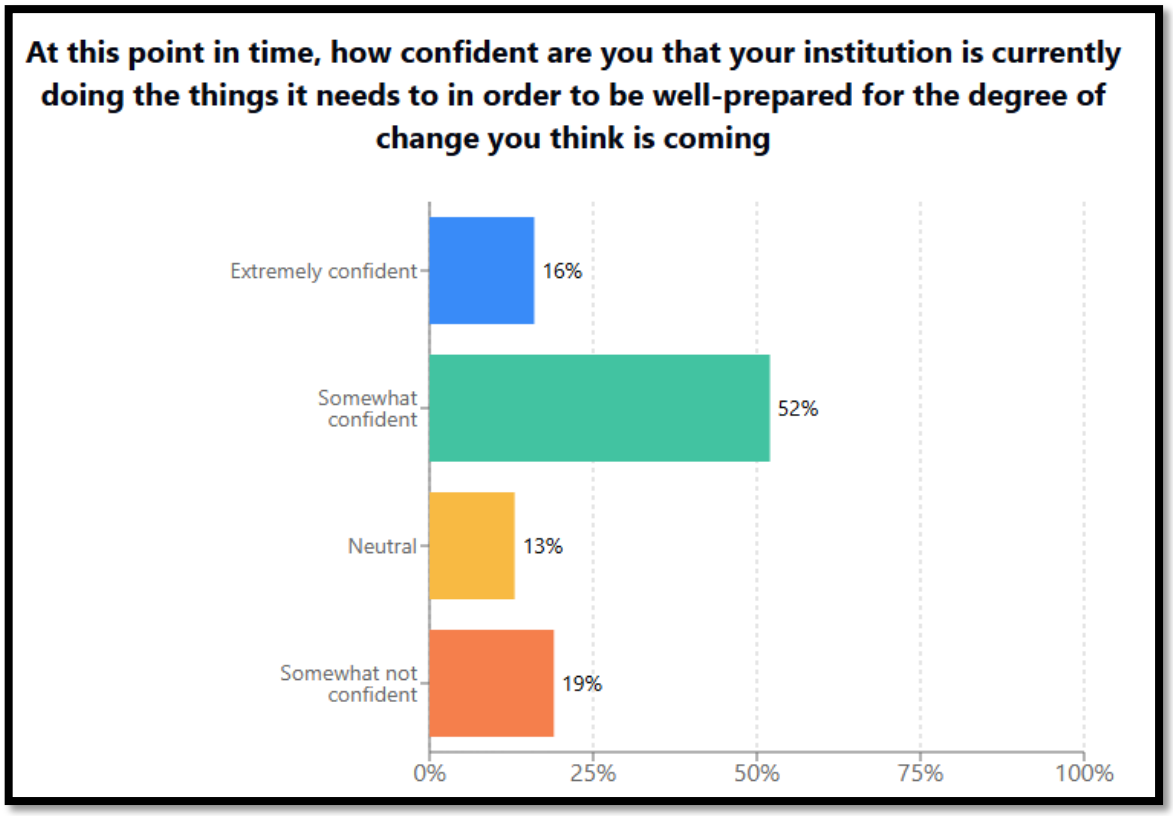
We present the key findings below. Participants being either early adopters or interested in genAI were naturally overwhelmingly bullish on its impact in HEI as shown on Figure 1 below.

Figure 1. *Assessment of GenAI Impact*



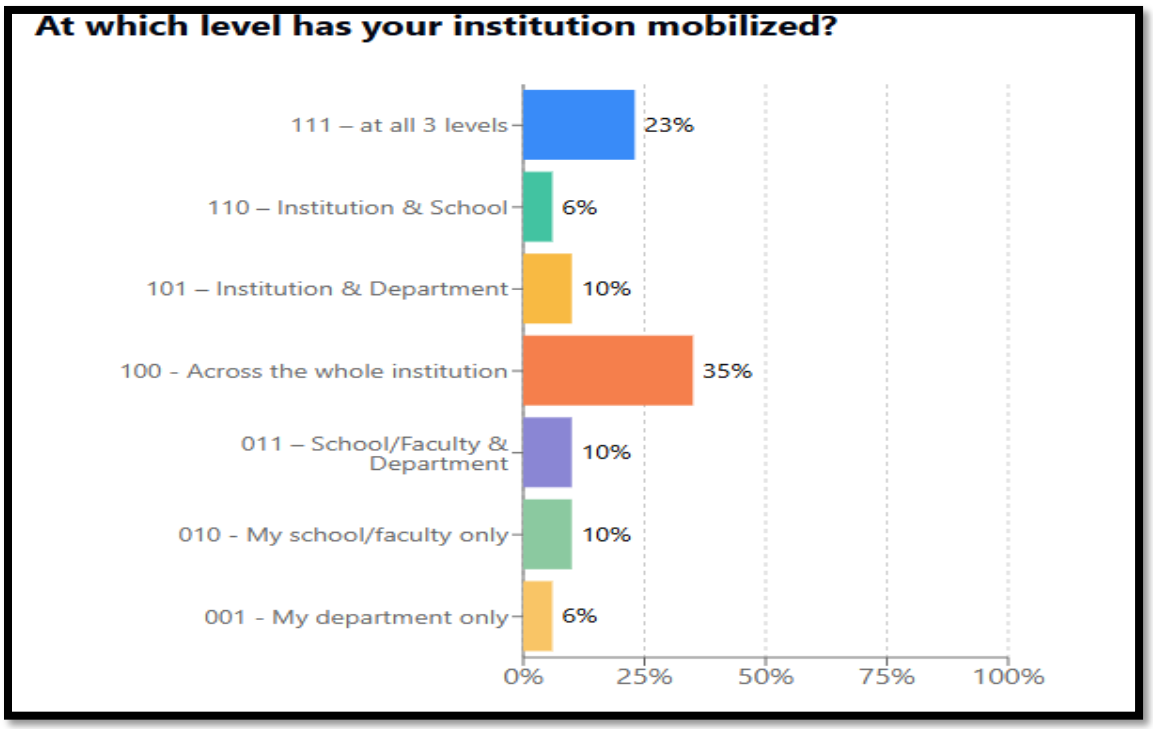
Evaluating how their institution is preparing, 2/3 of them feel positive about it. We will delve further into the positives and what can be improved further (32% are sceptical about the effectiveness) later on.

Figure 2. *Assessment of GenAI Institutional Preparedness*



We see though that the level of preparedness is still very uneven, with just ¼ happening across the institution, school/faculty and department, while 16% happening just at the school/faculty or department level. The key point is that genAI mobilization has not trickled down from the top and therefore it is a combination of top-down and bottom-up activities, confirming our earlier premise.

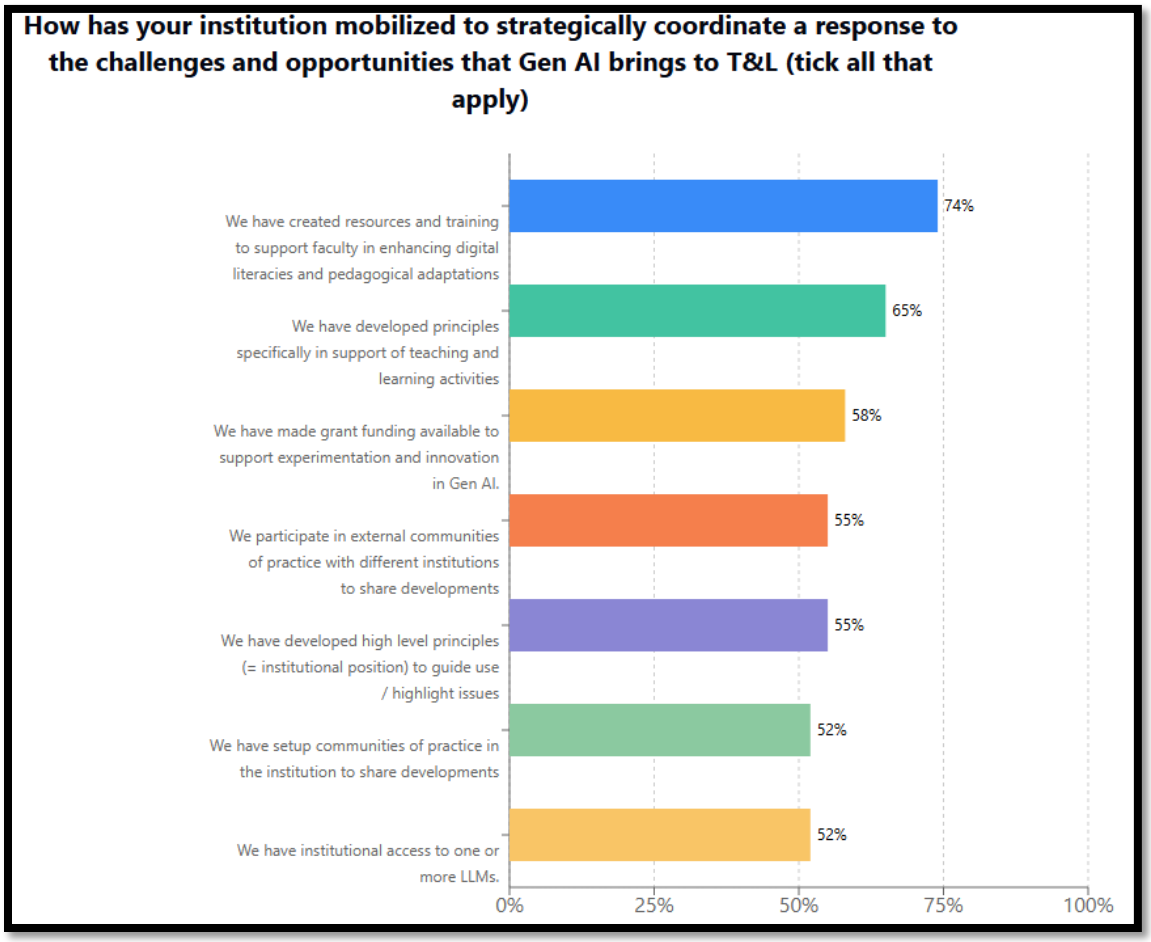
Figure 3. *Institution Mobilization Level (tick one)*



Looking with more granularity on what activities the institutions have undertaken, we see that these extend across three dimensions, providing *resources and support to faculty* (training, grant funding, access to LLMs), establishing *strategy and guidance* (both institutional principles and policies and specifically for teaching and learning) and thirdly, focusing on *community building*, *collaboration and practice sharing* (both internal and external communities of practice). Training is the most important activity, followed by guidance on how to apply genAI in the domain of teaching and learning through development of principles. These echo two of the three critical pillars of activities mentioned earlier in the paper (learning, listening) with less of a current focus on systematic experimentation.

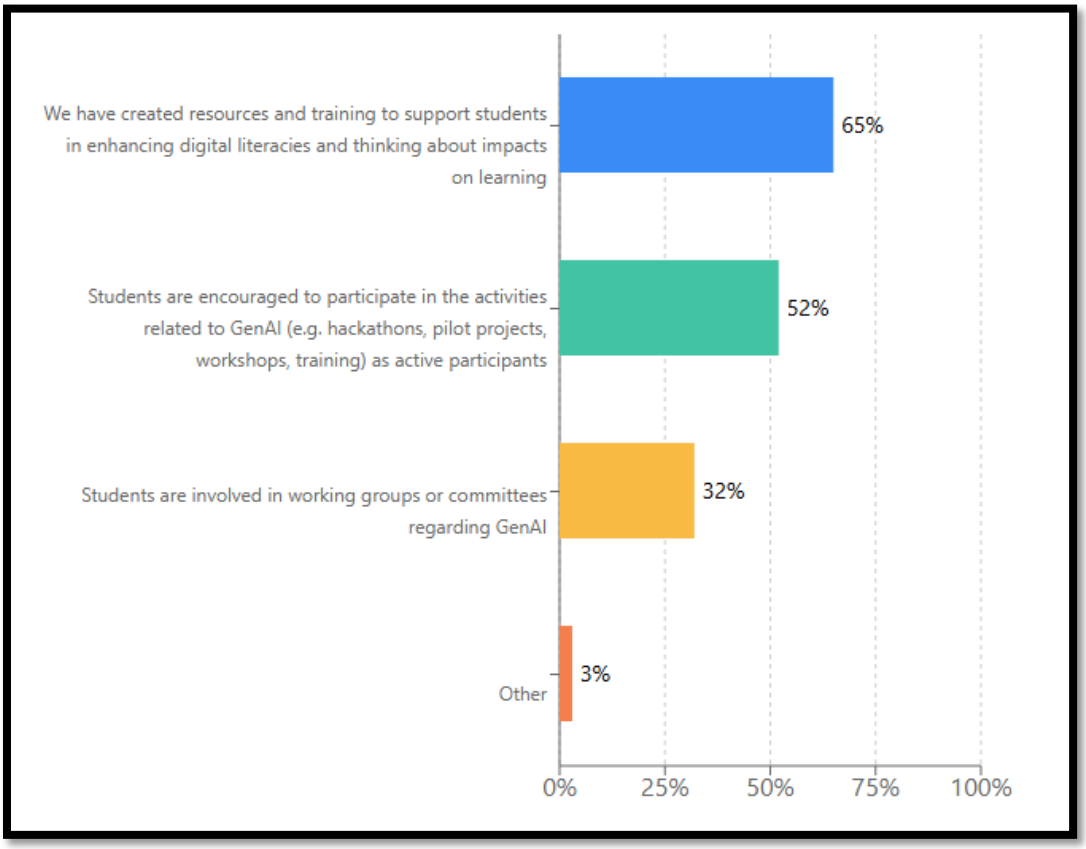
These three dimensions are the starting point for HEIs and as their practices maturity and capability evolve, we expect them to undertake additional activities, such as additional tools, hackathons, redesigning syllabus and assessments, etc.

Figure 4. *Institutional Activities (select key activities, tick all that apply)*



We examined earlier the critical role of student involvement in genAI, as they have a good understanding of genAI in higher education and expectations from their institutions. The good news is that institutions reach out to students to provide them with resources and support as well as pilot efforts. However, just 1/3 of the responses show that students are engaged pro-actively as key stakeholders in working groups or committees focusing on genAI. We regard that this reflects the maturity level of each institution, where at the first level student of experimentation it focuses on activities that are related to training, and other resources and participation in pilot projects, mostly as consumers of the use of genAI, while at a more advanced stage, they are involved pro-actively at shaping and developing the direction of genAI at their institution.

Figure 5. *How are students involved in this process? (tick all that apply)*



We asked participants to provide free text response questions about their impressions of what their institution was doing well and what they could / should be doing differently. An analysis of the text comments revealed the following commonalities of the top 3 themes:

Table 1. *What Institutions are doing Well and what they should Change or Prioritize More*

What institutions are doing well with Gen AI in T&L:	**What should your institution be doing differently or prioritize more of:**
Training and awareness	Training and skill development: need more!
Institutional support and leadership incl. development of policies	Curriculum impact assessment redesign and integration: do it rapidly
Openness to experimentation and integration, running pilots	Be more strategic on AI and provide more resources

The free text responses of what institutions are doing well are well aligned with the quantitative data, where the training, strategy and policies and collaboration and awareness are the right activities. In addition, the responses indicate that there is an element of *institutional culture that facilitates innovation and experimentation* which is important. This is distinct from strategy and guidelines.

The item on what HEIs should be doing differently or prioritize more provides some interesting insights. Respondents request more training and an elevation of genAI to a strategic pillar

that as such requires further support. Moreover, after pilot project experimentation, we should move rapidly to understand the impact on curriculum and redesign it. This is consistent with our insights from the activities that HEIs undertake as they move along from the exploratory and experimentation phase to the production phase where genAI is used as a key tool in teaching and learning.

In a nutshell, the survey shows that early adopters assess that genAI will have impact on teaching and learning and that their institutions are doing the right things even though genAI has not permeated all the structures or levels of their institution. Early adopters focus on providing resources, such as training, developing policies and leadership to create a culture conducive to experimentation and innovation and establishing intra and inter-institutional collaboration. Moving to the next stage of scaling genAI across the institution will require even more training, elevating genAI to a strategic pillar, assess its impact on curriculum and assessment redesign and proactively engage students in the redesign process.

Issues in Scalability of Efforts in HEIs & Learnings from the Commercial Sector

While early adopters have made significant progress, scaling generative AI across higher education presents unique challenges. This section examines key factors for widespread genAI adoption, drawing insights from both the education sector and commercial world to identify strategies for overcoming barriers and progress using a capability maturity model.

To accelerate technological adoption, Siegfried et al (Siegfried, Getz, & Anderson, 1995) call for "governing boards need to explicitly encourage institutions to be more progressive, perhaps even identifying specific new practices that they want to see adopted." Ipek and Karaman (2021) identified five main themes: motivation, standards, structural change, whole school involvement and leadership and "highlighted the crucial role individuals play in the systemic change process".

Microsoft Asia and IDC Asia/Pacific conducted research on "Assessing APAC Education Sector's Use of AI" (Gnaneswaran, 2019) which showed that "the educational sector is [was] currently lagging in Data, Strategy and Investment, as well as Culture when compared to Asia Pacific's overall AI readiness".

In an interview with Prof. Jules White, Senior Advisor to the Chancellor on Generative AI & Professor of Computer Science at Vanderbilt University who is one of the pioneers of the adoption of genAI in higher education (White, 2024), he stressed the role of leadership to set the tone to instil a culture of experimenting and learning by allowing the use of genAI in the classroom, unless told otherwise and providing the funding to kickstart the project. White stressed the role of interdisciplinary collaboration called "our distinct culture of radical collaboration," by Vanderbilt's Chancellor Daniel Diermeier (Vanderbilt University School of Engineering, 2023).

We have also looked at lessons that can be obtained from the commercial world and that can be relevant to Higher Education. Recent research by BCG (BCG, 2024) and Microsoft and LinkedIn (Microsoft and LinkedIn, 2024) has shed light on effective strategies for genAI transformation within organizations. This transformation is not a simple technological upgrade but a comprehensive shift in how organizations operate and innovate.

This process requires a balanced approach, starting with top-down leadership making AI transformation a CEO imperative. Organizations need to spotlight AI champions who can demonstrate the technology's potential and inspire others to create a virtuous innovation circle.

Continuous training is crucial to keep pace with rapidly evolving AI technologies. However, the focus should extend beyond mere productivity gains to align AI initiatives with broader

business strategies and value creation. Not just doing things faster but doing things more effectively to achieve the company's mission.

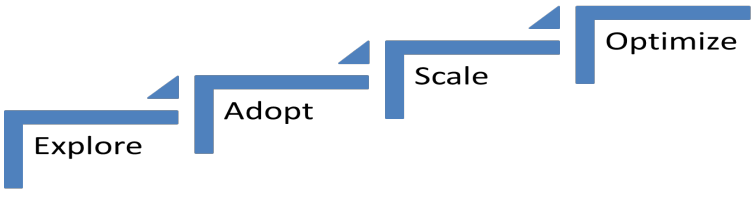
Effective implementation demands a holistic view of change management, including establishing clear OKRs (objectives and key results) to track progress. Equally important is a bottom-up approach that engages employees, exploring how AI and human workers can collaborate to enhance job satisfaction and outcomes.

Naturally, HEIs are not corporations led by a CEO who can mandate top-down initiatives and operationalize them using strategy, budget, etc. However, there are some key learnings that can be applicable to Higher Education. It starts with continuous training for all stakeholders (faculty, students). Leadership is key to establishing an innovation and experimentation culture and provides central direction and elevates genAI to a strategic transformation pillar. This transformation pillar should be tracked with KPIs and OKRs to ensure alignment. We should ensure that all stakeholders (incl. students) are engaged and promote intra and inter-institutional collaboration to share learnings. It will be important to prioritize AI initiatives that reinforce and accelerate the institution's mission.

In assessing genAI adoption, Papaspyridis (2024) has developed a holistic AI change plan that addresses the multifaceted challenges organizations face by recognizing that successful genAI implementation goes far beyond mere technological integration. At its core, the plan emphasizes the critical role of Strategy & Culture in driving AI transformation, ensuring that AI initiatives align with broader organizational goals and foster an innovation-supporting environment. Equally important is the establishment of robust AI Governance frameworks to guide ethical use and mitigate risks.

The plan also highlights the significance of People & Skills, acknowledging that upskilling and reskilling the workforce is crucial for leveraging AI's full potential. This human-centric approach is complemented by a focus on reengineering and optimizing structure & processes to support AI integration. In addition, Papaspyridis introduced a four-stage capability maturity model, that starts from an exploration phase of bottom-up pilot activities and training, continuing to a production phase supported by the development of appropriate policies and processes, then to the third stage of organization wide scaling of genAI and to the fourth and final stage where genAI shapes the organization's mission. This model is reflected and aligned to the survey findings, with most HEIs being at the pilot phase, with a few moving to the production phase which is supported by elevating genAI to a strategic pillar, assessing the impact on curriculum and assessment and proactively engaging students.

Figure 6. *AI Capability Maturity Model (c) Papaspyridis*



While technology remains a key component, it must be underpinned by strong data governance, ensuring high-quality, accessible and secure data. Finally, the allocation of appropriate resources, both financial and human, is spotlighted as essential for scalable AI adoption.

Learnings from the commercial sector can guide HEIs in scaling generative AI adoption, despite structural differences. Key factors include continuous training for all stakeholders, strong leadership to foster innovation and set strategic direction, and creating policies, processes, standards, a strong culture, and investment. Pilots are important to provide bottom-up innovation, with spotlight on these projects facilitated by collaboration and exchange of lessons learned.

We acknowledge that HEIs differ fundamentally from profit-driven enterprises both in terms of mission as well as structurally. Enterprises are top-down organizational structures where execution priorities, reviews and rewards are dictated by the CEO and the Leadership team. HEIs have looser structures with devolved decision making and faculty has significant autonomy. While enterprises focus on operational efficiency and revenue growth, HEIs have multifaceted and different missions while students do not constitute a uniform segment. Hence, transformation plans for for-profit enterprises and HEIs differ significantly and cannot be aligned. Our approach here is to signify commonalities between the two while considering nuances of HEIs, as indicated by the CRAFT framework which identifies Trust as one of the key pillars (Liu & Bates, 2025). Therefore, we have focused on comparing HEIs among themselves focusing on early adopters.

As organizations advance in their capability maturity, it is crucial to prioritize AI initiatives that reinforce the institution's mission and establish appropriate OKRs to track the transformation. A comprehensive change management plan addressing strategy, culture, governance, skills development, equity, responsible AI principles, academic freedom and integrity and evidence-based pedagogical changes, are essential for effective implementation and scaling of generative AI efforts in higher education. This necessitates slow but constant, reflective deliberation rather than the rapid "move fast and break things" mentality often celebrated in Silicon Valley. The more complex pathways should not constitute though an excuse for inertia.

