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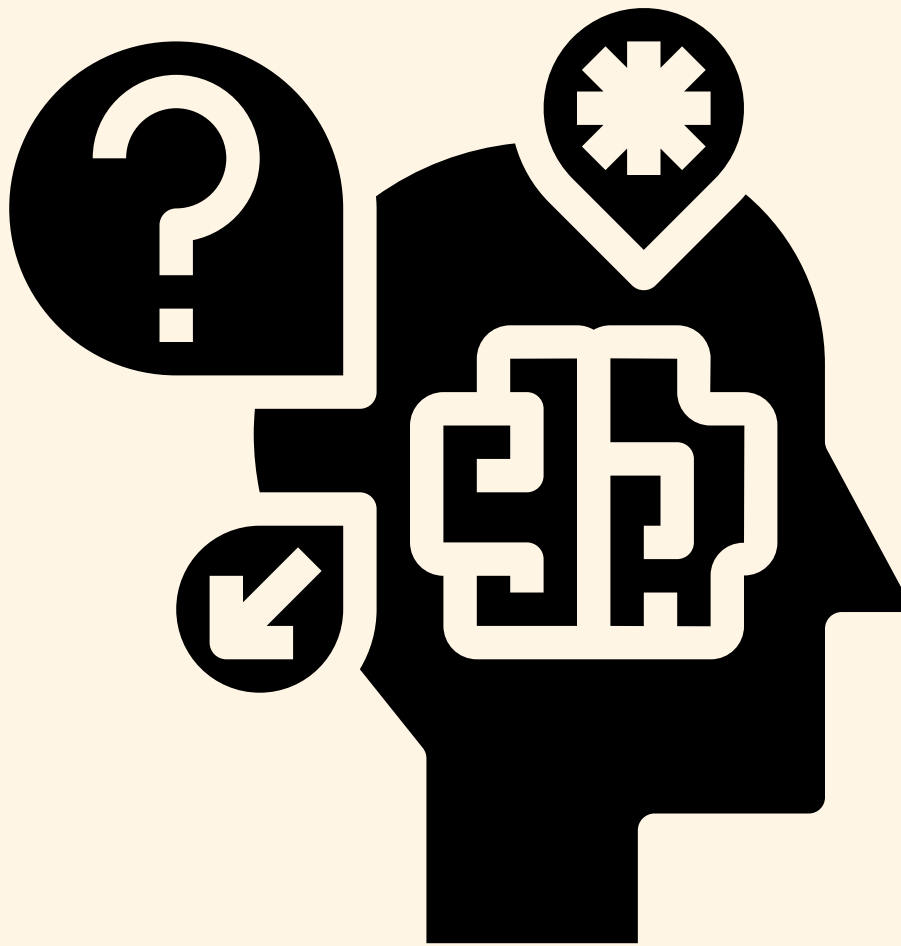


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Re-learning Learning: Brave New Perspectives on Learning and Teaching



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Now is an exciting time to be in education. Brave new theories of learning and teaching have emerged to help educators think and act within our current complex 21st century reality, like embodied learning, sociomaterial approaches, and the maker movement. Also emerging are reinterpretations of older theories that have fallen into disuse, such as pragmatism.

Of course, these theoretical approaches challenge common sense assumptions about learning and teaching, for example,

that students are vessels waiting to be filled with information, or blank slates that can be conditioned to perform the tasks we choose. We believe that these new approaches offer more effective and ethical ways to engage students in learning, being, making and critical thinking. Indeed, we use them every day in our own classrooms.

Explaining new theories clearly and concretely can be a challenge—precisely because they depart from entrenched common sense assumptions. However, that is the challenge we have taken on in this issue. Our purpose is to identify some brave new approaches to education and explain them clearly and practically. For instance, many of the articles include illustrations and photos. Given our busy lifestyles, we have tried something new in this issue by limiting the articles to 1000–2000 words, which is far shorter than typical academic articles. Nonetheless, we hope that you find these short articles enjoyable, illuminating, empowering and even a little challenging.



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Michelle Schira Hagerman is an Assistant Professor in the University of Ottawa's Faculty of Education. Her research interests include teacher education, digital literacies, and online reading comprehension. She is the Director of the Canadian Institute for Digital Literacies Learning. In her spare time, she is learning to make cold-press soap, to crochet, and to sew blinking LED lights into her clothes using conductive thread and the Lilypad Arduino.



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Megan Cotnam-Kappel is an Assistant Professor in the University of Ottawa's Faculty of Education. She is a specialist in minority-language education and is deeply committed to teaching and research that aim to close digital divides for minority groups across Canada. She is a founding partner of the Canadian Institute for Digital Literacies Learning, and led the Maker stream of the Institute in 2017.

Schira Hagerman and Cotnam-Kappel are currently collaborating on a longitudinal study exploring the possibilities of digital maker education for literacies learning with francophone and anglophone youth living in lower-income urban communities in Ontario.

Making as Embodied Learning: Rethinking the Importance of Movement for Learning with Digital and Physical Tools

Michelle Schira Hagerman and Megan Cotnam-Kappel

Abstract

In this article, we rethink the inextricable links between learning and physical action. We position *making* with digital and physical tools as a pedagogical approach that aligns, theoretically, with embodiment.

Keywords

maker movement, making, embodied cognition, technology integration, literacies learning

Résumé

Dans cet article, nous repensons les liens inextricables entre l'apprentissage et l'action physique. Nous positionnons la *création* avec des outils numériques et physiques comme une approche pédagogique qui s'aligne, théoriquement, avec la cognition incarnée.

