



From Imagination to Automation: How AI is Reshaping Students Creativity in the Digital Age

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Abstract—The explosive diffusion of generative artificial intelligence (GenAI) and especially large language models (LLMs) such as ChatGPT has changed the ways students ideate, draft, design and iterate creative work in digitally mediated learning environments. Yet the educational implications for creativity are still being debated GenAI has the potential to raise the novelty and perceived quality of outputs, while raising the possibilities for over reliance, lower creative confidence, and lost learning by doing, and homogenization of ideas among the learners. This paper presents its own integrative conceptual synthesis of how GenAI reshapes student creativity, based during the creativity theory (componential and developmental views), socio material and distributed views of creative action, and recent empirical evidence on artificial help in ideation and writing. We propose Imagination Automation Creativity Loop (IACL), which is a model of the process outlining when GenAI can act as a catalyst of creative learning (augmentation) and when it acts as substitute and weakens creative agency automation. The model offers an emphasis on three mechanisms, that is, cognitive offloading, idea anchoring, and the amplification iteration and are accompanied by moderating condition including artificial intelligence literacy, task constraint, assessment design, and classroom norms around disclosure and authorship. We translate the framework into teachable pedagogy in the form of policy recommendations such as process oriented assessment, structured prompting with reflection and pedagogy of explicit teaching aimed at saving student voice. Finally, we discuss a research agenda for proper causal and longitudinal research that measures both the success of creativity at the individual level and the rupture of diversity at the collective level in a classroom with access to AI.

Keywords: Generative Artificial Intelligence, Student Creativity, Creative Learning, AI Literacy, Academic Integrity

I. INTRODUCTION

Creativity is generally considered to be an essential human capacity and a major educational aspiration in the digital age. Contemporary schooling increasingly emphasizes creative problem solving, communication, and innovation as these competencies help to equip learners to solve complex social, scientific, and economic problems. At the same time, the rise of generative artificial intelligence (GenAI) which is widely accessible and rapidly developing, has led to a significant structural change in the way creative work is produced in an educational context. With the tools available thanks to large language models (LLMs), students are now able to rely on such algorithms to perform a large portion of the creative work brainstorming, outlining, drafting, elaborating, revising, translating tone and style, and even generating evaluative feedback without investing much time and effort.

Emerging research suggests that this shift has mixed results for the creativity of the student. On the one end GenAI can act as a massive cognitive and linguistic scaffold. By providing rapid suggestions, alternative perspectives and well recrafted drafts, LLMs can help to increase the perceived creativity and quality of student work, especially ideation and writing tasks. Experimental results suggest that the presence of AI support may be beneficial for enhancing creative rating of novelty and usefulness for creative ideas and written narratives, and that this advantage may be particularly pronounced for learners showing lower levels of creative performance. In these cases, GenAI has the potential to increase the range of productive strategies available to students, them to have fewer barriers related to language proficiency or confidence, enable students to iterate and refine their work faster. However, evidence also seems to suggest that GenAI will be better at promoting incremental novelty improvements within familiar patterns rather than highly original or radically unconventional outcomes.

On the other side, there are studies that warn of some costs, in particular at the collective level. When a large group of students are utilizing similar models same prompt patterns, it may lead to more similar outputs that reduces the diversity of ideas within a classroom or cohort. This homogenization trending is a cause for concern for creativity as a social and educational good where variation experimentation efficiencies individual voice is the key to learning. In addition, over reliance on automated support may attenuate the student engagement in the effortful practices that are key to creativity development such as problem framing, productive struggle, reflection, and identity formation as a creator.

Education systems therefore stand at a sceptical juncture does GenAI broaden the creative ability of students by augmenting them onto learning patterns, or does it automate creativity in processes where agency and competencies are disturbed? This paper addresses the said question by synthesising creativity theory and emerging empirical evidence in an integrative conceptual framework to guide research, pedagogy and institutional policy in AI rich learning environments.