Conclusions

This paper has presented an analysis of the context into which genAI tools emerged into widespread use in late 2022, together with an assessment of the current state of institutional preparedness and mobilization towards incorporating these tools into teaching and learning in Higher Education. We have surveyed "early adopters" of innovative use, which, although far from a representative sample of a faculty population, does give us additional insight into how institutions are approaching this issue and what more they might need to be thinking about. Parallels and learnings from the commercial sector are considered, through a four-stage Capability Maturity Model, while ensuring the differences and nuances of HEIs are considered. We can summarize our conclusions, supplemented with insights from the early-adopters survey, as follows:

AI Capability Maturity Model (CMM): we can frame the steps that HEIs take in their AI journey in terms of a four stage CMM. This allows a holistic approach in the change management across multiple directions, such as leadership and strategy, culture, processes and policies, resources, skills, curriculum, etc.

What early adopters think: they regard that genAI will impact significantly teaching and learning. Their institutions at the first exploration stage of the CMM, overwhelmingly mobilized at an institutional level, are providing training resources and awareness through collaborative sharing, are providing support including grant funding and establishing principles, both high-level and specifically in teaching and learning.

What can institutions do better: These are overwhelmingly positive first steps but transitioning to the second CMM stage of AI adoption, more training and skill development is needed as well as to elevate Gen AI to be a strategic pillar. Moreover, institutions should accelerate the deployment of Gen AI by assessing what will be needed to redesign the curriculum and resourcing it appropriately.

What advanced institutions do: at this AI adoption stage, HEIs undertake multiple activities, including conducting hackathons/rapid cycles of experimentation so they can test new ideas. In addition, they have a clearly articulated plan/approach for what they will do as an institution with respect to genAI for the near/medium term and get students to be involved in working groups or committees regarding genAI.

Students: At the initial explore CMM stage, students are well-engaged with AI tools and activities, both to support personal learning and discovery work, and in formal course assignments where this is permitted. In terms of strategic approaches, students are often included on committees or working groups, but it is not clear that they are active participants in the design of approaches as they are developed. In the faculty survey, one of the answers that stood out was from an institution that is "Encouraging a student-led AI-based project," which is notable as it empowers students to take an active role in using AI, preparing them for an AI-enabled workforce. Student involvement was identified in the improvement section of the survey where there was a call-out for more proactive involvement of students in the discussion, which we regard as a characteristic of the adoption phase of the CMM.

Figure 7. *AI Adoption Stages Using Papaspyridis CMM*

CMM Stage	Characteristics	Activities
1. Exploration	- Bottom-up limited scope pilots - Initial Awareness	- Provide training resources to faculty and students - Establish collaborative sharing - Offer grant funding - Create high-level principles
2. Production	- Strategic focus - Formal policies - Broader adoption in T&L	- Expanded training and resources - Conduct hackathons to identify use cases - Elevate genAI to strategic pillar - Create culture supporting innovation - Develop specific T&L policies - Assess curriculum & assessment impact
3. Scaling	- Organization-wide implementation across faculties and departments - Systemic changes	- Support rapid experimentation and data-driven educational insights - Involve students in working groups and committees on genAI in T&L redesign - Redesign curriculum and assessment - Establish clear transformation OKRs
4. Transforming	- genAI shapes institution's mission - Innovative use cases	- Integrate genAI into institutional mission - Redesign educational models - Lead industry collaborations - Pioneer new genAI applications

The early adopters in our survey have provided valuable insights, and it is now important to appreciate the broader challenge that lies in scaling these innovations across institutions. This transition from isolated initiatives to widespread adoption represents a significant hurdle. In the language of project management approaches, the fundamental challenge is to shift in approach from a waterfall model to an agile one: high flexibility and adaptability in an environment where the optimal solution will evolve and is not well-characterized at the outset, with frequent input from stakeholders to shape the path taken. Moreover, the rapid pace of innovation dictates an agile approach to adapt to the changes. Strategic foresight can help provide some preparedness for these changes.

Future Research

Further research can be extended to understand the perspectives of leaders in genAI, both short-term and long-term. Expanding the sample size of faculty respondents will allow also quantitative analysis of results as well as exploration of differences depending on HEI characteristics as well as disciplines. Resistance to change, transformation initiatives and their journey are additional directions to explore as well different perspectives influenced by national or cultural contexts.

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The Future of Employment: Preparing for an AI-Influenced Workforce

Eric D. Rubin & Lisa M. Rubin

Abstract

The increasing prevalence of AI technology and its use in education and the workforce will significantly change the workforce in the future. How colleges and universities adapt and engage with AI to improve students' development of AI skills and knowledge will influence how prepared students are to enter the workforce and leverage AI. The types of jobs may change, though history has shown that while some types of positions may disappear, new jobs will be developed that do not currently exist. This article reviews recent literature on AI's impact on employment and the future of the workforce. Implications for higher education leaders are provided to embrace students' use of AI and incorporate it into the curriculum and consider how potential future developments in AI might impact higher education and future professionals. ChatGPT also provided input on what positions and job categories may be created that require AI knowledge and skills.

Keywords: *curriculum, skills, talent development, technical education, workforce*

Artificial Intelligence (AI) technology will cause significant changes in higher education curricula and the workforce. Similar to how the internet created many new jobs while rendering some obsolete, AI will do the same (Briggs & Kodhani, 2023; Gabriel et al., 2024; Perna, 2023). For context, in this article, AI refers to Generative Artificial Intelligence (GenAI), such as chatbots like ChatGPT (Watkins & Monroe, 2025). These chatbots are rapidly evolving with greater capabilities to handle increasingly complex tasks. Via these chatbots and tools that integrate their functionality, components of many jobs will become automated, allowing employees to focus on tasks that create higher value for the organization (Briggs & Kodhani, 2023; Felten et al., 2023). AI will not necessarily result in mass unemployment; the number of bank tellers increased after the introduction of ATMs (Pethokoukis, 2016).

Some jobs, however, will be lost (e.g., 67,000 elevator operators since 1930, 210,000 travel agents since 1990) (Klein, 2019). Yet, Wu and Peçanha (2023) reasoned, "This will not be the first time that new technology changes how we work, of course. From lamplighters to switchboard operators to video store clerks, professions have come and gone. We've adjusted" (How long until machines take over? section, para. 3). In education, digital calculators automated math problem-solving, which changed how arithmetic was taught. According to Luterbach (2024), "there was extreme division" among people who believed children should use calculators in school when learning math or not (p. 23). Now, calculator usage, whether physically or virtually, is not so controversial.

It is unclear to economists and researchers who is really impacted by AI in the job market. Several sources (Chui et al., 2023; Gabriel et al., 2024; U.S.-E.U. Trade and Technology Council, 2022) suggested that AI has the potential to automate more than just routine tasks, potentially leading to job polarization, which refers to "hollowing out the middle," in which routine, "middle-skill jobs" decline, while demand increases for high- (e.g., analytical) and low-level (e.g., janitorial) work (Seguiza & Pajo, 2025, p. 1). Even non-routine tasks, including service roles (e.g., hair stylist) and highly skilled roles (medical diagnosis by a doctor), could be enhanced by the use of AI (U.S.-EU Trade and Technology Council, 2022). However, after reviewing the history of technological disruption in the U.S. labor market, Deming et al. (2025) determined that instead of a U-shaped curve, highly skilled jobs have grown in the age of AI, whereas both low-level and middle-level jobs have declined.

Because there is no consensus on what the future of the labor market will be in the age of AI, higher education must prepare its students for uncertainty (Chui et al.,, 2023; Miller & Cox, 2023). Shaffer and Zalewski (2011) suggested, "Many, if not most, of today's college students will hold jobs in their lifetimes that do not exist today" (p. 75). While AI will automate some jobs which will displace white collar workers, these skilled workers will likely find new positions that develop from AI's impact on society and workforce needs (Briggs & Kodhani, 2023; Gabriel et al., 2024). Colleges and universities need to adapt curricula to the scope of the changing needs in the workforce as AI evolves.

Literature Review

AI has rapidly advanced in its development and application since generative AI tools like ChatGPT were deployed in 2022, though AI innovations existed long before. Today, AI is already integrated into daily life (Gabriel et al., 2024; Knoth et al., 2024). Because of this, Gabriel et al. (2024) suggested that they "could radically alter the nature of work, education and creative pursuits" (p. 1). This review of the literature explores the evolving nature of work, students' use of AI, and AI impacts on the future curricula in higher education to prepare students for the workforce.

Evolving Nature of Work

According to Scott (2023), the job skills of the future include critically assessing AI output, communication empathy and relationship building, problem solving, anticipating and addressing bias, magic words/context specific knowledge (prompt engineering), and team building and project leadership. She called for the development of skill-based learning outcomes so students can gain these skills in the college classroom. Liza Wisner is a speaker and entrepreneur with a background in computer science and educational technology who presents on skill development for the workforce amidst the constantly-changing technology (PowerUp Talks, n.d.). As a guest on the ATD DEI podcast, she emphasized that the world of work has changed, and it will never return to how it was before AI became part of it. She suggested using "talent development to enhance skills, give people access to all the knowledge, to be able to give people the capability to be able to actualize their potentials. To me this is the goal of leveraging AI: to actualize human potentials" (Thompson, 2023). AI assistants add value to "training and upskilling" people "to ease or shorten the learning curve" as they enter new jobs (Gabriel et al., 2024, p. 170). Organizations are still

determining what skills and knowledge will be needed in the future for employees to successfully work in an AI-influenced environment (Chui et al., 2023).

Commentary from investment leaders on how AI will impact the workforce and global economy were not entirely apocalyptic. Jobs will be gained and lost, just as they have throughout history as new innovations were introduced to humans (Edwards, 2023). Economist David Rosenberg argued that similar fears surfaced when the internet became a familiar technology, but jobs ended up being created from this (Edwards, 2023). Yet, investor Cam Harvey cautioned, "The technology will be doing the jobs of many different types of workers across many industries. There will be permanent displacement and it is not obvious what the displaced will do" (Edwards, 2023, para. 12).

Along those lines, many companies are increasingly incorporating AI into their products, which will require expertise to both develop, use, and train others on best practices (Spataro, 2023). Corporations will look to leverage AI to gain efficiencies similar to how they have leveraged earlier innovations. For example, AI is already being used by news organizations to write stories about stock market earnings (Mullin & Grant, 2023). Chen's (2023) interviews with small business owners and entrepreneurs showed that AI has made time-consuming tasks very efficient, allowing people to take on more clients or complete tedious tasks, like editing images, much faster. In addition, AI can make recruiting and screening applicants more efficient for hiring managers (Kelly, 2023) as well as boost job applicants' chance of success (Blumberg, 2023). However, AI tools should be used with caution, as they are likely to introduce bias in the candidate screening process (LinkedIn, 2023).

People with AI skills are in high demand, and recruiters are willing to pay high salaries for top talent (Cutter, 2023). A job posted in summer 2023 by Netflix for an AI product manager came with a total compensation of around $900,000 (Cutter, 2023). The National Security Commission on Artificial Intelligence (2021) reported the potential for AI skills needed in defense, national intelligence, cyber warfare, and weaponry, which is relevant to governments across the world. These types of roles also offer lucrative salaries and benefits. There is a "positive link between AI exposure and employment growth. A key driver of these positive results was high income employees with strong digital skills who likely had the capabilities and freedom to adapt their roles in response to AI" (Gabriel et al., 2024, p. 168). Vinay Menon, a partner leading the global AI practice for a consulting firm, suggested that many organizations have to train their employees on AI because there are limited numbers of mid-level or senior managers with the right knowledge and skills (Cutter, 2023). Accenture's newly anointed chief AI officer, Lan Guan, lamented about the difficulty in hiring someone who has "industry expertise with a solid understanding of engineering, programming, math and statistics needed for AI work" (Cutter, 2023, para. 18).

Students & AI

Students are already using AI in college: 30% used ChatGPT in 2022-2023 (Kyaw, 2023; Terry, 2023). By 2024, 86% of college students worldwide reported using AI tools regularly for educational purposes (Rowsell, 2024). Students are realizing that it is not a panacea that will solve all of their academic issues; only 12% of those who used it saw their GPAs improve (Kyaw, 2023). ChatGPT users noted that

> the tool's advantages included its ease of use, simplicity, ability to help in organizational skills, and its ability to collect specific information and save time in researching. However,

> they also listed disadvantages, such as overreliance, inaccuracy, and potential to be considered cheating. (Kyaw, 2023, para. 5)

These pros and cons of AI tools will apply not only to higher education use-cases but also to their usage in the workplace.

It is good that students have begun to explore the capabilities of AI tools; thus, they will be adaptable to the changing nature of the workforce (Terry, 2023). Institutions have an obligation to expose students to AI, as it may harm students who have not already engaged with it (Gurung et al., 2023). Hiring managers will look for college graduates who can leverage AI to improve their work or develop AI prompts (Cerullo, 2023). New positions such as a "prompt engineer" will interact with AI services to deliver more "accurate and useful responses to the natural-language queries" to users (Cerullo, 2023, para. 3). Yet, there are differences in teaching and learning between AI and a human educator: "Human instructors provide crucial qualities that AI lacks, including profound comprehension, emotional acuity, and the ability to decipher intricate student reactions' (Luan et al., 2024, p. 105).

Irfan et al. (2023) conducted pre- and post-tests for quantitative data and semi-structured interviews for qualitative data with 50 journalism students in Tajikistan to study ChatGPT-3's usage on their critical thinking and writing skills. They found through the differences in test scores that

> the integration of ChatGPT-3 and AI literacy training significantly improved the students' critical thinking and journalism writing skills. The qualitative data analysis identified several themes in the students' perceptions of using ChatGPT-3. Students reported that ChatGPT-3 helped them generate new ideas, save time in research, and enhance their writing skills. (Irfan et al, 2023, p. 359)

The students in the study felt they could be more efficient with producing a quality story as a journalist. The authors strongly advocated for college students to receive AI literacy training (Irfan et al., 2023).

According to Kong et al. (2024), AI literacy "refers to the elements that the workforce needs to harness AI and form a synergistic relationship with the technology" (p. 1). They described four dimensions of AI literacy through the introduction of their AI Literacy Framework: cognitive (understanding of AI concepts), metacognitive (use of AI concepts for problem-solving), affective (psychological readiness to use AI) and social (ethics of problem-solving with AI) (Kong et al., 2024). The authors noted that while institutions target computer science majors with AI infused into the curriculum, college students and even those in secondary education are able to grasp AI concepts without knowledge of programming (Kong et al., 2024).

Through a systematic literature on AI in the educational domains of learning, teaching, assessment, and administration, Chin (2024) identified four learning outcomes students achieved through AI use. These included motivation and engagement across disciplines, improved academic performance, "21st century skills" which include many on the list of desired future skills by employers, and non-cognitive benefits such as increased confidence and decreased anxiety (Chin, 2024, p. 3). ChatGPT also provides students with a learning experience that is personalized (Albayati, 2024). Institutions are responsible for communicating academic integrity policies pertaining to AI usage with students. Students should learn how they can use it for their benefit in learning and for future careers, while also understanding AI's limitations (Niloy et al., 2024).

Future AI Developments & their Impact on Education & the Workforce

Four-year institutions may see advances in AI education both in high schools and at technical colleges as a threat to enrollment. However, Perna (2023) cautioned, AI is likely creating "new career pathways for young people that don't require a four-year degree" (para. 4). Thus, high schools with specialty programs, technical colleges, and GED programs also have a significant opportunity to market the development of valuable AI skills to prospective students, serving as a potential top choice for people seeking lucrative careers without attending a four-year institution.

University graduates, who tend to be higher paid than those who have less education, are more exposed to AI (Iacurci, 2023). Analytical skills such as science, mathematics, and programming are more important to jobs which have high exposure to AI (Kochhar, 2023). However, Kochhar (2023) reported that

> workers in those exposed industries do not feel their jobs are at risk—they are more likely to say that AI will help more than hurt them personally. For instance, 32% of workers in information and technology say AI will help more than hurt them personally, compared with 11% who say it will hurt more than it helps. (para. 10)

These workers may get some confidence from the fact that over time, technology makes workers more productive, and that automation often creates more jobs than it destroys (Kochhar, 2023).

Future computer science professionals will hopefully have gained knowledge and skills specifically through coursework to apply to careers after college graduation. For example, agentic AI tools like Anthropic's (n.d.) Claude Code can enhance a software engineer's ability to develop sophisticated code in a short time.

A computer science graduate might learn many coding languages while enrolled in their program, but could utilize AI to write a complex program in a short time for a specific task. However, the engineer must already be familiar with the coding language to be able to verify that the generated code is not low-quality, incomplete, or otherwise insecure code (GitLab, 2023). Thus, they are using knowledge and skills they have and applying that to coexisting with AI to achieve certain outcomes.

ChatGPT's Perspective on Future Jobs

When prompted "what sort of new jobs will AI create for those who don't have a four-year degree?" ChatGPT 3.5 (OpenAI, 2023) responded,

> AI is expected to create a variety of new job opportunities for individuals without a four-year degree. As technology continues to advance, there will be a growing demand for roles that require skills in areas such as problem-solving, creativity, communication, and adaptability.

Jobs that could be created include AI Assistants and Trainers, who will focus on "training, supervising and fine-tuning AI systems," according to ChatGPT (OpenAI, 2023). These roles will ensure that AI systems provide ethical and correct replies and will provide feedback for adjusting algorithms as needed (OpenAI, 2023). AI Data Labelers and Annotators prepare datasets for machine learning by curating, categorizing and tagging different types of information. Human-AI

integration specialists can help train organizations on how to effectively use AI tools into their workflows. Automation Coordinator roles could emerge that will identify processes suitable for AI-driven automation (OpenAI, 2023).

By comparison, when queried in 2024, Chat-GPT 4o added a few additional categories of jobs that AI will create for those without a college degree. These roles include "AI System Maintenance Technicians" who would be "responsible for maintaining AI hardware and software systems," and "AI Customer Support Specialists" who would "provide assistance to users of AI products and services, troubleshooting issues and providing guidance" (OpenAI, 2024). "AI Operations Associate" would monitor AI system performance in real-time to ensure they are operating as intended and identify/resolve issues, while "AI Quality Assurance Testers" would test "AI systems to ensure they meet quality and performance standards" (OpenAI, 2024).

These jobs may strike some as simple extensions of existing roles to cover AI systems. New creative roles may emerge, too, including an "AI Content Curator" that would manage digital content including social media posts and videos, while an "AI-Assisted Content Creator" that would work with AI to generate graphics or produce videos (OpenAI, 2024). GPT-4o also recognized the need for businesses to employ an "AI Ethics Officer" that would ensure "AI systems are developed and used ethically, adhering to relevant guidelines and regulations." as well as "AI Compliance Coordinator" roles that would "monitors and ensure compliance with legal and regulatory requirements related to AI" (OpenAI, 2024).

Besides the new job categories that are being created by AI, there are many existing job categories for those without a four-year degree that will either be enhanced AI or otherwise unaffected by AI. For example, IT roles such as Salesforce Administrator or managing systems in Microsoft Azure will likely continue to expand (Perna, 2023). Other jobs such as those in the skilled trades, personal services (e.g., trainers, coaches, hair stylists, makeup artists), elder care, and childcare, may be assisted by AI in some capability, but will largely be unaffected (OpenAI, 2023).

When prompted "what sort of new jobs will AI create for those who have a four-year degree?" Chat-GPT 4o responded with a variety of suggestions. Some, such as "AI Ethics Specialist," "Human-AI Interaction Designer," "AI Trainers," and "Automation Specialist" are similar but more advanced versions of AI-created jobs that would be available for those without a four-year degree (ChatGPT 4o, 2024). Other new AI-enabled roles include "Data Analyst/Scientist" which can use AI to help "professionals analyze large datasets to extract insights, build predictive models, and help organizations make data-driven decisions" (ChatGPT 4o, 2024), and "Machine Learning Engineers" who will work to develop AI solutions to various applications (ChatGPT 4o, 2024). "AI Product Managers" will oversee "the development and implementation of AI-driven products and services. It requires a blend of technical understanding and business acumen" (ChatGPT 4o, 2024).

Additionally, AI will enhance existing roles, such as in healthcare, finance, and education. "AI Consultants" will advise businesses on the "best strategies, tools, and technologies" for AI application (ChatGPT 4o, 2024). ChatGPT 4o (2024) concluded that these roles will "require a combination of technical skills, such as programming, statistics, and machine learning, and soft skills like problem-solving, critical thinking, and communication." The roles ChatGPT 4o (2024) described likely require a four-year degree in disciplines like data science, engineering, or computer science or a domain-specific area like education, finance, human resources, or health.

In 2025 when given the same prompt, ChatGPT 4o pointed to new opportunities in "AI Content Curator" that will "oversee AI-generated content for quality, accuracy, tone, and brand

consistency" and "Synthetic Media Designer (Audio, Video, Virtual Worlds)" that will use "AI tools to generate compelling media" (OpenAI, 2025).

Implications for Higher Education Leaders

What does this mean for higher education? In the U.S., Southworth et al. (2023) cautioned that higher education has "evolved to prepare students to enter the workforce as a primary mission" (p. 3). In that vein, institutions need to provide faculty and staff training to incorporate AI into teaching and extracurricular activities. Teaching and learning centers are putting together resources to help faculty engage with AI tools in the classroom. AI needs to be included in the curriculum, especially as college enrollment is declining (Fields & Brint, 2023). In Irfan et al.'s (2023) study, journalism students gained critical thinking skills when using AI in the classroom and felt more confident in producing stories. With some training, faculty can engage students with AI tools to build their skills for careers postgraduation to support their AI literacy (Lin et al., 2024; Southworth et al., 2023). Just like computer literacy became a part of curricula in all levels of education, AI literacy courses may be commonplace in the near future (Luterbach, 2024).

Colleges and universities should ensure that they are preparing students with the right skill sets to compete in the AI age. According to Ma and Siau (2018), AI systems are strong in areas requiring speed, accuracy and consistency, but weak in soft skills such as "creativity, innovation, critical-thinking, problem-solving, socializing, leadership, empathy, collaboration and communication" (p. 2). To respond to the AI threat, higher education needs to provide opportunities and training for students to enhance their soft skills (Ma & Siau, 2018). In 2018, Ma and Siau noted that "some universities are already offering AI and Machine Learning courses to not only computer science students, but also business students as business managers and executives need to understand the capabilities, limitations, and implications of AI in the business world" (p. 2). It is also possible that certain majors such as accounting and finance could see a drop in enrollment as perception could be that they would be targeted by AI (Ma & Siau, 2018). Other surprising beneficiaries could include liberal arts and humanities majors as those fields may be less susceptible to the "AI-invasion" (Ma & Siau, 2018, p. 2). Essel et al. (2024) suggested that integrating generative AI into higher education curricula "[bolsters] students' critical, creative, and reflective thinking abilities," soft skills desired by employers (p. 10).

