Learning for a World of Constant Change[1]:
Homo Sapiens, Homo Faber & Homo Ludens revisited

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The educational needs of the 21st century pose a number of serious problems for current educational practices. First and foremost, we see the 21st century as a time that is characterized by constant change. Educational practices that focus on the transfer of static knowledge simply cannot keep up with the rapid rate of change. Practices that focus on adaptation or reaction to change fare better, but are still finding themselves outpaced by an environment that requires content to be updated almost as fast as it can be taught. What is required to succeed in education is a theory that is responsive to the context of constant flux, while at the same time is grounded in a theory of learning. Accordingly, understanding the processes of learning which underwrite the practices emerging from participation in digital networks may enable us to design learning environments that harness the power of digital participation for education in the 21st century.

For much of the 20th century, learning had focused on the acquisition of skills or transmission of information or what we define as "learning about." Then, near the end of the 20th century learning theorists started to recognize the value of "learning to be," of putting learning into a situated context that deals with systems and identity as well as the transmission of knowledge. We want to suggest that now even that is not enough. Although learning about and learning to be worked well in a relatively stable world, in a world of constant flux, we need to embrace a theory of *learning to become*. Where most theories of learning see becoming as a transitional state toward becoming something, we want to suggest that the 21st century requires us to think of learning as a practice of becoming over and over again. This paper, then, is an effort to embrace change and focus on becoming as central and persistent elements of learning.

In order to understand both what that means and how it might be achieved, we need to examine some of the recent transitions in learning which have emerged in the 21st century. In particular we need to consider several dimensions of learning (knowing, making, and playing) that have taken on new, more distributed forms in the networked age.

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The Death of the Reader

The second half of the twentieth century witnessed a radical transformation in the nature of authorship. From Barthes and Foucault's discussions of the death of the author to reader response theory, there has been a radical reformulation of the ways in which we conceive of the process of reading. Indeed, in many ways the movement away from the sole authority of an author's text to a publicly interpreted version of that text marked by Roland Barthes' work in the 1970s has introduced the idea of reading as a social practice, rather than individual practices, and opened up the idea of interpretation as something done by communities rather than individuals.

When Barthes and others declared the author dead, they were describing a paradigm shift that moved from the transmission of meaning toward active interpretation. What we are [2]witnessing now, with new media, is a second transformation, marked by a shift from interpretation to participation (Jenkins, 2006). In just the past ten years, we have seen that change happen throughout the world of journalism, with news itself first being seen as factual, later being seen as interpretive, and with the emergence of the blogosphere, finally being seen as participatory.

In a remarkable reflection on new media, Andrew Sullivan discusses how it is that blogs are beginning to remake the landscape of journalism: "The blogger can get away with less and afford fewer pretensions of authority. He is—more than any writer of the past—a node among other nodes, connected but unfinished without the links and the comments and the track-backs that make the blogosphere, at its best, a conversation, rather than a production." (Sullivan, 2008)

The transformation that Sullivan is reflecting upon is not simply a change in readership, access or feedback. It is a structural transformation in the way that communication happens and in that transformation is as dependent on the experiences of the audience as it is on the text the writer produces. In blogging, authorship is transformed in a way that recognizes the participation of others as fundamentally constitutive of the text. It is not an author writing to an audience, but, instead, a blogger facilitating the construction of an interpretive community. But beyond that Sullivan draws two parallels to music, which begin to reveal a sense of what new media may be about. The notion of the author has been transformed not only in relationship to the reader, but also in function. He writes, "There are times, in fact, when a blogger feels less like a writer than an online disc jockey, mixing samples of tunes and generating new melodies through mashups while also making his own music. He is both artist and producer—and the beat always goes on." It is that first comparison we want to discuss as the framework for a new form of interactivity that new media invites, possessing an inherent malleability that is directed toward social ends.

As important, however, is the second comparison Sullivan makes between new media and music, "To use an obvious analogy, jazz entered our civilization much later than composed, formal music. But it hasn't replaced it; and no jazz musician would ever claim

that it could. Jazz merely demands a different way of playing and listening, just as blogging requires a different mode of writing and reading. Jazz and blogging are intimate, improvisational, and individual—but also inherently collective. And the audience talks over both." In contrast to Sullivan (who is writing as a blogger), our goal is to explore that aspect which is inherently collective and to understand the structure of that participation.

