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## **STE (AI)Ming Across Disciplines and into the Future: Generative Artificial Intelligence for Ethics, Access, and Interdisciplinary Skills Development in Classrooms and Communities**

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### **ABSTRACT**

*This paper shares the results of a research creation study that examines GenAI use in interdisciplinary STEM/STEAM classrooms. It outlines curricular examples developed for a university education setting and discusses the potential for the use of GenAI tools in wider, community-engaged research. The author argues that careful implementation of these tools can help teachers and learners engage with questions of ethics in technology contexts and offer new forms of access to technical and artistic training in cross-disciplinary learning environments. The paper proposes that informed and careful use of GenAI tools can contribute to helping grow “improvisatory” STEAM skillsets for both teachers and students, including self-directed learning, collaboration, responsibility, curiosity, and play.*

**Keywords:** art; artificial intelligence; community-engaged; creative technologies; GenAI; improvisation; research creation; STEAM; STEM

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## INTRODUCTION

I am a fine arts teacher working in classrooms in a Creative Technologies program in Toronto, Canada, where I teach a mix of students from computer science, engineering, and fine arts disciplines. I am also a professional transdisciplinary artist and community-engaged researcher. This paper bridges these worlds via a discussion of a research-creation project that began in 2023 and culminates in two outcomes: an undergraduate creative technologies class in the 2024 Fall semester, entitled “Creating with AI,” and the co-development of a new project that received national funding in the same year, where I work with other researchers and community partners exploring the role of AI in Indigenous-led game design. This research has emerged from my ongoing art and technology experiments over the last fifteen years, from building a new program in the interdisciplinary field of creative technologies at the University of Regina in Saskatchewan, Canada (2011–2021), to more recently developing a creative technologies program for a new campus at York University’s new Markham Campus in Ontario, a program we hope can effectively teach art and technology skillsets and foster innovation in a rapidly changing technological landscape (Caines et al. 2024). This research is therefore shaped by my own biases and perspectives as a white, Western-educated researcher and teacher at a well-resourced campus, coming from an interdisciplinary humanities background, and as a teacher who is already committed to pedagogy that explores new technologies and combines approaches from different disciplines across fine arts, social sciences, and computing and engineering.

In this paper, I outline and critically examine new improvisatory approaches for integrating Generative AI tools into Science, Technology, Engineering, Art and Mathematics (STEAM)-based education settings. I focus on the practical, ethical and creative complexities and possibilities of using web-based GenAI tools such as text to podcast generators and image, text, and video generators in the interdisciplinary undergraduate classroom context and end by discussing the potential for the application of AI tools in future workshops in community settings. I center my dialog on the new kinds of practical, critical and creative work required by teachers/facilitators in these fields, focusing mostly on the course/workshop design phase, with some reference to final assignments and delivery. Through sharing my concerns, approaches, experiments, reflections, and the projects I designed for myself, my students, and with coresearchers, I hope to contribute to new conversations about AI pedagogy, particularly for those moving across traditional disciplines, and for those attempting to prepare students and researchers for emergent knowledge economies and career paths.

## LITERATURE REVIEW

In 2019, Harvard/MIT PhD student and AI YouTuber Jordan Harrod argued in a TEDx Beacon Street presentation that “we are at the forefront of a new type of technological literacy [...] AI literacy [...] the knowledge that a person accumulates in order to be able to confidently understand and interact with AI-based systems. Like how in computer literacy, we do not necessarily focus on understanding the specifics of the hardware; in AI literacy, we are not necessarily concerned with the specifics of the code. Instead, we're interested in understanding how these algorithms affect our daily lives and how we could use them for our own benefits” (Harrod, 2019). My motivation in conducting this research-creation and integrating it into my teaching came from a concern I share with Harrod and many others that unless we take care, teachers and students run the risk of being “AI illiterate” and being unable to navigate and take advantage of the creative and technological skills and knowledge economies that are emerging alongside this technology.

As with previous technological and media disruptions, calls for “AI literacy” can parallel previous education movements where educators respond to social and technological change by designing new kinds of “media literacy” training (Jenkins, 2009) or by seeking new responses to new technological and “digital divides,” promoting the use of new technologies in classrooms and universities (Cullen, 2001). Since Harrod’s call to action, educational research on “AI literacy” has expanded to include other kinds of “AI self-efficacy”, which is defined by Bewersdorff et al. (2025) as students’ “confidence in their capabilities to effectively interact with, understand, learn about, and use (when desired) AI technologies and applications” (Bewersdorff et al., 2025, pp.1). Education scholars have argued for nuanced responses to AI literacy training that take into account both skills-based and other kinds of relationships to emerging technology: “For AI educators, it is thus crucial to understand the interplay between cognitive (AI literacy), affective (positive and negative attitude toward AI, AI interest), and behavioral (use of AI) variables and how they affect AI self-efficacy” (Bewersdorff et al., 2025). While I see this more nuanced response emerging in the educational literature useful, I remain concerned with what I see as a problematic binary that I observe in both my colleagues and my students. On the one hand, there is a position that holds to the very real danger of an unthinking uptake and ignorance of the risks that AI use entails, but on the other is a position I have witnessed that adheres to a kind of “strategic AI illiteracy” and refusal to even explore the possibilities of these technologies; a refusal I worry can actually contribute to less critical thought, creativity, and informed decision making about AI. I remain hopeful, however, that current AI scholarship in the fine arts encourages a more nuanced response, seeing AI as just one change in a history of

technological disruption, and that may require localized scholarly and industry responses (Harvey, 2025; Luka, Grohmann, & Idiz, 2025).