For students who pursue computer science or other Science, Technology, Engineering, and Mathematics (STEM) fields, it is paramount that they take into consideration the ethical issues around AI. There are concerns as to who is the creator of code, art, writing, and innovation. In the U.S., a person has to file for a patent; it cannot be AI (Sun, 2024). Many research journals will not accept AI as an author (Rubin, 2024). At Kansas State University (2018), computer science majors are required to take a course entitled "Ethics and Conduct for Computing Professionals" which encompasses the following:

> A study of the ethical issues raised by computing technologies and the impact on society. Exploration of how one might justify actions in regard to ethical dilemmas within the fields of technology, computer science, information security, and artificial intelligence. Other topics include an examination of terminology used, Professional Codes of Conduct for computer science professionals, ethics of software development, and ethical issues relating to privacy and intellectual property in cyberspace. (para. 9)

A course like this could easily incorporate ethical issues regarding AI usage, such as being aware of potential biases, noting limitations with the timing and source of information provided, and checking for accuracy of data and references (Gottlieb et al., 2023). There is a challenge for programmers who use AI for coding, as they are more disconnected from their output, and the quality of their work may decrease (Gabriel et al., 2024). Addressing this in class enables students to apply critical thinking skills when incorporating AI-generated code into their coding projects.

Online learning in higher education has existed for a long time, but the COVID-19 pandemic shifted many institutions into the direction of permanent offerings of online certificate and degree programs (Lin et al., 2024). Given that AI usage for learning and submitting work in the higher education setting is still a grey area for educators and students, institutions should strongly encourage all instructors to develop an AI policy (if there is not already one institution-wide) which is shared with students at the start of class. Transparency of expectations by instructors and usage by students ensures a better learning experience. Students, especially those at a distance, must understand the expectations of original works, what is permissible for AI usage (e.g., reviewing writing, generating ideas), and how to disclose AI usage with assignments. AI tools have helped students with writing and editing, especially non-native English speakers (Rubin, 2024). Online instructors have expressed concern with students' originality of their works and academic integrity because of AI usage (Sevnarayan & Potter, 2024).

More research is required for the "responsible development and deployment of AI assistants" which students could participate in with their faculty (Gabriel et al., 2024, p. 2). If institutions are using chatbots to provide advising support to current students or information to prospective students, they should have students help them in developing and refining the chatbot. For science courses, AI is able to simulate experiments without using living subjects, which may also enhance understanding in lab courses while reducing costs and using animals or humans in potentially dangerous research (Rubin, 2024). In addition, higher education institutions should consider requiring an experiential learning component to undergraduate programs (Southworth et al., 2023). This high impact practice would give students hands-on experience with AI tools in the workforce, whether through an internship or a class project with a company or organization as the "client" or "customer" of students' output. Connecting work-based learning experiences to the curriculum enables instructors to support students in leveraging AI from the classroom to a future career (Teo, 2024). Companies seeking college graduates with AI skills might wish to partner with colleges by offering externships so students can apply the skills they are learning in the workplace setting. These experiences enhance students' AI literacy and allow them to develop competencies to be desirable job applicants upon graduation (Knoth et al., 2024).

Higher education leaders and policymakers have the opportunity to capitalize on how generative AI can transform curricula. According to Chin (2024), "the introduction of GenAI in higher education would alter pedagogies by shifting the emphasis from transfer knowledge to processing knowledge, and from disciplinary learning to interdisciplinary learning" (p. 6). He recommended that institutions adopt "an interdisciplinary learning mentality" and develop their students' AI literacy through pedagogy (Chin, 2024, p. 7). There is also a need for organizations to be "human-centric" in their approach to training employees and adapting their roles as technology takes on existing responsibilities, and this includes faculty and staff at institutions of higher education (Chui et al., 2023, p. 50).

Conclusion

Artificial intelligence has developed over more than six decades. Recent developments have changed access to AI tools for anyone. Since AI assistants like ChatGPT, Claude, and Gemini launched, college students have embraced them to enhance their learning and engagement. Institutions of higher education are catching up by working on AI policies in courses and integrating AI into pedagogy. As AI continues to shape the workforce, there will be changes for careers due to automation and increased efficiency of tasks offered by AI. Though there is fear of such changes by many currently employed people and organizations who plan to hire college graduates, emerging positions utilizing AI and future jobs which do not exist yet will create exciting opportunities for career growth. Just as the calculator and the internet impacted education and work, AI will continue to do so with mostly positive outcomes.

Anyone with strong skills in using AI has the potential to get a high paying job, whether or not they have earned a college degree. However, colleges and universities can capitalize on the expertise of faculty while engaging students with AI in their classrooms in any discipline, not just the engineering, computer science, and statistics disciplines where it might seem most obvious. Higher education curricula can require students to engage in experiential learning to increase AI literacy. Because of the shortage in the workforce of AI talent, today's college students may soon be on the fast track to a lucrative career utilizing AI skills and tools that many companies are seeking right now.

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The Influence of AI on the Traditional Research Paper: Using Normalization Process Theory as a Framework for Ensuring Human Participation

Lori B. Doyle & Jill L. Swisher

Abstract

With the introduction of generative artificial intelligence (AI), the traditional research paper, as a standalone assessment measure, can no longer be trusted as the best or primary method for assessing whether students are meeting learning objectives. Educators are in the throes of rewriting, explaining, and upholding academic integrity policies while balancing the pros and cons associated with the realities of AI. The ease at which students can produce a generated paper on just about any topic must be considered at the onset and assignments should be developed with consideration regarding the level of AI susceptibility. Utilizing Normalization Process Theory (NPT) as an ecological process based on a grounded theory-to-practice methodology, the authors suggest alternative approaches to the research paper to ensure human participation in the learning process. The traditional research paper was deconstructed to determine skills, benefits, and goals of higher education assessment prior to reconstructing the process with the current AI reality in mind. The topic of AI permeation in education will continue to be an area for future research and the authors suggest some pathways for continuing the conversation along theoretical as well as practical avenues.

Keywords: *Normalization Process Theory, Assessment, Grounded Formal Approach, AI, Higher Education*

With the introduction of generative artificial intelligence (AI), the traditional research paper, as one single assignment, can no longer be trusted as the best or primary method for assessing whether students are meeting learning outcomes. The time to address this challenge is now given the easily accessible AI chatbots such as OpenAI's ChatGPT and Google's Gemini, and the prediction that Microsoft will soon add AI technology into its suite of products (Metz & Weise, 2023). Educators are wise to consider the elements of the normalization process theory when developing higher education writing assignments. The primary research question asks the following: Given the implications of AI on traditional research writing assignments, how can course developers reconstruct the traditional research paper to ensure human participation in learning and learning outcome mastery?

Grounded Formal Theory-to-Practice Methodology

A theory-to-practice methodology was the impetus regarding a pathway for answering the research question and addressing the problem space of academic integrity specific to AI and the traditional research paper as an assessment of content mastery prevalently used in higher education. When applying theory to practice, Reason and Kimball (2012) explained that "theory-to-practice models must assume the basic human ability to make meaning of new situations, take action, and reflect upon that action to develop a working model of the world moving forward" (p. 363). In that vein, this article takes NPT as a descriptive ecological model and adapts it as a prescriptive ecological process. Specifically, this paper is organized around the steps of a grounded formal approach for theory to practice including identifying a problem, selecting a relevant theory, translating theory into practice, formulating goals, designing an intervention based on those goals, and evaluating the intervention (Rodgers & Widick, 1980). With the aforementioned problem regarding the precarious state of the research paper in an age of AI, the following will describe Normalization Process Theory (NPT) as a relevant theory to translate into practice.

Normalization Process Theory

A theoretical framework based on tenets of the normalization process theory (NPT) will be discussed as a tool for protecting and maintaining human cooperation in higher education assessments, specifically, the traditional research paper. NPT elements of coherence, cognitive participation, collective action, and reflexive monitoring will direct discussion regarding the process of guarding against norming in the direction of an over-reliance on AI-generated content while also taking steps to sustain and promote creativity, critical thinking, and collaboration, three among many skills worth mentioning.

According to the seminal authors, "Normalization Process Theory explains how new technologies, ways of acting, and ways of working become routinely embedded in everyday practice" (May et al., 2009, p. 1). The theory originated as a result of empirical generalizations drawn from qualitative studies in healthcare. Referencing the original theorists, McNaughton et al. (2020) helpfully summarized NPT as a heuristic device to "engage with and think through issues around implementation (the way in which practices are actioned through social organization), embedding (the process of practices becoming routinised), and integration (the process of sustaining) of practices" (p. 220). Said differently, NPT "helps in understanding why some processes seem to lead to a practice becoming normalized while others do not" (May & Finch, 2009, p. 535). In a systematic review of studies using NPT, it was found to offer "a valuable set of conceptual tools to aid understanding of implementation as a dynamic process" (May et al., 2018, p. 1).

NPT proposes that "practices become routinely embedded in social contexts as a result of people working… to implement them" (May & Finch, 2009, p. 540) and that the work of implementation happens through four mechanisms. The first mechanism, coherence, refers to a practice being made possible by its perceived utility and persists via shared meaning and contexts (May & Finch, 2009). From this stems cognitive participation, the actual engagement in and later collective buy-in or commitment to a new practice (May & Finch, 2009). Then comes collective action, meaning that a new practice is purposive, goal-oriented, and takes collective effort (May & Finch, 2009). Lastly, reflexive monitoring, which happens both formally and informally, is an evaluative process by which participants make collective and individual judgements about outcomes of the practice thereby leading to attempts to modify or reconfigure the practice (May & Finch, 2009).

As a "replicable ecological framework" (May & Finch, 2009, p. 549), NPT can describe how generative AI has become normalized and how participants can utilize the mechanisms of NPT to reconstruct AI's normalization in a way that leverages its value while preserving the merit of the traditional research paper. It is evident that student users of generative AI have already established its coherence by seeing its perceived suitability for the task of writing (e.g., Hoover, 2024). Likewise, cognitive participation has also been evidenced by students participating in this new practice, whether legitimized or not. When it comes to collective action, that is, when "a practice is mediated and understood within the networks of people around it" (May & Finch, 2009, p. 544), there is room to differentiate its contextual integration. While *students* have already incorporated the use of AI within their contexts, *faculty* have not fully considered the ways AI will affect writing and the way writing and research skills are defined. This is where it is important to engage in the mechanism of reflexive monitoring. This means that the patterns of action – the student use of AI – and its outcomes must be continuously evaluated both formally and informally (May & Finch, 2009). These "formal patterns of monitoring...frame how things *ought* to be, rather than ...how things are worked out in practice" (p. 545). This appraisal then leads to the opportunity to reconfigure a practice, "feeding back into notions of coherence" (p. 546). The authors of the current paper intend to appraise and frame how things ought to be in order to reconfigure the practice of AI utilization in higher education research assignments to ensure human participation is necessary to meet learning outcomes.

Translating Theory into Practice

This paper focuses on NPT as "an empirically observable set of social processes that can be modelled (May & Finch, 2009, p. 548) and specifically hones in on "organizing agency of the implementation, embedding (or not), and continuing integration of material practices" (May & Finch, 2009, p. 549). Indeed, as shown in Table 1, May and Finch (2009) offered a framework for operationalizing normalization process theory.

Table 1. *Framework for Operationalizing Normalization Process Theory*
(May & Finch, 2009, p. 549)

	Coherence *What is the work?*	Cognitive Participation *Who does the work?*	Collective Action *How does the work get done?*	Reflexive Monitoring *How is the work understood?*
Systematic explanation of mechanics and components at work	Factors that promote or inhibit the mobilization of a practice	Factors that promote or inhibit participation in a practice	Factors that promote or inhibit enacting a practice	Factors that promote or inhibit the appraisal of a practice
Knowledge about the sources and operations of investments at work	Beliefs and behaviours that define and organize objects	Beliefs and behaviours that define and organize actors	Beliefs and behaviours that define and organize work	Beliefs and behaviours that define and organize understanding
Investigations of core questions that could include…	How is a practice conceptualized by participants?	How do participants come to engage with a practice? How do	How do participants enact a practice?	How do participants appraise a practice? What are its effects

	How does it hold together in action?	they decide on engagement and the purposes that it serves?	How are their activities structured and constrained?	of appraisal? How are they mediated?

With this understanding in mind, NPT as a robust descriptive ecological framework will be reframed as a prescriptive ecological process:

- Coherence: Understand the perceived utility of a practice within shared contexts
- Cognitive Participation: Engage in the new practice until collective buy-in is achieved
- Collective Action: Collectively describe the purpose and goals of a practice
- Reflexive Monitoring: Make judgments about the outcomes of the practice, thereby leading to modifications or reconfigurations of the practice

In considering the use of AI in research writing, the coherence step has ostensibly been completed considering that approximately 22 million student papers may have used generative AI in the past year (Hoover, 2024). Further, the use of generative AI has become so pervasive, even integrated in academically-acceptable tools such as Grammarly (Hoover, 2024), that it seems collective student buy-in for the use of AI in research writing has also been achieved. It is from this point forward that the authors of this paper propose that educators come together to describe the purpose and goals of the research paper in order to evaluate and reconfigure the practice to prevent or alter the normalization of AI in research writing. The following sections will describe these steps within the continued pattern of the grounded theory-to-practice methodology.

Formulating Goals: Using Collective Action for the Future of Research Writing

The next step in the theory-to-practice grounded methodology is to formulate goals prior to designing or evaluating any sort of intervention. One such goal for the higher education community, including ancillary faculty all the way to top-ranking administrators, should be to take collective action regarding the future of research writing as an assessment tool to determine learning outcome mastery. The influence of AI on writing cannot be denied and should not be ignored; therefore, the historical and traditional context of the research paper can be a catalyst when formulating new goals to provide assessment measures that recognize and even utilize AI as a tool rather than ignore and fight against AI as if it can be eliminated or conquered. The longstanding role and overarching goals of the traditional research paper will be discussed in terms of the benefits and skills for learners to achieve and develop. Indeed, Mollick and Mollick (2023) declared there are still skills necessary for today's learners to obtain regardless of ways AI has permeated the process. In the following sections, the traditional research paper will be deconstructed to protect the established skills and benefits prior to reconstructing the process all while acknowledging the influence of AI on the current learning landscape.

Collective Action Toward Deconstructing the Research Paper

Collective action is a purposive goal-orientation that may include reaffirmation or reinvention of a practice (May & Finch, 2009). The role and practice of the research paper can be decomposed into its benefits, skills, and goals. Prior to the digital age, research was necessarily chunked

into parts due to limited access to resources and challenges associated with finding, printing, and storing all of the information. Some suggest the information or digital age dates back to mid-twentieth century, yet the current authors ascribe to a secondary definition suggesting 1970 as the start of this era due to the introduction of the home computer (Brown & Duguid, 1996). The higher education assessment scene became more conducive to large-scale assessments due to the information age and ways for students to more easily access data and literature (Head & Eisenberg, 2009). During this time, students most frequently reported turning to class readings, internet searches, and even librarians as their primary sources for finding information (Head & Eisenberg, 2009). During the tail-end of the digital age, big-picture context is the way Head and Eisenberg (2009) described the goal of higher education students seeking to conduct research for class-related assessment purposes while working toward a degree.

Due to additional reasons related to credibility and honesty, the current authors suggest that the part-whole pendulum must swing back to smaller chunks or activities to achieve the goals of the traditional research paper rather than proceed with assessing learning outcomes by way of one final assessment (e.g., the traditional research paper). Based on evaluating the purpose and goals of the research paper within the NPT context of collective action, the traditional research paper as an assignment should be operationalized by being deconstructed into parts, a process that contributes to that which can be described as an exciting time in the history of higher education assessment. While some studies have shown that whole-task instructional approaches lead to better cognitive skill acquisition (e.g., Lim et al., 2009), "more literature leans toward part-task training as the more effective method for complex tasks" (Hillman, 2020, p. 28). The skills, goals, and outcomes need not change, yet the activities can be better designed to ensure human participation and allow for grading that is accurately linked to student learning. The big-picture or whole-task mindset is more difficult to instill in today's college students due to the immediacy of even the most narrow and focused topics that can be generated in minutes. Therefore, the entire configuration of the assessment measures should follow this lead and provide multiple opportunities for students to gain skills, reap benefits, and meet the goals associated with writing a research paper.

The context for this research considers a review of literature on the role, benefits, outcomes, and assessments most tied to the traditional research paper specific to higher education course work. Zhai (2022) asked ChatGPT to write an academic paper and described the output as a "coherent, (partially) accurate, informative, and systematic" paper (p. 1). Based on this description of a generated research paper, one might see why the output of ten minutes of effort, albeit partially accurate yet still coherent and organized, would be very tempting to college students who land at any point on a continuum between extremely lazy and incredibly busy. Before any application of NPT by way of suggestions and implications, the long-established role of the traditional research paper will be discussed.

Role of the Research Paper

With the goal of retaining the merits of the research paper in an age of AI, the authors will deconstruct the traditional research paper, specific to use in higher education, as an existing and well-established method for assessing student learning. To begin, the benefits and skills associated with requiring students to complete a research paper will be discussed for the eventual purpose of reconstructing with the reality of AI normalization in mind. In similar fashion, discussing some recognized goals associated with this traditional form of assessment will provide a pathway to reconstructing the research paper to protect and ensure the goals are being met through human

participation rather than via generated content. The current authors posit that the role and purpose of the traditional research paper can be maintained and even strengthened when the current learning landscape is considered rather than dismissed.

Benefits and Skills

Before contemplating ways to assess student learning in higher education, the benefits associated with different methods should be explored in order to adapt rather than replicate forms of assessment, one being the traditional research paper. Regarding the benefits of assessment measures, Cotton et al. (2024) listed knowledge, skills, and attitudes as elements of concern regarding that which any assessment reveals. Traditionally, all three of these key elements could be determined based on a student's written output; however, the infiltration of AI has brought all three into question. Using the same three benefits, curriculum developers can infuse assessments with alternate ways of unlocking what students know, what skills they have obtained, and how they feel about their newfound understanding. It is important that students still know how to generate and answer research questions, synthesize others' work and attribute credit, collect and analyze data, and clearly communicate their ideas.

When discussing benefits and skills associated with assessment measures, there are some to mention specific to the traditional research paper itself. The University of Maryland Global Campus (2022) described some key skills for professors to assess through a traditional college research paper: 1) finding and understanding data and information, 2) formulating informed opinions, 3) adding to the academic conversation of other writers and scholars in the field, and 4) learning how to attribute credit to sources. All of these skills are at risk if a student chooses to submit a generated paper; therefore, it is incumbent on curriculum developers and professors to use alternate methods of assessment to ensure the same skills are being achieved and are therefore able to be accurately assessed.

Cotton et al. (2024) discussed another benefit associated with forms of assessment, that being the way in which students learn through taking on a challenge. If the challenge of writing a traditional research paper is alleviated due to the ease at which students can get away with overusing chatbots to generate portions or even all of their paper, then one of the substantive benefits of this form of assessment is brought into question. Lastly, a glimpse into the true level of a student's understanding is a benefit the traditional research paper used to produce (Cotton et al., 2024). When synthesized, the benefits of the traditional research paper that should be considered and reproduced need to provide a pathway to assessing knowledge, skills, and attitudes, taking on and overcoming a challenge, and providing a clear indication of a student's true level of overall understanding.

Assessment Goals

The goal of assessments in higher education has been and will continue to be a topic of interest and concern for higher education professionals (Rawlusyk, 2018). The introduction of AI to the scene can be described as another fork in an otherwise long and winding road rather than completely unfamiliar territory. Carless (2015) argued against losing sight of the direct link necessary between the goal of assessment and the methods for getting there. There is danger in describing the end goal of assessment as the feedback or even the grade when the goal can be the entire assessment process. A more active approach to assessment widens the goal post which in

turn enlarges the scope of the conversation (McGinnis, 2018). The traditional research paper has always been about the process of learning that the student engages in along the way. Prior to the introduction of AI to the higher education scene, the traditional essay or paper was described as a means of active learning for students (Brown et al., 2013). A modern argument for active learning is still at play, yet AI has altered the concept of what is or is not active learning. By extrapolating the goals associated with requiring students to write a research paper, higher education curriculum developers, program directors, and instructors can take a multi-level approach regarding the influence of AI on higher education assessment measures. Carless (2015) suggested a minimum of two goals, assessment of a student's level of learning and assessment regarding a student's actual ability, and that measures overlap between formative and summative opportunities. If the part-whole continuum is applied regarding the goals of the traditional research paper, it seems a drastic swing toward a focus on parts is in order. No longer can the final and entire output of the traditional research paper be that which reveals or determines goal completion. Rather, the strategic parts of the process that lead to the end output become the goals that take into account benefits that still apply regarding summative assessment and allow students to showcase understanding and instructors to confidently assign a grade, or perhaps grades along the way, based on the assumption of human interaction rather than AI generation.

Designing an Intervention

The grounded formal approach (Rodgers & Widick, 1980) is a process model that provides action steps to blend theory into practice within a particular context. At this point in translating NPT into practice, the action step for developing goals has been completed and the step for applying or designing a practice is next. The following describes how the reflexive monitoring mechanism of the NPT theory will be applied in practice by reconstructing the research paper to ensure human participation in learning while still meeting traditional learning outcomes, skills, benefits, and goals as previously described.

Reflexive Monitoring Toward Reconstructing the Research Paper

While there is no perfect replacement for the traditional research paper, the concept of reflexive monitoring is that the outcomes of collective action are continuously evaluated and that the appraisal of a given practice may lead to that practice being reconfigured or reconstructed (May & Finch, 2009). Given the goal-orientation of collective action being the retention of the benefits and goals of the research paper in a part-versus-whole format, the following section considers practical opportunities for human participation in learning.

Many are predicting the end of the traditional paper as a form of reliable assessment (Cotton et al., 2024). The following statement from Baidoo-Anu & Ansah (2023) is a call to action regarding changes to transitional forms of assessment:

> One area that has garnered more attention and become topical is students' assessment. It is too soon to conclude but very soon educators may need to rethink how students are assessed. They may have to change how assessment is currently done to more innovative assessments. (p. 59)

Innovative assessments are key to a learner-centered approach, but these must take AI into consideration (Rasul et al., 2023). Indeed, "while essays as assessments are regarded as threatened by ChatGPT, therein lies the very opportunity for educators to introduce innovative assessments" (Rudolph et al., 2023, p. 353).

The authors of this paper used Google's Gemini AI to generate some suggestions regarding the ways in which assignments can be crafted to make it challenging for a chatbot to respond. The following questions were asked:

- When a student is asked to display understanding, what skills can you (AI) not replicate?
- Are there any kinds of student assignments with which you can't help?
- How should teachers create an assignment in which AI can't help?