CONCEPTUAL FOUNDATIONS

II. MAKING STUDENT CREATIVITY IN THE DIGITAL AGE

The creativity of students in education today would be best described as a capacity for development and context, and is not narrowly defined as exceptional achievement. Typically, when people discuss creativity in a traditional way, they link creativity to great, culturally valorised breakthroughs ("Big-C" creativity). However, educational environments more often entail everyday creative activity ("little-c" creativity), which means generating a personal interpretation of a text, a unique artifact for a project, or a novel response to a regular problem. Importantly, creativity research also focuses on what has been called "mini-c" creativity, i.e., personally meaningful insights and new understandings during learning. This framing is especially applicable within classrooms in that student creativity is frequently described as emerging in the course of growth (in terms of experimentation, sense making and refinement of one's thinking and, more broadly, affective responses) versus final innovation, as publicly validated. In the digital age, the horizons of creativity open up even more as students are working with platforms, mediums and networks, where the work of creating is often remixing, transforming and iterating on content that has already been created. Therefore, in order to define student creativity today, attention should be paid not only to the originality of the product, but also to the learning processes during which students develop ideas, express their identity, and build their creative confidence over time.

III. EMERGING EMPIRICAL EVIDENCE ON GENAI AND CREATIVITY

III.I. GenAI AS IDEATION AMPLIFIER

An increasing stream of empirical studies have suggested that generative AI especially large language models (LLMs) such as ChatGPT can function as a useful "ideation amplifier" for students and other creators. For both everyday creative tasks e.g., coming up with titles, generating examples, suggesting solutions and more innovation-focused activities e.g., product ideas, campaign messages, narrative sketches, AI assisted conditions typically produce outputs that external raters agree are more creative than those created without any technology or only using a standard web search. One hypothesis is that LLMs widen the effective search space for associations they can quickly propose several alternatives, recombine remote ideas into coherent options, and give language that allows users to articulate half-formed thoughts. In educational contexts, this is important because students often have difficulty with initiation blank page paralysis, structuring converting ideas into organized drafts and articulation finding the "right words". GenAI can lower these barriers by providing scaffolds like outlines, metaphors, counterexamples, and rephrasing's. Thus, students can progress more quickly from fuzzy intention to usable creative stuff to cluttered table space for polishing, tweaking and repeating. Particularly striking, the ideation benefits seem especially robust for learners who start with lower creative confidence or less domain fluency, indicating that GenAI may allow gap filling where experience or expressive skill may be lacking.

III.II. INNOVATIVENESS IS A BENEFIT OF GROUP HETEROGENEITY LOSSES

Although benefits to individual creativity are often reported, several studies produced similar results GenAI can increase the diversity of the average creativity at the expense of the diversity of the outputs of a group. This tension between creativity and diversity can be manifested when the number of individuals is great and draws on the same model family, when their suggestions are similar or their prompting template is similar. In massive experimental research on story writing, ratings of novelty and usefulness and better perceived writing quality were obtained by providing the participants with ideas produced by GenAI. Nonetheless, any AI generated story was closer to another compared to a story written without artificial assistance. The authors see this trend as a type of social dilemma people get to enjoy refined and inventive proposals, and group novelty suffers as production gets grouped into shared narrative forms, themes and stylistic devices.

Similar findings are found in studies done on brainstorming. Idea-generation analyses have revealed that, although ChatGPT can support idea generation score e.g., generating more elaborated, coherent and market ready ideas with individual ideas, it may diminish the diversity of the overall generated pool of ideas a phenomenon that contradicts one of the core strengths of group ideation. Good brainstorming requires not only coming up with good ideas but also taking different directions then converge. In cases where AI is pushing a large number of students to the same solution, classrooms will be deprived of some of the exploration that is the foundation of deep learning and innovation. In contexts beyond small-group settings, there are more general issues of scale, where as AI generated content becomes increasingly common, smaller additions to the cultural pool of ideas could increasingly be of less diversity than those produced by humans, which supports the danger of homogenization at scale. In the case of education, it is obvious that in spite of the fact that GenAI may enhance personal performances, higher education institutions still have to take care of the ecosystem of student work as a whole, especially in the areas where originality, diversity of perspectives, and risk taking are vital learning objectives.