For those familiar with STEM but not with STEAM, the idea of “STEAM education” emerged from roundtable discussions in the U.S. in 2017 “and merges the arts with STEM subjects for the purpose of improving student engagement, creativity, innovation, problem-solving skills, and other cognitive benefits and to improve employability skills (e.g., teamwork, communication, adaptability) necessary for career and economic advancement” (Perignat & Katz-Buonincontro, 2019, pp.32). The use of AI in STEAM education has been a topic of increasing research interest, with scholars emphasizing the possibility that “AI technologies [can] contribute to the development of thinking skills, such as computational and analytical thinking, enhance self-confidence, increase satisfaction and enjoyment among students, and deepen their understanding of STEAM concepts” (Al-Zahrani et al., 2024).

AI tools can be used to aid AI literacy in STEAM contexts, as these tools act as “educational scaffolds to educe (draw out) students’ AI-Thinking skills in the form of AI-assisted human-centric reasoning for the development of knowledge and competencies” (How & Hung, 2019, pp.1; see also Narahara & Kobayashi, 2018; Relmasira 2023; Sun & Saleh 2024). Some, such as Leavy et al. (2023), caution, however, that using “emerging technologies” in the classroom requires extra care, as the tools are evolving, not maturely researched or understood, subject to hype cycles that could lead to either rapid uptake or abandonment and that it remains problematic that some of these technologies have perhaps not reached their full potential. Scholars highlight “the critical need for the field to adopt robust methodologies to study the effects of emerging technologies on students' learning in STEAM education” and the “need for investment in teacher education and the requirement that researchers assist teachers and schools in seamlessly integrating these emerging technologies into day-to-day STEAM instruction” (Leavy et al., 2023, pp. 1079). I agree, but I worry about what happens if these robust studies and investment in teacher training options are not seen as important or are not yet available and accessible; how do we pursue learning and engagement in a timely and responsive manner, with the everyday resources at hand? This research paper is one way I hope to contribute to knowledge sharing in this area.

### **Approach to the Literature:**

Unlike a standard literature review, in research-creation studies such as this one, a literature review is just one form of exploration undertaken in conjunction with creative and technical research. The literature in this project informed and aided in the development of the study, but it was also incorporated directly into creative experiments as part of the data uploaded into multishot

prompts for the software. Examples of this are discussed in the section on generative podcasting below.

In exploring GenAI in the STEAM classroom, , new approaches to finding literature in this field become necessary, as expert scholarly sources were not always available or useful. For example, gaining AI literacy requires some understanding of the activities of corporate and not-for-profit “major players” in AI development, as well as of the specific technological advancements that change the tools we may use. In response, we need to reframe ideas of “expertise” to include non-formally trained technical reviewers who are leading explorers in these untested waters and who embrace a wider range of disciplinary literature that might better encompass the interwoven social, technical, creative, and curricular challenges of this field.

Reviewing the literature on GenAI is particularly difficult, as the field is constantly evolving and adapting, and, as of this publication, is undergoing rapid, intensive change (Bick et al. 2026). Research into media and technology is also increasingly confronted with the culture of secrecy surrounding many large-scale proprietary technology systems, making scholarship difficult (Idiz et al. 2026). It has been argued that modern research is itself in the throes of a major shift as researchers and universities engage with AI processes that challenge the premises of what constitutes knowledge (Harvey, 2026). I argue that it is also difficult to rely solely on academic experts for this research, as the pace of academic scholarship does not align with the pace of industry innovation. This speed of change is compounded by the fact that the large language models (LLMs) being used by GenAI systems are themselves opaque, and the engineers who are developing and releasing them require years of study to understand their behaviors in depth. As the Anthropic Research Team, who created the “Claude” AI system, suggested, “We mostly treat AI models as a black box: something goes in and a response comes out, and it is not clear why the model gave that particular response instead of another” (Templeton et al., 2024).

During my research-creation study and the teaching that followed, I have therefore had to constantly review industry news, government policy think papers, company announcements, platform changelogs and media releases, along with my normal review of scholarly books, papers and conference presentations. Sudden changes made my research and lectures redundant, sometimes from one week to the next. One example was the release of the Chinese tool “Deep Seek”, which was released with no notice during week two of my 2025 class, challenging long-held opinions on U.S. industry dominance and ideas of the minimum technological requirements for AI development and bringing a completely different player into the ecology (see Conroy & Mallapaty, 2025). My lecture, based on my research study, entitled “Major Players in the Field of AI”, was immediately out of date and had to be swiftly and completely rewritten. The next year’s lecture will need to be

rewritten again considering the impact of new controversies and bans arising in the U.S. over the capacity of the latest LLM models (Anthropic, 2026).

I began to teach myself (and then my students) to follow weekly technology company and government policy updates and media coverage, while also browsing the most up-to-date scholarly research. Following current government policy developments inside and outside of Canada has become relevant to understanding and predicting change. For example, the creation of new Ministries of Government in various nations (see: a LinkedIn report by Sanjar, 2025) and the resulting Ministerial statements and reports can help educators and students understand how policy can shift the nature and accessibility of GenAI tools (Government of Canada, 2025a; Government of Canada, 2026). Briefings from global summits and declarations can help learners better understand perceived and actual risks, as well as the socioeconomic pressures that will impact the field (e.g., the Bletchley Declaration (gov.uk, 2023)). Tech blogs and forums are also useful sources, despite these being increasingly driven by profit-making and full of affiliate links, with the attendant needing to be aware of bias. Examples of useful sources of AI developments include tech blogs such as Slashdot and TechCrunch; tech industry newsletters such as TL; DR; and the news, research, and forum sections of the major players in the field (e.g., Google, OpenAI, Meta, Anthropic, Midjourney).