The following are some of several strategies Gemini (Google, 2024) provided that teachers can use to create assignments that minimize the advantage AI tools might give students: focus on higher-order thinking skills (e.g., open-ended questions, case studies and real-world problems, debate and discussion), incorporate creativity and originality (e.g., creative simulations, student-driven data collection), emphasize process and reflection (e.g., portfolios and self-reflection prompts), and utilize non-written formats (e.g., presentations, in-class activities). Gemini pointed out that while chatbots can assist in understanding a prompt, brainstorming or researching a topic, and proofreading, it does not have the ability to reflect on the student's own learning process (metacognition) or wrestle with a problem to arrive at solutions through the student's own reasoning.

The traditional research paper has long served as a catalyst for assessing a human's ability to convey meaning and share content-specific learning for the purposes of meeting learning outcomes in higher education. A literature review to determine a set of expected skills, benefits, and goals associated with the traditional research paper as well as suggestions from Gemini (Google, 2024) made clear the importance of maintaining human interaction in the learning process. To protect against the ways in which AI-generated papers have the potential of disrupting outcome measurement, human participation in the process must be pointedly and specifically integrated into the assignment from the onset (Mollick & Mollick, 2023; Cardona et al., 2023). Students have been found to prefer projects with clear requirements, guidelines, and feedback to help them determine when or if outcomes were met (Cliburn & Miller, 2008; Schoepp et al., 2019) and the entrance of AI on the scene does not negate this consideration. The current authors suggest taking an approach that chunks the research paper assignment based on the skills, goals, and benefits widely accepted as those which students should obtain as a result of completing a research paper and couple this with the notion that such an approach to assessment is actually more in line with the ways in which students process and learn. The following section will provide some general considerations for reducing the whole-paper, one-assessment, one-rubric tradition into smaller parts that integrate human participation components and will provide rationale as well as examples for taking this approach.

Annotation

One approach that discourages AI misuse—and encourages careful reading—is to ask students to annotate what they read, either with hand-written comments on printed paper or

> through tools such as Hypothesi.is and Perusall. Watkins described this as adding "friction" to the learning process. (McMurtrie, 2024, para. 9)

While it is tempting to jump all the way to putting a line through skills that are more easily replaced with AI, a strong argument can be made against this mindset. Evidence has shown that literacy levels can impact employability as well as overall life opportunities (Zywica & Gomez, 2008); therefore, the normalization toward AI use should be approached in such a way as to protect the skills associated with literacy levels. One such skill is annotation, which not only aids in overall literacy but contributes to content-specific learning (Zywica & Gomez, 2008), which is exactly the type of learning that has been the focus of the traditional research paper. One specific assignment suggestion would be to ask students to annotate a content-specific text in two directions: positively skewed viewpoints as well as those considered negatively skewed (Wolfe, 2000). In an age of AI infiltration, the skill of determining bias as well as directionality of a text will be paramount for determining credibility and the process of annotating can further embed content for the sake of deep learning. Lepik (2023) highlighted verification of content as integral to welcoming AI onto the education scene; therefore, assignments such as annotating, and even more specifically, narrowly focused annotating, could prove fruitful in the quest to protect human interaction in the processes of gathering data and doing research for higher education assessment purposes.

Reflection

Mollick and Mollick (2023) mentioned both known and unknown risks associated with AI to include responses filled with errors either ignored or unrecognized by the student, perpetuation of unreliable outputs, and the challenges that accompany using an imperfect tool. For these and many other reasons, students must be called upon to reflect along the way, not only on their personal level of understanding, but on whether or not they are avoiding or multiplying the risks associated with generated content. Asking for the integration of unique ideas, insights, and perspectives helps to ensure there is a human at the helm (Mollick & Mollick, 2023). One way to mitigate the risks of non-human outputs is to force the human back into the content by way of reflection. Perhaps students need to submit a one-page reflection sharing how their perspectives differ or align with generated outputs. Or, students record a collaborative conversation where they review the content submitted by others and ask follow-up questions in order to reflect on the topics together. In an article focused on ways to promote human reflection in an age of AI, Lepik (2023) provided a short list of ten questions to encourage students in this direction (e.g., "How did the AI-generated content affect your thoughts?, To what degree is this paper your writing?, and Do you expect a reader would notice text produced by the artificial intelligence versus your own – what would help her in this case?") (p. 4). While these are just a few ways to inject reflection into the process of writing a research paper, the point is that it can be a tool to infuse human conversation and contemplation in order to minimize some of the risks associated with AI use.

Collaborative Writing

In considering the ways to integrate human participation in learning, collaborative writing is one area that naturally engenders participation. Collaborative writing processes include the generation of ideas, language deliberations, collective scaffolding, co-construction, and recursive approaches to brainstorming, writing, and reading (Storch, 2005). Collaborative writing is a positive

experience for students that allows opportunity for active participation (Dobao & Blum, 2013). Additional features of collaborative writing include interaction and negotiation, as well as affective elements such as humor or conflict, that lead to development of writing and social skills (Fung, 2010).

Creativity

Zhai (2022) proposed that educators hone in on creativity and critical thinking skills by utilizing AI-incorporated learning tasks to engage students in solving problems. Indeed, Livingston (2010) advocated for injecting creativity into higher education and suggested that "practicing problem solving as a team game should be part of every student's experience" (p. 61). In addition, it is known that creativity increases when group members are diverse (Simonton, 2012). Furthemore, Rudolph et al. (2023) suggested that assessments should be designed with creativity in mind, such as performances, videos, learning experiences that foster intrinsic motivation, or writing about topics that genuinely interest the students. The ability for the student's own voice to shine through is a common denominator in creative pursuits and can be facilitated by giving students permission to brainstorm ideas no matter how inappropriate or foolish (Brinkman, 2010). One example of a task that combines the benefits of creativity with the understanding that students are using AI would be to have students generate main topics or headings using AI and then creatively represent those main ideas in either a graphic organizer, poster, or visual model.

Oral Presentations

While oral presentations have an assortment of pedagogic objectives, one of those is the ability to share information from research (Amirian & Tavakoli, 2016). One of the advantages of oral tasks is that they can enhance skills related to critical thinking and problem solving (Makena & Feni, 2023). Likewise, it has been found that oral presentations have the capability to produce learning opportunities (Sundrarajun & Kiely, 2009). Further, students appreciate the oral presentation as both a learning tool and as an assessment for learning outcomes (Thalluri & Penman, 2013). Whether conducted live or recorded with embedded audio/video elements, oral presentations teach students to deliver a persuasive argument (Grieve et al., 2021). AI capabilities are continuing to expand and become more intrusive to include human voice replication (Hughes, 2024). For this reason, requiring the human learner to be physically present or physically appear on screen has great benefit to ensuring participation in the process. Perhaps the added requirement of memorization would be another tactic for encouraging deeper content connections. Many of the strategies that are suggested by higher education curriculum developers reflect a swing back to education methods used decades ago such as recitation, rote memorization, oral presentations, and debate.

Action-Based Learning

As the pendulum in education is always in motion (Preus, 2007), it can be helpful to reach back in time to identify effective teaching methods from the past. In teaching the rhetorical organization of research papers, Hill et al. (1982) suggested giving groups of students misordered sections of a research paper without headings and have them attempt to order them correctly. Like-

wise, having students pair up to conduct peer-editing of one another's drafts has been recommended as a way to teach students to self-edit (Ferris, 1995). Other suggested class activities for learning to develop research papers is to collect data from the class as a group and have them compare their results with published data, or to have them conduct a pre- and post-test of the class to gauge the effectiveness of a teaching method (Hill et al., 1982). Similarly, students could be asked to develop an analysis based on an in-class discussion or a very recent event, neither of which could be well-generated by a chatbot (Rudolph et al., 2023). An effective method for teaching synthesis and summarization is to provide students with a particular text and have them create a graphic organizer (Anderson & Hidi, 1988). Joseph and Konrad (2009) advised that writing performance should be evaluated in an ongoing manner throughout the learning process to determine student progress and to identify gaps that may need continued development. Having baseline data would also help teachers pick up on changes that could be attributed to the use of generative AI. These are some of the various methods that have been used prior to the influence of technology on writing. Of course, AI technology helps with accessibility and inclusion for those who have communication disabilities (Hemsley et al., 2023), so it is important to consider accommodations when implementing any strategies that shy away from it.

Purposeful AI-Integration

One important caveat in reconsidering the ways that AI can be normalized is that students are known to engage with AI as "philosophers of technology" (Higgs & Stornaiuolo, 2024, p. 2). A recent study found that young people do have ethical concerns about writing with chatbots and that they desire support in deepening their critical thinking about using AI for writing and in everyday practice—"not in a punitive or simplistic way (e.g., don't use AI) but through deep, sustained, and balanced inquiry" (Higgs & Stornaiuolo, 2024, p. 15). Incorporating AI and assignments related to the ethics of AI will continue to be valuable and new, ever-evolving resources for the constructive use of AI in the classroom continue to become available, such as The AI Pedagogy Project run by the metaLAB at Harvard (McMurtrie, 2024). As OpenAI recently launched ChatGPT Edu for colleges and universities, it is becoming more evident that "students will need AI skills for workforce success" (Ascione, 2024, para. 1). Of course, chatbots should never replace the human instructor or jeopardize the benefits of relational rather than transactional learning (Rasul et al., 2023).

Metacognition

The normalization toward AI integration and acceptance must not replace the human ability to think, and this should include the human capability for metacognition, which is, broadly, to think about how one thinks. There are two forms of metacognition. Metacognitive knowledge is the awareness of how one learns and metacognitive control describes how one uses that information to regulate future learning methods and opportunities (Fleur et al., 2021). The current authors posit that an overreliance on AI has the potential to lead to lower levels of metacognitive control because the chatbot is essentially replacing the need to regulate the learning process. Fleur et al. (2021) suggested learners be required to make retrospective metacognitive judgments on learning elements such as confidence levels, any discovered biases, and overall sensitivity levels regarding the ability to decipher their own correct or incorrect decisions along the way. An assignment for curriculum developers and instructors to consider building into the traditional research

paper assessment would be to require a mid- and post-reflection asking students to provide some metacognitive judgments focused primarily on knowledge but that can, in turn, affect and protect metacognitive control. Ojeda-Ramirez et al. (2023) extended this idea to suggest that AI-literacy be another aspect that learners be asked to reflect upon in order to determine their ability to correctly utilize generated information as well as their comfort level doing so and pushed for the importance of this in an age when AI is both replacing and creating new employment opportunities and career options. Järvelä et al. (2021) also pushed for adding a collaborative component to the reflection process in order to provide the added benefit of learning to process about learning for the sake of the collective good. Yang and Xia (2023) called for the integration of AI technology and metacognitive abilities as a promising conceptual model for further research and investigation while stating that the tenets of metacognition must not be thrown out in the name of AI advancements.

Evaluating the Intervention: Future Research

It is widely agreed upon that theory-to-practice models must involve evaluation of a practice and some would go so far as to say a feedback loop is necessary to assess practice for the purpose of informing theory (Reason & Kimball, 2012). The reconstruction of the normalization process regarding research writing within the context of AI has provided many suggestions for practice. Because the authors of this paper have not themselves tested these in practice, a formal evaluation cannot be described. However, the following offers a discussion regarding the potential for future research regarding these efforts.

While this paper is limited in its scope specific to rethinking AI's influence on the research paper, AI will continue to become normalized as the technology expands. Google's DeepMind researchers have indicated that AI's potential to be a deeply integrated and impactful technology will "radically alter the nature of work [and] education" (p. 1). Future research requires new methodologies that focus on the societal effects of AI (Google DeepMind, 2024) and "the choices we make today, as researchers, developers, policymakers and members of the public will guide how this technology develops and is deployed across society" (Gabriel & Manzini, 2024, para. 21). It is in this deployment where NPT can be a player for guiding the normalization of this technology. Utilizing NPT as an ecological process will provide parameters for developers and policymakers in guiding this work. This will be especially important to guard against AI's dangerous capabilities, whether unintended or malicious. While today's society seems to agree on the perceived utility of AI, researchers and developers should continue to engage in the NPT mechanism of collective action, whereby the purpose and goals of AI are described, and ultimately in reflexive monitoring, in which outcomes of the practice are continually reassessed for the purpose of modifying or reconfiguring the practice to adhere to its agreed upon purpose. For example, since AI threatens to foster loneliness, perhaps its goal should move away from efficiency and toward interpersonalization and connections between instructors and students (Morris, 2024).

While NPT is a highly cited and utilized implementation theory, other implementation science approaches are increasing (Dalkin et al., 2021). For example, a systematic review by Kirk et al. (2016) found over 400 research articles across a wide range of topics using the Consolidated Framework for Implementation Research. Therefore, it will be important to consider the appropriate theoretical frameworks and conceptual approaches regarding implementation. Likewise, there may be more robust or efficacious theory-to-practice methodologies to examine.

Besides these alternative frameworks to consider, suggestions for future educational research should consider qualitative research questions worth investigating regarding empirical data as well as perceptions of the role of writing assignments in higher education. Quantitative surveys could provide opportunities to study differences between student populations from universities that take proactive versus reactive approaches to AI influence considering a range of variables (e.g., motivation, determination, confidence, etc.). Qualitative methods would allow for results specific to student perceptions of learning when they do or do not submit an AI-generated paper.

Conclusions

Rooted in the normalization process framework, the authors of this paper focused on strategies to protect traditional research paper learning outcomes from extinction. The current authors suggested that a general swing back toward teaching and assessment strategies employed in education prior to the digital age should be revisited. Some examples mentioned in this paper are collaboration, oral presentations and discussions, creative displays of concepts, chunked learning tasks rather than one form of assessment, activities that require reflection to include metacognitive reflection on the actual process of learning, and in general, human engagement that requires physical motion, cooperation, or action on the part of the learner. Additional and specific examples for each of these categories or suggestions were provided as jumping off points for thinking beyond the traditional research paper of the digital age which typically entailed one assignment rubric, one submission due date, and one completed paper graded by an instructor as the sole determining evidence that the course learning outcomes were met. The outcomes, in the form of research and paper-writing skills, benefits, and goals need not be thrown out or disregarded; rather, they can be reconstructed with an understanding that AI infiltration on the learning landscape is the current and future reality. Future researchers and policymakers are encouraged to consider utilizing NPT or other implementation theories to continually define and reevaluate AI's goals in and for education.

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From Bytes to Books: Navigating the AI Frontier in Postsecondary Education

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Abstract

Many scholars agree that there is no consensus between what students and teachers consider as proper use of generative Artificial Intelligence (AI). Further, even if there are a plethora of studies on the topic of AI as technical integration to the curricula and academia, a scarcity of research still exists as it relates to ethical aspects. The purpose of this Conceptual Framework contribution is to offer a new approach to understanding how to integrate AI into postsecondary teaching, learning, and administrative tasks. Specifically, we center this piece around the following question: how do educators, students, and administrators leverage generative AI's expanding capabilities to improve teaching and learning, while minimizing educational risks? In doing so, we offer a combined ADDIE-AIAS framework that may help to mitigate these issues in higher education and pair this framework with examples from the field to illustrate its application in different contexts.

Keywords*: Generative Artificial Intelligence, teaching and learning, administration, efficiency, ethics, ADDIE Framework, AI Assessment Scale*

The introduction of generative Artificial Intelligence (AI) has had several implications for teaching, learning, and administration in the field of education, including the way that students engage with content and the way teachers plan, design, and execute their courses (Bowen & Watson, 2024; Clark, 2023). The purpose of this contribution is to offer a new approach to understanding how to work with and integrate AI into postsecondary teaching, learning, and administrative tasks. As faculty, administrators, and graduate students, we investigate how different strategies leverage generative AI in the contexts that we experience in higher education. Specifically, we center this piece around the following question: how do educators, students, and administrators leverage generative AI's expanding capabilities to improve teaching and learning, while minimizing educational risks?

To do so, we explore examples centered on teaching and learning areas relevant to higher education including faculty, student, accessibility, and assessment processes and how generative AI has been utilized to enhance or diminish resources and efficiency within these areas. In these instances, we offer a discussion regarding pragmatic usage and contrast it with ethical concerns and risks that it can pose with respect to these contexts. As part of this analysis, we apply the Analyze, Design, Deliver, Implement, Evaluate (ADDIE) framework (Larson & Lockee, 2014) – a foundational instructional design methodology that provides a structure for reliably creating effective learning experiences – with the AI Assessment Scale (AIAS) as a lens to analyze common experiences with generative AI and how it can be appropriately integrated into teaching, learning,

and administrative processes to best support student success. Through these examples and analysis, we connect to lessons learned and implications for others navigating similar scholastic terrain.

Context in Higher Education

The Chronicle noted in a recent survey of college officials, that the majority believe that AI will positively influence the fields of teaching, research, career and library service within the next five years (Parnell, 2024). To this end, AI can prove to be beneficial to many postsecondary work responsibilities, but navigating the new technological advancements can also prove challenging. Further, as this relates to applications in postsecondary teaching and learning, there exists a need to address ethical and pedagogical implications of integrating AI into educational assignments, learning environments, and even administrative tasks (Bowen & Watson, 2024). Feisler (2023), an AI and technological and computer scholar, warned:

> I sometimes describe myself as a technology optimist who thinks and prepares like a pessimist. The only way to decrease ethical debt is to take the time to think ahead about things that might go wrong – but this is not something that technologists are necessarily taught to do. (par. 11)

Feisler (2023) defined the ethical debt as anything and everything that could go wrong with the use of AI such as harm to society or any type of consequential effects on or interaction between AI and humans. Many scholars agree that there is no consensus between what students and teachers consider as proper use of AI resources and more research is needed. Also, even if there are a plethora of studies on the topic of AI as technical integration to the curricula and academia, a scarcity of research still exists as it relates to ethical aspects.

Scholars, such as Feisler (2023) point to many complexities connected with AI use, indicating that,

> …public concern about the ethical and social implications of artificial intelligence keeps growing, it might seem like it's time to slow down. But inside tech companies themselves, the sentiment is quite the opposite. (par. 1)

By the same token, when it comes to the use of generative AI, postsecondary educators note concerns which include misinformation or false information, weakening of the content knowledge, and a threat to academic integrity (Clark, 2024; Parnell, 2024). As Chiu (2024) argued, institutions of higher education are being called to provide guidance and direction on AI use for teachers, administrators, and students alike, considering their role in educating future professionals in the use of AI. However, although the need for policies and guidelines at the university level is helpful, scholars take this point further by underscoring the necessity to better understand AI in terms of learning theory and pedagogical practices instead (Xu & Ouyang, 2022).

Conceptual Framework

Existing Frameworks

As with other advances in technology, understanding the use and integration of AI in university level teaching and learning is paramount to providing the guidance needed to better engage with this technology. To this end, several frameworks to understand AI have been developed. For example, Holstein and colleagues (2020) explored AI use in education by focusing on the jointly enacted AI systems and human facilitators (e.g., teachers or peers) dynamic inherent in educational AI (AIEd) systems. Their work builds on frameworks that have explored AIEd through computer-supported collaborative learning, teacher cognition, and classroom orchestration that offer insight into specific aspects of adaptive learning systems (Holstien et al., 2020). Understanding different elements of the human-AI hybrid adaptivity in education, the scholars offer a generalized set of dimensions, including (1) Goal Augmentation, (2) Perceptual Augmentation, (3) Action Augmentation, and (4) Decision Augmentation. Each goal is intended to capture components of adaptive instructional behavior, "suggesting distinct ways in which AIEd systems and human facilitators might augment one another" (p. 35).

Focusing on the learning theory behind the integration of AI into education, Ouyang and Jiao (2021) explored extant literature on the topic to see if, and how, AIEd researchers link AI integration to learning theory. In their work, they found that scholars rarely underscored the purpose and use of AI with relation to relevant learning theories that could help augment the ways in which educators leverage AI in learning. Specifically, the authors contended that the AIEd literature, "[lacked a] critical reflection of theoretical, pedagogical, and ethical implications," and those that did reportedly focus on pedagogy, "..the applied learning theories or educational frameworks had not been reported in most cases, even though the theories played an important role in understanding the context in which a system was implemented" (p. 2). To address this issue, they proposed three paradigms where AI techniques can be used to address educational and learning issues in varied ways: (1) AI-directed (Behaviorism) learner-as-recipient, (2) AI-supported (Cognitive, Social Constructivism) learner-as-collaborator, and (3) AI-empowered (Connectivism, Complex Adaptive System) learner-as-leader. Tied to specific learning theories, each paradigm posits the appropriate ways in which to engage learners with AI as part of the learning process and offer guidance on the design and creation of content (Ouyang & Jiao, 2021).

In a similar vein, Xu and Ouyang (2022) researched AIEd scholarship to explore in what ways AI is positioned with respect to other educational elements. They contend that as a new, emerging, and interdisciplinary field, specifics related to the deep connections between AI integration and learning theory and instructional design principles have not yet been readily established. Leveraging a systematic literature review process, Xu and Ouyang (2022) examined the practical, theoretical and technological uses and implications of AI in various learning environments. From their analysis, they proposed that AI has three primary roles in education including: AI as a new subject, AI as direct mediator, and AI as a supplementary assistance to influence the instructor-student, student-self, and student-student relationship (Xu & Ouyang, 2022).

Providing another perspective on AI use in education, Chaudhry and colleagues (2022) reviewed several existing checklists and frameworks that focus on different dimensions of ethical AI use to better understand the requirements of transparency for different stakeholders of AI in education. They posited that,

> An AI tool built with huge amounts of data and the best performing machine learning algorithms will perform at its best only in certain contexts. Transparency is essential to know in which contexts the tool will not perform at its optimal level. (Chaudhry et al., 2022, p. 4)

To address this issue in education, they proposed a Transparency Index framework that highlights five aspects of transparency that need to be considered when using AI, including: fairness, explainability, safety, accountability, and interpretability. The Transparency Index framework was intended for use in the planning, development, and deployment of AI tools that are used in learning contexts. Chaudhry and colleagues (2022) underscored that this index builds on transparency in AI literature, including frameworks proposed by Felzmann et al. (2020), Richards and King (2013), and Ananny and Crawford (2018).

ADDIE Framework & AI Scale Combination

Albeit just a glimpse of the frameworks that are currently in the AIEd literature, those shared above offer a foundation by which to understand how AI has been thus far explored and integrated into education. Building on this extant literature, it was important for us to situate ourselves as scholars, educators, and learners and leverage tools that are familiar to our discipline to navigate the development of learning environments or administrative tasks with AI. As Ouyang and Jiao (2021) and Xu and Ouyang (2022) posited, the relationship between the integration of AI into educational materials or postsecondary administrative assignments is less developed. In accordance, we gravitated towards the ADDIE framework as a design and planning tool that could be used with an AI scale to help create learning environments that integrate AI in an efficient and ethical manner.

ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, which are iterative phases or stages described by the literature as pivotal parts of an instructional product (Aldoobie, 2015; Patel et al., 2018). This model intentionally considers principles of various learning theories, the learner's needs and environment, and approaches to training practitioners and educators in continual improvement processes (Patel et al., 2018). Larson and Lockee (2014) contended that the phases are rather activities that emphasize the processes inherent in both teaching and learning that lead to the continual improvement of both. This means that every component of the instruction is governed by student-centered learning processes that are dictated by learning outcomes determined after a thorough analysis of the learners' needs (Larson & Lockee, 2014). Patel and colleagues (2018) further emphasized that the ADDIE model can be utilized as a project management guide to understand the inputs and outputs that make up the efficiency of the learning environment being developed or evaluated.

Although ADDIE has been a beneficial framework to understand course and instructional design, the integration of AI is not fully integrated into the activities/phases of the framework. As AI integration in learning is not a binary yes/no, black/white, good/bad decision because nuances allow for the use of AI in a higher education setting to enhance efficiency in teaching and learning, it is valuable to use a scale as an evaluation metric to understand when and how it might be incorporated. To this end, we found that the Perkins et al. (2024) AI Assessment Scale (AIAS) becomes a viable tool to use in tandem with the ADDIE framework to better comprehend the full potential of AI possibilities. According to Perkins et al. (2024), "The AIAS has emerged as a response to these changing dynamics, highlighting the need for a more structured approach to the integration

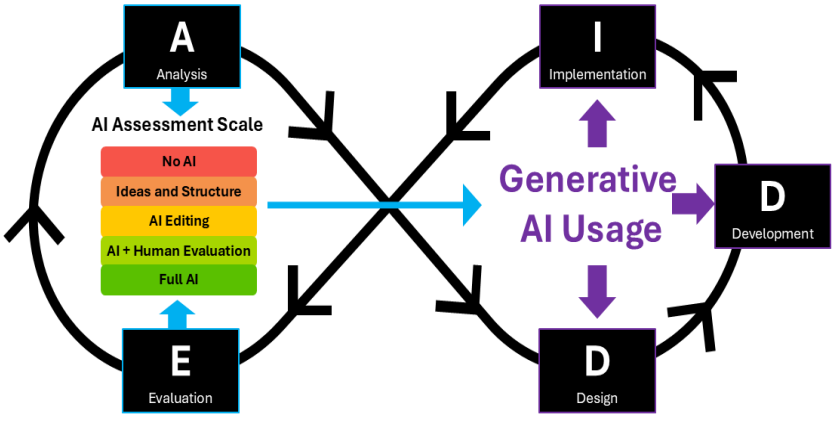
of Gen AI in academic settings" (p. 5). Further, three goals define the AIAS: 1) Help educators consider how their assessments might need to be adjusted in light of Gen AI tools, 2) Clarify to students how and where Gen AI tools might be used in their work, and 3) Support students in completing assessments in line with the principles of academic integrity (Perkins et al., 2024). The AIAS scale itself has five pointers:

1. No AI: AI must not be used at any point during the assessment.
2. AI-Assisted Idea Generation and Structuring: No AI content is allowed in the final submission.
3. AI-Assisted Editing: AI can be used but your original work with no AI content must be provided in an appendix.
4. AI-Task Completion Human Evaluation: You will use AI to complete specified tasks in your assessment. Any AI created content must be cited.
5. Full AI: You may use AI throughout your assessment to support your own work and do not have to specify which content is AI generated. (Perkins et al., 2024)

The AIAS further provides a scalar approach to integrate digital technologies in education, especially in a time when the broad spectrum of digital tool usage is becoming so prevalent in higher education (Perkins et al., 2024).

In Figure 1, we offer a visual of how the components of the AIAS, Generative AI, and the ADDIE Framework would function together. In this figure, the ADDIE framework follows an infinity pattern to underscore how the phases continually influence one another. In the first half of the infinity pattern, the Analysis and Evaluation components of the ADDIE framework are pointing towards the AI Scale because these components are actively being guided by the selection of the AI Scale being used. For example, in the Analysis phase, an instructor would determine the level of AI use in student learning based upon student needs as described by the AI Scale. In the Evaluation phase, student learning and content design is evaluated based on the use of AI as previously selected by the AI Scale in the Analysis phase.

Figure 1. *Integration of AIAS into ADDIE Framework*



The other three phases in the ADDIE Framework—Design, Develop, and Implementation—are in the second half of the infinity pattern. This implies that they are guided by the Analysis and Evaluation phases, as well as the selection of levels on the AI Scale. These three phases are pointing to receive input from Generative AI technology use based on earlier phases informed by the AI scale. The infinity cycle underscoring the ADDIE Framework in the visual implies a continual review process with respect to AI selection, design, and use in faculty teaching and student learning.

In combining the AIAS with the ADDIE framework, we are proposing a way to help facilitate the understanding between students and teachers regarding the pedagogical benefits of using AI as part of the teaching and learning process in higher education (Patel et al., 2018; Perkins et al., 2024). As the AIAS helps to address concerns related to academic integrity, AI literacy skills development, plagiarism, and other issues, integrating it with the ADDIE framework may help develop learning environments, student activities, and other instructional related content. It was important to have a flexible framework that worked for both educators and practitioners to bolster critical learning and teaching skills when it comes to the use of AI. Specifically, by identifying the ways in which AI will be used as part of the design of course content or student engagement, this could amplify putting ethics on the forefront when discerning when and how to use digital technologies in the learning processes at the postsecondary level.

In our conceptual framework, we propose using the AIAS as the means by which to identify initial teaching, learning, and administrative needs, especially as part of the Analysis phase in the ADDIE framework. In this way, when educators, administrators, or students are planning their work, the AIAS will be the first tool leveraged to understand the need for the use of AI, which then would guide the design and development of the content created or strategy used. The AIAS could then also be utilized to assist with the evaluation aspect in the ADDIE framework, as educators, administrators, and students could anchor evaluation in the ways in which AI was initially intended to be used in the design process. In Table 1, we offer a supporting organization of how and when the AIAS could be incorporated as part of the ADDIE process, complementary to Figure 1.

Table 1. *ADDIE Framework with AIAS Incorporation*

Analysis	Identify student learning needs or teaching needs using the AIAS. This would pinpoint how and why AI is used in the learning process.
Design	Create course content or engagement with AI around the decision on how AI can be used in this activity.
Develop	Prototype the course content or engagement with AI around the decision on how AI can be used in this activity.
Implement	Carry out the course content or engagement with AI as designed and developed in previous stages with AI decisions.
Evaluate	Reference the initial decision to use AI as per the AIAS. Gauge what worked and what did not work in terms of the use of AI.

Teaching and Learning Vignettes

To highlight how AI intersects with postsecondary ethics and learning parameters, we feature four vignettes that offer different perspectives of how this type of technology may be used in postsecondary settings. These vignettes also provide narrative to understand where the combined ADDIE and AIAS framework could address discrepancies relating to ethical considerations in AI use. To anchor these perspectives, we posit the following question: how do educators, students, and administrators leverage generative AI's expanding capabilities to improve teaching and learning, while minimizing educational risks? Through these examples, we reflect on how the ADDIE framework and AIAS can be combined to evaluate the efficiency of the uses of AI in various contexts in higher education.

Teaching and Learning: Faculty Perspective

The human oversight of AI is a must to harness its biggest potential. There can be a multitude of ways for faculty to use AI to help support their teaching and scholarly tasks. This new technological advance can assist in feedback and email creation, nevertheless it is not enough to simply copy and paste the generated text. For example, the feedback or an email template offered by AI can be a starting point for further additions, with student specific information and directions, a base which the instructor supplements, assuring students the benefit of receiving the correct and deserved personalized and relevant information.

The introduction of AI has several implications for teaching and learning in the field of education for faculty, including the way that educators design how students engage with content and assessment that could leverage AI for learning purposes. For example, an instructor may use AI for designing a study guide assignment which is used as part of many undergraduate level courses. This study guide assignment is essentially a form that engages students in reflection of several chapter textbook questions to which students need to provide reflective answers based on the text, at times citing meaningful passages from the reading. In creating the content for this assignment, AI could help faculty with generating study guide prompts by outlining lists of content questions that could provide a selection for the instructor. AI could also be utilized to create a template for various student feedback content that could ensure that necessary study guide features are outlined, with the instructor adjusting and individualizing this feedback to tailor to students' needs.

Further, it is advantageous to allow students to use generative AI to supplement their research endeavors for this assignment, and in the same token teach them how to verify peer-reviewed sources as part of their learning. In this example, AI can provide the first step in a vast research search, but ultimately it needs to be the student who writes-up the scholarly sourced results, citing meticulously where the information was found for further verification and transparency. Hopefully, it is needless to say that same standard should apply to faculty. In using AI, it is appropriate for faculty to note and acknowledge use in these endeavors, placing an acknowledgement note as part of the content of the study guide material.

For faculty, the use of AI can potentially provide a springboard for ideas. How often do faculty sit in front of a blank sheet of paper or a white screen? In these academic situations a brainstorming session or an engagement with AI could launch the imagination to a scholarly universe of possibilities and could prove productive and valuable. The human factor, however, is the most important and critical thinking skills should always be at the forefront of any scholarly tasks.

AI can improve writing and, by its use, we learn alongside it, often requesting a synonym or correcting the wrong syntax. This speeds up the writing process and provides an additional level of instruction that occurs almost in an implicit manner. As postsecondary instructors are becoming more open to such AI use, many are utilizing the same resources to advance writing.

When both teachers and students use AI in an ethical manner, when we leverage AI possibilities, we can ensure the best outcomes. Some specific ways to use AI in an ethical manner in teaching and learning include the use of a disclaimer regarding AI use in the generation of any scholarly content, discerning how to use AI in different settings, incorporating classroom discussions on the appropriate use of AI technology for teaching and learning, and setting clear guidelines on what is expected in terms of appropriate AI use for the discipline. Several scholars and universities offer guidance on how this potentially could be accomplished. For example, universities could offer workshops where faculty can learn how to make mindful and ethical choices in using AI, collaborate with institutional leaders to integrate AI projects into existing courses, create communities of learning to help foster discussions on the critical evaluation of the use of AI in faculty-developed content, offer professional development training on issues of transparency and privacy in using AI, and partner with various campus offices to understand how AI can help support student learning and enhance accessibility features (Cornell University, 2024; Dwivedi et al., 2023; Noyes & Girdharry, 2024; Uzzi, 2020; Wargo & Anderson, 2024). Ultimately, these discussions need to be centered on "striking a balance between riding the wave of AI advancements and upholding ethical principles" (Wargo & Anderson, 2024, par. 22).

In teaching and learning, the focus needs to remain on individual growth and development in terms of the content shared in the classroom. Adding AI as a technological tool, whether to advance faculty responsibilities or student learning, can be considered skill development as part of the overall educational environment. AI tools can and should revolutionize postsecondary environments. More conversations and opportunities to discuss current technological advancement would be constructive as we have just started walking on this new technological path and we all need guidance regarding what is right and wrong. Sure…some answers are black and white, and ethical conduct gives straightforward responses, but as on many paths there are gray areas, and further conversations would bring about clarity. Also, we should not just assume that AI use is bad and unwanted as progress is unavoidable and should be welcomed and desired, with academic ethics in mind.

Teaching and Learning: Student Perspective

The goal of a university class should be mastery of the course content. One of the best ways to achieve mastery is for a student to put focused attention on learning and understanding their coursework while also having a professor or tutor at hand to help. Unfortunately, both professors' and tutors' time is limited, and if extra help beyond university-provided resources is needed then it is often expensive. Friends and study groups can make up more of this gap but often provide little more than a sounding board, rather than information-rich instruction. Fortunately, AI promises (and delivers, with caveats) the experience of having both an information-rich tutor and a natural-language sounding board at a student's fingertips whenever and wherever they are working.

If the goal of a university course is mastery of the content, then a tool that gives answers with no thinking required from the student would be a catastrophic addition to the academic landscape. Fortunately for mathematics, large-language-model AI is not capable of providing accurate

answers to computational problems the way a dedicated mathematics software, or even calculator, can. Using AI to help with course mastery consists more of treating the AI as a combination search engine, tutor, and sounding board. One of the co-authors started using AI as an academic tool when she began her calculus II course. The following is an excerpt from her experience.

Since I had taken calculus I eight years prior, I was woefully behind at the start of the course and had forgotten many basic calculus concepts. I found myself unable to read and decipher complex mathematical notation and struggled to keep up with the assigned homework. Basic searches using a search engine provided resources, certainly, but those resources often were not targeted to exactly my problem and required me to spend extra time searching through them for the information needed. When I realized I was spending so much time trying to find answers to what was, usually, a basic question any professor or tutor could answer in a single sentence, I changed my strategy and added AI to my study routine.

Since it was both unlikely and undesirable to get solutions to homework problems from AI (I was determined to master the content as a foundation for my future studies), my queries often looked like a Google® search, for instance: what are the properties of logarithms? The accuracy of that answer was excellent since the model was trained on natural-language answers, which included natural-language explanations of the properties of logarithms. If I did not understand the explanation, I was then able to ask the AI to rephrase in a different way, clarify a part of the answer, or add the context of my specific homework problem. These are functions that you can get in real-time from a tutor, but not from a webpage search result.

The second kind of question I would ask was a clarifying prompt about the phrasing or notation of the homework problem itself. In the past, before this kind of AI existed, I would try search Google® and see if someone had explained a similar question. That technique often failed, even in the lower-level mathematics courses where there is much more content online, because teachers and professors often phrase or frame things using very different key words. It was especially difficult to find clarifying information about complex mathematical notation, since specialized formatting cannot translate to a simple search. Using generative AI, I was able to describe what I was seeing and get a detailed explanation of what it meant, which then enabled me to continue working on the problem.

The third kind of question I would ask AI was intended to refine my thoughts by writing them out rather than to obtain a specific answer. It was similar to the rubber-duck method in programming (explain your problem to a rubber duck and you will often realize the solution before you have even finished), except that the AI could give me an intelligent answer the same way a human conversational partner could. Simply organizing my thoughts enough to write a query was valuable, but the AI was often able to point out nuances I had missed, or add context that I had not thought of.

Ultimately, one of AI's strengths is that it does not magically give you the right answer to any question. For me, the value of AI as a tool came from thinking critically about the answers it gave me and using those answers to hone in on what I needed, the same way Miller (2023) suggested it should be done. Inaccurate answers still provided me with new keywords I had not thought of before. AI's inability to do problems outright meant that I could only use it as a tool to help me achieve mastery and find the answer myself. This is especially important because I often used other mathematics-specific software to check my answers, as suggested by scholarship (Miller, 2023). If I did not care about mastery, the tools to cheat already existed prior to AI and, indeed, the nature of AI as a tool made it less appealing to give up on understanding a problem when I could not get to the calculated answer unaided.

Teaching and Learning: Accessibility Perspective

Although AI has been talked about in the literature from the perspective of students and faculty, narratives reflecting first-hand encounters with this technology in other university units is rare. To add to these narrative, we share in the following the experiences of another co-author who, as both a graduate students and staff at a university, shares a unique perspective from the accessibility aspects of AI. The following is an excerpt from her experience.

As both a visually impaired graduate student and university administrator, I have witnessed the transformative impact of AI on educational accessibility. AI has not only streamlined processes but has also opened up unprecedented opportunities for students with disabilities. The integration of AI technologies in education represents a significant leap forward in our efforts to create accessible learning environments that cater to different needs and abilities. The challenge of accessing reading materials, once a significant barrier, has been largely mitigated by AI-powered tools. Screen readers and text-to-speech software, utilizing Optical Character Recognition (OCR) and Natural Language Processing (NLP), have revolutionized how visually impaired students engage with course content (Kaplan-Rakowski & Heap, 2023; Roshanaei, 2024). Tools like Seeing AI by Microsoft and Job Access With Speech (JAWS) offer robust support, making both digital and physical texts accessible. These technologies have made it possible for students to access a wide range of materials, from textbooks to academic journals, with unprecedented ease and efficiency.

During my graduate studies, integrating OCR technology into my daily routine proved invaluable, significantly enhancing my reading efficiency and allowing me to keep pace with my peers (Alkhawaldeh & Khasawneh, 2023; Shuford, 2023). The ability to quickly scan physical documents and convert them into accessible digital formats meant that I could participate fully in class discussions and complete assignments without the delays that once accompanied the process of obtaining accessible materials.

Navigation of physical spaces, particularly expansive university campuses, presents another hurdle for visually impaired individuals. AI-driven navigation apps like BlindSquare and Be My Eyes offer crucial assistance, providing real-time auditory directions and environmental descriptions (Alkhawaldeh & Khasawneh, 2023; Kaplan-Rakowski & Heap, 2023). Be My Eyes, leveraging AI-powered software, even goes a step further by describing images captured in real time, facilitating tasks like reading signs, papers, and navigating unfamiliar spaces. These tools foster independence and confidence in campus navigation, allowing students to move freely among classes, libraries, and other campus facilities without relying on constant human assistance. However, it is important to note that these technologies are not without limitations. The AI algorithms, often trained on data from sighted users, may occasionally misinterpret images captured by visually impaired individuals, necessitating a balanced approach to their use. As educators and administrators, we must be aware of these limitations and work to provide complementary support systems when necessary.

In the digital realm, AI assistants have proven instrumental in developing digital literacy skills, an increasingly crucial aspect of modern education and professional life. AI assistants like ChatGPT®, Google Gemini®, and Claude® serve as virtual tutors, offering step-by-step guidance and troubleshooting assistance for navigating complex software applications. In my role as a university administrator, I frequently rely on these AI-powered tools to navigate complex software applications, particularly in deciphering specific settings or functions within Excel® and Word® documents. These virtual tutors offer step-by-step guidance, effectively demystifying intricate dig-

ital processes and enhancing workplace productivity (Shuford, 2023). For people with visual impairments, mastering these digital tools is not just about academic success; it is about preparing for a future where digital competence is a prerequisite for many career paths.

The impact of AI extends beyond individual accessibility to academic research, an area where visually impaired students and researchers have historically faced significant challenges. AI-driven literature review platforms streamline the research process, allowing visually impaired students to efficiently filter and focus on the most pertinent academic literature (Müftüoğlu et al., 2022). This capability is particularly beneficial for visually impaired students who, unlike their sighted peers, rely on screen readers to process information in its entirety. AI tools level the playing field by rapidly filtering vast amounts of academic literature, allowing students to focus their efforts on analyzing and comprehending the most critical studies.

The ability to quickly identify relevant sources and extract key information has been particularly beneficial in fields where the volume of published research is overwhelming. However, it is crucial to emphasize that these tools serve as assistants rather than replacements for critical analysis and comprehension (Roshanaei, 2024). As educators, we must ensure that students develop the skills to critically evaluate and synthesize information, even as AI tools make the process of gathering that information more efficient.

While the benefits of AI in improving educational accessibility are substantial, they come with ethical considerations that warrant careful attention. Issues of data privacy, potential biases in AI systems, and the risk of over-reliance on technology must be addressed (Müftüoğlu et al., 2022; Shuford, 2023). As we integrate these technologies, we must balance leveraging AI tools with fostering fundamental skills development. It is crucial to consider how AI can complement human skills rather than replace them, providing opportunities for upskilling and reskilling (George et al., 2023).

The integration of AI in education has the potential to transform accessibility from an aspiration to a reality for students with disabilities. However, technology alone is not the answer. It must be accompanied by intentional policies, adaptive teaching methods, and a commitment to addressing the unique challenges faced by individuals with disabilities.

Teaching and Learning: Assessment Perspective

Universities and colleges are often data-driven institutions that rely on accurate numbers to make decisions that are aligned with their mission. The utility of data-driven decision making in the postsecondary context is not only valuable, but also a necessary part of the fabric that supports student success practices (Gagliardi, 2022). For example, during the pandemic, data- driven processes were leveraged by several institutions to better understand the student experience and provide essential support, including much needed access to federal funding, technology (e.g., internet and computers), and mental health services (Gagliardi, 2022). However, for this data to be readily accessible, the data offices of postsecondary institutions needed to have access to resources like advanced software and data collection techniques to help deliver and expedite such requests.

This is precisely where artificial intelligence can play a major role in facilitating access for institutions that may have limited resources. In the example shared here, we look at a community college data office where two of our co-authors worked that was charged with better understanding the propensity of AI to assist in fixing integration challenges. Data management for this particular office included leveraging a variety of datasets from several units in Academic Affairs, Student Affairs, and President's Office to understand enrollment, retention, and student success trends.

Over the course of a semester, as a two-person team, we would create over 300 reports for various learning outcomes and institutional reporting mechanisms. However, in manually merging these various datasets, this small, understaffed, data office under the Institutional Effectiveness unit was taking hours as multiple tasks and projects were being managed. Therein lies the challenge that AI could assist with in terms of efficiency.

To help address this challenge, this office enrolled in a Presidential initiative to review functionality possibilities that could be enhanced through AI. After participating in AI training as part of this initiative, we tasked AI to see if it could find a way to assist in developing the programming code needed to get the various datasets merged and cleaned efficiently. By using common software services, Microsoft SharePoint® and Power BI®, two that were familiar to faculty and staff at the college, we were able to create looping systems and codes, with the assistance of AI technology, that not only seamlessly merged the datasets needed for these reports, but also could be used to double-check inventory and track related to this data. By using AI technology, we were able to create a homegrown, embedded system that cut down time on data entry and allowed for more time to be used for advanced analyses on these reports.

In this regard, AI was leveraged as a third essential staff member that would essentially guide staff in understanding and developing codes for effective data integrations. Limited in resources to purchase more advanced software that could potentially address this issue initially, we used resources available to create our own software for this purpose. Although we knew exactly what we wanted the programs to do, and were versed in programming and coding, complex integrations were where we needed the most assistance, especially when creating code that was intended to speak to two different programs. AI became an assistant and third staff member essential in helping to think more thoroughly about programming and coding nuances.

In this journey, however, there were several ethical implications we had to consider. For example, we could never share or upload institutional data for AI to review to provide ideas. Having student and identifiable information on the datasets made that option an impossibility. Further, we had to be careful in terms of the integration information we were asking for as it held implications for our college's security. For this reason, we had a sandbox on our secured college site to run coding experiments using the software we were adopting for our homegrown system. This helped to keep data secure while also instituting a place wherein codes and programming language could be tested. This is also precisely where our first successes occurred that were then transferred to a more formal system shared with faculty and administration.

