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# Using Creativity and Imagination to Understand our Algorithmic World: a Conversation with Dr. Ed Finn

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I think of creativity as, perhaps, an applied form of imagination
~ Ed Finn

Is music a craft
Or is it an art?
Does it come from mere training
or spring form the heart?
Did the études of Chopin
reveal his soul's mood?
Or was Frédéric Chopin
Just some slick "pattern dude"?
~ Douglas Hofstadter

## Introduction

Throughout this article series, we have explored how scholars of creativity explore the topic and its intersection with the many ways of knowing and thinking that make up our diverse academic landscape. We have considered how creativity is a common thread woven into areas as diverse as dance, cybernetics, social justice, neuroscience and more.

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The role of creativity in the design and innovation of technology is undeniable. It changes how we live, drives economic prosperity, and enables us to communicate across time and space. At the same time, artificial intelligence and computational systems are integrating into our lives and workflow in such a way that we are forced to wonder what it means to be creative when a piece of software (a generative adversarial network) can create images of human faces indistinguishable from real ones (check out the website: thispersondoesnotexist.com) or a snapchat filter can change your gender in eerily realistic ways. Or when a machine can compose music as well as a human composer (Kaleagasi 2017) or believably compose in the style of the greats (Mishra et al. 2013); or when it can teach itself to play chess at the highest level (Kasparov 2018). These complicated uncertainties about what it means to be creative in a digital age are at the forefront for Dr. Ed Finn, Associate Professor in the Department of English and the School of Arts, Media, and Engineering at Arizona State University. Our discussion with Dr. Finn explored the intersections between creativity, education, and science and technology from a perspective that sees imagination as central to creativity as well as being the key to envisioning possible futures which can allow us to consider the pressing issues of today.

Before entering academia, Dr. Finn was a journalist for *Slate*, *Popular Science*, and *Time* where having to write quickly about a wide range of topics developed his thinking and approach to creativity. This kind of writing freed him from perfectionism—allowing his work to be "good enough" and forcing him to rely on his curiosity. He then completed a PhD in English and American Literature at Stanford University, because he believed that English was a big enough arena to allow him to continue to follow his curiosity while still having a disciplinary base to work from. Later he became founding director at Arizona State University's *Center for Science and*

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*the Imagination*, where he still considers himself foremost a writer, but has discovered many more ways to be creative, as he notes:

> In the past few years, I've found myself becoming more and more of a builder, a maker, a ringmaster, an experimenter. [And even] a provocateur…I really enjoy that role… [but] authorship gives me too much credit…it's a different kind of creativity in expressing these ideas, and trying to do that in a really collaborative, co-creative way with other people.

These many ways of doing collaborative work are demonstrated at the Center's celebration of the 200th anniversary of the publishing of Mary Shelley's *Frankenstein.* Dr. Finn and his collaborators embarked on a series of public readings, art installations, hands-on lab activities for children at science museums, and collaborative writing projects with scientists and technologists. The novel's themes of the ethics of design and science, the question of taking responsibility for what we make as well as what it means to be human, serves as a powerful springboard to use creativity to think through difficult questions. Moreover, this work demonstrates important characteristics of how he envisions creativity:

> We've done a range of projects and the core thread of that whole infrastructure of different projects and grants is scientific creativity and responsibility. So rather than thinking about art plus science, which ends up reinforcing the division even as it's trying to bridge it, when you think about a word like "creativity"—if you ask a poet or an engineer or a writer or a scientist, they will all tell you that imagination and creativity are essential to success in their fields.

Creativity, as Dr. Finn explains, is not an isolated way of working exclusive to the arts, but rather a "core skill" that should be used in every discipline. Moreover, part of the responsibility that all researchers should feel, argues Dr. Finn, is not just for owning and being responsible for what they create, but for the world we share. We have an ethical obligation to face the challenges, such as climate change and the implications of artificial intelligence, together. This ethical formulation is an important area of creativity scholarship which is not always significantly addressed within dominant psychological discourses of creativity. Yet increasingly, scholars have noted the importance of creativity paired with wisdom, ethicality, and a humanistic perspective (Craft 2008; Walsh et al. 2017; Henriksen and Mishra in press)—all of which becomes ever more important in a world of fast-paced technological innovation. This concern for the ethical obligations of creativity is central to Dr. Finn's perspective, and highly relevant to the times we live in, in which creators are hard-pressed to keep pace with the technological innovation all around us, or consider the ripple effects on society.