III.III. AMBIVALENT EFFECTS ON CREATIVE EXPERIENCE, CONFIDENCE AND AGENCY

Creativity in education is not merely concerned with the end artifact, it is also the experience of making art by the learner, work, pleasure, sense of ownership, identity forming, and agency. Here, the evidence is mixed. GenAI support has been linked to better creative writing performance and perceived ease in creative writing in the case of university writers. However, the same studies indicate a decrease in enjoyment and growth in moral concern, which is to the effect that when the tool undertakes central creative steps, the students might feel less personally invested in the work or less sure who is the author. This trend is educational in the sense that subjective experience of I made this leads to the sense of identity in creativity and long term motivation.

Likewise, GenAI can also boost fluency more ideas and occasionally originality in educational higher education settings where divergent thinking measures e.g. Alternative Uses Task are used. Nonetheless, there are also results suggesting adverse influences on creative confidence students can assume that the AI is the actual creative agent and their skills are inferior to it. This is important since repeated practice, self efficacy, and feedback are important in building creativity. In case GenAI diminishes the perceived necessity to work ominously or weakens a belief in one's creative ability, then short term performance benefits can be at the expense of long term growth.

III.IV. GENAI IN THE REAL STUDENT WORKFLOW

Beyond using controlled experiments, qualitative research conducted in the classroom demonstrates that students use GenAI throughout the process of real writing workflows brainstorming topics, generating outlines, refining arguments, editing style and improving grammar. Students commonly talk about these uses as being both practical and time saving when it comes to getting through language barriers or even something as complicated as an assignment. Yet they also report ongoing dilemmas, related specifically to issues of maintaining authentic voice, ensuring the work still reflects their thinking, and weighing the convenience of the AI support and the potential loss of learning that comes with trying hard to draft the work. These accounts imply that "creativity with AI" cannot be judged through output measures. Instead, it needs to be explored as a wider learning relationship that includes voice, authorship, integrity, and identity dimensions which affect whether or not GenAI will act as a scaffold for creative growth or as a short cut that displaces the formative parts of creative practice.

IV. THE IMAGINATIONAUTOMATION CREATIVITY LOOP

IV.I. CORE CLAIM

The Imagination Automation Creativity Loop (IACL) The generative AI redesigns student creativity within a dynamic framework of students moving back and forth between their own creativity and assistance with AI tools. Crucially, in this loop there are two qualitatively different directions for which stability can occur. In Imagination - Augmentation pathway, GenAI acts as a scaffold for extending exploration while retaining agency, judgment and reflective control with the student. Students still constitute the ultimate decision makers in the creative process, framing the problem, considering other alternatives and incorporating AI recommendations in a selective fashion to enhance either originality, coherence or expression. In contrast, the Imagination - Automation pathway is the one that emerges where GenAI is used to replace essential creative steps such as problem framing, ideation, drafting and revision thus promoting dependency and reducing opportunities for practice. Over time, focusing on automation may result in narrower creative risk taking and lack of skill development even though the quality of short term output may increase.

IV.II. MODEL COMPONENTS

(A) Creative phasis of tasks toward student

The IACL structures student creativity in five phases that are common to writing, design and project-based learning Problem framing and sensemaking Goals, constraints, audiences, and criteria for evaluation. Divergent ideation coming up with many alternatives and points of view before choosing a direction. Convergent selection examinations of ideas; deciding among avenues to take; decision justification. Elaboration and revising the selected direction, then testing the direction in order to develop it into a coherent artifact. Reflection and attribution interpreting what was learned, expressing ownership voice & documenting ethical use of tools. This phase structure emphasises an educational reality, that creativity is not just the product, but also the learning process in building transferable capabilities e.g., judgment, originality, and voice.

(B) GenAI affords tool facing

GenAI adds a set of tool capabilities that map on to and can be capable of replacing these phases:

Instant ideation and variation generation rapid lists of alternatives, analogies, examples and what if scenarios. Style transfer & rewriting Changing tone, using simpler language, emulating genres and coming up with alternative drafts. Outlines, thesis statements, argument maps, step by step plans: Summarization and structuring

Feedback simulation: Rubric based critiquing, suggestions of what you did wrong editors, possible audience reaction and ways to revolutionise. These affordances are powerful because they shorten the time and effort. However, they alter what students practice and what is optional in the created workflow as well.

