



# Literacy as a Technology: a Conversation with Kyle Jensen about AI, Writing and More

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We don't normally think of it as such, but writing is a technology, which means that a literate person is someone whose thought processes are technologically mediated. We became cognitive cyborgs as soon as we became fluent readers, and the consequences of that were profound — Ted Chiang

Literacy really matters because we need to have a more even-tempered discussion about the implications of technology for how we will live our lives moving forward — Kyle Jensen

## Introduction

This column series has focused, in recent years, on conversations with a diverse range of creativity experts exploring the relationship between technology, creativity, and learning. More recently, we have focused specifically on how exponential advancements in artificial intelligence (AI) are impacting creativity, education, and society at large. Prior articles have followed conversations with Dr. Chris Dede, a former Professor of Learning Technologies and current Senior Research Fellow at Harvard University (Warr et al., 2023), and Dr. Ethan Mollick, an Associate Professor at the Wharton School of the University of Pennsylvania (Henriksen et al., 2023).

This is a significant moment to engage in these conversations, particularly given the advent of revolutionary generative AI tools, including ChatGPT, Bing AI, DALL-E, LaMDA, MidJourney, Stable Diffusion, and Wordtune. While the educational community has acknowledged the enormous potential of these tools, they have also raised questions and concerns about the future directions of AI in education (AIED). In addition to ongoing issues with data privacy and accuracy, recently published literature has also highlighted concerns about assessment, accountability, academic integrity, and overreliance on AI (Baidoo-Anu & Owusu Ansah, 2023). Moreover, educational stakeholders (e.g., students, parents, educators, developers, researchers, policymakers, and philosophers) need opportunities to participate in the critical interrogation of current technology trends and the development of AI tools to ensure that they align with the best interests of learners (Holmes et al., 2022). This series aims to support the ongoing dialogue around enabling educators to leverage and harness the capabilities of AI tools to intelligently and thoughtfully support student learning and creativity.

In this article, we highlight the work of Dr. Kyle Jensen, an educational leader and researcher. Dr. Jensen is a Professor in the Writing, Rhetorics and Literacies program in the Department of English at Arizona State University (ASU) and the Director of ASU Writing Programs, which serves more than 23,000 students annually. Besides publishing extensively on modern rhetorical theory and rhetorical education as a scholar, Dr. Jensen maintains a strong commitment to creatively solving pedagogical problems and initiating positive changes in educational systems.

As the Director of ASU's Writing Programs, he adheres to the principles of giving his best to students, providing transparent justifications for his decisions, and collaboratively working with staff and faculty members to realize a fully formed program. Throughout our conversation, Dr.

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Jensen offered diverse perspectives and possibilities regarding the future of AIED by drawing on his depth of knowledge regarding the complex processes of writing and writing instruction, and their relationship to emerging technologies.

## Creativity as the Capacity to Produce Unexpected Results

Dr. Jensen highlighted the unexpected, emergent nature of creativity as the “human capacity to produce unexpected or surprising results” while recognizing that “creativity can operate at a number of different levels in a range of different types of media.” This aligns with most standard definitions of creativity, which emphasize originality and novelty (Runco & Jaeger, 2012)—and, at the same time, reflects the diverse applications of creativity across media and a range of disciplines. Jensen’s interest in creativity focuses specifically on writing as a historical, material, and social phenomenon that mediates between human and non-human agents and systems (e.g., algorithms, computing systems, etc.). While creativity is fundamental to the act of writing, too often, we see it through an instrumental lens, as a means to an end. To counterbalance this tendency, he recommends that we define writing in much more expansive terms:

To expand the study and practice of writing, we need to think about writing as more than just an instrumental activity. We must step back and study how humans and non-humans write, suspending our tendency to seek methods for getting better as writers. This approach allows us to conceptualize writing as a social phenomenon that evolves and expands over time with the introduction of new technologies. It also teaches us to watch writers engage complex problems so that we, in turn, may do the same.

He contrasts this with how most writing in schools focuses on gaming the system or on seeking to get better at it as quickly as possible—ignoring the broader historical contexts and social systems within which writing functions and its role in genuinely engaging with and communicating about important issues.