To explore how creativity can be used to approach uncertain, ill-defined problems at multiple scales in society, our discussion with Dr. Finn first examines one key issue that he has thought a great deal about, which is how computational systems are already enmeshed with creativity, or as he calls this phenomenon, *algorithmic creativity* (a topic previously covered in an article in this series, see Mishra et al. 2013). Then we will explore themes such as: viewing creativity as an approach to problem solving through the imagination, how creativity is a collective endeavor, and ways teachers can build safe spaces and capacity for creativity in the classroom.

## Algorithmic Creativity

To understand how artificial intelligence and computational systems fit into our lives and creativity, we have to begin with the algorithm itself. Algorithms, which are lines of code designed to solve problems efficiently at the software level, make human-like decisions, execute lightning fast calculations, and adapt to our behavior. They seem harmless and agnostic, but in his book W*hat Algorithms Want* (2017a), Dr. Finn explains that algorithms abstract and quantify human behavior and desires in ways that have unseen yet critical implications for how we work and live. For example, he invites us to consider the everyday act of "liking" a movie we have just watched on a video streaming platform. By doing this, the algorithm will interpret that "like" into a number that indicates a preference for a particular genre, actor, or characteristic of the movie, which is then incorporated into a growing profile that the platform keeps on us in its database in order to make future recommendations based on what it thinks we want. Part of that profile building process includes other factors, namely the platform's agenda to sell products, promote sponsors, or simply keep us glued to the screen as long as possible. Noted design ethicist Tristan Harris has written extensively about these issues, with the concern that new platforms, tools and software, "play your psychological vulnerabilities (consciously and unconsciously) against you in the race to grab your attention" (Harris 2016).

Dr. Finn explains this algorithmically mediated environment also has unexpected implications for creativity, which must be considered in technology, design and education:

> If we're relying on computational systems to filter more and more of what we perceive, what we read, listen to, think about, talk about, that's obviously going to have a huge impact on the creativity space. We don't tend to think about the question of algorithmic filters or the ways in which we rely on these computational systems. But if you think about the creative workflow of any "creative person" today, it relies heavily on Google and maybe

> Facebook and Twitter. All of these different platforms that are influencing us and redefining who we are in important ways. These are modes of machine, intelligence or algorithmic imagination that are at play right now. We don't need general artificial intelligence to be wrestling with these challenges because we already have them. And so, those problems will become more acute.

Dr. Finn calls this reliance on computational systems "algorithmic creativity" in which decisions are automated, often without our even knowing it. The impact of algorithmic creativity has already been significant on the workforce, but also on people's perceptions of creativity as a commodity:

> We've gone from the specialized society where some people, like architects and artists, are supposed to be creative and other people are not creative, to apps and hardware and software that is supposed to be creative for us. Think about the way that Apple advertises its products. In some ways, the pitch is, "Buy this expensive machine and you will be a turtleneck wearing creative artist." You know, this is how much it costs to become creative or to look creative. But in other ways the pitch is, "Buy this machine and the machine will be creative for you."

In this case, Dr. Finn's point highlights the concern that others have expressed about the fact that creators and leaders at the helm of new technologies and the digital industry need to be more deeply grounded in ethical and human-centered thinking about societal wellbeing (Tarafdar et al. 2015). Otherwise, we risk what Craft (2008) refers to as the marketization of creativity, in which consumers ultimately become the product—or worse, as media theorist Douglas Rushkoff (2019) worries, humans are reduced to mere data fodder for the algorithms.

Another example of algorithmic creativity can be seen most strikingly in the visual arts, in which it highlights a kind of crisis of creative identity around what it even means to be creative or artistic, as Finn commented:

> Software platforms like Photoshop have really transformed photography and in some ways created existential crises about what it means to be an artist, when being an artist means pushing buttons and having machines apply algorithmically modulated filters. Almost every smartphone photo is automatically image corrected, the instant after it's taken. So already we're depending on machines to correct some of our mistakes, in ways that we didn't before. And that's just the tip of the iceberg.

