

The Courageous Rationality of Being a Neuroskeptical Neuroscientist: Dr. Arne Dietrich on Creativity and Education

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“If I can tell you, right now, a piece of neuroscience that enhances creativity, I wouldn’t be talking to you. I would be living in a palace... and I would have trillions of dollars.”

– Dr. Arne Dietrich

“The virtues of science are skepticism and independence of thought.”

– Walter Gilbert

“The deeper the experience of an absence of meaning - in other words, of absurdity - the more energetically meaning is sought”.

– Václav Havel

Introduction

Research on human behavior and psychology is often caught up in methodological and ethical debates—at the core of which lies a tension between the observable and the unobservable aspects of being human. This tension exists between what

can or cannot be identified, defined, and quantified about human experience. In educational research, for instance, scholars have attempted to study the contents and workings of the human mind using the methods of natural science. These approaches aim to create categories of human experience to try to find causality and correlation between these categories. We have created constructs such as self-efficacy, self-determination, creativity, political beliefs, religious inclinations, and other such categories, in our attempt to explain the causes of human behavior.

This is true of creativity research as well. For instance, some creativity researchers study participants engaging in “creative” tasks and construct logically consistent yet unobservable explanations for creativity, such as the idea of divergent thinking. The question of course is whether divergent thinking is a phenomenon that can be pinpointed as occurring in the brain of an individual, or whether it is a label we apply to a range of brain functions and neural connections we do not completely understand.

The fact that these are human-made constructs, created to explain individual and social behavior sets them up for negotiation, discussion, and argument. The urge to essentialize these constructs, and thus to assign them “reality,” is strong. Just as important however, is the counter-urge to question and problematize these constructs—to also see them for what they are, human created constructs to explain and understand human behavior.

This critical perspective, to question and problematize current neuroscientific research on creativity, is something that the scholar we interviewed in this article—Dr. Arne Dietrich—seeks to do. We interviewed Dr. Dietrich, a neuroscientist, on his views on creativity and education as part of our on-going series of articles on creativity and education. In a previous piece in this series (Mehta et al. 2016), we interviewed another neuroscientist, Dr. Rex Jung, about his

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work on creativity and the fundamentals of what neuroscience offers education. Dr. Dietrich offers a contrasting perspective on this issue providing an incisive and blunt critique of the approach that the field of neuroscience has recently taken towards creativity and the mind.

The Neuroskeptical Neuroscientist

Dr. Arne Dietrich is professor of neuroscience at the American University of Beirut in Lebanon. A bit of a self-described non-conformist, Dr. Dietrich received his doctorate from the University of Georgia, where he surprised his dissertation committee, “with a thesis that concerned such an opaque topic in neuroscience that no one even bothered to read it.” He describes himself as a “tour guide into the bizarre world of brain cells and human behavior,” where he surfs “the stream of consciousness every chance he gets.” He also describes himself as “restless and obstinate” in nature with a wide range of interests that fuel his interest in the brain and creativity. He has written a textbook on consciousness as well as a more popular book on the neuroscience of creativity (Dietrich 2007, 2015).

Apart from being a renowned name in cognitive neuroscience, Dr. Dietrich is also a self-acclaimed critic of his field. With an expertise in neuroanatomy of the frontal cortex, dedicated to higher cognitive functions, Dr. Dietrich initially worked with human and animals to learn what makes humans what we are and not something else. Big challenges have always fascinated him, even if they bring with them a need to rethink or reframe the most fundamental understandings of the human mind. Dr. Dietrich works on understanding consciousness and creativity from a neuroscience perspective, but he also offers significant cautions and critiques of research, which are bigger than and beyond the topic of creativity. At its core, this is more than a discussion of Dr. Dietrich’s work around creativity, but is also a tale of the virtue of skepticism in research.

Through his approach, which we might term humanizing reductionism, Dr. Dietrich challenged the very existence of constructs that have been popularly embraced in the arena of neuroscience. He reminded us of the significance of questioning the mainstream, even if that includes commonly-cited research. He cautioned us of the intricacies of the human mind and the fuzzy boundary between reality and imagination. Finally, he grounded us in the transdisciplinary pursuit of knowledge, and the importance of being patient.

In the following sections, we discuss three major themes from our discussion with Dr. Dietrich. First, we address Dr. Dietrich’s skepticism towards existing practices of research

in neuroscience. Second, we discuss what this skepticism means for creativity and education. Finally, we share Dr. Dietrich’s understanding of the concept of creativity.