Analysis

From the above examples, the use and integration of AI in higher education activities is varied and not tangibly measured in terms of how or to what extent it needs to be used. These examples are offered in the context of better understanding the situations that faculty, students, and administrators may face when trying to engage with AI for instruction, learning, or efficiency-related tasks. Below, we expand on the second example shared, from the student perspective, to indicate how an ADDIE-AIAS combined framework might have been applied to help guide student learning and set ethical parameters for the assignments. In Table 2, we summarize the phases of the ADDIE framework for each example, linking the Design phase to the level and use of AI as a helpful tool to better understand the varied technological needs and uses for AI in postsecondary tasks.

Table 2. *Cross-Examination of ADDIE Framework with AIAS*

Vignettes	Teaching and Learning: Faculty Perspective	Teaching and Learning: Student Perspective	Teaching and Learning: Accessibility Perspective	Teaching and Learning: Assessment Perspective
Lesson Learned	Example 1: Balanced Approach	Example 2: Student Homework	Example 3: Accessibility Support	Example 4: Efficiency
Analysis	Identify top level learning goal Problem identification Ex: Study Guide and student learning	Identify top level learning goal Problem identification Ex: Calculus homework and student learning	Map required resources Ex: accessibility office resources needed to support students	Identify stakeholder needs Ex: Integration of new program language to improve efficiency in reporting
Design	AIAS Scale 4: AI Task completion, human evaluation	AIAS Scale 2: AI-assisted idea generation and structuring	AIAS Scale 5: Full AI	AIAS Scale 5: Full AI
Develop	Develop the AI instructional strategies that best support students Develop the best technological access	Develop the AI instructional strategies that best support students Identify the best technological tools to access	Create an inventory of needed accessibility resources and link to student needs	Create parameters of expectations with use of AI and align to stakeholder needs
Implement	Faculty and students are free to	Student is free to	Student is free to use any AI tool	Team is free to leverage available AI

	use AI with appropriate sourcing and citations	use AI to brainstorm tasks but no AI is allowed in the final submission	to support learning environment	tools to adapt and modify coding
Evaluate	Evaluation of faculty and student use of AI, its appropriate sourcing, and alignment of knowledge acquired	Evaluation of percentage of student's original work with points for improvement of process	Evaluation of student participation in AI accessibility resources as a case study	Evaluation of project goals and proposal of points of improvement for use of AI in future efficiency-related projects

Teaching and Learning Student Example Explained

Analysis

Highlighting Example 2 (Table 2, Column 2) for the purposes of describing this combined model, we begin by identifying the components of the Analysis phase. In the ADDIE framework, the Analysis phase focuses on problem identification, assessment of target audience, and identifying top-level learning objectives (Larson & Lockee, 2014). In terms of problem identification, the activity (i.e., calculus homework assignment) would center around the core calculus concepts that a student needed to learn as part of that homework assignment (e.g., specific calculus functions and applications) as well as what skills are needed to bolster student learning.

Design

Once those objectives and skills are identified, in the Design phase, the professor may outline the ways in which AI could be used as part of that assignment. In this example, where the focus was the use of AI to complete a calculus homework assignment, a few questions should guide this task including:

- How would students need to engage with AI for the purpose of completing this homework task?
- What would detract from student learning if AI is used inappropriately?
- How can AI enhance student learning?

In answering these questions, AI could be utilized as an assistant to help correct and guide students with understanding the complex functions within the calculus homework, but students need to be able to learn the specific objectives through the application of these functions. In this case, the AI scale was set at two, wherein AI-assisted idea generation and structuring was allowed but the final submission had to be the student's own work.

Develop

In the Develop phase, the focus is to determine the strategies and methods for implementation, the way that technology will be leveraged to support the implementation, and the creation of evaluation, learning, or other related products for implementation, *inter alia* (Larson & Lockee, 2014). For this example, as the focus is on understanding how AI would be used as part of the students' calculus homework, two major priorities need to be considered. The first is the development of the AI instructional strategies that best support and guide students on what the expectations are for AI use on this assignment; the second is the identification of the best technological access strategies (i.e., what AI tools will be available for students to use).

Implement

Based on the guidelines provided in the Design and Develop phases, the homework assignment is implemented following the alignment to the AIAS scale identified. In this example, because the AIAS was set at 2, students are free to use AI to brainstorm tasks, but no AI is allowed in the final submission. The two items identified in the Develop phase, the instructional strategies, and the best technological access strategies, are then used to help students navigate how to engage with AI as part of their learning process. In this case, students are free to use AI in a way that reflects the example provided, wherein AI offered support and assistance in the brainstorming phases of the assignment, but the final thoughts and products had to be students' own work.

Evaluate

In the Evaluate phase of this framework, the purpose is to engage in continuous improvement, including the evaluation of each phase, what worked, what did not work, and the identification of points for improvement. In this example, as is the case in most learning environments, there needs to be an evaluation of student learning as well as students' navigation of AI integration into their learning. For the calculus homework assignment, the evaluation of percentage of student's original work with points for improvement of process would benefit future iterations of this activity. It would also help to understand any improvements needed to the strategies created in the Develop phase of the framework.

Although this analysis focused on the calculus homework example provided, Table 2 details the application of the ADDIE-AIAS combined framework to each vignette offered in this work. As each example is reflective of a different aspect of higher education settings, it is imperative to note that the alignment of AI is also different for each case. This, in turn, shifts the types of activities listed in the Design, Develop, and Implement phases with the purpose of indicating how the integration of AI can shift the course of higher education activities.

Lessons Learned

What Works?

Leveraging the combined ADDIE-AIAS framework provides a potential avenue to help faculty, students, and administrators understand how AI could and should be integrated into stu-

dent learning, teaching, and/or administration projects. Taking into consideration the ethical aspects that are still being developed in postsecondary settings and using the combined guidelines provide clear expectations for all (students, faculty, and administrators) on how to engage with this new technology. The guidelines also help to refine learning/teaching and working environments in a way that is supportive and not convoluted. Such combined guidelines provide the basis for future developments of both frameworks and new pointers altogether.

What are Areas for Improvement?

AI use is new and revolutionary. We are only in the footsteps entering the full potential of AI technologies. This is why as AI evolves, we need to revise how it is used and utilized in postsecondary environments. Frameworks such as ADDIE and AIAS need to be revisited and looked at again in the light of future advancements. The guidelines for both ADDIE and AIAS need to be also always considered with flexibility in mind. As postsecondary faculty, students, and administrators, we wear multiple hats as we plan lessons, teach lessons, engage in lessons and student life, advise students, enroll in courses, participate in research, design presentations, and share our scholarly discoveries via conferences and publications. In using the combined ADDIE-AIAS framework for designing learning environments and administrative projects, it is important to note that certain parts of the guidelines work better when looked through the student and teacher lens rather than administrative one. As ADDIE was intended to be a framework for developing learning environments, it is not a surprise that this is the case; however, it is also not the case that it is not applicable to administrative projects. The critical review of what can and cannot be applied and used to particular postsecondary tasks is thus an important component.

Conclusion

The purpose of this contribution was to provide an in-depth review of the recent advancement in generative AI technologies used in the context of postsecondary education. As faculty, administrators, and students, we positioned our research from the lens of different arrays of experiences with generative AI in the contexts that we experience in higher education. It is our hope that our collective stories—the good, the bad, and the ugly—help others in the realm of postsecondary teaching, learning, and adminsitration while navigating the new technological terrain. Due to the complexity of the use of AI in its varied formats throughout postsecondary settings, we found it useful to analyze the use and related evaluation of the implementation of AI using a combination of the ADDIE framework and the AIAS. We hope that the cross-examination of both provides a guided path for postsecondary education, a path that continues and is not concluded.

The integration of AI can be transformative and bring about multiple positive factors. Moving forward, we need to focus on the best ways to harness and maximize the potential of AI in an ethical and beneficial manner to faculty, administrators, and students alike. When all stakeholders use AI in an ethical manner, when we leverage AI possibilities, we can ensure the best outcomes and AI tools can revolutionize postsecondary environments. Ethical conduct needs to be on the forefront of what is required and permitted in our classes for students, for ourselves as teachers, and administrators as leaders. The balanced approach to AI use can be a roadmap moving forward where the partnership with artificial intelligence can aid efficiency but not take away from the hard work needed to be done while interacting with students and colleagues.

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Integrating Generative AI into ICT Education in Mauritius: A Comparative Analysis of Global Frameworks and UNESCO Perspectives

Chitisha Gunnoo

Abstract

This chapter explores the role of Generative Artificial Intelligence (AI) in enhancing ICT (Information and Communication Technology) education in Mauritius. Through a comparative analysis of international frameworks and the UNESCO report, the study aims to identify best practices, challenges, and recommendations for integrating Generative AI into the educational landscape of Mauritius. The paper provides an overview of the significance of ICT education in Mauritius, the concept of Generative AI and its potential applications in education, and a critical examination of international frameworks and the UNESCO report on AI integration in education. The study evaluates the alignment between the recommendations from these sources and the potential application of Generative AI in enhancing ICT education in Mauritius. Additionally, it discusses the ethical considerations associated with the integration of Generative AI and proposes a framework for effectively incorporating it into ICT education in Mauritius. The chapter concludes by summarizing the key findings and suggesting avenues for future research and implementation.

Keywords*: Generative AI, ICT education, Mauritius, International frameworks, UNESCO report, Personalized learning, Interactive simulations, Intelligent tutoring systems, Ethical considerations, Educational enhancement*

Introduction

ICT (Information and Communication Technology) education plays a pivotal role in equipping individuals with the necessary skills and knowledge to thrive in the digital age (Haldorai et al., 2021). In the context of Mauritius, a small island nation in the Indian Ocean, ICT education is widely recognized as a crucial driver for economic growth, employment opportunities, and social development (de Melo, 2020). The government of Mauritius has been proactively advocating for the integration of ICT in education to augment learning outcomes and equip students for the demands of the digital workforce (Madhou et al., 2022).

Generative Artificial Intelligence (AI) is a rapidly advancing field that holds significant potential in transforming various sectors, including education (Yu & Guo, 2023). Generative AI refers to AI systems that can generate new content, such as text, images, or even entire virtual environments (Jo, 2023). According to Fui-Hoon Nah et al. (2023), these systems leverage machine learning algorithms to recognize patterns and generate original outputs that often resemble content created by humans. In the context of ICT education, the integration of generative AI opens

up exciting prospects for personalized learning experiences, interactive simulations, and intelligent tutoring systems (Yu & Guo, 2023).

This chapter seeks to explore the role of Generative AI in enhancing ICT education in Mauritius through a comparative analysis of international frameworks and the UNESCO (United Nations Educational, Scientific and Cultural Organization) report. Through an examination of existing frameworks and reports, the aim is to identify best practices, challenges, and recommendations for the effective integration of Generative AI into the educational landscape of Mauritius.

The research problem addressed in this chapter pertains to the insufficient comprehensive understanding of the potential benefits, limitations, and ethical considerations related to the utilization of Generative AI in ICT education in Mauritius. Through an investigation of international frameworks and the UNESCO report, this study aims to provide insights into the current state of Generative AI adoption in education worldwide and derive valuable knowledge that can guide the development of strategies and policies specifically tailored for Mauritius.The objectives of this chapter are as follows:

1. To provide an overview of the background and significance of ICT education in Mauritius, highlighting its role in economic development and digital transformation.
2. To explore the concept of Generative AI and its potential applications in enhancing ICT education, emphasizing its role in personalized learning, interactive simulations, and intelligent tutoring systems.
3. To present a comparative analysis of international frameworks that address the integration of Generative AI in education, identifying best practices, challenges, and lessons learned from different countries' experiences.
4. To examine the UNESCO report on ICT education and AI integration, analyzing its recommendations and strategies for leveraging Generative AI in educational settings.
5. To evaluate the alignment between the recommendations of international frameworks and the UNESCO report with the potential application of Generative AI in enhancing ICT education in Mauritius.
6. To discuss the ethical considerations associated with the integration of Generative AI in ICT education, including issues of data privacy, algorithmic bias, and student autonomy.
7. To propose a framework for effectively integrating Generative AI in ICT education in Mauritius, considering factors such as teacher training, infrastructure development, and policy changes.
8. To conclude by summarizing the main findings of the chapter, reflecting on the potential impact of Generative AI in enhancing ICT education in Mauritius, and suggesting avenues for future research and implementation.

By addressing these objectives, this chapter aims to contribute to the understanding of the role of Generative AI in enhancing ICT education in Mauritius and provide insights for policymakers, educators, and stakeholders in shaping strategies and policies that leverage the potential of Generative AI to improve educational outcomes in the country.

Overview of ICT Education in Mauritius

The landscape of ICT education in Mauritius exhibits a complex and multifaceted nature, as elucidated by Obika (2023). On one hand, commendable strides have been achieved in the seamless integration of ICT into the educational curriculum and the facilitation of unfettered access to digital resources. In drawing inspiration from the Singaporean model (Lee & Koh, 2008), the Mauritian government has exhibited astute foresight by actively promoting Mauritius as a cutting-edge "cyber island," positioning it as a regional hub endowed with a diversified economy (Bhowon, 2012). Since the late 1990s, Mauritius has diligently endeavored to foster the proliferation of ICTs within educational institutions, as evidenced by its national ICT policy, which features a dedicated segment specifically catering to education (Soyjaudah et al., 2002; Isaacs, 2007).

The government has implemented various initiatives aimed at equipping schools with indispensable infrastructure, including the provision of computers and internet connectivity within educational premises (Subrun & Subrun, 2015). Noteworthy programs such as the "One Tablet per Child" initiative have been enacted with the objective of furnishing students with personal computing devices, thereby fostering their active engagement with an extensive array of digital learning resources (Appavoo & Koonjal, 2015).

Nonetheless, the implementation of ICT education in Mauritius confronts a multitude of challenges and limitations, as highlighted by Oolun et al. (2012). One significant hurdle pertains to the availability of proficient ICT educators equipped with the requisite technological acumen and pedagogical expertise to effectively integrate technology into instructional practices (Veeraragoo, 2018). The scarcity of adequately trained teachers in the realm of ICT undermines the quality and comprehensiveness of ICT instruction rendered to students, adding to the rapid pace of technological advancements necessitates continuous professional development for educators in order to remain abreast of current trends and adapt teaching methodologies accordingly (Mautadin et al., 2019).

Another significant challenge arises from the existence of a digital divide, notably concerning disparities in technology access and internet connectivity, as discussed by Gopee (2016). Despite ongoing efforts to address this divide, inequities persist, particularly in underserved regions. The constrained availability of digital devices and reliable internet connectivity hampers students' capacity to fully engage with online learning resources and actively participate in digital collaboration (Gopee, 2016).

Addressing these challenges in ICT education assumes paramount importance for enhancing educational outcomes in Mauritius. Subrun and Subrun (2015) assert that the integration of ICT has the potential to facilitate personalized learning, active student engagement, and the cultivation of crucial digital literacy skills. Equipping students with ICT competencies enables them to adapt to the evolving demands of the digital workforce and contribute to the country's economic development (Sooltan et al., 2015).

Furthermore, Santally (2019) posits that a robust ICT education framework has the possibility to enhance creativity, critical thinking, and problem-solving abilities among students. By harnessing technology, educators can create interactive and immersive learning experiences that cater to diverse learning styles and abilities. This, in turn, fosters heightened student motivation, satisfaction, and academic achievement (Santally, 2019).

To harness the full potential of ICT education, Salas Pilco (2013) argues that comprehensive strategies are necessary to address the challenges and limitations that impede effective imple-

mentation, and the same is applicable in the Mauritian context. These strategies encompass professional development initiatives for teachers, ensuring equitable access to technology and internet connectivity, and fostering a supportive policy environment that encourages innovation and collaboration in ICT education. Overcoming these challenges will pave the way for a thriving ICT education ecosystem in Mauritius, empowering students with the requisite digital competencies to thrive in the 21st century.

The Concept of Generative AI in Education

Jaouadi and Maaradji (n.d.) assert that Generative AI has significant potential to enhance ICT education by providing personalized and adaptive learning experiences for students. Through the dynamic generation of educational content, Generative AI can tailor learning materials to the specific needs, learning styles, and progress of each individual student(Fitria, 2021). This adaptability can increase student engagement, motivation, and knowledge retention in ICT-related subjects (Zharmukhanbetov & Singh, 2023).

One key application of Generative AI in ICT education, as posited by Alier et al. (2024), is the creation of interactive simulations and virtual environments. These AI-powered simulations can replicate real-world ICT scenarios, allowing students to gain practical, hands-on experience in a safe and controlled setting (Dai & Ke, 2022). This can be particularly valuable in areas such as programming, cybersecurity, and network administration, where students can explore complex concepts and develop critical skills through immersive, simulation-based learning (Lakshmi et al., 2022).

The extant literature suggests that intelligent tutoring systems powered by Generative AI have shown promise in the domain of ICT education (Ma et al., 2014; Crow et al., 2018). These AI-driven systems have the capability to provide personalized guidance and feedback to students. By analyzing individual learning patterns and identifying areas of difficulty, the intelligent tutoring systems can generate targeted support, such as remedial resources and step-by-step instructions, to help students overcome challenges and deepen their understanding of different ICT-related topics (Erümit & Çetin, 2020).

Existing research and case studies provide evidence of successful implementation of Generative AI in various aspects of ICT education (Hazzan & Erez, 2024). For instance, Okonkwo and Ade-Ibijola (2020) have documented the utilization of Generative AI-powered chatbots, such as Python-Bot, to facilitate interactive language practice for students learning programming languages. Additionally, researchers have explored the use of AI-generated educational content, including interactive coding tutorials and simulations, to enhance the learning experience in ICT-related subjects (Denny et al.,2023).

Comparative Analysis

International frameworks and guidelines serve as influential instruments in shaping the landscape of ICT education and the integration of AI across diverse countries(Voogt, & Roblin, 2012). These frameworks provide essential guidance for policymakers, educators, and stakeholders to develop comprehensive strategies and practices that foster effective implementation. For instance, UNESCO's ICT Competency Framework for Teachers, which was developed in the early 2010s underscored the utmost significance of digital literacy, critical thinking, and creativity in the

realm of ICT education. Similarly, the European Framework for the Digital Competence of Educators emphasizes the integration of digital technologies, including AI and data-driven approaches, into pedagogical practices(Redecker, 2017).

Countries adopt distinct approaches when it comes to integrating Generative AI into their ICT education initiatives. or instance, India's National Education Policy (NEP) 2020 offers a comprehensive blueprint for integrating AI in education. It mandates early exposure to AI and coding from Grade 6 onwards through a flexible 5+3+3+4 curricular structure. This policy aims to overcome rigid academic silos and low digital penetration, especially in rural areas. Its digital strategy is driven by platforms like DIKSHA and SWAYAM, which deliver multilingual AI-enhanced content to support remote and inclusive learning (Aithal & Aithal, 2020; Ambar et al., 2021; Das et al., 2023).

In Finland, the integration of artificial intelligence (AI) education takes a unique and holistic approach by embedding AI concepts as a cross-curricular theme rather than treating AI as a separate, standalone subject. This educational strategy allows students to encounter and explore AI not only in the context of technology and computer science but also through other disciplines such as ethics, language arts, and natural sciences. By weaving AI into multiple subject areas, Finnish education encourages students to understand AI from a broader societal and humanistic perspective, fostering critical thinking about the role and impact of AI in everyday life.

Central to Finland's approach is a strong emphasis on teacher empowerment and professional development. The Finnish government has made significant investments in training and supporting educators to become confident and competent in integrating AI into their teaching practices. This includes comprehensive professional development programs that equip teachers with both the technical knowledge of AI and pedagogical strategies for responsibly guiding students in exploring AI technologies. The focus on teacher preparedness ensures that AI instruction is not only technically sound but also ethically informed and age-appropriate, allowing educators to address complex issues such as data privacy, algorithmic bias, and the societal consequences of AI deployment in a sensitive and effective manner (Haapaniemi et al., 2021).

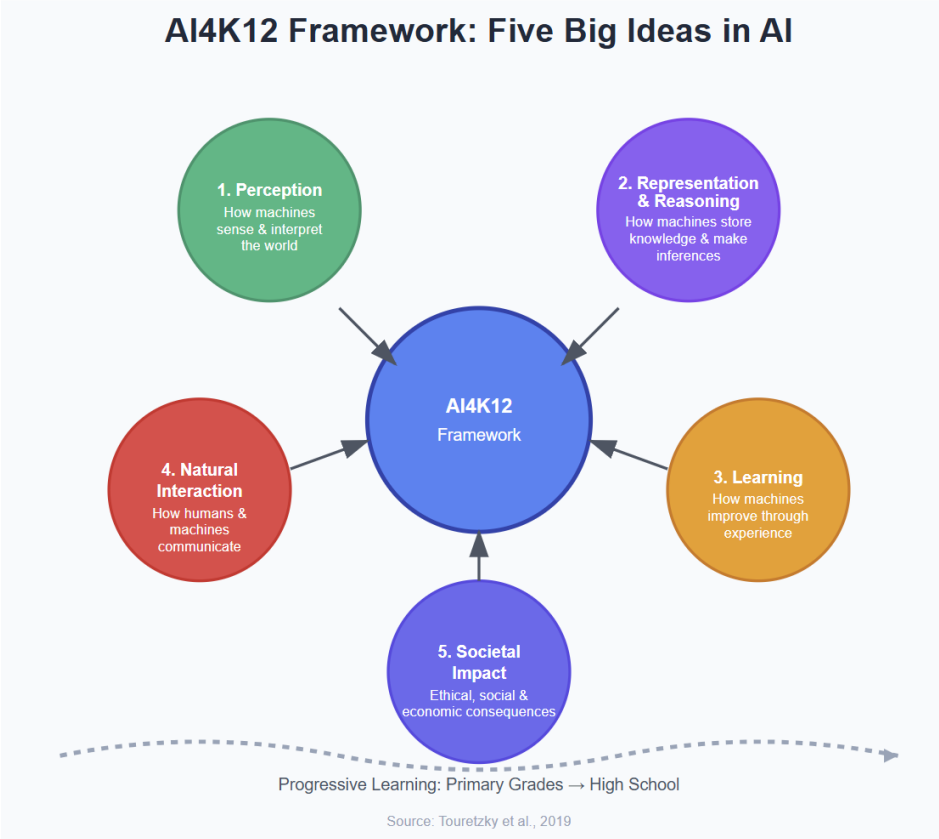
Moreover, the Finnish model prioritizes the ethical and social dimensions of AI education, reflecting the country's broader educational philosophy centered on holistic development, equity, and democratic values. Students are encouraged to critically examine how AI affects human rights, social justice, and decision-making processes, fostering a sense of responsibility and agency. This aligns with Finland's long-standing commitment to cultivating citizens who are not only knowledgeable but also ethically aware and socially conscious, preparing them to navigate and shape an AI-driven future with care and insight (Mertala et al., 2022). By integrating AI education across the curriculum with a focus on ethics and teacher empowerment, Finland exemplifies a forward-thinking model that balances technological literacy with the cultivation of critical, reflective learners

In the United States, the AI4K12 initiative was created through a collaborative effort involving educators, researchers, and experts in artificial intelligence, with the goal of equipping K-12 students with the foundational knowledge and skills necessary to thrive in a rapidly evolving job market increasingly influenced by AI technologies. Recognizing that artificial intelligence is becoming a transformative force across virtually all industries, the initiative seeks to integrate AI education into the standard school curriculum in a way that is accessible and developmentally appropriate for students at different grade levels.