On one level, the algorithm brings everyone closer to being a photographer, and thus it can be argued that the democratization afforded by new tools also opens up creativity to more people (Henriksen et al. 2016). Yet there is a danger that algorithms make uniform decisions and corrections that can lead to a blandness, a standardization that is less than creative, where nothing new and original is being created (Finn 2017b).

At another level, Dr. Finn explains these algorithms are doing so much on our behalf creatively that it begs the question of what it means to be creative. Moreover, Dr. Finn wonders "to what extent we can encode creativity into machines and systems" begging the question, what about creativity will remain exclusively within the human domain?

This is a complicated question considering the reciprocal relationship forming between ourselves and the machines we are creating:

> We are now, for the first time, building tools that are really adapting to us and watching us even as we try to adapt to them and watch them. For millennia, it's been true that we shape our tools and then our tools shape us. But, now, there's a feedback loop. A very active feedback loop where our tools continue to change and evolve based on our behaviors even as we our consciously or subconsciously adjusting our behaviors to try to modulate them with machines.

Thus far, Dr. Finn cautions that the examples of artificial intelligence writing news articles, novels, and other acts of creativity have been stunts, but machines doing what was once thought of as only what humans can do has already arrived.

For instance, Mazzone and Elgammal (2019) describe an AI process that was created in Rutgers' Art & AI Lab, developed expressly for making art based on the AI's learned processes for art making, style analysis, and detecting large-scale style patterns in art history. Their study showed that human subjects could not tell whether the art was made by a human artist or by the machine, and overwhelmingly judged the machine's work to be that of a human artist. Human study participants even described the AI-generated work using descriptors such as "intentional," "having visual structure," "inspiring," and "communicative," at the same levels as human-created art—all of which suggests that AI creativity raises new issues for understanding art and artists in the twenty-first century.

With regard to human-centered creativity and the gadgets or technology tools we operate with, Dr. Finn proposes that scholars and creatives approach the realities of algorithmic creativity directly. First of all, Dr. Finn is not likely to recommend that everyone toss out their iPhones and switch back to 35 mm Nikons. He observes productive cooperation between humans and computers, pointing to how chess grandmasters play in tandem with computers, rather than pitting themselves against them (Finn 2017b, September). The human-machine teams are called centaurs and thus far have been unstoppable as humans use the machine's vast database of chess strategies and ability to calculate moves to avoid making mistakes. In

that sense, the human still holds his finger to the piece and has not let go. Second of all, scholars and teachers should not avoid, but rather engage directly, with these emerging relationships with computational systems in ways that are "reflexive and playful" (2017a, p. 13). The work that Dr. Finn and his collaborators do at the Center for Science and the Imagination exemplifies this, as he brings together his medium of choice, storytelling, in the service of problem exploration.

## Creativity as Applying Imagination to Problems

Dr. Finn is a life-long science fiction buff—so hanging out with literary luminaries of his childhood, like Neal Stephenson, Bruce Sterling, Kim Stanley Robinson, and Margaret Atwood, makes him smile and reminds him how fortunate he is. It should be no surprise that he is a strong believer in the power of creativity to change the world through telling stories and imagining possible futures. In order to understand how this works, we first begin with how Dr. Finn sees creativity as having an important relationship to the imagination:

> I think of creativity as, perhaps, an applied form of imagination…[which is] a fundamental human capacity that we all have, the ability to perceive things that aren't right in front of you. So, you can think of that as the ability to create new stories, see alternative possibilities, see into the future, see into the past. It's also the faculty of empathy, to imagine the lives of other people.

This ability of the imagination to form new perceptions for us is based on our need to make sense of the world through stories:

> Making sense of things is a pattern making process and a narrative process. We take the evidence of our senses and we throw out 90 percent or more of that data and we take the remaining bits and we editorialize them. We stitch them together into a narrative about what's happening right now and who we are and what the world is. We're not telepathic and so we're always constructing stories about the world around us but also the humans we interact with. We're shaped by stories that are, often times, outside of our control.