Mots-clés :

mouvement Bricoleur, création, cognition incarnée, intégration de la technologie, apprentissage des littéracies

“Je n'ai jamais cru que j'allais réaliser un instrument qui

existe déjà. Alors, je suis contente de l'avoir dans les mains maintenant.” [I never believed that I would be able to succeed in making a real instrument. So, I am happy to hold it in my hands now.] ~Yasmine

Yasmine (not her real name) had never made a ukulele before. At first, she told us, she did not believe she could do it. And yet, through a series of online explorations followed by sensory and physical activities—cutting, gluing, pulling, pressing, flipping, painting, watching, and listening—she figured it out. Yasmine did not start with a clear plan. Rather, her process was self-organizing. After watching some YouTube^{LLC} videos and talking with her friends about what she might create, she chose a tissue box from a pile of recycled materials. Yasmine's



Figure 1. Yasmine holding her ukulele.

process was slow and contemplative. She cut the box quietly and carefully. She walked around the room observing her friends' projects but said nothing. Back at the materials table again, she picked up some feathers, pompoms, and shiny stones. Turning them over in her hands she seemed to consider the aesthetic properties of these ornaments. Some of these she affixed to her box with the hot glue gun. Through our analysis of Yasmine's process of bricolage, it seemed that her explorations of these material resources (Wohlwend, Peppler, Keune & Thompson, 2017) and their affordances in relation to her emerging ideas allowed her to discover new principles of design through activity. In the ukulele, she made us see the physical and synthetic representation of Yasmine's understanding of sound; it is a physical assemblage of how she understands sound that can be performed through the strumming of fingers across elastic bands affixed tightly across a tissue-box sound hole (Wohlwend et al., 2017).

Yasmine and her classmates are participating in a four-year longitudinal study that aims to understand how, if at all, maker projects—that invite the use of diverse tools and materials to create new things—might support literacies learning, critical and creative problem solving, collaboration skills, and their developing sense of agency. As we analysed students' gaze, captured with video-recording "spy glasses" worn as children worked, we identified a range of socially-situated literacies practices. (See Figure 2 showing Yasmine wearing her Diggro "spy" glasses which have a small camera in the bridge that records up to one hour of video and audio. Data are stored in three-minute snippets and downloadable via a micro USB cable.)

The students described their processes to one another and to their teacher; they asked questions and shared their insights and they laughed with, challenged, and affirmed one another as they worked. Some students also disagreed with one another, or sought out affirmations; one boy showed off the double-guitar he crafted to his friends, stating how "cool" his work was with a deep sense of pride.

We were especially struck by the complexities of students' movements, actions, and their talk about their physical processes. Their movements seemed integral not just to the physical creation of their projects (which we expected to see) but also to their planning, to their information seeking, and to their multimodal process of composition using Chromebooks™ and Google slides. At any given moment as the musical instrument project played out, students were moving around their classroom, watching one another, touching materials—their own and those of their classmates—manipulating tools, cutting, gluing, holding, pressing, flipping, pushing, pulling, tying, and navigating. As they planned and wrote up multimodal representations of their maker processes, they used the touchpad of their Chromebooks™ to crop,

copy, insert, and resize images. All of this active work was accompanied by explicit wonderings, by descriptions of their actions, by peer-to-peer and teacher guidance, and verbal expressions of emotion—frustration, confusion, surprise and joy.

The observed physicality of the learning was not our initial focus, but it grew impossible to ignore. We began to wonder deeply about the foundational, embodied mechanisms for learning that students use during Maker projects. As teachers ourselves, these observations disrupted long-held assumptions. We had never considered that students' movements were as important as their abstract understandings of key literacies concepts, nor that students' thinking and learning could not happen without these movements.

In what follows, we present a brief overview of embodiment as a learning theory and articulate connections from the tenets of the theory to Making as a pedagogical approach. We conclude with recommendations for embodied instructional design informed by our research and the work of other scholars.

Embodied Cognition

Arthur Glenberg (2010) writes that "a basic claim of the embodiment framework is that all psychological processes are influenced by body morphology, sensory systems, motor systems and emotions." (p. 586). Theories of embodiment suggest that thinking is shaped by information that our bodies gather about the world. Barsalou (2010) calls the body and the environment "external informational structures that complement internal representations" (p. 717). According to his theory of grounded cognition, our brains constantly leverage the environment as a scaffold for thinking through our senses. Cognition doesn't happen once information comes into our brains. Rather, cognition happens as we interact with the world. Understanding is generated in activity. Consider laptop computers and word processing applications. Using a traditional cognitivist perspective, we might say that these technologies are receptacles for our ideas. From an embodied perspective, however, the computer is an external informational structure that allows us to see, hold, and move words in ways that would not otherwise be possible for our brains. In turn, what we assemble externally feeds back into our internal representation of our own ideas and (re)shapes what we understand. In this way, our thinking is located in our physical and sensory interactions with the keyboard, screen and touchpad. From this perspective, Yasmine's new understandings of sounds and music are located in her making, and in the ukulele itself.

You might read this and say of course our minds and bodies are inextricably dependent on one another. How could this not be the case? Historically, learning scientists have been concerned with higher order cognitive processes such as language, critical thinking, and metacognition, all of which presumably happen in the mind. Proposing that the body is the foundation for higher order thought, that sensory perception is inextricable from abstract cognitive processes, and that humans use the environment to scaffold cognition are relatively new ideas for both psychology and education.



Figure 2. Yasmine in her "spy" glasses.

The evidence for embodiment, however, comes from diverse research methods and traditions. Neuroimaging studies, for example, have found that when we imagine, we activate the same parts of the brain used when we are actually processing visual information with our eyes (Kosslyn, 2005). Several studies have shown that when students move their bodies to enact a concept or process using physical, virtual or augmented reality models, they learn more than comparison groups who only listen to the same content, watch the process or engage fewer sensory channels as they interact with complex scientific principles (DeLiema et al., 2016; Stull, Gainer & Hagerty, 2018). Over decades, George Lakoff and his colleagues (e.g., Lakoff, 2012) have demonstrated that metaphorical language is grounded in foundational sensory experiences with the physical world. For instance, if someone were “wearing blinders”, or “has had the wool pulled over their eyes”, they literally could not see the world. Metaphorically though, these expressions refer to someone whose understanding (vision) is limited by strict adherence to a particular ideology and whose understanding (vision) has been compromised through trickery. Interestingly, we see evidence of embodiment in Yasmine’s own words too, when she described the completion of her ukelele. She said, “Je suis contente de l’avoir dans les mains” [I am happy to have it in my hands]. An apt choice of words given that she created the ukelele with her hands. In this way, we see that process and product may be inextricable.