At the heart of AI4K12 is the framework known as the "Five Big Ideas in AI," which serves as the conceptual backbone for curriculum development and instruction. These big ideas include:

(1) Perception:how machines interpret the world through data; (2) Representation & Reasoning : how machines represent knowledge and draw conclusions; (3) Learning — how machines improve their performance from experience; (4) Natural Interaction :how humans and machines communicate; and (5) Societal Impact :understanding the ethical, social, and economic implications of AI. This structured framework, as illustrated in Figure 1, provides educators with clear learning goals and a progression pathway to scaffold AI concepts from early elementary grades through high school, ensuring that students build a deep and coherent understanding over time (Touretzky et al., 2019).

Figure 8: *AI4K12 Framework—Five Big Ideas*



However, the actual implementation of the AI4K12 curriculum varies widely across different states and school districts. Many states have adopted the framework with the support of targeted grants, industry partnerships, and professional development programs designed to train teachers in AI topics. These resources enable innovation in classroom practices and curriculum design, fostering engaging and relevant learning experiences. At the same time, this decentralized approach has resulted in disparities, where well-funded districts with access to partnerships and technology infrastructure are able to offer more comprehensive AI education. In contrast, under-resourced districts often face challenges such as lack of trained teachers, insufficient technology, and limited funding, which hinder the equitable distribution of AI learning opportunities (Wang et al., 2023; Yue et al., 2022). Addressing these disparities remains a key concern for policymakers and educators aiming to democratize AI literacy and prepare all students for future careers shaped by artificial intelligence.

The Republic of Korea has taken a more centralized and systemic approach. Its 2020 national AI curriculum outlines AI integration in both primary and secondary education, with a strong emphasis on computational thinking and ethical use (Zhou et al., 2022). The country has also established over 500 AI education leader schools, creating innovation hubs to incubate best practices and regional expertise. This reflects Korea's strategic aim to nurture a future-ready workforce capable of driving national innovation.

Each of these examples reflects deliberate choices grounded in national priorities. India's focus is on scale and inclusion; Finland prioritizes ethics and pedagogy; the U.S. seeks workforce readiness through flexible state-led innovation; Korea emphasizes central coordination and excellence. These nuanced implementations highlight that AI-in-education policies are not interchangeable blueprints but context-responsive frameworks. Mauritius, with its trilingual, socioeconomically diverse, and geographically compact education system, must design a localized strategy that draws inspiration from global models while adapting to its unique challenges

Examining these international frameworks and the incorporation of Generative AI provides valuable insights into best practices, lessons learned, and promising strategies. An emphasis on digital literacy as a foundational competency resonates across these frameworks, highlighting the importance of equipping students with the skills necessary to navigate AI technologies(Long, & Magerko, 2020).

UNESCO Reports

Lewis et al. (2021) have highlighted the significant contributions of UNESCO, a prominent international organization specializing in the domain of education, through its numerous reports and publications centered on information and communication technology (ICT) education and the assimilation of artificial intelligence (AI). These scholarly works offer profound perspectives into UNESCO's prescribed guidelines and approaches pertaining to the effective utilization of AI within educational environments (Holmes & Miao, 2023)

An exemplary report from UNESCO is titled "AI and education: guidance for policy-makers," which offers comprehensive guidance for policymakers aiming to incorporate artificial intelligence (AI) into education systems. The report emphasizes key aspects such as AI literacy, ethical considerations, and the cultivation of critical thinking and creativity among students. It provides specific recommendations concerning curriculum development, teacher training, and the seamless integration of AI across various subjects.

Another notable publication is the report titled "Education in the age of artificial intelligence." This report explores the emergence of EdTech as a significant phenomenon in Africa and examines Estonia as a leading example of a nation that has readily embraced digital technology in its education system. Additionally, the report delves into the case of Argentina, where an algorithm has been developed to address the issue of school dropout rates.In her publication on Education 2030, Shiohira (2021) draws attention to the transformative impact of AI automation on job roles and emphasizes the crucial role of effective policy and governance in the AI era. Shiohira's work emphasizes the profound ethical implications of AI and emphasizes the imperative of acquiring new skills to thrive in this transformative era. She goes as far as to state: "The era of artificial intelligence is young in years but advanced in impact."[pg 3, Shiohira(2021)].

The publication emphasizes the significance of lifelong learning and collaboration between educational institutions and industry stakeholders to enable ongoing upskilling and reskilling efforts (Shiohira, 2021).

When considering the potential application of Generative AI in Mauritius, it is essential to evaluate the alignment between UNESCO's recommendations and the specific context. The integration of Generative AI within educational contexts is in alignment with UNESCO's emphasis on the development of digital literacy, computational thinking, and creativity, as discussed by Tsortanidou (2022).

The emphasis on ethical considerations in artificial intelligence (AI) education by UNESCO is particularly pertinent when assessing the implementation of Generative AI in Mauritius, as articulated by Pedro et al. (2019). It is imperative to ensure that the utilization of Generative AI technologies adheres to ethical principles, such as fairness, transparency, and the protection of privacy (Gupta et al., 2024).

The ethical integration of Generative AI in education is a core focus of UNESCO's recent guidelines, which emphasize four key principles: fairness, transparency, accountability, and privacy. These principles aim to ensure that AI applications in education do not replicate or exacerbate existing societal biases or inequalities.

Fairness entails actively preventing discriminatory outcomes in AI-powered educational tools. For example, if a Generative AI system disproportionately favors English-language learners due to training data biases, it could marginalize Kreol or French-speaking students in Mauritius. Ensuring fairness requires rigorous bias audits, localized training data, and multilingual content.

Transparency involves making AI decision-making processes understandable to educators and students. In practice, this means educational platforms using Generative AI should include explainable AI components—such as dashboards that show how and why a recommendation or grade was produced. This builds trust and allows teachers to override AI-generated decisions when necessary.

Privacy is particularly sensitive in educational settings, where students' data, including behavioral patterns, learning histories, and even biometric data (e.g., facial recognition in e-learning), may be collected. UNESCO stresses the importance of strong data governance frameworks, including data minimization, encryption, and informed consent. In Mauritius, this could involve aligning educational data practices with the Data Protection Act and appointing data protection officers at school levels.

Specific safeguards and guidelines that could be implemented in Mauritius include the development of a National Ethical AI Charter for Education by the Ministry of Education in collaboration with stakeholders, which would outline clear standards for the ethical use of AI in schools. Additionally, mandatory impact assessments should be required before deploying AI systems in classrooms to evaluate potential harms or exclusions. Teacher and student training programs must also be established to build awareness and competence in digital ethics, data privacy, and algorithmic bias, ensuring responsible use and supervision. To support accountability, redress mechanisms should be put in place, allowing students and teachers to challenge or appeal AI-generated decisions, such as automated feedback or assessments. Finally, the creation of localized AI content that reflects Mauritian culture, language, and values is crucial to prevent cultural misrepresentation and ensure the relevance of AI-generated educational materials.

UNESCO also recommends interdisciplinary AI education, where ethical, social, and technical dimensions of AI are explored across subjects—an approach that dovetails with the GAM-Framework's vision to integrate AI ethics into ICT curricula at all levels. By aligning with these guidelines, Mauritius can ensure that its deployment of Generative AI in education is not only innovative but also responsible, inclusive, and equitable.

Therefore, it is essential to establish safeguards and guidelines to mitigate potential biases and ethical challenges associated with the use of Generative AI technologies (Akinrinola et al., 2024). The interdisciplinary learning approach advocated by UNESCO, which emphasizes the integration of AI across various subjects, is well-aligned with the potential application of Generative AI in Mauritius, as noted by Miao and Holmes (2021).

Case studies of Successful Implementations

Case Study 1: AI for K-12, United States

According to Lee (2020), the integration of artificial intelligence (AI) in K-12 education within the United States is gaining significant attention, with a focus on cultivating computational thinking, creativity, and digital literacy skills among students. This is supported by Wang et al. (2023), who highlight the importance of the AI for K-12 Education initiative, a pivotal framework for AI integration in the United States.

From the perspective of Yue et al. (2022), this framework serves as a valuable example for other countries to consider, as it emphasizes the necessity of aligning AI integration with ethical principles and guidelines, such as fairness, transparency, and respect for privacy.

The successful integration of AI in K-12 education in Mauritius requires careful consideration of the various components of the AI for K-12 Education initiative and the identification of potential gaps and challenges in the local context. As Crompton (2022) notes, these challenges may include the need to invest in infrastructure and technology, build teacher capacity and provide professional development opportunities, and ensure that AI integration is aligned with ethical principles and guidelines.

To address these challenges, Mauritius can draw on the experiences of other countries, such as the United States, and develop a framework for AI integration that is tailored to the specific needs and priorities of the local context. This may involve a range of strategies, such as investing in teacher training programs, developing partnerships with technology companies, and establishing ethical guidelines and standards for AI integration in schools.

Case Study 2: New Education Policy 2020, India

According to Aithal and Aithal (2020, the National Education Policy (NEP) 2020 of India addresses key challenges in the education sector such as rote learning, rigid academic structures, inequitable access, low learning outcomes, outdated curricula, and inadequate teacher training. It aims to transform the system by promoting conceptual understanding, foundational literacy and numeracy, vocational integration from early grades, and continuous professional development for educators. At the same time, the policy creates new opportunities by encouraging holistic, multidisciplinary learning; incorporating Early Childhood Care and Education (ECCE); leveraging educational technology and platforms like DIKSHA; promoting instruction in regional languages; internationalizing higher education; and fostering a culture of research and innovation through initiatives such as the National Research Foundation. Collectively, NEP 2020 represents a paradigm shift towards a more inclusive, flexible, and future-ready education system(Das et al., 2023).This policy is a good example for Mauritius to learn from, as it promotes a more holistic and student-centered approach to education, with a focus on developing critical thinking, creativity, and problem-solving skills (Sharma et al., 2022).

One of the key components of NEP 2020 is the implementation of a flexible, multidisciplinary structure through the 5+3+3+4 curricular framework, which replaces the old 10+2 model. This structure aligns with children's cognitive development and allows early exposure to a range of disciplines including arts, sciences, and vocational subjects (Aithal & Aithal, 2020; Sharma et al., 2022). For instance, vocational training, coding, and internships are introduced from Grade 6 to develop practical and future-ready skills (Ambar et al., 2021). In higher education, the policy enables students to select interdisciplinary combinations of majors and minors and adopt a Multiple Entry and Exit System (MEES), promoting greater academic flexibility (Joshi & Somani, 2021). NEP 2020 also emphasizes digital literacy and technology-enhanced learning by leveraging platforms like DIKSHA, SWAYAM, and the proposed National Digital Educational Architecture (NDEAR) to deliver personalized learning and expand access in underserved regions.

Case Study 3: AI Integration in National Curriculum, Finland

Finland's integration of Artificial Intelligence (AI) in their national curriculum is a notable example of how AI can be leveraged to enhance teaching and learning, and it is a good example for Mauritius to learn from. In Finland, AI is integrated into the curriculum as a cross-cutting theme, rather than as a standalone subject. This approach allows students to develop a more holistic understanding of AI, and to apply their knowledge and skills in a variety of contexts (Wittka, 2020).

One of the key strengths of Finland's approach to AI integration is the emphasis on promoting ethical and responsible AI use. The curriculum includes a focus on the ethical and social implications of AI, and on promoting the development of ethical and responsible AI applications (Mertala et al., 2022). This is particularly important as AI systems, including Generative AI, can perpetuate biases and raise privacy concerns if not implemented responsibly.

Another important component of Finland's approach to AI integration is the emphasis on building teacher capacity and providing professional development opportunities (Haapaniemi et al., 2021). The Finnish government has invested heavily in training and development programs for teachers, to ensure that they have the skills and knowledge needed to effectively integrate AI in the classroom. This is crucial, as teachers play a pivotal role in guiding students in the responsible use of AI technologies.

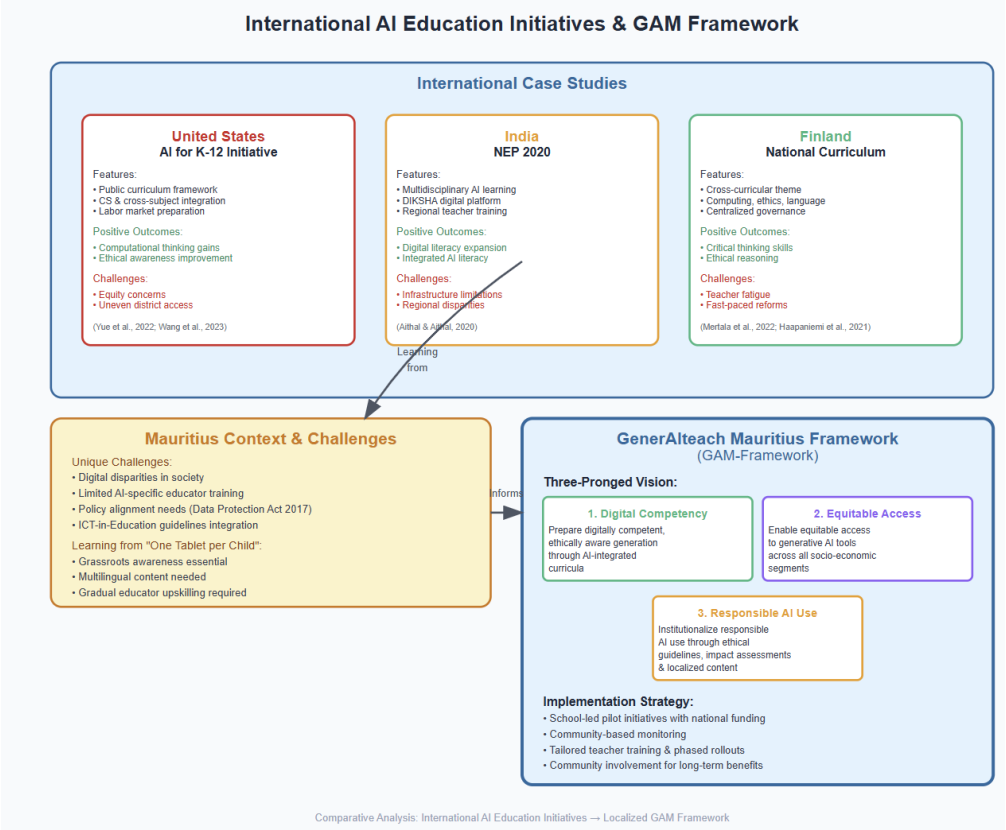
As evidenced in the above three scenarios, the U.S. AI for K-12 Initiative includes a publicly accessible, detailed curriculum framework co-developed by researchers and educators, aimed at embedding AI concepts in computer science and other subjects from early schooling. This policy was driven by the need to prepare students for a labor market increasingly dependent on AI technologies. Early evaluations of this program (Yue et al., 2022; Wang et al., 2023) show promising gains in students' computational thinking and ethical awareness, but also note equity concerns due to uneven access across districts. Similarly, India's NEP 2020 emphasizes multidisciplinary AI learning through digital platforms like DIKSHA and integrates AI literacy through regional teacher training efforts (Aithal & Aithal, 2020). Finland, often considered a benchmark, has integrated AI into its national curriculum as a cross-curricular theme. This means students explore AI concepts not just in computing but in social studies, ethics, and language, with positive feedback on students' critical thinking abilities and ethical reasoning (Mertala et al., 2022). Yet, Finnish researchers have cautioned about teacher fatigue due to fast-paced digital reforms (Haapaniemi et al., 2021).

If contrasted to the local context, it can be asserted that Mauritius faces unique infrastructural and sociocultural challenges, including digital disparities in the society, limited AI-specific training for educators, and the need for policy frameworks aligned with the Data Protection Act (2017) and existing ICT-in-Education guidelines. These differences necessitate a localized adaptation of international strategies. For example, while Finland leverages centralized governance for curriculum alignment, Mauritius would benefit more from school-led pilot initiatives backed by national funding and community-based monitoring. The "One Tablet per Child" policy has shown that Mauritian implementations require grassroots awareness, multilingual content, and gradual upskilling of educators to succeed.

This paper's proposed GenerAIteach Mauritius Framework (GAM-Framework) incorporates these comparative lessons with contextual realities. The phrase "establish a clear vision" has now been operationalized into a three-pronged vision: (1) to prepare a digitally competent, ethically aware generation through AI-integrated curricula, (2) to enable equitable access to generative AI tools across all socio-economic segments, and (3) to institutionalize responsible AI use through clear ethical guidelines, impact assessments, and localized digital content.

By presenting successful international implementations with noted benefits (e.g., increased digital literacy, ethical awareness) and drawbacks (e.g., infrastructure strain, bias propagation), this study offers concrete pathways for Mauritius. It also outlines how local adaptation—through tailored teacher training, community involvement, and phased rollouts—can mitigate risks and incentivize long-term, inclusive benefits.

Figure 9: *Comparative Analysis :International AI Education Initiatives*



These outcomes, as can be seen in Figure 2 above, highlight the potential benefits of integrating Generative AI in ICT education in Mauritius. However, challenges have emerged, including the need to ensure teachers' competence in AI education, adapt curriculum materials to evolving AI technologies, and address potential biases and ethical considerations associated with Generative AI. These challenges should be taken into account in the Mauritian context to ensure successful implementation.

Ethical Considerations in Integrating Generative AI in ICT Education

According to the research by Farrelly and Baker (2023), the integration of Generative AI in ICT education necessitates a thorough examination of the ethical implications and considerations associated with its use. This discussion aims to explore the multifaceted ethical concerns that arise in educational settings when employing Generative AI, while drawing insights from the attached Mauritius AI Strategy. The responsible integration of Generative AI requires addressing issues such as data privacy, algorithmic bias, and student autonomy, as highlighted by Bozkurt and Sharma (2023).

The research by Arinushkina (2024) suggests that data privacy assumes paramount importance when employing Generative AI in educational settings. As Generative AI systems typically rely on extensive datasets for training, it becomes imperative to ensure that student data utilized in these systems is handled securely and in accordance with relevant data protection regulations. Ajabani and Da Chen (n.d.) emphasize the need to establish robust safeguards to protect the privacy and confidentiality of student information, thereby fostering an environment characterized by responsible data management. This approach aligns with the recommendations put forth by Nguyen et al. (2023).

Ferrara (2023) states that another critical ethical consideration revolves around algorithmic bias inherent in Generative AI systems. Arora et al. (2023) point out that these systems learn from existing datasets, which may inadvertently reflect biases and prejudices. Tanvir and Horrocks (n.d) emphasize that the deployment of Generative AI in educational settings necessitates a proactive approach to address algorithmic bias. Karan and Angadi (2023) suggest achieving this through meticulous curation of training data, regular monitoring and evaluation of system outputs, and active mitigation of any biases that surface. By actively countering bias, educational institutions, as emphasized by RADWAN and MCGINTY (2024), can foster fairness and inclusivity in the utilization of Generative AI.

Preserving student autonomy is a fundamental ethical principle that should be upheld when integrating Generative AI in education (Berendt et al., 2020). Although Generative AI technologies provide valuable opportunities for learning and fostering creativity, it is crucial to find a harmonious equilibrium between harnessing AI tools and nurturing students' abilities for critical thinking, creativity, and independent decision-making (Smyrnaiou et al., n.d). Tang and Su (2024) argue that respecting student autonomy entails ensuring that AI systems enhance and complement students' agency and individuality in the educational process, rather than replacing them.

To address these ethical concerns, the formulation of comprehensive guidelines and recommendations for the responsible use of Generative AI in ICT education in Mauritius is recommended. These guidelines should prioritize transparency, ensuring that educators and institutions are forthcoming about the purpose, functionality, and potential impact of Generative AI systems on student learning experiences. Obtaining informed consent from students and their parents or

guardians before utilizing their data in Generative AI systems is also crucial. This entails providing clear explanations regarding the usage, storage, and protection of student data.

Continuously monitoring and evaluating Generative AI systems is vital to identify and rectify algorithmic biases or unintended consequences. Regular audits should be conducted to ensure fairness, accuracy, and ethical use of AI technologies. Additionally, it is essential to prioritize education and awareness by providing appropriate training and resources to educators and students. This education should encompass an understanding of the ethical implications, limitations, risks, and societal impact of Generative AI, fostering a culture of responsible and ethical AI practices within the educational community.

Proposed Framework

GenerAIteach Mauritius Framework (GAM-Framework)

The GenerAIteach Mauritius Framework (GAM-Framework) is a remarkable blueprint for integrating Generative AI into the heart of ICT education in Mauritius. Drawing inspiration from the successful implementation of AI education frameworks in countries like Japan, India, and the United Kingdom, this conceptual guide has been meticulously tailored to the unique educational landscape of Mauritius.

Visualize it as a thriving tree, its roots firmly grounded in international best practices, yet its branches reaching skyward, adapting to the distinct needs and challenges of the Mauritian context. This framework is not merely a static set of guidelines, but rather a living, breathing entity—one that will grow and evolve alongside the students, educators, and the education system as a whole.

Through this framework, Mauritian students will be empowered to harness the potential of Generative AI, exploring its creative and analytical capabilities while navigating the complex ethical considerations that come with these powerful technologies. It's a blueprint that not only addresses the practical implementation of AI-driven pedagogies but also cultivates a deep understanding of the societal impact and responsible use of these transformative tools.

Metaphorically, the GAM-Framework is a testament to the dynamism and adaptability of Mauritius's educational landscape. It is a living, breathing entity that will continue to evolve and grow, shaping the future of ICT education and empowering the learners of today to become the innovators of tomorrow.

Implementation Roadmap

To translate its vision into practical outcomes, the GAM-Framework proposes a phased, five-year roadmap for implementation. In the first year, priority will be given to broad stakeholder consultations, the co-design of pilot projects, and the development of foundational teacher training modules. The second year will see these pilots launched in selected schools—balancing urban, rural, and island contexts—alongside the first wave of teacher certifications and the early deployment of prototype AI tools adapted for local languages and low-bandwidth environments. By the third year, the revised curriculum incorporating Generative AI concepts will be rolled out nationally, supported by scaled-up teacher development and the introduction of locally trained, multilingual AI applications such as chatbots, simulators, and content creation tools. In the fourth year,

the framework will undergo a rigorous evaluation to measure impact and refine strategies, coinciding with the formal launch of the National AI Ethics Charter for Education. The final year will consolidate these gains, integrating Generative AI fully into the national ICT education policy and setting the stage for continuous improvement based on emerging trends and stakeholder feedback. This phased approach ensures that the integration of Generative AI remains systematic, inclusive, and responsive to Mauritius's evolving educational landscape(See Illustration of Timeline at Figure 3).