In this way storytelling is a creative act that we do intersubjectively with those around us in a collective fashion. In fact, Dr. Finn's depiction of this storytelling aspect of creativity bears interesting connections to some of our past work in this column, on transdisciplinary skills—namely the importance of pattern seeking and creation, and of abstraction for creativity (Henriksen et al. 2014a, b). Dr. Finn's point that stories "happen to us" brings to mind how larger narratives currently surround us—stories we read on the news like polar ice caps melting and revelations of data breaches and privacy loss on social media platforms, are things playing out in our lives.

But if storytelling is a way we construct reality, then it can also be used as a way to make concrete what we fear, what is unfolding in uncharted territory, to explore future possibilities. By imagining a character who faces conflict in a setting, an issue can become tangible, explains Dr. Finn. Using storytelling to explore an issue lays out what is at stake, what are the fears, what are the potential consequences of that reality? Dr. Finn explains how they use storytelling at the Center to transform perception:

> When you tell a story, you usually have characters in your story. So you have a very immediate, local context that some things are happening to some people and they respond to those things. There's some kind of progress. Things happen. Usually there's some kind of character development and the people in the story change based on what happens. Those are all ways to take this abstract notion of a problem and ground it in something that's meaningful for human affairs. And so, when we do this story telling of the future, we're not asking people to come up with a 49-point bullet plan for solving climate change, you know? We're exploring the idea of what it's going to be like to live in the future. To create another point or another perspective in the wide plane of possibilities. When you do that, again you expand your point of view. You see the world in a different way. And if you do it enough times, you also create a broader perspective on the landscape of possibilities.

By using storytelling to make an issue or problem that is complex or far away concrete, creativity can enable us to work outside of the limitations of the rational mind. This use of applied imagination is not making predictions about what *will* happen, but the potential impacts of what is *possible*. It puts one in an imaginative headspace that is not boxed in by political positions. Moreover, in order for a change in perception to happen on a vast scale, it has to begin with the storytellers themselves. In this case, it would be scientists, writers, and technicians who have come together to imagine possible futures through collaborative storytelling. With these fictional realities out in the open, we can begin to think about what we want and do not want to happen, which can inform our decision making in the present.

## Creativity as Collective Effort

In addition to seeing creativity as an applied form of the imagination, Dr. Finn also emphasizes that creativity is "a doing, a verb, a practice with a medium" that has context. In other words, creativity is done through specific practices within a culture based on ways of doing, thinking, and seeing that is repeated from instance to instance, person to person, in groups and institutions over time. Dr. Finn finds there is "a constant tension between creativity as a set of practices that can be applied over and over again, like a jazz musician, and creativity as the doing of things that have never been done before." Moreover, to conceptualize creativity as a social endeavor goes against the myth of the lone genius, toward a more collective notion:

> If you think about the people we idolize as the really creative geniuses of the world, they learn from, they draw from, they borrow, they steal from others. They feed on others. Their ideas and stories can only exist and live when they're told by others. So the artist's work only gets counted when other people look at it. That myth of the genius, the celebration of an individual genius, only functions when there are a lot of people who believe in it. So there's always this collective enterprise involved in creativity.

The networked and mutually supporting and interdependent aspects of creativity relates to what Farrell (2003) calls collaborative circles where groups of like-minded individuals form around a particular idea or reaction against the norm. The group collaborates and supports one another as their shared perspective(s) take shape and they work to gain this new perspective's acceptance by the rest of the discipline and other audiences. For example, the relationships and collaborations between Monet, Manet, Degas, Renoir, and other painters yielded Impressionism, a new, radical way of perceiving and representing the world. As Dr. Finn puts it, creativity is a "collective project [that is] not just about empowering individuals to be creative."

## Creating a Safe Space and Capacity Building for Creativity

Helping others use their imagination and develop their creativity requires risk taking on everyone's part. Dr. Finn admits that sometimes he fails, but it can be done. In considering the ways in which creativity might function in teaching and learning environments, he reflects on the notion of teaching for creativity as being about "empowering the imagination and creativity of others," stating:

> We're focused on this notion of inclusive visions of the future that will inspire more people to feel a sense of agency and responsibility for the world of tomorrow. But, in practice, we're not just trying to create compelling visions that we have authored and curated and polished. We're trying to give people the tools to do that kind of future thinking. We model creativity. If you're more expansive in your understanding of what the methods and practices are, you can find many different ways in which people are creative. Likethe practice of empathy and understanding other people.