I also looked toward leading creative AI researchers and explored the work of many artists, curators, and other creative practitioners who were themselves researching (and struggling with) how to use AI. It is outside the scope of this article to analyze all of these artworks and approaches, but one useful resource for teachers, students, and practitioners is the excellent 2-part interview with the leading artist and scholar Casey Reas on the “History of Generative Art,” demonstrated by Peter Bauman (2023a, 2023b), as published on the online repository of “digital generative art,” *Le Random*, which reminds scholars that creative experiments with data and machine learning are not actually new but have a long history. The online Reggaetón community also provides an interesting example of creative AI practitioners expanding outside of corporate models, as Laurisa Sastoque (2024) suggests, in sound studies, blog *Sounding Out!*. Examining the history of musical imitation and digital innovation in Reggaetón expands the bounds of artistry as defined by GenAI theorists. In the conventions of the TikTok platform, Reggaetón listeners have found a way to participate in the artistry of imitation that has long defined the genre. The case of [Reggaetón AI artist] FlowGPT, along with the overwhelmingly positive reception of “nostalgIA,” points toward a future in which the boundaries between the listener and the artist are blurred, and in which technology and digital spaces serve as platforms for enhanced cyborg creativity.

I also spent many hours examining the work of AI pioneers such as Mike Tyka (discussed below), Anna Ridler’s fascinating work linking technological and

social change via AI processes, e.g., “Myriad (Tulips)” (2018), and the work of Alexander Reben, first artist in residence with OpenAI (Heaven, 2024), whose large-scale art both critiqued and celebrated AI tools, as well as the longstanding explorations of Refik Anadol and his use of AI to question practices of museum curation in both his own work and his leadership of the new Dataland AI museum in LA (Whiddington, 2024). Renowned new media scholar Lev Manovich’s use of the tool Midjourney as a creative and scholarly provocation (Manovich, 2024a) and his new fine arts exhibitions such as “Unreliable Memories” (Manovich, 2024b) were very useful resources. I also explored the ongoing curation of AI creative work in online galleries such as *Feral File* (Feral File, 2025) and turned to art from outside professional art contexts, such as the long running website, prize, and forum ai-arts.org (ai-arts.org, 2025), as a great source of conceptual explorations, providing me and my students with fascinating examples of approaches to using AI for art and design.

Research-creation directly encourages creative practitioners to pursue their practice-led and accompanying literature-led investigations across different spheres of information gathering and testing, moving back and forth across and between popular and scholarly sources of inspiration and knowledge (Dickinson & Waterman, 2023). Instead of being disheartened by the difficulties of shaping the correct literature review to inform a study on AI in the STEAM classroom, research-creation methods helped me to stake out scholarly freedom, following my query across disparate spheres and sources and entering the somewhat “wild west” interdisciplinary terrain of AI scholarship and creativity (with all the deliberately colonial and violent connotations of the term “wild west”). In the course that I eventually taught, this approach continued, and I enrolled students as co-researchers to continually update our sources and continue the ongoing risky investigations that I argue must form part of any kind of AI literacy.

Throughout this research-creation, however, I was ever cognizant of a growing binary in considering the “risks” of AI use. This binary posits that there are only two positions vis-à-vis AI: either to be completely and vehemently against all AI use in research, classrooms, or industry or, conversely, to be wholeheartedly supportive of AI use without any critical engagement. As Canada’s new “Minister of Artificial Intelligence and Digital Innovation” Evan Soloman suggests, governments (and I would argue, educators) “can’t be ‘it’s all hype, it’s all confetti, this is going to be great’ or ‘it’s doom’ — we’ve got to be practical...we’ve got to have a plan and get this right because we have a lot of control here” (qtd. in Lopez Steven, 2025).

This binary is particularly stark in observing university responses to students’ use of AI writing tools such as ChatGPT (Niraula, 2024; Popowich, 2024; H. Wang et al., 2024) and in the creative industries’ reactions to AI use (and abuse) in image, music and audio production, and related fields (Epstein et al., 2023). Knee jerk or uncritical responses are emerging across disciplines and may

in fact be obscuring efforts to genuinely investigate the possibilities of new platforms or approaches. In my interdisciplinary review of the literature on AI ethics in creative work, I identified several concerns that were feeding this binary and argued for responses to these issues that allow for a third way, located between unthinking uptake and strategic refusal. In the results section, I outline ways in which a more critical and creative response emerged in my research-creation and teaching.

### **Themes and patterns in the literature:**

In my review of the literature on more critical responses to AI use that could influence an educator, a pattern emerged. It became clear to me that *all* of the ethical and practical concerns articulated about the use of AI tools and platforms that received intense scholarly, media, and industry attention were in fact the very same ethical issues that inform any conversations around wider technological uptake (and yet which do not seem to attract the same widespread anxiety). Instead of focusing just on AI, synthesizing these key areas of the AI literature required situating each major issue within its wider sociotechnological context.

One main theme of the AI literature focuses on the environmental impact of AI platforms emerging from water use, e-waste, extraction of rare earth metals, and large power-hungry data centers to run these systems (Hosseini et al., 2025) as well as to train them (Chauhan et al., 2024) and extend them to the ecological imprints of these systems (Q. Wang et al., 2024). There is no denying these problems, yet other studies have shown that water use and environmental impact are growing problems for *all* technology companies, from semiconductor fabrication (James, 2024) to Google searches and Tik Tok videos (Tiwari, 2024, as seen on the media platform TechStory). Many contemporary technological systems have extreme water needs and major, ongoing carbon footprints, but these seem less commonly discussed as a reason to, for example, avoid all computer or platform use in the classroom. Why is the conversation about AI obscuring this larger issue?