(C) Three mechanisms that control the direction of loop

The IACL specifies three mechanisms that to a large extent determine whether the loop is augmentation-oriented or automation oriented. Cognitive offloading also on the common notion, that students will delegate effortful thinking e.g., generating possibilities, developing arguments or revising structure to GenAI and may free working memory up for higher level decisions or they might reduce deliberate practicing in creativity-relevant skills The same offloading behaviour, therefore, can be beneficial (strategic support) or harmful (skill atrophy), depending on the way that it is regulated.

Idea anchoring: When students are first exposed to fluent AI suggestions, it can constrain their creative search in beneficial ways; by imposing these suggestions on the student, the student may come to see certain themes, structures or solutions as being "obvious" and dado off more original alternatives. Anchoring is particularly likely to occur when GenAI is employed at the very start of a task prior to the students undertaking their own framing or ideation. Evidence that LLMs can increase creativity ratings even as they influence a shape of outputs that is towards typical patterns is in line with this danger of convergence.

Iterative amplification: Repeated prompting and revision has potential for amplifying creativity but which way? Iteration can throw out diversity in outputs with the help of students deliberately making solicitations for contrast, unusual constraints, or diversified views. On the contrary through iteration, prompts can become homogenizing in which 'best' or 'most polished' or 'most academic' responses are optimized and possibilities for students to venture into finer solutions are pushed further away. Studies on creativity with LLMs space a great deal: explaining that the individual output can become superior, but on the other hand, the diversity of the idea pool diminishes.

IV.III. MODERATORS WHEN AI HELPS & WHEN AI HURTS HYPOTHEZIZE

The IACL says that the impact of GenAI is strongly tempered by the learning conditions AI literacy and critical prompting skills students who have the ability to question outputs, ask for diversity, identify the limitations and record the use of the tools have a better chance of staying in the augmentation path. This is in line with emerging policy efforts on quantifiable AI literacy of learners, such as the initiative of the Organisation for Economic Cooperation and Development (OECD) and the European Commission to define competencies for interacting with and creating with AI.

Teacher competencies and scaffolding teacher attendance to structure tasks, model ethical use and retain peoples agency is pivoting. UNESCO's AI competency framework does stress the importance of human centred, ethical and effective use of AI, in teaching, learning and assessment exactly the conditions that promote augmentation over automation.

Assessment design product only grading (in focusing on final polish) is incentives based automation whereas process rich assessment intradems, focus on rationale, reflection, attribution is students agency and creative decision making based. Disclosure norms and authorship ethics where the use of AI might be unclear or stigmatized, however, students report feeling more moral concern, and former ownership, causing distorted knowledge of learning, and promoting concealed automation. Clear norms are helpful to make it more possible to reflect responsibly.

Task type and constraints Several pieces of evidence suggest that LLMs might be more reliably aiding incremental novelty getting better at something that one has already seen than the original coatings, i.e. Task design and constraints affect whether GenAI will broaden or could make the creative process standard.

V. EDUCATIONAL IMPLICATIONS

V.I. PEDAGOGY: DESIGNING TO AUGMENT

To ensure that GenAI supports and increases the strength of creative learning instead of substituting it, pedagogy needs to ensure that human AI co-creation is clearly designed as a guided and reflective process.

Students should submit a short "AI use appendix" with the following information: (a) the prompts used, (b) the most relevant information they received from the model, (c) the student's edited rewritten version, and (d) a reflection of what the student accepted, rejected and the reason for doing so. That makes GenAI no longer an "answer machine", but a dialogic partner and spaces creative decision-making is made visible. It also supports metacognition as it requires learners to explain choices (as in, why a particular structure enhanced readability, or why AI provided suggestion did not apply to desired voice etc).

As there is the risk of AI suggestions converging around common patterns, the methods developed in source points is to learn strategies to increase idea space consciously. Examples include asking for ideas from many perspectives by a stakeholder, asking for contrasting constraints (ex: one solution that is low cost, one that is high tech, one that is community based), coming up with "anti-ideas" to go beyond cliches, or forcing variation across genres/tones. In group work, instructors can also assign different prompting assignments (e.g., contrarian, realist, futurist, ethicist), which allows the class to go in a variety of directions, rather than converge to conclusions too soon.