Further, he argues that writing is a deeply technological phenomenon. He speaks of technologies not just in terms of the digital, but as tools to think with, when viewed through a social constructivist lens. In that sense, technologies are both physical and cognitive, supporting the process of thinking and its inscription in media. Roy Pea’s (1987) definition of *cognitive technologies* as “any medium that helps transcend the limitations of the mind (e.g., attention to goals, short-term memory span) in thinking, learning, and problem-solving activities,” includes the systems of written language and mathematical notation (p. 91). Any profound

new technology—whether orality, writing, print, or the internet—has in some way transformed the ability of humans to inscribe ideas, and thus expanded human creativity.

A similar argument can be made for generative AI tools such as ChatGPT, Bard, and Wordtune, which use natural language processing in generative (almost seemingly creative) ways. In some ways, these new technologies appear fundamentally different from many other technologies that have come before. Dr. Jensen is circumspect about these claims, noting that generative AI is not a monolith defined solely by ChatGPT. Different generative AI tools might produce different outcomes for creativity.

In particular, he is concerned about the “black box” nature of the technology, where processes between input and output are hidden from the user, noting:

ChatGPT concerns me because there’s no public transcript for how it works. For many users, it’s a cool parlor trick because you type an input, and it produces something that’s impressive in its scope and coherence. The impression is made all the more intense because many users don’t know how the system works.

He noted how ChatGPT has impressively engineered a way to crawl billions of texts, mathematically calculating, with predictable precision, how a sentence may be finished to “create fluid, conversational, sometimes academic, sometimes professional prose that can really help people.” However, Dr. Jensen sees a problem here in that ChatGPT provides a written product, without giving any sense of the process or rationale that helped to create that product. This gets back to his concern about understanding the history of writing (at both a social and personal level); how it is often a fruitful struggle to comprehend and inscribe, and that the process of inscription itself is critical to writing processes:

It’s interesting when you can focus on how the technology does what it does—going behind the scenes and understanding how things work. That is where I get excited about observing other people’s creativity. However, we need technologies that reveal that process so we can participate in them more fully.

This is something that these current versions of generative AI do not do. The applications hide the generative components of the writing process in a black box, which prevents users from engaging with how it makes decisions to achieve a specific goal, and in that process minimizing human agency. This returns us to the assertion that we might learn best by observing writers or creators to understand their processes, allowing us to see how writers, as Dr. Jensen says, “multiply and negotiate those possibilities, sometimes to productive ends, and sometimes to outcomes where you are curious to understand why or how someone chose a specific direction or path.”

Writing, thus, for Dr. Jensen is a series of decisions writers make, from within a range of possible choices that aim to best inscribe and instantiate their ideas. And being able to observe and analyze how that writing process unfolds, according to him, is critical to the development of technological literacy, given the intimate connection between writing and the tools and technologies that help instantiate it.

## Multiplying Possibilities for Decision-Making and Problem-Solving

This multiplication of possibilities is fundamental to Dr. Jensen's views about creativity, writing, learning, and technology. He sees teaching and creativity, especially with writing, as grounded in helping students multiply possibilities. He explained:

We try to help students multiply possibilities so they're in a decision-making mode about what they want to focus on and why it matters. I'm very happy to give students multiple possibilities. If they don't know how to write an introduction, I'll ask them to collect examples of introductions, and then together, we can abstract general principles about what makes those introductions particularly successful given the problems they are trying to solve. However, I don't tell them how to do it, or what I want to see in their introduction. I create the occasion for them to step back and realize they know more than they give themselves credit for, and then take those non-conscious intellectual tendencies and make them the subject for conscious reflection.

He noted how this process “punctuates the creativity that is characteristic of all writing,” irrespective of the level of expertise or experience of the author. Creating meaning through language involves multiplying possibilities and choosing what appears optimal at the moment, which in turn leads to a cascade of possibilities to explore and means that “we have to make decisions about what we want to accomplish, and what sounds best.”

Multiplying possibilities is also fundamental to most theorizations of creativity, seen in concepts like divergent thinking or fluency (Runco & Acar, 2012), or in the idea of creativity as “combinatorial,” which is embedded across our past columns on the foundations of creativity (Henriksen & Mishra, 2014). When Dr. Jensen describes creativity, writing processes and pedagogy, he connects with combinatorial creativity and problem-solving—how the creative process toggles between “going wide” and branching out to generate many ideas (divergence) and narrowing to analytically make decisions targeted to a purpose (convergence). Writing for him is a dynamic

process of expanding possibilities, thoughtfully and intentionally choosing between them, based on their possible consequences:

We want students to imagine possibilities and make decisions from them, and to be able to justify those decisions so when they're thinking about their thinking, they can identify the limits of their existing approaches and build new strategies from there.