Making as Embodied Learning

Cognition, it seems, is built partly on grounded sensory and physical interactions with the environment. As teachers we need to know that the development of abstract thinking skills such as language, (inter)disciplinary problem-solving, mathematics, and values such as equity and social justice, are rooted in students’ interactions with their physical world. Making and maker-oriented projects ask students to manipulate materials and to use both digital and physical tools and applications in new ways, for new purposes, and to make things that they have never made before. More than the latest trend in technology integration for classrooms, Making may actually be a teaching method ideally aligned with the ways that human systems of cognition are built. Indeed, as Abrahmson and Lindgren (2015) write, “a child balancing on a seesaw is developing more than physical coordination—she is building an embodied sense of equivalence that one day will inform her moral reasoning about social justice” (p. 371). For Yasmine and her classmates the processes of Making and tinkering with physical and digital tools in their classroom may equip them with new sensory motor skills. These skills lay the foundation for embodied understanding of themselves as agents in the world who can create new things, new systems, new policies, and new opportunities for themselves and others.

How Can Teachers Design Maker Activities to Support Abstract Thinking?

In terms of activities, materials, and instructional techniques that

teachers can use, Abrahmson and Lindgren (2015) offer evidence-based recommendations. They suggest that teachers should design activities that draw on students’ capacity to move and act on the world, to use their senses and bodies to explore the properties of diverse materials, and to perform new actions for a range of increasingly challenging purposes with a range of technologies. Ultimately, instructional goals should help students to gradually develop new perceptuomotor schemas that allow them to use tools in increasingly sophisticated and novel ways, and to develop functional metaphors, as in the see-saw example, for higher-order concepts. Certainly, in-the-moment feedback in response to students’ questions, co-production, and hands-on coaching will move students toward deeper expertise. In one study by Danish, Enyedy, Saleh, Lee and Andrade (2013), second graders explored the properties of matter through collaborative role play and interactions with augmented reality representations of particles. The students consistently noticed fundamental relationships between particle movement and temperature, but needed teacher supports, such as guided questions, to be able to articulate what they noticed. In their study, the embodied activity enabled children to experience core scientific principles with teachers to support the children’s meaning making through dialogue and reflection.

Wohlwend et al., (2017) suggest that teachers might also become enmeshed in the “assemblage of meaning” (p. 458), and in the playful, emergent meaning making that happens through spontaneous co-production in a Makerspace. In this way, the structures of power are distributed, and the embodied, self-organizing, and emergent assemblage of meaning can unfold according to the learners’ needs.

A maker-oriented classroom looks like a hive of activity, with every student moving in different ways as their understandings and purposes evolve. For some teachers, this might feel chaotic. As Yasmine’s teacher, Mme S., told us, the level of activity in her maker-oriented classroom felt overwhelming at first, but the discomfort she felt—as she learned to embrace her students’ unpredictable, active, and emergent learning processes—was also valuable. By relinquishing her need to control the activity and noise level, and by positioning herself as a co-questioner and co-learner with her students, she saw them gain confidence and become more autonomous in their ability to find solutions to their own learning challenges. Certainly, there is risk involved in a shift toward a more intentionally active and embodied approach to learning in schools. Mme S. acknowledged the importance of leadership support, and of colleagues with whom to co-plan, share, and assemble emergent understandings of themselves as maker-oriented teachers.

As teachers ourselves we confess that we have judged some student movement as “off task” in the past. If all psychological processes are influenced by body movements, by sensory, motor, and emotional systems, then behaviours that look like frivolous inattention may actually be the foundations for new ideas and understandings. Theories of embodiment help us to see that when movement is constrained or discouraged in our classrooms, so too is student learning.

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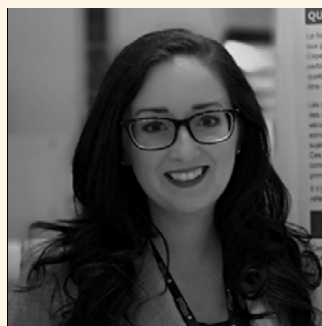


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Coffee Shop Scholarship: Pragmatism as a Reflexive Approach to Educational Research and Practice

Catherine M. Giroux and Rachel Grant

Abstract

In this article, we narratively explore pragmatism as an epistemology that can be used by researchers in the field of Education. We begin by outlining some of the common misconceptions associated with pragmatism then challenge the notion that pragmatism refers solely to “what works”. We conclude by addressing pragmatism's applications as a reflexive approach for education research.

Keywords

pragmatism; epistemology; mixed methods research; reflexivity; education research; theory

Résumé

Dans cet article, nous explorons sous la forme d'un récit le pragmatisme comme une épistémologie qui peut être utilisée par les chercheurs du domaine de l'éducation. Nous commençons par souligner quelques fausses croyances souvent associées avec le pragmatisme et nous remettons en question la notion selon laquelle le pragmatisme se référerait exclusivement à « ce qui fonctionne ». Nous concluons en abordant les applications du pragmatisme comme approche réflexive pour la recherche en éducation.

Mots-clés

pragmatisme, épistémologie, méthodes mixtes, réflexivité, recherche

en éducation, théorie

It had been a very long morning. I had just finished presenting my latest research project, a work-in-progress, to some members of the Faculty of Education which never seems to get less anxiety provoking. The knot in my stomach dissipated as I walked across campus and became aware of other physical discomforts that my nerves had been masking. My arms were aching from a morning of lugging around my laptop, a few textbooks, and a stack of term papers. My increasingly lukewarm coffee—clutched precariously in the same hand as my cellphone—seemed to be providing the only degree of separation between frozen and frostbitten fingers. I had planned on popping by my office before meeting one of my graduate students at Café Nostalgaica. However, as I walked past the snow-covered patio, my fingers demanded a change of plan, and my stomach demanded sweet potato fries. As I walked over to an empty table I overheard some of my colleagues discussing my presentation.

“I’m so jealous of how pragmatic Suzy’s research seems to be!” Steve groaned, “She can basically just do whatever she wants as long as it works.”

“I know, right?” Winnifred sighed, “Maybe we should all start using pragmatism in our research and teaching.”

Just like that the knot in my stomach returned. I took a big gulp of my coffee before letting them know I had heard them. Rather than becoming confrontational, I decided to make it a teachable

moment. We are educators, after all, and what better way is there for us to learn than through challenging questions and conversations? We may sometimes even generate new collaborative understandings.