Another thread focuses on the grim realities of algorithmic and training biases in LLMs and the resulting impacts on women, BIPOC and 2SLGBTQI+ people. Attention to this issue elides the fact that similar biases shape all levels of technological systems (Hacker et al., 2025; Thomson & Thomas, 2023; Williams, 2023). (An excellent resource for teachers is the Algorithmic Justice League: <https://www.ajl.org/>). Biases have been placed at every level of technical development, from gendered tech education to biased investment selection for what types of tools are funded to bias keywords and tagging and name recognition in hiring policies (Bender et al., 2021; Klein & Díaz-Hernández, 2014; Stacey 2023). One must also consider the impact of large-scale technology on vulnerable populations via poor working conditions, as evidenced by the abuses of BIPOC

and Global South labor at all points of the technological pipeline, from mining to construction to the management of tools and systems and even moderation systems for online platforms that rely on Black and Brown bodies to preview traumatic content for low wages (Balendra, 2025). The literature shows that it is imperative that scholars and practitioners understand AI as one highly visible part of a larger problematic technology ecosystem, and I approached it as such in my research-creation classroom activities.

Another key theme in the literature was concern about GenAI's potential for producing misinformation or disinformation via deepfake videos. While distressing, this is just one example of a threat to "reliable data" associated with the growth of broader networks of technologically mediated and underregulated information systems (Government of Canada, 2025b). Deeper fears of sentient or out-of-control AI (Hinton, 2024; and explored by Anthropic CEO Dario Amodei on his personal website, 2026), or of bad actors within AI infrastructure, seem inseparable from the true risks of widespread contemporary technology uptake, where technical systems are so dependent on corporate systems, so complex, and so implicated in wider international politics that loss of control remains an ever present danger that is not always at the foreground of how we teach technology in classrooms. By synthesizing the literature in this area, I began to see that these "new" problems with AI are truly less new 'problems of technology,' scaled up, intensified, and highlighted, and I believe that engaging with these issues in the classroom via AI may be a useful teaching aid to develop better critical (and historically grounded) approaches to *all* technologies.

There are also, however, specific themes emerging around GenAI's place in the creative industries and STEAM fields (see Krekovic et al., 2024). GenAI tools such as Midjourney or DALL-E are trained on copyright-protected creative material, for which most creatives were not compensated (see Heikkilä, 2022). Debates remain as to whether generated content can be owned by anyone, and in the U.S., AI-generated works are not subject to copyright (United States Copyright Office, 2025), meaning that artists (and students) using AI tools do not own their AI-generated work. Some creative industries are also deeply concerned about skill loss and/or devaluing of creative skillsets as generative production increases (*Forbes* 2023; Fenwich & Jurcys, 2023) as well as resulting in job losses (del Castillo, 2025) and the flooding of the internet with low-quality generated content (which comes with its own risks by bad actors such as connected click-bait scams and fraud (Diresta & Goldstein, 2024). However, disputes about job loss from automation and concerns about corporate theft or institutional control are not new (Fleming, 2020). My philosophy as an educator and research-creation practitioner is that we should not respond to these issues with avoidance or with a lack of criticality but use these newer tools to continue exposing and addressing the ubiquitous problems of technology. AI seems to have become a mirror for all our technological fears—fear of corporate control, fear of government failure, fear of

job loss, fear of environmental destruction, and fear of quality loss in our art and media landscape. However, many of these fears disguise the wider fact that it is not just AI that shapes these concerns and that banning it would not solve these problems.

Some useful alternative positions have emerged from creative arts fields, encouraging users of AI to better acknowledge the diversity of AI-assisted works (Eapen et al., 2023). Some argue that it is creatives who have the skillsets to imagine “unexpected, diversified, affordant, and evolvable” uses for these tools (Krekovic et al., 2024 pp.102). In thinking about the multiple possibilities for AI use, consider composer/performer and music theorist Jennifer Walshe, who encourages users in her think piece: “13 Ways of Looking at AI, Art & Music” to remember the following:

“AI is not a singular phenomenon. We talk about it as if it’s a monolithic identity, but it’s many, many different things—the fantasy partner chatbot whispering sweet virtual nothings in our ears, the algorithm scanning our faces at passport control, the playlists we’re served when we can’t be bothered to pick an album. The technology is similar in each case, but the networks, the datasets and the outcomes are all different.”

Walshe’s work helps to critically navigate the very different frames and possible uses of AI practices. Her “13 ways” are poetic and creative and require letting go of preconceptions. If AI is simultaneously manifesting as predictive, generative, useful, terrifying, pornographic, conceptual *and* relational all at once, then our scholarship and the ways we teach our students should also allow for more expansive approaches to these tools and the problems they engender.

Walshe ends her provocation with the following demand:

“To truly think and live with companion species, we have to try to meet the world as nonhuman beings do, to understand the world on their terms, not ours. We have to understand how other forms of intelligence perceive the world, which means understanding how they process our behavior and take responsibility for the repercussions of their actions as well as our own. This is not just a cute, pet-friendly way of regarding AI—it helps remind us that work is required of us. Because ultimately it is people who are responsible for what these networks will do, for the joy as well as the brutal violence that will result.”