The need to expand possibilities is one area where he believes connects well with the future of large language modeling, where designs and inputs matter when it comes to multiplying possibilities. That said, he noted that, at the moment, few technologies can generate many different options to do this, since few companies have large language models that are big enough to generate a wide range of truly diverse options.

Dr. Jensen thoughtfully employs AI in his teaching, so students can explore possibilities and use it as a learning partner. For instance, in teaching an English methods course, he had students utilize multiple AI-driven tools (e.g., Wordtune and ChatGPT). They used the tools to refine their work, and during iterative moments embedded throughout the semester, they reflected on the implications of using these tools in their writing process. Interestingly, many students stressed the importance of having a historically rich framework for understanding the evolution of AI technologies because they felt that knowing something about the history of technology redefines how they engage with it. Further, “many reported that learning about its history made them feel less anxious and fearful because they could see that it wasn't fate—they had agency in shaping the direction of the technology.” Speaking specifically of Wordtune (a generative AI model designed for writing instruction), he said that:

Almost every student reported an extremely positive experience with Wordtune for a nuanced reason. Sometimes it gave a sentence that better captured what they wanted to say. Other times, it gave them bad options, clarifying how they had written the sentence originally was the right direction. Other times, they realized something didn't sound like their voice, requiring them to finesse it with clarity about what they wanted to accomplish relative to audience, purpose, and situation.

Large language models can be instantiated in many ways and there are better and worse “designs” that support reflection and thoughtful decision-making, rather than merely generating text. Such models recognize the complexity inherent in the writing process and seek to scaffold it, making the process transparent, rather than hiding it in a black box.

## Increased Awareness of the Complexities of Writing and Teaching

The act of writing is a complex inscriptive practice that has been described in varied ways; it has been defined as a problem-solving process, as a means of self-development, and as a powerful tool for learning and demonstrating knowledge. Since writing is deeply intertwined with identity and significantly impacts cultures and ideologies (Debenport & Webster, 2019), Dr. Jensen stressed that educators need to utilize writing tools and teaching methods that align with their pedagogical values, particularly with the evolution of writing processes amid significant technological advancements. He elaborated:

Last summer, I was approached by an AI lab and product company eager to develop an AI thought partner for writers. Their technology allows you to type a word, a sentence, or even a paragraph into the interface and request to rewrite it. It will then generate 10 or 15 different options that students may choose to incorporate or ignore. From an ethical and pedagogical perspective, that seems more consistent with the kinds of values that I uphold. We must be able to justify the technologies that we are encouraging students to use by providing good, principled reasons for why we are asking them to engage with them.

He argues that the fundamental nature of writing has not changed despite technological advancements. However, educators have called for an extended definition that captures the complexities of writing as a “technology for creating conceptual frameworks and creating, sustaining, and performing lines of thought within those frameworks, drawing from and expanding on existing conventions and genres, utilizing signs and symbols, incorporating materials drawn from multiple sources, and taking advantage of the resources of a full range of media” (Lunsford, 2006, p. 171). To better understand this definition and the complexities of writing, Dr. Jensen stated that the scale, speed, and immediacy of recently developed AI tools could potentially be used:

I don’t think AI tools change the nature of writing, but they might make people more aware of the complexities of writing. For instance, a couple of weeks ago, we had a number of AI engineers talk about ChatGPT and why the people in the audience shouldn’t be particularly worried about hallucinations that happen in these models, because those problems will be fixed. It will eventually become more and more accurate. However, as a scholar of writing, I wondered why they did not realize that hallucination is fundamental to writing. If you look at the history of Western philosophy, to say nothing of other intellectual traditions, the problem

of hallucination is more than 2,000 years old and not specific to generative AI.