"Hi guys, I couldn't help overhearing. Did you know that pragmatism is actually much more complex than 'what works'? Let me show you!" I pulled up a chair at Steve and Winnifred's table and settled in for what could potentially become a long—but interesting—conversation.

Understanding Pragmatism

"Pragmatism is a really nifty tool. It has a wealth of philosophy and theory supporting it. Thinking about it simply as 'what works' reduces the rich history of pragmatism. Pragmatism became increasingly applied in research after what was called the paradigm wars..."

"Paradigm wars?" Steve cut me off.

"Philosophical—not literal—war," Winnifred giggled, "Basically over whether quantitative and qualitative paradigms could exist simultaneously."

I nodded. "In short, quantitative researchers argue that Truth is external to the individual while qualitative researchers contended that there are actually multiple truths, each unique to our own reality. Morgan (2014), one of the leading contemporary pragmatic thinkers, argues that pragmatism basically exists outside this debate because it doesn't regard quantitative and qualitative approaches to research as being incompatible. Both paradigms can work together to help researchers answer their research questions. And let's not forget that John Dewey (1919), one of the most influential minds in education over the past century, is one of the fathers of pragmatism. He argued that only those ideas that really work are true. I think this frees researchers up to use the methodological approaches they need to seek the truth, or at least *warranted assertions*, as Dewey calls them."

Steve sighed, unconvinced. "That still sounds like 'what works' to me."

Winnifred nodded.

"Not exactly," I said, leaning in closer. "Let's dig a bit deeper."

Pragmatism as a Reflexive Approach

"Of course, this isn't the only interpretation of pragmatism, but I like to think of it as a reflexive approach to my research," I explained.

Steve, ever the skeptic, frowned, "What do you mean by *reflexive*?"

"Oh, I know this!" Winnifred grinned. "Reflexivity is an examination our values, assumptions, beliefs and experiences, as well as how these influence our teaching and research."

"Exactly. It makes for more of a dynamic relationship between myself and my research," I nodded. "As Morgan explains, when I use pragmatism in my research I consider how different research approaches will impact the results I get, as well as what it means to produce one kind of knowledge instead of another.

Pragmatism gives me the flexibility to pick the methodological tools that best answer my research question."

Steve nodded, "Interesting. What if you're more inclined to ask questions a certain way based on your training and background?"

"That's a good question. While pragmatism allows us to break free of loyalties to certain philosophical or research approaches, I think we need further discussion of reflexivity in this area. Given that my research question dictates my methods while using pragmatism, I believe it's important to be reflexive when writing my research questions. For example, I need to consider how my initial training as a qualitative researcher may inform how I pose my questions. I also need to consider how being a white, heterosexual, middle-class woman influences my questions. I wouldn't want to inadvertently marginalize someone by how I ask my question, or write it in such a way that favours qualitative research when perhaps the problem could be better addressed with a different approach. But that's just my perspective."

"What if you don't have a diverse methodological toolkit?" Steve asked, "I'm a purely qualitative researcher. I don't know much about quantitative or mixed methods."

"That's why working with an interdisciplinary team can be very fulfilling. It's also why I ensure my graduate students are trained in multiple research approaches." Winnifred nodded enthusiastically. I could tell then Winnifred was getting on board with pragmatism.

Application to Research

I finished off the last of my now cold coffee and looked around, wondering if I should purchase another. Winnifred turned to me and asked, "How else could you use pragmatism in your research?"

I smiled at her. "Well, that's a big question! In short, I do a lot of mixed methods research now, which combines qualitative and quantitative approaches. Pragmatism gives me a philosophical foundation for combining these approaches. When my qualitative and quantitative findings are seemingly contradictory, it allows me to explore these differences as a thoughtful dialogue, rather than as a failed study. The key is that you need to use a constant approach of action and reflection." I motioned for the waitress to bring me a cup of coffee. "It's important to note that you can use pragmatism in purely qualitative, or quantitative, research. I have a friend who uses it for program evaluation, so it can be used in more than just research."

"So with pragmatism, you are free to choose whichever methods work best for achieving your objectives or answering your stated questions," Steve paused, "but it is important to have that reflection piece in order for the process to be actually pragmatic."

Winnifred and I both nodded. Winnifred piped up, "This reminds me of complexity science. You know, where knowledge is constantly emerging from our relationship with the world?"

I smiled at them both, and nodded before responding. "You're right. Pragmatism and complexity science are actually quite

compatible, but that's a conversation for another day I think."

I waved across the room to my grad student, who had just arrived. I thanked Steve and Winnifred for the engaging conversation and hoped I was able to make pragmatism, as a reflexive

approach, more accessible to them. Now on to introducing pragmatism to the next generation of students!

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Learning and Knowing are About Relationships with the World, Not Information Stored in the Head

Angus McMurtry

Abstract

Mainstream educational discussions are usually hamstrung by assumptions about learning as "acquisition" and knowing as correspondence between objective truths and subjective representations. Educators now have access to better ways of thinking about learning and knowing that transcend these old categories. Education is better understood as nurturing and engaging, and one that encourages students to construct coherent beliefs that interact effectively and ethically with their changing physical and social contexts.

Keywords

Learning, knowing, coherence, constructivism, complexity, sociomaterial

Résumé

Les discussions générales sur l'éducation sont souvent entravées par des hypothèses portant sur l'apprentissage comme « acquisition » et le savoir comme correspondance entre les vérités objectives et les représentations subjectives. Les éducateurs ont désor-

mais accès à de nouvelles façons de penser l'apprentissage et le savoir qui transcendent ces anciennes catégories. L'éducation est mieux comprise comme le soutien et l'engagement des étudiants dans le but de construire des croyances cohérentes qui interagissent de façon efficace et éthique avec leurs contextes physique et social en évolution.

Mots-clés

apprentissage, savoir, cohérence, constructivisme, complexité, sociomatériel

Many politicians and parents encourage teachers to return to traditional schooling practices, like mediaeval-style lectures or factory-like conditioning. As educators, we know that these approaches generally don't work very well. When teachers churn out the exact same information as in previous years while students try to stay focused, take detailed notes, and regurgitate facts on standardized tests, the result is usually disengagement and shallow understanding. Yet many of our schools, colleges, and universities still seem to follow this template. Why are we

stuck in this rut?