Neuro-Anything: the Problem of Theoretical Incoherence

The first theme that evolved out of our discussion with Dr. Arne Dietrich centered on a significant degree of skepticism about what neuroscience offers to complex sociocultural concepts, such as creativity. Dr. Dietrich reminded us that creativity is a complex social phenomenon that is, above all, a created construct. Creativity is difficult to relate to other social constructs, such as certain types of thinking or intelligence, without further reducing it to the mechanisms that make it happen. His reductionist approach may seem ironically positivistic for a topic like creativity, but its repercussions are, in the end, deeply humanizing. In his attempt to explain why reductionism is important in understanding creativity, Dr. Dietrich drew a parallel between phrenology and the present neuroscientific practices such as neuroimaging. He highlights that studying a compound construct like creativity in neuroscience is a bad idea. He notes that using cookie-cutter tests in a functional MRI to find arbitrary relations between biology and human-social constructs will always produce seemingly significant results. But that is not because it reveals a new finding about the human mind. It is because the construct of creativity is so compound and complex that it leaves enough subjectivity for researchers to interpret the results as desired. The race to finding *the* answer has led to an unproductive practice that does more disservice to this field of study than good. As he commented:

I’ve been very, very critical...of my colleagues’ work when it comes to neuroscience and neuroimaging, particularly of creativity. That is because it’s very simplistic template kind of research that is theoretically uninformed. In fact, it’s theoretically incoherent. You take a very simple creativity test like the Torrance test and combine it with the functional MRI—it’s cookie cutter work. For us in neuroscience, it presents a big problem, if not an insurmountable hurdle.

According to Dr. Dietrich, the biggest problem facing neuroscience is one of theoretical incoherence. He created a simple logical argument to expose the underlying challenges in his field. He reminds us that the latest, most discussed neuroscience research on creativity has not revealed anything to the world that we did not already know 50 years ago. Through extensive study of the literature, he

found that irrespective of what neuroscience study you pick, all strikingly different studies confidently claim to have found *the* answer. So, he asks, how can they all be right? He provided an example of how this plays out across neuroscience studies of creativity, noting:

I did a large review study on neuroscience work on creativity, and I exactly found what I predicted I would find. That is, regardless what study you pick up in neuroscience, you get a different result. You pick up one study, the one brain area lights up. You get another study, another brain area lights up. But each one of the papers talks confidently that they have found part of the circuitry of creativity. When, in fact, another study doesn't find it at all. You pick up a fifth study and guess what? Yes, you guessed it, you get a fifth set of results. So, at some point, this must stop.

This theoretical incoherence, he argues, stems from the existential dilemma facing the field of neuroscience. Neuroscientists working on creativity have spent decades trying to decipher the biological answers to creativity. He shared examples of where this creates a problem in the field, stating:

We are neuroscientists. We hunt mechanisms. We break down a phenomenon into its elements and into its pieces. That means the concept of divergent thinking, on which the alternative uses test (Torrance or similar ones) is built, would have to be broken down because there's no such thing in the brain as divergent thinking. There is no place in the brain for your political convictions or religious beliefs. Or for your concept of democracy. Or for creativity, or for that matter, for divergent thinking. There's no such thing. So, you can't image it because you don't know what you're imaging.

So, he suggests that even after years of exhaustive work, the field of neuroscience has nothing new to contribute to the field of creativity or educational research. This puts them in a grueling state of limbo, where all they can do is wait for either an advance in either technology or in our theoretical approaches to bridge this gap between our social constructs and the observable workings of the brain. Until that happens though, most neuroscientists continue working with what we have. But according to Dr. Dietrich, this creates a problem of false categorization, particularly in creativity research. He noted the difference between what the field often does, and what it should do, commenting that, "what you would have to do is break it down into pieces. And my colleagues are unwilling to do this. So, that when they use the divergent thinking test, with the functional

MRI, you get garbage in, garbage out." This has ongoing implications for research on creativity.

What is in it for Creativity?

When neuroscientists continue working with half-formed theories and no new experimental support, Dr. Dietrich argues that they do more disservice to the field than good. He used the example of divergent thinking to explain false category. He recalled how J.P. Guilford—the American psychologist who rejected Spearman's view of measuring intelligence with a single parameter—divided creativity into convergent and divergent thinking (Guilford 1956, 1959). He also reminded us that Guilford never tied creativity only to divergent thinking (Guilford 1956), noting:

You divide creativity into convergent thinking and divergent thinking. The idea from Guilford was that creativity is tied to divergent thinking, although he never said this – he always understood that you can also be creative with convergent thinking too. But our current neuroscientist friends don't get this. Almost everybody I talk to agrees that you can also be creative with a convergent process. Bach is a good example. Thomas Edison is a good example. It is methodical systematic conscious application of alternative uses, until you have a creative solution... Unless you are willing to argue that Bach and Edison are not creative, which I recommend against, then you have to admit you can be creative with a convergent process.

However, it has become a common practice to consider divergent thinking as the key contributor to creativity. But, not only does this neglect the impact of convergent thinking in the process, it is also problematic because we know nothing about what divergent thinking is made of:

How much attentional processes go into it? How much of perceptive processes go into it? What kind of working memory, reference memory, categorization processes... And these you can measure on a function line. These we can isolate. What we can't isolate is when we put them all together and we talk about your idea of democracy. You can't image this.

Dr. Dietrich uses "the idea of democracy" as an example of how false categories can lead neuroscientists to stray off track. We know that we like to use labels to construct our personal ideas of democracy. This means that the idea of democracy is made of sub-units that constitute it. Therefore, it should be

possible to tease apart the idea of democracy and find what makes it. Once we identify the sub-units that make the idea of democracy, we can further tease them apart, until we eventually and hopefully reach a point where we have identifiable units that can be imaged using an fMRI. However, there is a long way to go between knowing the idea of democracy and imaging it.