Hallucinations are often the product of imagination (Thomas, 2014), enabling learners to build on their prior knowledge and experiences to generate new combinations, connections, and possibilities that transform into creative outcomes (Beghetto & Schuh, 2020). In that sense, the hallucinations generated by AI might be seen as the seeds of creativity—allowing students, if they approach the outputs thoughtfully and critically, to see alternatives and possibilities they may not have considered. This has important consequences for how educators think about teaching.

The increased use of AI tools in academia will challenge educators to reexamine their pedagogical approaches and methodologies and to value creativity and imagination (Bishop, 2023; Dergaa et al., 2023). This aligns with a point that Dr. Ethan Molllick mentioned in a previous piece in this series on the potential of AI to disrupt outmoded views of pedagogy and flawed ways of assessing student learning (Henriksen et al., 2023).

## Preparing Students for Twenty-First Century Writing Situations

Dr. Jensen argues that the effective use of new technologies for writing requires a more profound and comprehensive understanding of the history of writing and its relationship to existing technologies. Twenty-first century writing instruction has pressed for a move beyond the narrow focus on academic performance, to emphasize familiarizing students with real-world issues (e.g., digitalization, automation) and facilitating the development of overarching skills, like problem-solving, critical thinking, innovation, and creativity (Tan & Chua, 2022). In writing instruction, there has been a decreased emphasis on mechanical writing and increased interest in *sophisticated writing*, described as a thoughtful, self-aware, and creative writing process focused on generating new insights that “requires critical thinking skills that language generation models do not possess” (Bishop, 2023, p. 3). In this context, Dr. Jensen discussed moving away from deficit-based approaches to writing instruction and the importance of providing students with high-quality resources that encourage them to experiment with AI tools in affirming spaces that support identity expression and development. He affirmed a belief that educators “can put students in a much better position to succeed if we just recognize that they can accomplish a lot more than they believe they can.”

In relation to recognizing students’ strengths and unrealized potential, Dr. Jensen presented the idea of shifting to a pedagogy of knowing. Instead of viewing writing as a “set of slots [or] an inert code to be mastered by drill,” a pedagogy

of knowing inspires students to actively engage in the processes of interpreting and making meaning (Berthoff, 1984, p. 755). Drawing on one of the main points from his book titled *Reimagining Process: Online Writing Archives and the Future of Writing Studies* (Jensen, 2015), he explained the importance of having students bear the burden of believing in their work as part of a pedagogy of knowing:

I wish more educators and policymakers knew about managing the role of belief in the work of writing with their students. Having taught students to write for the better part of two decades, I believe that students need to feel the weight of that burden in order to discover, to encounter difficult perspectives that they might not want to negotiate, and then come out on the other side. Then, reflect on how that changed their learning process as a whole so that they approach the work with more complexity moving forward. In other words, they have to bear the burden of the responsibility of believing in the work of writing to grow at it.

Furthermore, he explained that having students bear the burden of belief in their work is integral to writing instruction, providing students with the time and space to consciously go through the process of identification before associating or disassociating with ideas and persuading others (Burke, 1969). Thus, he raised concerns about the consequences of students unloading the burden of belief onto ChatGPT and other AI tools and “short-circuiting” meaningful writing processes. As the larger educational community moves forward, Dr. Jensen stated:

Educators need to think carefully about what we believe in and who’s bearing the responsibility of the belief in our learning processes, and then simultaneously be very critical about the kind of formal engagements that we’re caught up in so that we can make conscious, well-informed, literate decisions about how we move forward as educators.

To thrive in an age of acceleration, both educators and students must develop the knowledge, skills, and abilities to become critical consumers and ethical designers who can make informed decisions about AI.

## Improving the Quality of AI Literacy

Building on the definition of *literacy* as a state of agency in which signs (that are used to name our truths and frame our world) can be consciously subverted, contested, and negotiated (Myers, 1995), Dr. Jensen emphasized the need for improving AI literacy as AI continues to change how we communicate and educate. Definitions of *AI literacy*,

focused on broadening and democratizing participation in AI developments, include: (a) knowing the basic functions of AI, (b) understanding how to use AI tools and apply AI knowledge and concepts, (c) evaluating and designing with AI tools, and (d) being aware of AI ethics (Ng et al., 2021). Drawing on his recent efforts to improve AI literacy, Dr. Jensen explained:

I’ve been on a committee to consider how we, as a university, can respond most responsibly to the emergence of large language modeling. What I have said consistently of late is that educators need to remember what we do really well. We need to improve the quality of literacy for the general population so that there are democratic contributions to issues consequential to how human beings live their lives. The main problem with ChatGPT’s unexpected emergence is that very few people actually understand how large language models work. Educators can learn that and teach students so that they can choose how they wish to participate.