I think that one reason is a deeply entrenched misconception about learning and knowing. Since the ancient Greeks, we in the Western world have usually thought about knowledge in terms of correspondence between 1) objective realities out in the world and 2) subjective representations of them stored in our heads. Learning was thus about acquiring the correct representations while teaching meant *transmitting* these representations to students in the most efficient way possible (Osberg, Biesta and Cilliers, 2008). It is no wonder that early schools resembled mediaeval lecture halls or factories, and that good teaching was assumed to demand standardized lesson plans, passive students, and strict classroom management!

Of course, we do need some conception of learning and knowing in order to orient our actions as educators—even though it is unlikely that any one particular conception will provide a perfect or eternally true way of understanding something as complex as learning. The conventional, correspondence-based conceptions above, however, have led to stagnation in teaching practices. New and better ways to conceive of learning are needed if we are to move forward as educators.

Fortunately, in recent years, new theories of learning and knowing have emerged based on organic metaphors from biology, ecology, and philosophy. Associated with radical constructivism, pragmatism, enactivism, complexity science, sociomaterial, and posthuman thinking, these theories propose a more complex yet pragmatic way of understanding the relationship between knowers and the world.

In contrast to “folk theories” of acquisition, transmission, and correspondence, they describe human knowing as relating to the world in a similar way to how organisms relate to their environment, how lungs relate to the atmosphere, or how people relate to their workplace: They fit their current context. Human learning and knowing, from these new perspectives, are about how people adaptively reorganize their physical and mental structures to cope with their physical and social environments (Davis, Sumara & Luce-Kapler, 2015)¹. To say that people know something means that they can interact effectively with something—not that they have somehow acquired objective truths and stored them in their heads.

These new theories are sometimes referred to as *coherence* (vs. correspondence) theories of learning and knowing. Coherence is required in two ways. First, there is internal coherence, which admittedly is largely about beliefs in our heads. As constructivists assert, the relationships within our web of beliefs, or schema, are usually coherent and organized. We cannot, for example, believe both that $2 + 2 = 4$ and that $2 + 2 = 5$. However, these coherences need not represent or correspond with any objective truth in the outside world. Indeed, they can vary enormously between people. That is why views that are bizarre or repugnant to us may still be internally consistent—the way, for instance, that a bigoted person might link his views to simplistic interpretations of biology or

religious texts.

Second, and perhaps more importantly, there is external coherence. This is what we know must work or fit viably with our contexts. For instance, if I believe that I can fly and go up to the top of my building to test it, then my relationship with the physical world will not be viable for very long! But again, having knowledge that fits or is coherent with the world does not mean that we have acquired objective truth in our heads. It means that we have adapted effectively to our current purposes and contexts whether that is not jumping off a building or getting an A in English class (Osberg, Biesta & Cilliers, 2008).

This deceptively simple assertion actually undermines many entrenched Western assumptions about learning, knowing and teaching. In the first place, it transcends traditional binaries of objective and subjective and of mind and matter. These categories may make sense to those who think about knowledge in correspondence terms, that is, where students acquire mental representations that correspond with objective truths about matter in the outside world.

However, they are not very useful from a relational, coherence perspective. As pragmatists have long argued, we should start with our actual lived experience rather than abstractions of subjectivity and objectivity, or of mind and matter. What matters is which beliefs and actions work in our present contexts, what their practical and ethical consequences are, and how we reflect and revise our beliefs and actions in response to those consequences (Morgan, 2014).

This revisioning of learning and knowing has several implications. First, it better fits with the actual history of science. Science can produce tremendously useful knowledge, which is often called “objective truth”. As Kuhn (1970) has illustrated, however, scientific paradigms undergo regular and fundamental reformations as unpredictable consequences or anomalies accumulate. What scientists used to think of as objective truth usually turns out to be a limited yet useful tool. Much the same could easily be said about the knowledge generated by social scientists.

Second, these new views reframe the content we teach. Traditionally, subjects and disciplines were taught as facts—objective, unchanging truths that existed independently of human knowers. From a relational, coherence perspective, though, they are neither objective truths nor idiosyncratic, purely subjective inventions. Subjects and disciplines are understood as valuable, constantly evolving cultural tools and practices that help us to interact with the world in (hopefully) ever-more effective, nuanced, and ethical ways.

Third, our job as teachers is not to transmit facts, but rather to engage our students in the collective enterprise of human knowing. It is an enterprise that, like biological evolution, has no pre-ordained endpoint (i.e. final objective truth). Rather, it adapts, diversifies, and grows more complex over time. As teachers our focus should be on helping students to both explore current knowledge, and push the boundaries of that knowledge through

¹ Indeed, most of these theories assert that learning and knowing are not limited to individual humans. Enactivists see learning as a fundamental quality of all life; complexivists understand learning to occur at multiple levels—from cells to societies; and sociomaterial and posthuman theorists assert that learning and knowing are enacted through effective networks of influence among all actors, even non-living ones.

creative experimentation with the world.

Finally, we need to give up the notion that learning is a mechanical, predictable, and factory-like process. Instead, we should think of it as a living process of adaptation that we can nurture, guide and scaffold—but not dictate or determine. Our work as teachers is undoubtedly crucial for education, but the effect that our work has will ultimately be determined by the learner and her response to our efforts.

Fortunately, some eminent Canadian educational thinkers have suggested ways in which we as educators might work with these living processes. For example, Stanley (2009) describes how math teachers can *proscribe* supportive boundaries for learning

and interaction, but not *prescribe*, or control everything students think or do. Davis, Sumara and Luce-Kapler (2015) suggest several conditions for nurturing a classroom culture of learning. One example is designing group projects that create space for student diversity but also prompt them to share and build upon one another's ideas. Their approach advocates neither a return to traditional, rigidly structured classrooms, nor an embrace of "anything goes" pedagogy. As with all the ideas discussed in this article, they prompt us to transcend limiting dichotomies.