[False categories] give you the illusion that you are hunting something when, in fact, we have carved into the wrong joints and we are all chasing a ghost.

Leading neuroscientists such as Dr. Dietrich know that technologically there is nothing neuroscience can do to reduce the gap between the questions of social constructs of creativity and the neurobiological answers. Instead, he asserts that what they can do is to strengthen the theory and make it more coherent. There is a need for neuroscientists to come to a logical agreement that they do not have anything to contribute to education, at least not yet. Till then, they need to strengthen what they already know from a theoretical perspective. Neuroscience must, therefore, wait before it has something new and tangible to offer to the research on creativity and education. However, Dr. Dietrich's skepticism towards his own field and its methodology is in itself a great contribution. His research reminds us that it is equally important to know what you do not know, rather than to create a false sense of knowing.

What Can We Say with Confidence?

Despite a sense of skepticism towards contribution of neuroscience to creativity, Dr. Dietrich still holds value in continuing to conduct research. Educational researchers studying creativity have a lot to offer the field. But it is going to take a while before they meet neuroscientists' ideas. There is a conceptual gap between the two fields, between what we can directly observe and what we cannot, and this gap cannot be overcome as of now. The challenges that prevent educational researchers from coming to an agreement with neuroscience are both technological and theoretical. While technological challenge will take its own time to resolve, Dr. Dietrich notes that the theoretical challenge is what researchers on both sides need to work on.

Neuroscientists need to work towards a theoretically coherent understanding of the social constructs of creativity. They need to realize that the biggest service to the field is not in finding theories that sound "sexy" in their popular appeal, but in validating tests and theories that currently exist. Educational researchers, on the other hand, have taken the lead, in not looking to neuroscience for concrete answers—

at least, not yet. In the meantime, Dr. Dietrich has a helpful way of thinking about creativity, which is based in the evidence of experience and sociocultural interaction.

Dr. Dietrich described three types of creativity: *deliberate*, *spontaneous*, and *flow*. The first type, deliberate, speaks of solving a problem systematically, methodologically, and consciously. There is a sense of purpose to problem solving and the goal is to find the solution. For example, the Apollo 11 engineers faced specific problems in real time that demanded deliberate attention, yet novel and effective solutions (Dietrich, personal communication). The second type, spontaneous, speaks of the unconscious creative engagement that is bubbling underneath the mind. Dr. Dietrich believes this type deals with completely different brain structures than deliberate creativity deals with. This is the more common way of defining creativity (Dietrich 2004). The third and the final type, flow, speaks of bypassing the consciousness all together and getting lost in the act of doing something creative. It could be playing music, painting, or writing, when in the flow mode, there is no sense of time or surroundings.

According to Dr. Dietrich, there is a clear distinction between these three types of creativity. This is where, and how, he suggested researchers should start:

Stop talking about creativity as a whole beast ... We don't talk about creative thinking anymore. We take one type. That type we even have to break down further. Then I think we can do good neuroscience work. That is, I think, where my direction is different, that I take break downs of the creative process which, I think, gets you to better experimental paradigms down the line. Which means in neuroscience, that we can throw away all the psychometric tests that we currently have.

Conclusion: Humanizing Reductionism

In looking across Dr. Dietrich's key ideas on creativity research from a neuroscience perspective, his underlying approach of reductionism seems to be a driving force. Although he quite freely labels himself as a reductionist in his approach to understanding creativity, he does it with a humorous ruthlessness that makes his sharp critiques of the field engaging for his audience. He characterizes much of his role here as critique, but not a conventional, so much as an existential critique that pushes for a paradigm shift in how the field operates:

What I essentially do is pull the rug out from underneath them because it's such an existential problem, that the

entire paradigm essentially faults. And most of my colleagues who are involved in this research do intellectual stonewalling. They don't even want to hear it. They refute, they go into blatant forms of rejectionism. It's absolutely stunning...I hope that the new people in the field are joining me, and a large number of them are.

But, wrapped in his mechanical reductionist approach is a humanizing appeal, for the field to study creativity in ways that respect its complexity and richness, in all of the many components that go into it. In this, there is a transdisciplinary reminder that we are talking about human beings. Putting ill-informed or simplistic labels on them have only hampered progress in the past. Making false categories based on half-formed theories of the workings of the human mind are not helpful to the fields of neuroscience, or of education. The urge to know the answers behind the intricacies of the human mind is understandable. But, Dr. Dietrich's rhetoric tells us that it is a journey that cannot be made in haste. It is a slow, rigorous, collaborative process that will take technological advancement, shared methodologies, coherent theoretical structures, and transdisciplinary exchange of paradigms, before we reach a point of common understanding. Until then, we must engage in a dialog and not confine ourselves within the siloes of academia, and continue to do more of the same in an insatiable

restlessness to know the answers, instantly. We have to work at it, and wait, as complex and but verifiable information emerges.

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