I found this “AI as companion species” approach very useful as a tool to inform my scholarship and research-creation practices to encourage myself and my students to imagine different relationships with machines that are based on non-extractive logics and practices of relational care, whether these machines have sentience yet or ever will. We might also look to artists, researchers and Indigenous communities who are currently building their own new AI systems and AI governance with similar “companion species” logics as reminders that there are real alternatives to the corporate models that play such a dominant role in

discussions about GenAI in both popular and scholarly spheres (see Abundant Intelligences, 2026; Schulz, M., & Loewen-Colón, 2026).

## RESEARCH METHOD

Research-creation is a methodology used in the humanities and other disciplines by creative practitioners to create new knowledge through creative practice and accompanying process documentation and reflection. The term is common in Canada, where it is utilized in national government funding rubrics to support an “approach to research that combines creative and academic research practices and supports the development of knowledge and innovation through artistic expression, scholarly investigation, and experimentation.” In this work, “the creation process is situated within the research activity and produces critically informed work in a variety of media (art forms)” (SSHRC, 2025). It has parallels, or what Chapman and Sawchuk (2019) call “family resemblances,” to other practice-based methodologies widely utilized in the social sciences and in education, including arts-based research and *a/r/tography* (Leavy, 2020; Irwin, 2013) and to methods of fine arts “artistic research” or “creative research” common in Europe and the UK (Biggs & Karlsson, 2010), where “researchers are thinking, questioning, or approaching research in a creative way, drawing from creative disciplines and practices, or extending these to other disciplines which have not traditionally foregrounded creative practices” (Bristol University, 2026).

Since 2011, I have been using research-creation in my teaching to develop and reflect on practice-led investigations into new pedagogies in creative technologies. In 2012, for example, I worked with co-teachers in Computer Science and Music, alongside students, to examine the potential of the (then brand new) iPad for teaching, learning and creating free improvised music [Caines et al., 2013]. From 2013–2021, I worked with teachers in engineering to examine how research-creation methods could be used to develop courses in audio to mixed fine arts and engineering cohorts (Caines, 2019). In both of these examples, the knowledge developed was manifested primarily in the practical artistic work developed by myself in the curricular design stages and then by my students during the courses (outcomes included performances, concerts, installations, and showcases), but these were also accompanied by cross-disciplinary reflections completed with co-teachers and students, shared in peer reviewed publications, industry magazines, and conference papers (Caines & Watson, 2023; Canadian Art 2017; Caines et al. 2024).

This methodology allowed me to shift from using students or community members as study participants to focusing on a practice-based examination of the role of the teacher as a reflexive practitioner—navigating these new technical, creative, and participatory terrains produced by GenAI in university settings. Under Chapman and Sawchuk’s four subcategories of research-creation, this

study may be best categorized as “research-for-creation,” as I focused on “literature reviews, the tracking down of precedents for one’ creative ideas, the articulation of a cluster of concepts, as well as trying out different prototypes or iterations”, with the understanding that “one keeps track of progress over time during research-for-creation phases to allow an on-going iterative process of experimentation, and of trial and error to take place” (Chapman & Sawchuk, 2019, pp.16). As they discuss, “the “result” of [...] research-for-creation may not be a full-scale production of a final product but may remain an experimental prototype” (2019, pp. 16). As Loveless (2019) and others note, research-creation challenges other more fixed research forms, as it provides for nonlinear, personal, partial, transient and localized knowledge to emerge in the form of process-based creative experimentation and connects to wider historical challenges to dominant research discourses.

## RESULTS

### *Creative Experimentation as Ethical Pedagogy: Choosing and Learning the Right Tools*

Choosing and learning the right tools and formats for myself and my students was a complex challenge. ChatGPT, developed by OpenAI, was released in 2022 and has posed a challenge for universities globally, as students and teachers have used it in ways that push the limits of long-standing academic plagiarism and integrity guidelines. When I began this study in 2024, many universities, including my own, were still struggling to develop new policies for AI usage in the classroom, and many of my colleagues were (and still are) expressing a wish to ban the use of any AI tools in universities altogether. New communities of practice among classroom AI users were emerging, and I joined each one I could access, from new (limited) communities at my university to the OpenAI, Midjourney, and Eden Discord channels.

However, the climate in which I was working remained full of fears and anxieties. Along with the general fears around a loss of critical thinking and writing specific to ChatGPT and essay writing, I summarize these fears as a combination of privacy anxieties (how can we control what data are gathered and used for future model training), evaluation arguments (how can we ensure learning or creativity is taking place if AI tools are being utilized), and the ethical arguments outlined in the literature above (how can we ethically condone the use of tools if they are engendering environmental and social harm?)

While I hoped to create lab machines where anyone could try out a range of tools at any time, almost every tool I hoped to use failed to support computer-based subscriptions and was tied to individual user access, and my university refused to load generic subscriptions to computers despite the legal gray areas this use would inhabit. I see the potential appeal of downloading open-source models onto local

machines and avoiding the complexity of proprietary systems, but the technical complexity of doing this was well beyond what I and my students were capable of. I remained committed to my attempt to produce AI literacy through practical experiences that could continue after the study and classes concluded, rather than learning to depend on the time and expertise of those with deep technological skillsets I could never emulate.

The economies and ecologies of AI subscription were also rapidly changing. When I began the study in 2024 and initially proposed the class to my university, many AI sandbox play spaces online were free, with economic models only present for some companies, and access fees were modest. By the time we were deciding on software for my class, AI subscription costs had increased exponentially, and many of the free spaces were now available only to subscribers. My resulting choice reflected my attempts to balance these concerns. I bought myself (and eventually each of my students) a monthly subscription to OpenAI Teams, a hub that offered access to the most up-to-date models, with an enterprise-level guarantee that no data would be shared with the company or used for training. For 35 students and the teaching team, at \$25 per student per month for the semester, this added up quickly.