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Catherine-Laura Dunnington is a PhD Candidate in the University of Ottawa's Faculty of Education. She has been working with text and textile since she was old enough to hold a pencil. She had the privilege of teaching preschool for many years while working toward her Masters of Education degree at the

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More Than a Sweater: What Sociomaterial Learning Theories can Teach Us About our Classroom

Catherine-Laura Dunnington

Abstract

Every day, everywhere, children enter classrooms clothed. Yet, this ubiquitous classroom experience is at best tangentially acknowledged and most often pedagogically ignored. This article discusses how sociomaterial learning theories, those that deal with the complex interactions between humans, materials, systems, and knowing, provide a starting place as we consider the potential for including textiles in both our classroom consciousness and learning endeavors.

Keywords

sociomaterial; textile; cultural universal; clothing; complexity; craft

Résumé

Partout et chaque jour, les enfants entrent dans les salles de classe avec des vêtements sur le dos; pourtant, si cette expérience scolaire répandue est, au plus, tangentiellement reconnue, elle est le plus souvent ignorée pédagogiquement. Cet article discute de la façon dont les théories d'apprentissage sociomatérielles, celles

qui touchent aux interactions complexes entre les humains, les matériaux, les systèmes et le savoir, constituent un point de départ alors que nous considérons le potentiel pour inclure les textiles dans la conscience de la salle de classe et les efforts pédagogiques.

Mots-clés

sociomatériel, textile, universaux culturels, vêtements, complexité, artisanat

Almost everyday children around the globe enter millions of classroom spaces. It is a safe assumption to say each of these children is, in some fashion, clothed. Yet, we pay very little pedagogical attention to clothing or textiles. A classroom couch, a student's backpack, a rug, or a window hanging, are all examples of textiles already in many classrooms. Yet, the most readily available classroom textile—clothing—remains taken for granted.

There are problems in attending to clothing. One problem is that as we live in a diverse world where clothing, and our relationship to it, can signify difference as well as commonality. Another problem is that clothing covers bodies and talking about bodies is relatively delicate territory. We may all be clothed, but our clothing could indicate religious belief, socioeconomic difference, personal style, sexual identity, or even political affiliation (cite). We are touching on a topic that could, at best, spark sensitive conversation and, at worst, cause great divides.

Yet for me an even more important challenge looms large. On the whole we aren't craft artists anymore. Most citizens of Canada purchase their clothing from large clothing outfitters. We are far removed from the locations where sheep are shorn, cotton is milled, t-shirt patterns are cut, or denim is woven. It is no wonder we might feel daunted in turning our attention to clothing in the classroom. We as teachers may have little personal experience of crafting clothing to draw from, and apart from fashion magazines, very little writing attends to clothing either. How can we begin?

Sociomaterial learning theories are where I propose to begin. Generally speaking, this theoretical term can be thought of as the cloud of learning theories that deal with complex interactions among humans, materials, systems, and knowing. Sociocultural learning theories do this to some degree, but they ignore material interaction. Within this type of approach to learning, the term "material" is understood as the tools, actions, objects, technologies, and bodies (human, animal, and collective) that we interact both with and from (Fenwick, Edwards, & Sawchuk, 2011). So, concretely this means that we are learning from the people and culture around us (socioculturally) but also from the messages on t-shirts, from the experience of bumping our toe on a bureau, and from the type of hammer we choose for a home improvement project (sociomaterially).

Material learning theories may be used to understand discourse and text (e.g. books and conversations) but do more than simply analyze content. A sociomaterial learning theory is interested in the *material* book, not just the words on the page. This includes the author of the text, yet also the paper selection, the acidity of the ink, the people responsible for printing and binding a particular text, and even the physical weight of the book in hand. In each of these learning theories, the material is

understood as something "entangled in meaning, not assumed to be separate from it" (Fenwick et al., 2011, p.vi)

The learning theory I find most helpful for discussing textiles in classrooms is actor-network theory (ANT). Rooted in the 1980's and the work of Bruno Latour, ANT pays particular attention to the role of the material in matters of knowing and practice. Latour (2005) might say that knowing something is really a complicated network (like a messy web) of effects and translations between both materials (the non-human) and people (the human) actors. The material matters. Latour (2005) claims that changing any tool or material in an interaction always changes the learning and accompanying social interaction. The instruments or materials change what is known. So, the non-human actor (the material) participates in the knowing just as much as the human actor (the person). The interaction between these two spaces, material and human, is what forms the basis of what we "know" and what enacts knowing. Knowing is the entanglement of material and human.

Below I provide an illustration to help us visualize the complex nature of clothing a child wears as she enters a classroom (Fig. 1). If we return to our discussion of ANT, then we can think of the clothing (material) interacting with the child (human actor) to make form learning interaction. If we take each item at face value, we might simply see a student entering, carrying a gift. However, each layer of material and interaction bears on the meaning made in the classroom space. For example, consider the "hand knit wool cardigan" she wears.

If we know that the cardigan was knit by a deceased grand-mother, our knowledge of the cardigan's context greatly increases. We can imagine that wearing it brings the girl memories or thoughts about her grandmother. We can further imagine that these could be positive or negative memories as she may have had good or bad experiences with her grandmother. We might also imagine that this child's cardigan is itchy or that her mother insists she wear it. The color of the sweater may not be



Figure 1: A child entering a classroom as a complexly clothed individual. *Peony Girl* Illustration credit to Robin Clugston® 2017. All rights reserved.

her favorite, yet a friend of hers might think it is beautiful. These imagined complexities bear on the cardigan's use and meaning. Additionally, they go further and bear on what we might imagine she learns.

For example, it might be difficult to learn when she is thinking of her grandmother. Biologically, itchiness might make her distracted and unable to focus on the task at hand. The friend of hers who enjoys this cardigan might offer to share math solutions. All these influences stem from a material-human interaction and the web of learning that both unfolds and spreads is bound by the context of this child, this sweater, and this moment of interaction. The layered, complex nature of the item is an example of a sociomaterial entanglement that may be enacted in the classroom (or in life). We could expand the example to include each item labeled in Figure 1. Changing the context and interactions for any item changes its meaning as well.

The intersection of the imagined child in Figure 1 and our discussion of actor-network theory is a space of opportunity for the classroom teacher. As we attend to these entangled material/human interactions we begin to see how objects are part of our teaching and learning practices (Thompson & Adams, 2013). For the teacher, attending to textile materials means attending not only to our imagined student, or her sweater, but the two together. Through this attention we might see the complexity of our students' experiences in our classroom as well as our own. It might be a simple change such as not asking our imagined student to remove her sweater indoors. It might be a complex change, such as noticing the clothing each student wears and acknowledging how it might impact their learning in our more reflective teaching moments.