As he mentioned, the education community is making efforts to help students become AI-literate citizens by developing guidelines and curricula. For instance, the Advancement of Artificial Intelligence and the Computer Science Teachers Association jointly developed national guidelines for K-12 AI education (AI4K12, 2020). The International Society for Technology in Education also created a professional learning program to help educators support student-driven AI explorations (ISTE, 2023). However, given the pervasive impact of AI on society, Dr. Jensen believes that AI literacy must be improved for the general population, and conversations about AI must go beyond school walls and involve as many people as possible:

Literacy, in this more expansive definition, is about giving greater access to as many people as possible so that we can learn from them, listen to their perspectives, and negotiate the best paths forward. That seems to be the next crucial step. The ethics or the legality of borrowing images or words across different kinds of domains, all of those issues are coming very quickly to the forefront of public debate, and we need a range of different minds to contribute meaningfully to those discussions. Literacy really matters because we need to have a more even-tempered discussion about the implications of technology for how we will live our lives moving forward.

A range of ethical concerns related to dishonesty, manipulation, and misinformation have emerged about the use of AI tools (Tlili et al., 2023). Further, Dr. Jensen pointed out that AI research and development companies are businesses that prioritize raising money:

The first and most important point to remember is that the developers of generative AI tools are businesses. We can't forget that fact. Many of the applications are moving into search functionality because that's where the advertising dollars are. They make their tools hyper-personalized because the more personalized we feel the suggestions are, the more likely we are to buy recommended products. It is a really creative approach to revenue generation, but I don't find it particularly ethical.

He describes literacy as the key that will enable humans to "suspend our tendency to view technology as an existential threat to humanity," "pursue uniquely human forms of knowledge production," and co-design the future of AI. With the spread of AI literacy, he believes there will be greater optimism around the future of AI—ideally building bridges between massive tech companies, computer engineers, and diverse users of AI technologies, including students and educators, even "pastors who are using them to persuade people about their existential values" and "day laborers who are interested in using them to increase their businesses." In alignment with human-centered design, Dr. Jensen's perspective on moving forward with AI calls for empathizing with users or "gathering stories," to better understand their experiences and perspectives.

## Conclusion

In response to the questions and concerns raised about the future directions of AIED, our conversation with Dr. Jensen sheds light on the need for educators to reexamine their pedagogical approaches, methodologies and values. He emphasized both continuity and change—continuity in that writing remained a complex process of exploring multiplicities and deciding among them based on their potential consequences; change in that these new tools have the potential to support or deter from this process. Amid rapid changes and progress in the field of AI, he highlighted the need for educators to develop and implement approaches and methodologies that align with their values and the best interests of their students—to increase students' capacity for problem-solving, critical thinking, innovation, and creativity, as informed consumers and ethical designers in the twenty-first century.

Whether you're a first-year writer or a professional writer, we all have to multiply possibilities and make decisions on how to solve the problems that matter to us. Looking at the future of large language modeling, I'm encouraged by the possibilities for ChatGPT and technologies that can generate a multiplicity of different options. When I listen to teachers theorizing about how to use it in their classrooms, it's encourag-

ing that they take affirmation-based approaches and believe that we can use these technologies as thought partners to advance education in a way that prepares students for the twenty-first century because these large language models are not going away.

Dr. Jensen offered a balanced perspective on AI that considers the benefits of generative tools as well as the risks that come with them. He cautioned against putting the burden of believing in our work onto AI tools and "short-circuiting" meaningful writing processes. Further, he emphasized the need for all educational stakeholders to develop their AI literacy to become involved in larger, future-focused conversations about AI.

Seeing the future of AI as an expedition to be undertaken, he noted that the future depends on educators' willingness to critically examine and understand technologies with an attention to detail that the task demands—engaging in the careful and inclusive work of bringing as many individuals as possible into discussions that shape their existence.

## Declarations

**Competing Interests** We declare that we have no competing interests as authors.

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