I also chose to use Google's NotebookLM, as my students and I were all already utilizing Google products, and it offered unique ways to bring my literature search into new formats. My university issued "Google Apps" accounts to all students and emphasized to students the possibilities and limitations of free Google products (whose advertising and data-sharing controversies are regularly exposed and discussed). I also explored (and offered as an option) an additional Midjourney subscription, with the caveat that students understood their data would be used for training and made public (we could not afford the "Stealth Mode" option they began offering only to those enrolled on plans of over \$500 USD per year per user). I also explored (and then demonstrated for students) a variety of other free tools, each without any real privacy protection, making sure that my students I and did the research to understand the risks involved.

I then began to teach myself these tools, taking a series of online GenAI courses offered by providers such as Coursera, MIT Open Learning, and LinkedIn Learning, and attending workshops led by leading local AI creators (Sade et al., 2024; <https://thecreativealgorithm.substack.com/>). I also sought out training resources such as prompt engineering guides, discord channel resources, and AI creation wikis and examined the work of creatives sharing their techniques in videos, blogs and articles of varying quality. It was astonishing to me how quickly suggestions and techniques from these sources became out of date. For example, in one of my online courses—a certificate from LinkedIn Learning in "Prompt Engineering for Generative AI" that I completed in December 2024—much of the material referred to using sandbox environments that were no longer accessible or offered prompt suggestions that did not work, as they did not take into account

newer guardrails introduced into later models of programs such as DALL-E 3 to help OpenAI avoid copyright infringement and to prevent pornographic and violent materials (OpenAI, n.d.). truly useful resources, such as the fan-made DALL-E 2 prompt guide (Parsons, 2022), were also full of tricks that worked only with the earlier release, and the fact that no new version was ever released for the later version of this program is perhaps reflective of the speed of change (and obsolescence) in these tools. Now, there are a plethora of up-to-date (for-profit) prompt guides available for purchase, but this was not the case during my study and class.

One important part of this phase was my collaboration with a friend and colleague at another campus—Dr. Maya Chacaby. While I was working on this study and course development, Chacaby was developing her own AI resources, experimenting with training LLMs with a specific Anishinaabe worldview, and creating AI-generated images, videos, and texts informed by large databases of community-held knowledge. We met regularly throughout our parallel projects to share the results of our explorations and learn from each other. Her work explores Indigenous futurism and “survivance”, and we see AI as a vital tool in this work (Chacaby, 2023).

My experiments with “prompt engineering” encouraged me to learn how to use text precisely to produce specific results. Some have argued that this kind of creativity is its own kind of art movement: “promptism” is a term I heard first on Discord and Reddit threads for European AI developers <https://www.reddit.com/r/promptism/>. It was interesting to explore how grammatical expertise is required to prompt effectively and to obtain more controlled results. This raised concerns about how my students from STEAM backgrounds might fare, as many of them struggle with writing skills. It might seem ironic, but this is a reminder of the importance of teaching writing to better teach the use of generative image, video and audio.

### **Recommendations:**

In a research-creation study, the creative outputs (in this case, the curriculum and creative exercises) constitute the results of the study. Research creation, however, allows practitioners to reflect on lessons they learned that may be useful to others approaching the topic.

My first reflection is that economics play a large role in attempting to balance financial, ethical, and practical considerations. I was fortunate that my campus wanted to invest in exploring these technologies and paid for subscriptions despite their excessive and rising costs; many teachers would not be able to afford the options I chose, leaving them subject to the changing and arbitrary data use and privacy policies that accompany cheaper options. I recommend that teachers be open and honest with their students about the compromises they will inevitably make for economic and other reasons as one way to encourage dialog and critical

thinking with students alongside AI tool use. I also recommend teaching tools whose use can continue outside the classroom rather than those dependent solely on the technical expertise and equipment at an educational institution.

Second, it is vital to realize that these tools cannot follow previous learning models. I recommend that to be an “expert” in this field means to practice continually, adapt flexibly, learn iteratively and partially, and accept that no one has the expertise to answer your specific questions in full. Instead, teachers must acknowledge the impossibility of expertise and know that working with these tools is a constant exploratory learning process coupled with the understanding that previous training will quickly become obsolete. I recommend that educators make room in their curriculum for co-learning with students to take place.

Third, I recommend that teachers aiming to be proficient in these tools seek, build and support communities of learning that may not exist inside their schools and institutions. For example, seek out colleagues doing projects with AI, join any communities of practice or drop-in groups outside your department, and speak to your school’s teaching and learning centers about the needs you have. You may have to form your own groups if these do not exist.

Finally, I recommend that teachers continue to promote traditional literacy skills while emphasizing to students how these skills interrelate with new forms of digital literacy, including but not limited to “prompt engineering”.

### *Using GenAI Creativity to Explore Ethics: 2 Case Studies using AI Portraits and AI-Generated Critical Podcasts*

Two class exercises that developed as part of this research-creation were especially impactful to my understanding of AI use in the classroom—an assignment using image generation to produce portraits and another using AI to create podcasts about AI. Both are explored below.

In my research, I had come across the work of Google Engineer and creative Mike Tyka, who worked on early AI experiments with Google’s DeepDream and who has collaborated with important AI artists such as Refik Anadol. His 2017 series “Portraits of Imaginary People” (Tyka, 2017) is considered an important historical moment in art, as he used a type of neural network training called generative adversarial networks (GANs) to produce a series of photorealistic portraits of nonexistent people. For this study, I explored my own version of “Portraits of Imaginary People” using DALL-E 3 and Midjourney.