I do not propose it is simple. However, in acknowledging the meaning and knowledge that come from the entangled materials (and in particular clothing) of students, we begin to unwrap the possibilities they have for learning, knowing, and curriculum.

An Invitation

I have struggled to decide how best to close this article. I have landed on an invitation. As it is clearly my wish that educators turn their attention to clothing, I am thus tasked with assisting each of you to do so. To best achieve this, I ask you to open your own closet. Find an item of clothing you have that requires mending: as a pair of pants with a small tear, a skirt with an ink stain or perhaps a few holes in a beloved pair of socks. I invite you try fixing it. Turn your attention to this item of clothing, how it bears meaning, and how you can interact with it to change it. It might be that you take your pants to the tailor. It might be that you purchase fabric paint and get creative with the ink spot. Or, for the adventurous of heart, you might just pick up a needle and thread and do your best to darn the holes in your socks. If the hole stays closed you've done it right, no matter how it looks.

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Learning Styles: Why Teachers Should Forget About Them and Instead Focus on Differences That Matter

David Trumpower

Abstract

Developing instruction to match student learning styles remains popular among educators despite the lack of reliable evidence to support the practice. In this paper, it is argued that teachers should abandon the concept of learning styles and instead focus on empirically-verified differences that really do affect learning. More fruitful factors (i.e., differences that matter) to consider when planning instruction to support learning for all are presented.

Keywords

learning styles; instructional planning; pedagogical strategies; teacher practices; learning

Résumé

Le développement d'un mode d'instruction qui convienne aux styles d'apprentissage de l'étudiant demeure populaire auprès des éducateurs, et ce, malgré un manque de preuve fiable qui appuie cette pratique. Cet article soutient que les enseignants devraient délaisser le concept des styles d'apprentissage pour plutôt se concentrer sur des différences dont les répercussions sur l'apprentissage ont été prouvées empiriquement. Nous présentons des facteurs plus fructueux (c.-à-d. des différences réellement importantes) qu'il importe de considérer pour une planification pédagogique qui favorise l'apprentissage de tous les étudiants.

Mots-clés

styles d'apprentissage, planification pédagogique, stratégies pédagogiques, pratiques pédagogiques, apprentissage

Do students learn differently? It sounds absurd to even ask the question. Of course, all students learn differently—they learn at different rates, with various levels of motivation, and have different interests and skills. But, do they have different learning styles?

When I first meet a new group of teacher candidates, I ask one of them to describe how the human circulatory system or respiratory system works. After hearing their explanation, I ask them if it was a description of men or women, or if it was of introverts or extroverts. Invariably, they'll say that these human processes work the same for everyone. But, when I then ask them how human learning occurs, they'll claim that we all have different learning styles. They'll state that some people are visual learners who need to see pictures, diagrams, and graphs to learn things best, whereas others only learn effectively if they do hands-on activities. Some learn best by listening to verbal explanations or having a discussion, whereas still others learn best by reading on their own. Some students even go so far as to claim that they can only learn if information is presented in a certain way. The popular conception of learning styles is that we each have an optimal style of learning (most typically distinguished as "visual",

“verbal”, “auditory”, or “kinesthetic/hands-on” learning styles, although other classifications such as “abstract” vs. “concrete” are also common), and that learning occurs best if the to-be-learned content is presented in a corresponding manner.

Indeed, this idea is so entrenched in the field of education that it is often thought of as a basic tenet of learning. One study reported that as many as 90% of educators believed this (Macdonald, Germine, Anderson, Christodoulou, & McGrath, 2017). Yet, several large-scale reviews of the literature have failed to find empirical support for this popular notion of learning styles (Pashler, McDaniel, Rohrer, & Bjork, 2008). Simply put, there has of yet been no sound evidence that teaching in a way that corresponds with one’s supposed learning style (whether a self-identified preference or empirically determined individual difference in how one processes information) leads to more successful learning outcomes than if it did not. Despite the plethora of assessment instruments that claim to be able to identify one’s learning style, evidence shows that these instruments lack reliability and validity (Kirschner & van Merriënboer, 2013). This is not to say, however, that our students do not differ in many other ways that we can capitalize on to facilitate learning. They most certainly do! So, why then do teachers, students, and parents focus so steadfastly on the idea of learning styles? And, why does it matter if they do?

The two main propositions of this paper are that a) teachers should be discouraged from considering the popular, yet unsupported, concept of learning styles when planning instruction, and b) there are other evidence-based differences—in students, in pedagogical strategies, and in the to-be-learned content itself—that teachers should instead focus on in order to support learning for all students.

Why We Should Abandon the Concept of Learning Styles

Even if there is no firm evidence to support the concept of learning styles, why should we discourage teachers from considering it? If a teacher wants to identify some of his students as visual, some as verbal, and others as kinesthetic learners, and then develop three versions of all of his lessons—one visual, one verbal, and one kinesthetic—why not? Surely, it’s not harmful, is it? Actually, I believe that it is for several reasons. At the very least, it is likely to divert valuable time and effort away from differences in the classroom that really matter with respect to learning, which I’ll talk about later. Let’s take a look at some other reasons why consideration of learning styles should be discouraged.

Labelling of students. For one, belief in learning styles can result in labeling of students, often self-imposed. Such labels as ‘visual learner’ or ‘concrete learner’ can provide ready-made excuses and limit expectations about learning potential. For instance, how many teachers have heard utterances like, “I don’t get anything from class discussions and lectures because I’m a visual learner,” or, “She could never be a mathematician because she’s too much of a concrete learner”? Such beliefs that one is this or that type of learner can initiate self-fulfilling prophecies.