Students are often concerned that work that has been assisted by AI will not sound like them. Teachers can maintain the voice by: requiring students to write an initial position/personal outline before using AI; only using AI for specific steps e.g. revising,

or using AI to get feedback, not to write their content using AI as a critic rather than a ghostwriter to identify weaknesses, rather than as a ghostwriter to write their content. Focusing on voice as a criterion of assessment reinforces authenticity and ownership.

V.II. EVALUATION IN THE AGE OF AI

Assessment should not only reward good looking results but also the process of being creative. Some effective approaches are process portfolios drafts, iterations, rationales, in class ideation with take home elaboration balancing authenticity with deeper development, and oral defense viva style explicatory approaches, in which students justify key creative choices. The rubrics themselves are used are should be explicitly valuing of divergence, risk, and originality, in addition to coherence and usefulness. These methods discourage the incentive to automate and inspire students to practice judgement, reflection and revision as essential creative skills.

V.III. POLICY AND GOVERNANCE

At the institutional level, GenAI policies ought to create a balance between innovation and protection. Human centred governance usually encompasses explicit rules on disclosure, acceptable use based on the type of task, awareness of privacy and data protection and capacity building for teachers and students. The risk oriented frameworks may assist universities to institutionalize how they recognize an address problems in terms of transparency or bias, accountability issues, and academic integrity for instance while still being able to experiment responsibility and evidence-based adoption of GenAI for teaching and learning.

VI. RESEARCH AGENDA

In order to get beyond polarized claims ("AI kills creativity" vs. "AI supercharges creativity"), tests in the future should:

- Measure individual creativity rather than average creativity scores in classrooms; and also measure diversity.
- Use longitudinal designs to test if repeatedly supported by AI, the performance of creative skills will be strengthened or weakened by it.
- Comparison of scaffolding conditions (e.g. reflection prompts, disclosure requirements, diversity prompting lessons).
- Extend work in all the usual text domain tasks to multimodal invention (visual design, music, coding based invention).
- Study motivational, identity effects (creative confidence, ownership, enjoy her) Not just output rating.

Investigate risks of misuse of automation (overreliance, reduced monitoring) = use human factors theory on misuse / disuse of automation

VII. LIMITATION

This paper only provides an integrative conceptual synthesis as opposed to publishing a new empirical dataset. Although it relies on the emerging experimental data and classroom research, the knowledge base of generative AI and student creativity is evolving fast and is still methodologically unbalanced across settings. Most of the reported impacts seem to depend on other factors, including the nature of the task e.g., open ended writing vs. constrained problem solving, the preexisting level of creativity in students, the familiarity with the domain, and AI literacy, and institutional norms of AI use and academic dishonesty. Consequently, one should be careful on making a generalization of results at various levels of education in different fields and cultures. Cross-cultural studies are especially sparse, even though there are high possibilities that the language background, the tradition of assessment, at least the access to technologies predetermine the usage patterns and the outcomes of creativity. Further research should focus on more powerful causal inference with preregistered designs, training skill and longitudinal and multi institution replication research. These would assist in separating temporary performance improvement with sustainable changes on creative agency, voice, and learning.

VIII. CONCLUSION

GenAI is not a simple creativity tool and neither is it a creativity killer. It is an altering socio technical companion which transforms what the students are doing, how they are feeling and what the classroom is rewarding. The most common trend through existing evidence is a trade off. GenAI has the potential to enhance the creativity or refinement of individual work and, at the same time, undermine diversity, effortful interaction, and creative property should educational design become automatized.

The Imagination Automation Creativity Loop (IACL) suggested above explains that the question of students using GenAI is not whether they will, but whether the institutions will create an environment where the use of AI will reinforce human agency, safeguard the voice of the students, and maintain the developmental practice of creativity. GenAI can turn the idea of automation of creativity into a process of augmentation of creative learning with intentional pedagogy, process based assessment and AI literacy education.

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