Attempting to do this exercise taught me much more than techniques for artistic creation with a generative tool. By creating portraits, I examined my own ethical boundaries via the boundaries of the tool. When I started experimenting with Midjourney and DALL-E in the years before this study, it was possible to produce nuanced, stylistic and moody images in the style of the artists and filmmakers I adored. DALL-E 3—however, at the time I was using it for my class—was clearly trained to produce a certain kind of default image. This default

was mostly white, smooth-skinned and bright-eyed, and never quite realistic. These were thin bodies; they were clean, young, calm, and representative of able-bodied ideals and were often in bland corporate settings or generic urban streetscapes. With constant revision of your prompts and a careful emphasis on different ages, cultural backgrounds, body types and settings, it was possible to take out images that were less stereotypical, but this process was frustrating, extraordinarily slow, and prone to constant error (and needed to start from scratch again). Midjourney still allowed me some of the options I remembered from early experiments, but as mentioned above, I had to publicly share my images to be able to access the tool on my affordable basic account. I also explored deepfake portraiture and video using the free video avatar tool HeyGen. I loaded just a handful of photos and 2 minutes of video of myself and was able to generate disturbingly lifelike video that was never filmed. It was uncanny and alarming to experiment in this way. Because it was a free tool with major privacy risks, I did not insist students try this themselves when I taught the final course, but some did choose to explore HeyGen in their final assignments, knowing the possible risks.

My research also led to my exploration of, in class, the effectiveness of AI-generated podcasts in engaging critical voices in the key ethical issues surrounding AI use. Google's NotebookLM has an audio feature allowing users to turn any text into a podcast, featuring two AI-generated voices discussing the material in an accessible way. They describe this feature in their tool as "Your research and thinking partner, grounded in the information you trust" (Google, 2025). Users create "Notebooks" of uploaded or linked papers, videos or other resources as "sources," and NotebookLM then creates broad overviews, timelines, study guides, reports, flashcards and quizzes on the material. The audio overview feature generates a podcast-style audio file that can be shared or downloaded, featuring fictional AI hosts discussing the topic. More recent additions since my study include Advanced Chat, with the ability to interrupt the AI with questions. As I began this study, this feature had gone viral, with people generating podcasts on every type of text from the ridiculous to the artistic, as in tech journalist Mahnoor Faisal's experiments documented on [xda-developers.com](https://xda-developers.com) (2025).

I found this tool a way to further explore the ethical challenges surrounding AI without resorting to either refusal or ignorance. I uploaded all the research material I had gathered in my literature reviews and began to generate a range of AI-generated podcasts of the material. I experimented with editing the audio file and adding my own voice as an intervention where I saw gaps in the discourse. I also generated podcasts based on my own publications and other writing. Eventually, I developed an assignment for the course where students were asked to collaboratively choose from a reading list and then generate group podcasts and edit them to add their own voices to the conversation.

This process-driven audio exploration of the literature deepened my understanding, helped me remember key points, and became a research process I

continue using when I engage with new material and hope to use it again with students. My colleague Chacaby and I also shared our experiments with podcasts as a way to share our discoveries and learn more about each other's work.

### **Recommendations:**

When I tasked students with using DALL-E to create Imaginary Portraits, I required that students try to create a prompt that would make an image that told a diverse story, emphasizing that they try to push against the guardrails and biases inherent to DALL-E. As a class, we then explored where our ideas of ethical representation began and ended. While the analysis of submitted class assignments was not included in the terms of this research-creation study, some students did go on to show their work publicly at separate events after my class, agreeing that I could discuss their artworks in this paper, along with my own, to show the variety of responses possible from this activity.

Other teachers will have other AI-produced works that inspire or frustrate them into creating their own unique class exercises, but I recommend that all teachers ask their students to overcome the limitations of these tools. That iterative and explorative process is where so much learning and creativity takes place and allows students to engage with their own differing ethical boundaries with respect to the use of AI tools in the classroom.

Generating AI podcasts with human interventions also became a way to learn from key voices in the field while acknowledging that AI is only part of a range of wider issues faced in STEAM practices and classrooms. Making, sharing and listening to each other's podcasts became a way to divide up the learning and then share it back with each other, along with our own tips and tricks as we navigated the potentials of NotebookLM together. I recommend that other instructors find their own ways to use these tools in ways that engender communal collaboration and questioning among learners.

Last, building from my experiences, it is important to always remind students not to take for granted the privacy risks inherent in using these tools and explain differences in privacy settings across and within distinct free and corporate AI platforms.

### *AI and Access to Skills Development*

One surprising outcome emerging from this study centers on the unanticipated skills development that occurred during the project. I had hoped that I (and eventually my students) might become more informed about the risks of using GenAI (ethical and practical) and more proficient at generating creative outputs from web-based GenAI tools while gaining some technical learning about how the tools worked. I also looked for some evidence that this kind of research-creation project could support my wider STEAM skillsets, such as collaboration and teamwork, across disciplines. What I observed, however, is how these tools also

have the potential to allow learners to guide themselves across new fields of exploration that may have barriers to entry.