Shallow learning. Second, attempts at creating instruction to match or span different learning styles can lead to shallow learn-

ing and a focus on irrelevant or superficial aspects of to-be-learned content. For example, imagine a History class learning about World War II. A teacher influenced by learning styles might ask kinesthetic learners to re-enact a crucial event of WWII, verbal learners might be asked to write a synopsis of the event and explain its relevance to the outcome of WWII, while visual learners might be asked to create a poster illustrating a key scene from the event. While these activities might be very engaging for the self-identified kinesthetic, verbal, and visual learners, it is unlikely that the activities lead to the same level of learning. Whereas the re-enactment and poster could be mere reproductions of something seen before in a movie or in a book, the written synopsis requires a deeper understanding of the significance of the event. It is very tempting to provide feedback on such activities that miss the mark with respect to intended learning outcomes, such as commenting on the creativity or emotion displayed in the re-enactment, and the artistic ability or visual impact of the poster. Because it is easy to create activities that use a specific sensory modality, teachers can be misled into thinking that they are helping learners of a specific learning style even though the activities are not necessarily supportive of meaningful learning. Worse yet, differentiating based on learning styles might even shift focus to an altogether different skill.

Overload. Third, although providing to-be-learned information in multiple ways (e.g., text and video of the same information) to appeal to each learning style may seem like a good idea, it can actually create cognitive overload. Research based on Cognitive Load Theory (van Merriënboer & Sweller, 2005) reveals that redundant information presented in multiple modalities can actually impair learning under certain circumstances. Further, a belief that one needs to create instruction that connects with all of the possible learning styles in a classroom may also overburden teachers.

Non-critical adoption of teaching methods. Finally, and perhaps most importantly, in an age where “alternative facts” are being adopted if they are voiced loudly and frequently enough, it is important that teachers and faculties of education not send the message that it is okay to believe in ideas that “just sound right” despite the lack of solid evidence. Allowing teachers and faculties of education to continue teaching and incorporating learning styles in their classrooms is troubling for this reason. As a community responsible for the professional development of future educators, it is imperative that we encourage a lifelong commitment to critical inquiry.

Refocusing on Differences That Matter

If it is not different learning styles that matter, then what are some differences that might be taken into consideration to support learning? Four suggestions follow that, unlike learning styles, have been supported by empirical evidence to foster learning. These and other factors that support student learning are documented in the *APA Coalition for Psychology in Schools and Education* (2015).

Differences in students’ prior knowledge, interests, and motivations. Knowing what students already know, enjoy, are

biased about, or motivated by provide a teacher with useful suggestions about where to begin and focus a lesson. For example, students with less prior knowledge can benefit from more structured learning, such as that provided by advance organizers, worked examples, and scaffolding. Students with more prior knowledge may benefit from less structured learning, such as unguided discovery learning, or problem-solving activities (Kalyuga, 2007). Pairing students of higher and lower prior knowledge can be beneficial in collaborative learning exercises. Difficult concepts can be better grasped when they are presented in a familiar context, and learning is more effective when it is meaningful to the learner. Indeed, in a meta-analysis of teaching strategies in science, Schroeder, Scott, Tolson, Huang, and Lee (2007) found that instruction in which new material was related to students' prior knowledge, experiences, and interests had the largest effect on learning of all those teaching strategies examined. All of this highlights the importance of diagnostic assessment—finding out what students know, what they don't know, what interests them, and what motivates them—not what their learning style is.

Differences in metacognition. Students who recognize their own learning successes and areas for improvement, and who have developed effective learning strategies to apply to those areas in which they need improvement, are more likely to achieve their learning goals than those who don't. This is one of the primary intended outcomes of formative assessment—to help build students' metacognitive abilities and become self-regulated learners. Research has confirmed the benefits of providing students with formative feedback and providing activities that help students recognize when they have or have not achieved meaningful learning (Black & Wiliam, 1998). Metacognitive activities, such as self-explanation and critical reflection of to-be-learned concepts, help students construct coherent understanding, and monitor their success in doing so (Lin, 2001). Such assessment, both for and as learning opportunities, provides students with greater insight into how they learn than do tests to identify their preferred learning style.

Differences in context and perspective. Nearly everyone has experienced the situation whereby they learn something in class but are then thoroughly stumped when they have to apply it outside of class. This observation is confirmed by many studies showing the difficulty of transfer of problem solving strategies and other knowledge to new contexts. However, other research (Ormrod, 2011) shows that transfer to novel contexts—the hallmark of meaningful learning—is more likely when students are provided a wide range of examples and practice, when contexts are familiar and relevant to the student, when generalities across contexts are highlighted, and when multiple strategies and perspectives are considered. This suggests that time spent trying to create activities for multiple learning styles would be better spent elsewhere. By developing multiple examples of to-be-learned concepts, soliciting different solution strategies, and considering new concepts from multiple perspectives, teachers spend their time efficiently. It would also be helpful to compare and contrast these different strategies and perspectives to recognize

the important commonalities (and irrelevant differences) that help students develop transferrable, practical knowledge.

Differences in to-be-learned content. Perhaps the most easily overlooked differences that can have an impact on learning are differences in the to-be-learned content itself. If you want to help students learn about literary conventions, it's probably best to have students read and write; if you want to help them learn about art, you'd be better off showing them some pictures. Although these two examples are obvious, the point is that for most concepts there are certain instructional strategies that can help *all* students learn about them, regardless of learning style. Even if only 10% of students in a science class identify themselves as visual learners, the entire class is likely to benefit from seeing a well-constructed demonstration or video of a vehicle driving off a cliff to highlight vertical and horizontal motion. Critical examination of the to-be-learned content and associated learning goals can suggest more effective ways of engaging with the content than simply trying to create visual, verbal, auditory, or kinesthetic alternatives for every lesson.

Conclusions

The widespread adoption of learning styles in education today, while based on little to no empirical support, is nonetheless understandable. It is intuitively appealing, and it is likely a backlash against traditional teaching and assessment practices that were heavily comprised of lectures, rote memorization of facts, and assessments requiring predominantly written responses. But, resorting to creating lessons and assessments based on different modalities to cater to individual learning styles is not the solution. Fortunately, there are good teachers and sound research that have revealed the differences that really do matter for promoting meaningful learning.

By buying into learning styles, we ignore evidence, perceive limitations on our students' capacity to learn, and likely impede their learning by diverting our valuable time away from more effective instructional planning. We should instead focus on differences that really do matter, such as students' prior knowledge, interests, motivation, and metacognitive abilities, as well as the to-be-learned material itself and the context and perspectives through which it is presented. This latter approach is based on the view that all students are capable learners and it enables us to set the appropriate conditions in which they can do so.

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