Figure 10: *Proposed Timeline*

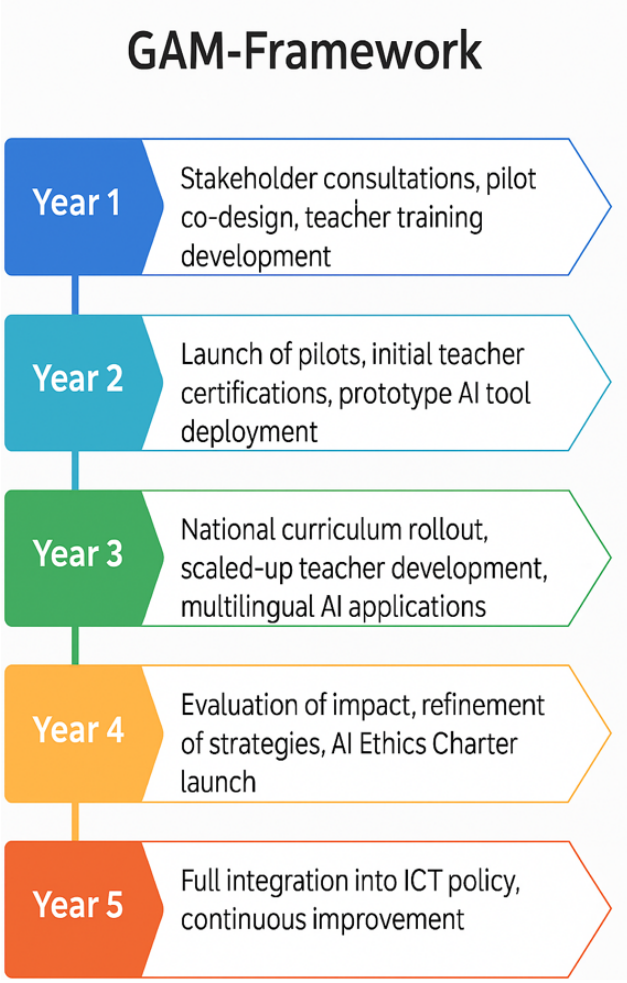


Figure 11: *Tree Representation of the Proposed GAM Framework*

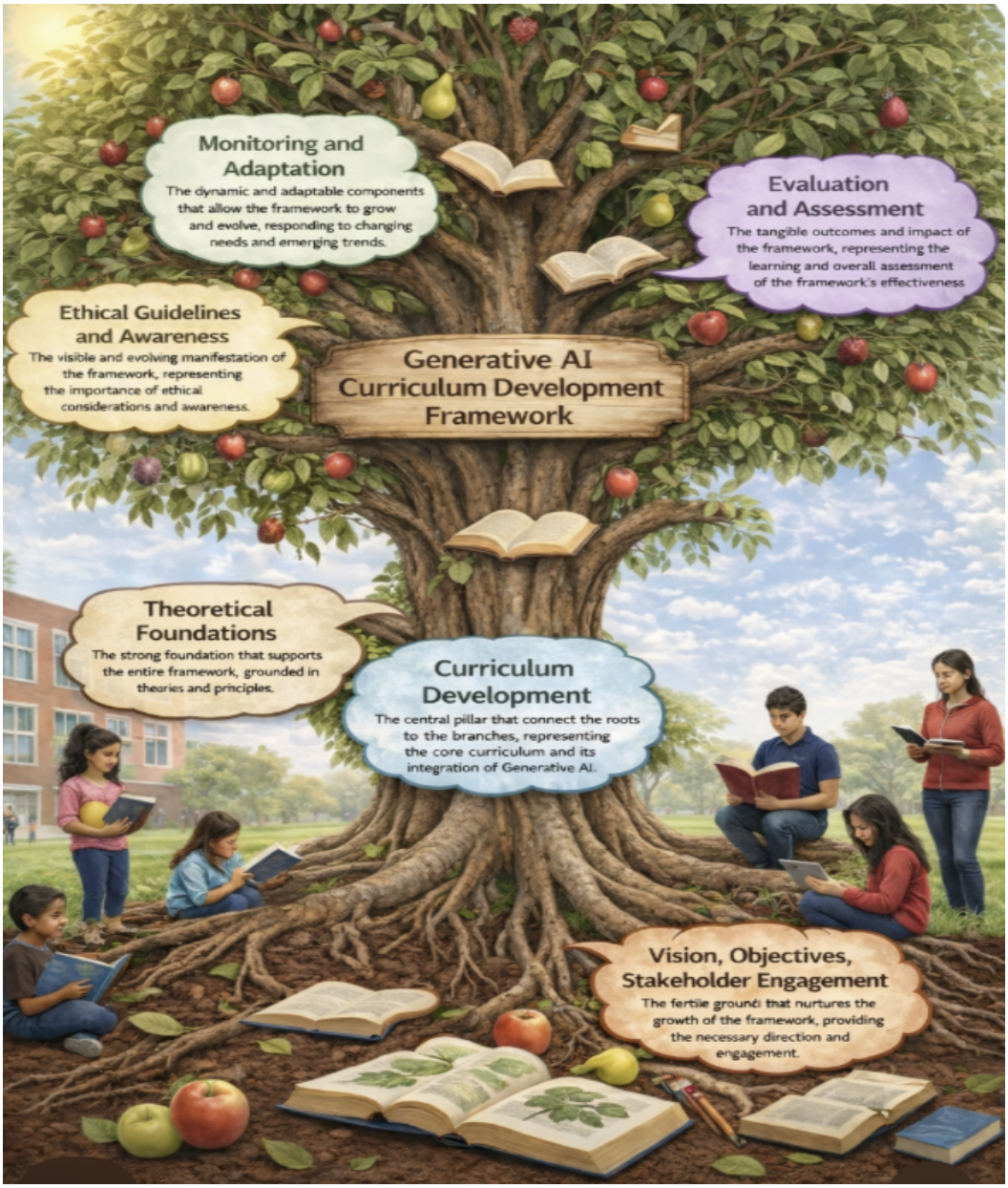


Table 1: *Components of the GAM-Framework*

Vision and Objectives	● The vision of the GenerAIteach Mauritius (GAM) Framework is to create an inclusive, future-ready ICT education ecosystem in Mauritius by responsibly integrating Generative AI technologies into teaching and learning. This vision aligns with international frameworks such as the UNESCO AI in Education Guidance for Policymakers,

	the European DigCompEdu Framework, and the AI4K12 initiative, while remaining rooted in national priorities defined by Mauritius's National ICT Policy, Digital Mauritius 2030 Strategic Plan, Data Protection Act 2017, and Ministry of Education's ICT-in-Education roadmap. The framework envisions: A digitally empowered generation equipped with AI literacy, computational thinking, and ethical reasoning. Equitable access to *AI-powered tools* and resources for *learners and educators* across all regions and socio-economic backgrounds in Mauritius. The institutionalization of *ethical AI practices* through robust governance, localized content, and culturally relevant applications of Generative AI. ● Define objectives that focus on fostering creativity, critical thinking, problem-solving skills, and ethical understanding among students.
Stakeholder Engagement	● Engage educators, policymakers, industry experts, researchers, students, and parents in a collaborative process. ● Facilitate discussions, workshops, and forums to gather diverse perspectives and incorporate valuable insights into the framework.
Policy and Governance	● Develop policies and governance frameworks that address ethical considerations, data privacy, and responsible AI use in the Mauritian educational context. ● Align the framework with existing national policies such as the Mauritius National ICT Policy and the Digital Mauritius Strategic Plan 2030 (Central Informatics Bureau, n.d.), which includes a dedicated section on education and digital transformation, the Data Protection Act 2017, ensuring ethical and privacy-conscious AI use in schools, and ongoing initiatives such as the "One Tablet per Child" programme, which enhance digital equity.
Requirements	● Successful implementation of the GAM-Framework requires collaboration among education authorities, policymakers, schools, and industry partners. ● Adequate resources, including funding, infrastructure, and training programs, are essential.

	● Regular monitoring, evaluation, and adaptation ensure the framework remains relevant and effective.
Curriculum Development	● The revised ICT curriculum in Mauritius should incorporate key Generative AI concepts such as machine learning basics, natural language processing, and prompt engineering, alongside essential ethical topics like algorithmic bias, data privacy, and fairness. Applications integrated into the curriculum can include chatbots, AI-powered content creation tools, language translation, simulations, and AI-assisted coding platforms. Students should develop skills in critical thinking, ethical reasoning, creativity, and responsible use of AI tools. ● Learning outcomes should focus on understanding how generative AI works, using AI to support digital creativity and collaboration, and evaluating the ethical implications of AI in society. Lesson plans and assessments should be contextually adapted to the Mauritian environment, using localized examples and open-source AI platforms to ensure accessibility and cultural relevance.
Teacher Training and Professional Development	● Provide comprehensive training programs and professional development opportunities for educators in Mauritius. ● Equip them with the necessary knowledge, pedagogical strategies, and technical skills to effectively teach Generative AI concepts.
Infrastructure and Resources	● Ensure schools in Mauritius have access to the necessary infrastructure, including hardware, software, and internet connectivity, to support Generative AI integration. ● Identify resource requirements and facilitate their procurement.
Collaboration and Partnerships	● Forge partnerships with industry stakeholders, research institutions, and universities in Mauritius to leverage their expertise, resources, and real-world applications of Generative AI. ● Encourage collaboration through joint projects, internships, and mentoring programs.
Ethical Guidelines and Awareness	● Develop ethical guidelines specific to Generative AI in the Mauritian context.

	● Raise awareness among educators, students, and parents about ethical considerations, algorithmic bias, and privacy concerns associated with Generative AI.
Evaluation and Assessment	● Implement an evaluation and assessment framework to measure the effectiveness and impact of Generative AI integration in Mauritius. ● Regularly assess students' knowledge, skills, and ethical understanding related to Generative AI.
Monitoring and Adaptation	● Establish mechanisms for monitoring the implementation of the framework and gathering feedback from stakeholders. ● Continuously evaluate and adapt the framework based on emerging trends, educational needs, and technological advancements.
Target Audience	● The GAM-Framework caters to educators, policymakers, school administrators, and stakeholders involved in ICT education in Mauritius. ● It aims to guide their efforts in integrating Generative AI responsibly and effectively.
Gaps Filled	● The GAM-Framework addresses the gaps in Generative AI integration in ICT education in Mauritius. ● It provides guidance on policy development, curriculum design, teacher training, infrastructure requirements, ethical considerations, and evaluation mechanisms.

Operationalizing the Vision

To ensure that the vision of the GAM-Framework moves beyond aspiration into actionable reality, this framework commits to concrete, measurable targets grounded in educational technology implementation research. Within the first three years, it aims to ensure that at least 30% of the secondary-level ICT curriculum meaningfully integrates Generative AI concepts and applications. This target is strategically realistic given that while research shows that 48.9% of studies have integrated technology across all knowledge areas, these represent optimal research conditions, and the International Computer and Information Literacy Study (ICILS 2018) found that less than 50% of participating teachers reported frequent technology use for teaching. The 30% figure allows for a quality-over-quantity approach, enabling focused implementation in core ICT subjects first while building expertise and resources for gradual scaling.

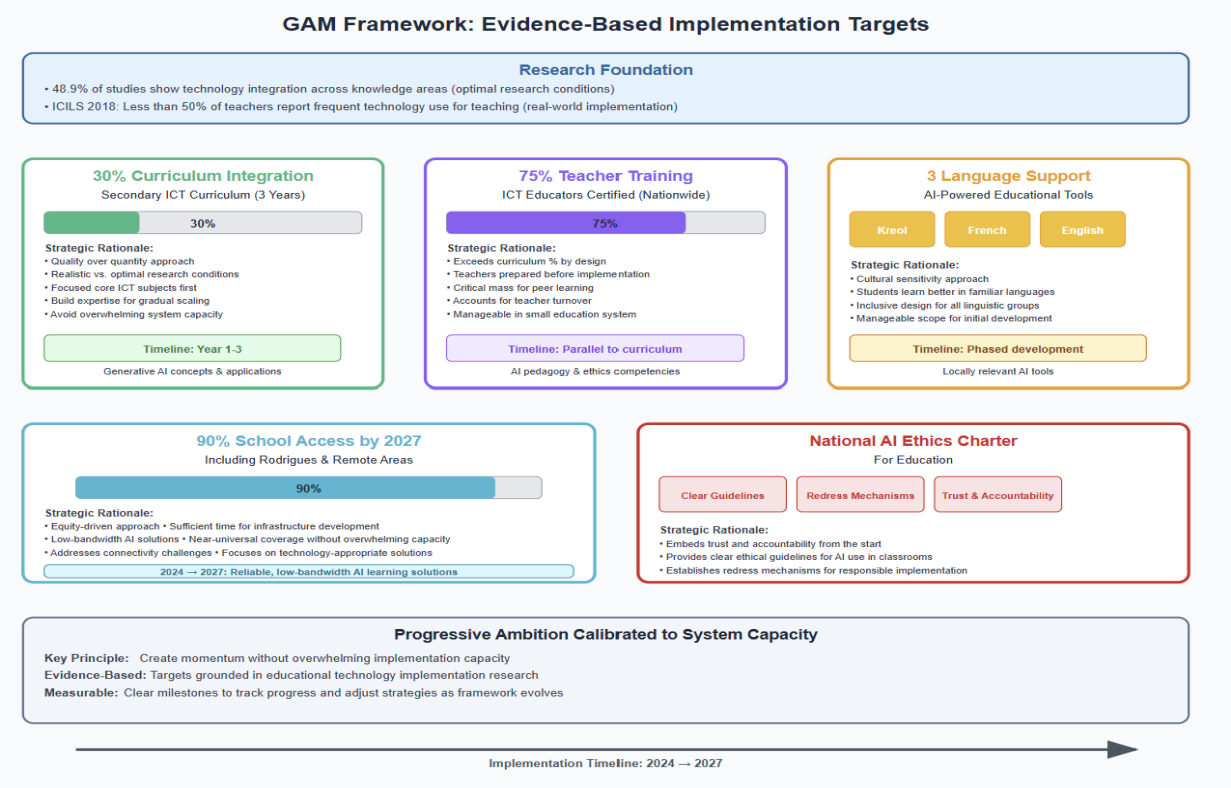
Simultaneously, a nationwide teacher training drive will equip a minimum of 75% of ICT educators with certified competencies in AI pedagogy and ethics. This ambitious target exceeds the curriculum integration percentage by design, ensuring teachers are prepared before implementation and creating the critical mass necessary for peer learning and mentorship. The 75% threshold

accounts for teacher turnover and ensures continuity, while being manageable within Mauritius's relatively small education system.

Recognizing Mauritius's diverse linguistic landscape, the framework prioritizes the development of at least three locally relevant AI-powered educational tools that support Kreol, French, and English. This trilingual approach reflects cultural sensitivity and practical necessity, ensuring students learn better in familiar languages while maintaining manageable scope for initial development.

Equally vital is bridging the digital divide: by 2027, the goal is for 90% of schools, including those in Rodrigues and remote areas, to have access to reliable, low-bandwidth AI learning solutions. This equity-driven target provides sufficient time for infrastructure development while focusing on technology-appropriate solutions suitable for Mauritius's connectivity challenges. The 90% threshold ensures near-universal coverage without overwhelming the system's capacity for change.

Figure 12: *Proposed Implementation Plan*



To embed trust and accountability, a National AI Ethics Charter for Education will also be established, setting clear guidelines and redress mechanisms for the ethical use of AI technologies in Mauritian classrooms. These evidence-based targets provide clear milestones to track progress and adjust strategies as the framework evolves, demonstrating progressive ambition calibrated to create momentum without exceeding the system's implementation capacity.

Limitations and Considerations

The successful implementation of the GAM-Framework in Mauritius, integrating Generative AI in ICT education, requires careful consideration of various factors. Resource limitations,

including funding for infrastructure, training programs, and curriculum development, need to be assessed to ensure adequate support for the integration process. Access to reliable technology infrastructure, such as hardware, software, and internet connectivity, is essential for effective integration, enabling hands-on learning experiences and practical application of Generative AI concepts in Mauritian schools. Furthermore, the capacity and expertise of teachers are crucial, necessitating the provision of adequate training programs and professional development opportunities to ensure their readiness to effectively teach Generative AI concepts. Ethical considerations, encompassing issues like algorithmic bias, privacy concerns, and responsible AI use, should be addressed through clear ethical guidelines within the framework, fostering students' understanding of the ethical implications of Generative AI.

Developing an evaluation and assessment framework is important to measure the effectiveness and impact of Generative AI integration, considering appropriate assessment methods that evaluate students' knowledge, skills, and ethical understanding in the context of Generative AI.

Given the rapidly evolving nature of AI, regular updates and revisions to the framework are necessary to keep pace with emerging trends and maintain its relevance within the Mauritian educational context. Collaboration among stakeholders, including educators, policymakers, industry partners, and researchers, is vital for the successful implementation, requiring effective communication and engagement strategies to ensure the active involvement of all relevant parties.

By addressing these limitations and considerations, the GAM-Framework can overcome challenges and provide a solid foundation for integrating Generative AI in ICT education in Mauritius.

Contextual Situation in Mauritius

Mauritius can be seen embracing AI as a pivotal force in driving its economic growth and technological advancement. The GAM-Framework will be strategically aligned with the country's vision to prepare its students for the challenges and opportunities of an AI-driven future.

Crucially, this framework addresses the unique needs and obstacles within Mauritius's education system. It goes beyond mere technical skill-building, focusing on cultivating critical thinking, creativity, and a deep ethical understanding of Generative AI technologies. This holistic approach ensures that Mauritian learners are not only proficient in AI-powered tools but also equipped to navigate the complex societal implications of these transformative innovations.

Why Mauritius Needs a Localized Approach

Mauritius’s unique cultural, linguistic, and infrastructural context makes a one-size-fits-all adoption of international AI-in-education frameworks impractical. Unlike larger countries with homogeneous populations, Mauritius’s trilingual society, where Kreol, French, and English as well as other Asian languages coexist in daily life and classrooms, necessitates AI tools and content that are genuinely multilingual and culturally resonant. While countries like Finland benefit from robust, widespread digital infrastructure, certain schools in Mauritius still face intermittent internet access and bandwidth constraints, especially in outer islands. This reality demands low-bandwidth and offline-friendly AI applications to ensure equitable access. Additionally, any AI-generated educational content must reflect local cultural values, economic activities such as tourism and the sugar industry, and even unique environmental factors tied to the island’s ecosystems. By tailoring

the GAM-Framework to these local conditions, Mauritius can avoid the pitfalls of importing external models wholesale and instead build an ICT education ecosystem that is inclusive, practical, and relevant for all Mauritian learners.

As Ge et al. (2024) astutely observed, accounting for cultural and contextual differences is paramount for the successful implementation of the AI frameworks within any local societal landscape:

> Yet, how cultures shape people's views of AI and its potential has not received significant empirical attention. This lack of attention to culture in AI theory and design limits the space of the imaginary, and in particular, people's ideas about how humans and artificial agents might interact. (Introduction, p. 2)

Tailoring the framework's content and examples to reflect the Mauritian context and incorporating local cultural values and perspectives can enhance its relevance and effectiveness. Given that Mauritians come from different cultural milieus, it is essential to adapt the framework's content and examples to reflect the unique Mauritian context.

This justifies the inclusion of multilingual chatbots, locally trained language models, and translation apps that empower students to learn and create in their language of choice. Moreover, unlike larger countries with homogeneous school systems, Mauritius must balance equity across all educational institutions, which makes offline-friendly and low-bandwidth AI applications essential—an insight drawn from but adapted beyond India's NEP 2020 and Finland's infrastructure-rich approach. Similarly, AI-integrated learning activities in Mauritius should reflect local realities, such as using environmental data from island ecosystems, generating tourism-related media, or exploring the impact of AI on local industries like sugar, ICT-BPO, and hospitality. Ethical education must also be rooted in Mauritian values, such as community solidarity, cultural pluralism, and environmental stewardship. These contextual needs explain why the GAM-Framework selectively draws from international examples like AI4K12 (U.S.), NEP 2020 (India), and Finland's cross-curricular integration—but filters them through a Mauritian lens. Rather than a copy-paste adoption, this framework can be considered as contextual translation, positioning AI education not just as a tool for skills development but as a culturally embedded driver of national innovation and equity.

Future Directions and Final Words

The potential impact of integrating Generative AI in enhancing ICT education in Mauritius is profound and far-reaching. By harnessing the transformative power of AI-driven technologies, the education system in Mauritius can empower students to develop a truly innovative and future-proof skill set.

At the heart of this integration lies the opportunity to nurture creativity, critical thinking, and problem-solving abilities in students. Generative AI can serve as a catalyst for boundless imagination, challenging students to push the boundaries of what is possible. Through AI-driven projects and challenges, learners can engage in active, dynamic learning experiences, fostering the skills that will be essential for navigating an ever-evolving digital landscape.

Moreover, the integration of Generative AI in ICT education must be accompanied by a deep understanding of the ethical considerations surrounding these technologies. By cultivating a

strong ethical foundation, students can become responsible users and developers of AI, recognizing the societal impact and potential pitfalls of these powerful tools. This holistic approach will equip the next generation of Mauritian leaders and innovators with the wisdom and foresight to shape a future where technology serves the greater good.

Future research in this domain should delve deeper into the practical implementation of Generative AI in the Mauritian education system. This includes the development and refinement of the GAM Framework, a robust and adaptable approach to integrating AI-driven learning experiences. Rigorous piloting and evaluation of these frameworks in real-world educational settings will be crucial, as will addressing any challenges or barriers to implementation.

Equally important is the exploration of the long-term impact of AI integration on students' learning outcomes, employability, and societal development. By tracing the trajectories of students who have benefited from this transformative approach to education, researchers can uncover the true power of Generative AI to shape the future of Mauritius.

Realizing the full potential of Generative AI in ICT education will require a collaborative effort, with educators, policymakers, industry partners, and researchers working in harmony. Continuous engagement and dialogue among these stakeholders will be essential, fostering a shared vision and mutual understanding of the challenges and opportunities that lie ahead. By embedding clear targets, context-driven adaptations, and a phased roadmap, the GAM-Framework transforms its vision from a broad aspiration into a tangible, actionable plan that addresses Mauritius's unique challenges and opportunities in the age of Generative AI.

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