One example is the gendered barriers facing STEM fields where women and BIPOC people remain underrepresented and where certain kinds of technological experimentation, even with the best teachers and guides, can feel off-limits to some (Tandrayen-Ragoobur & Gokulsing, 2022). One result that interested me was when I asked the audio tool StableAudio to generate an audio process called granular synthesis, which involves an incredibly complex process of breaking down sound into tiny samples (1–100 ms) and then processing and controlling the playback of these grains (Truax, 1988). This kind of audio processing has traditionally required both extensive technical expertise and the use of expensive software and hardware, and like many areas of audio production and computer science, it has historically been the province of males and has been inaccessible to female identifying users. My prompt “Take my uploaded sample of birdsong and apply granular synthesis” produced an interesting creative result in under ten seconds. What could this kind of open, accessible and exploratory approach offer my female-identifying students to help address some of the gendered imbalances in technical fields?

### **Recommendations:**

Based on this study, I recommend that teachers inform themselves about GenAI to support creative expression for those who have been denied access through economic or disciplinary divides or through systemic inequities (see also Guedes et al., 2023 and Hasibuan & Azizah, 2023). My collaborator Maya Chacaby has also been partnering for many years with Nokiiwin Tribal Council, in Northern Ontario, Canada, on building digital and creative resources for language and cultural preservation for First Nations people, and together (in 2024 and 2025), her and I and Nokiiwin raised over two million dollars in research funding to support the creation of an online metaverse—“Biskaabiiyaang”—a gaming world where characters gain Anishinaabe cultural knowledge and learn the Anishinaabemowin language (See: <https://www.biskaabiiyaang.com/>). This funding comes from the Connected Minds project, an interinstitutional think tank for socially just technology (<https://www.yorku.ca/research/connected-minds/>), as well as a reconciliation focused grant from the Canadian Social Sciences and Humanities Research Council, and part of this funding is specifically to continue exploring the potential of AI to open opportunities for Indigenous communities to use creative expression for local community goals such as the preservation of languages at risk and the sharing of Elder teachings, stories and land-based learning. Our youth workshops specifically using GenAI in game creation began in Spring 2026.

## *Fostering Improvisatory 21<sup>st</sup> Century STEAM Skillsets*

Artistic models for improvisation in the arts require creativity, which is based on moving across boundaries, building responsibility and trust, flexibility, collaborative exploration and the constant reconfiguration of mistakes into productive material. I have written about the impact improvisatory approaches offered across research and community work elsewhere (Caines 2021). During this study, I began to see my work with AI tools as a kind of critical improvisation practice, subject to the same complexities as improvisation in theatre, music, dance and other fields, where skilled professionals engage with both old and new “material” with a deep responsibility to how this material is utilized and through a constant cycle of navigating power, adaptation, surprise, failure, and creation. I am not alone in seeing GenAI creativity as improvisatory (Heaven, 2025). I also began to wonder how improvisatory skillsets learned via AI engagement might support the wider tenants of STEAM education, asking students to engage in collaborative learning and self-directed exploratory inquiry and to reach outside the comfort zones of their own degrees and disciplines.

For the final class showcase in 2025, entitled “Synthetic Horizons,” sample student projects included an AI photo booth that photographed, uploaded and playfully recreated your portrait using DALL-E 3, an AI-informed roleplaying session with AI-generated character portraits with scenarios with a live dungeon master and players, an interactive live chess game where moves by students were documented, uploaded and used to create a verbal, often sarcastic ChatGPT commentary played back over speakers as the game progressed, and a demonstration on AI Podcasting, where audiences chose the AI topic to be discussed. AI tools, including NotebookLM and ChatGPT, generated a play script, and students then recorded the script as a podcast in front of the audience, with hilarious and surreal results as students read out verbatim the AI’s attempts to assess and create narratives on key hopes and fears about itself. Computer science students experimented with AI poetry, and fine arts students attempted technical demonstrations of AI coding.

### **Recommendations:**

When teaching the class, I encouraged students to help each other navigate the complexities of these tools, as I am doing with my coresearchers. I set group assignments on combining AI with non-AI and other interdisciplinary tools, on group research, on possible applications outside class, and on creating collaborative, interactive final projects, which I believe can be broadly applied to many differing creative classrooms.

The combination of the unpredictability, promise, and surprise of using these untested and emerging GenAI tools and the capacity of these tools to foreground

ethical questioning, alongside the very practical need to help each other navigate its opacity and technical challenges, seemed to create the conditions for improvisatory responses and support related skillsets, including experimentation, real-time decision making, and interdisciplinary play. Further study is needed to assess these impacts on students, but perhaps these are the very skills we need to promote in 21<sup>st</sup> century STEAM classrooms.

## DISCUSSION & CONCLUSIONS

While I hope in the future to involve my students in further research on the efficacy of GenAI tools, this early research-creation study involved developing my own skills and helping to guide my curriculum development for the course “Creating with AI”, which has taught me many lessons about the possibilities and issues with GenAI in the STEAM classroom that I hope will be useful to others thinking of incorporating GenAI into their own teaching and learning. In particular, this process reminded me that STEAM classrooms need to balance working with evidence-based approaches alongside less certain, more exploratory approaches, such as those from fine arts, that might help teachers and students develop the skills to navigate this contemporary climate of rapid (and what can feel like terrifying) change. My study revealed that using GenAI carefully in the studio (and later the classroom), while understanding the financial, sustainability and research challenges accompanying its use, can offer different ways to explore the ethics of new technologies and to increase technological literacy, possibly offering vital routes to creative expression that help to address systemic issues such as a lack of diversity or socioeconomic barriers to tools and training. The risks and possibilities of AI are impossible to ignore, but exploring GenAI tools may help teachers and students to grow together, to be curious researchers and learners “STEAMING” across disciplines and to be self-driven explorers able to research, understand and apply knowledge in its many forms.

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