Dr. Finn's and the Center's modeling of creativity involves giving oneself permission to experiment and fail. Too often what goes for creativity in the classroom, recalls Dr. Finn, is far away from creative risk taking; and in the standardized environments of much policy today, teachers are often working within limiting predetermined boxes. Fostering a space for creativity involves keeping in mind Maslow's hierarchy of needs, in that if a person does not feel safe and free to try new things and make mistakes, they will not work creatively (Maslow 1962). Dr. Finn notes that:

> People can't be creative until you've made a space for them, by addressing those fundamental needs. And those are not just things like food and shelter, it's also a sense of belonging and inclusion and a sense of safety. The safety to take creative risks… A teacher should ask themselves, do my students feel like they are allowed to be creative in the classroom or the workspace? Quite often, turns out that they don't. Whether that's a fear of some external force or an internal construct that they've created for themselves. Like, "Oh, this isn't something that I can do or I'm allowed to do or I shouldn't do this."

One of the first places that teachers can start to create a safe space is within themselves, and teachers need to be able to give themselves permission to be creative and to allow creativity to happen. Most research confirms that creativity involves risks (Dewett 2007; Glover 1977). As Dr. Finn suggests, "it involves that notion of creativity and responsibility. You have to take ownership for the things that happen. But if you can find a way to be playful and to strike the right aesthetic, that is hugely important."

Finn suggests that teachers not teach creativity as a separate subject but that they see it as one that is interwoven in many

disciplines. He notes that it is important for teachers to be open and flexible in their perceptions of what products their students produce:

> Many of our most important creative insights in human history have been about a shift in perspective. For teachers, that means that you can't have a predetermined understanding of what you think counts as creative or not creative. You have to be ready to open yourself up to really different efforts and attempts from students. But that's not to say that you can't give them feedback or push students in certain directions or say, "This isn't what I was looking for."

One's capacity for creativity can be developed, argues Dr. Finn, through working with creative constraints, particularly that of time. As mentioned, working in a short burst forces the writer to set aside perfection for "good enough," a technique he uses at the Center for Science and the Imagination and in the classes he teaches at ASU. For example, he will have students write a haiku or a short essay that must be a certain word count – these constraints force the writer to focus on craft while seeing the topic from another perspective. Another exercise that they use at the Center is to use other creative constraints to focus on avoiding some of the typical stumbling blocks to creative work:

> In workshops, we'll offer to bring together writers, different kinds of technical experts and we'll set them some challenge or ask them to develop a narrative about a future. We'll give them very short amounts of time to get to the next stage of the process. They might have 40 minutes to develop a first sketch of this world that they're going to be setting their story in. Then half an hour to create a character. Then another 40 minutes to write a draft of the story. So, giving people "impossible" deadlines takes perfect off the table. It invites them and pushes them to create something that's good enough. It steps you into a prototyping mindset rather than a perfectionist mindset.

## Conclusion

Dr. Finn's conceptualization of creativity as applied imagination combines both context and practice with the imagination as a necessary ingredient. As a final word about the importance of the imagination, Dr. Finn explains:

> I think [imagination] is one level below creativity… we have to pay more attention to [it] because it's the precursor to creativity. It's the precursor to resilience, the precursor to innovation and it's the thing we're going to need if we're going to survive this coming century. And so, I think, how this conversation plays out in education is hugely important because we're not preparing young people today to survive the coming century and to deal with the kinds of change and complexity that they're going to be facing. We need to think about creativity and imagination not as academic topics or even just as methods but really as fundamental life skills. And almost as a human right: a deeply important part of individual and collective empowerment and personhood.

It is in facing this challenge, that of "preparing young people to survive the coming century"—a century that will be increasingly dependent on creativity and algorithms—that the work of Dr. Finn comes into focus. By choosing to work at the intersection of technology, imagination and creativity, Dr. Finn provides us a different perspective on creativity, technology and its role in education.

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