The act of participating in new media provides a set of experiences that is fundamentally different from the experience one gets from engaging with tradition forms of media (particularly broadcast). We believe that the ways learning happens in the context of new media is also fundamentally different. Where broadcast media, as a one to many system, presumed that learning was a function of absorbing (or interpreting) a transmitted message, new media presumes learning to be a process of engaging with information and using it *in a broader social context* as a crucial part of what we describe as "productive inquiry."

The notion of productive inquiry dates back to John Dewey's pragmatism and certainly applies to notions of older, broadcast media as well. But the social framework of new media begins to open up an aspect of productive inquiry unimaginable and unavailable in Dewey's time. As we read Dewey, perhaps the single most important aspect of productive inquiry is the ability to engage the imagination. The infrastructure of new media has enabled the fusion of network technology, communities of interest and a shared sense of co-presence, resulting in emergence of what we have deemed a "networked imagination."

If the paradigm for learning in old media is a notion of direct transfer, the question that interests us most is "what does a theory of learning look like for collective, social, and participatory media?"

To get at that question, we believe it is necessary to understand the epistemological foundations of social and collective participation, to understand how people are learning in the social context of new media. In doing so, we examine learning in the context of three frames: knowing, making and playing.

The goal of this paper is to advance three central theses. First that the world of the 21st century is characterized by a sense of constant change and that such a landscape requires us to further rethink our notions of interaction with new media toward a deeper understanding of participation (knowing) as in the Andrew Sullivan story. Second, how the notion of experience (and participation) within new media contexts has shifted from a traditional sense of experiencing content to using content as context to construct a social world with others (making) . Third, understanding how networked media supports a kind of play (playing) that allows people to navigate the complexities of a constantly changing world. What may be most important to understand is that each of these dimensions of learning are in the process of evolving in response to the demands of the 21st century. In a world of flux, knowing, making, and playing emerge as critical components of *becoming*.

Three Perspectives on Learning

In the opening pages of *Homo Ludens*, Johan Huizinga suggests that the relationship between play and culture may be more complicated than we have suspected. It was a concept that was prescient in 1933 when the work was written and has only begun to find full expression in the digital world. In fact, the premise of Huizinga's book is that culture emerges from play and that all of our most vital cultural elements, indeed the very notion of the sacred itself, emerge from the basic human instinct for play. We contend that Huizinga offered a fundamental insight which is now more relevant than ever to learning. Our effort is an attempt to reconcile the theoretical notions of knowing, making, and playing through an understanding of the affordances that new media provides. In doing so, we contend that there is something special in networked media that illuminates not only how important each of these three concepts are for knowledge construction, but that the interactions of these ideas shows us just how powerful these tools are for establishing a theory of learning.

Much of the recent thinking about learning and new media has focused on the concept of transfer, with the primary question being "does information from the digital world transfer to the real world?" Games in particular have been subject to this test and much of the literature on games and learning has been directed at either answering that question (arguing for transfer) or reframing it (arguing that different things may transfer than what is supposed). Our position is different. We believe the basic assumption of knowledge transfer is wrong. It is, quite simply, not how learning works.

In particular, we draw upon the work of Michael Polanyi who suggests that knowledge itself is always composed of both an explicit dimension and a tacit dimension. In that sense, to view knowledge as an object, divorced from experience and embodiment (the central elements of the tacit dimension) is to fundamentally misunderstand the nature of knowledge. One of the primary consequences of Polanyi's insight is that if knowledge is not objectifiable, it is not capable of being transferred as suggested by most traditional education paradigms. If we can not divorce the explicit dimension of knowledge from the tacit, then knowledge transfer begins to lose its conceptual coherence. *This is especially true as we think about knowledge in a rapidly changing world.* In a stable world the part of the tacit that could be made explicit was made explicit (through the social processes of science, etc) and that part of the tacit that was truly tacit became a part of the shared practices of the (epistemic) community. These slow maturation and absorption processes don't work as well in a world of rapid change and are being transformed (often unwittingly) with new media with fluid genres, new practices and networked infrastructures.

Perhaps as important is the shift that occurs when we begin to take the idea of the tacit seriously. The tacit begins to honor the social dimension of knowledge that the explicit

does not. In order to understand the ways in which tacit knowledge enables learning, we need to also understand the domains in which people act. We can think about these in terms of three basic domains of human behavior which correspond to mind, body, and imagination. Within these domains, we identify three kinds of practices: knowing, constructing and playing. When we look to new media, we can begin to see social contexts in which knowing, constructing, and playing all start to emerge as central elements of learning and that the structure of learning within these new contexts are related to the interaction of these terms. These three domains of learning, also correspond to three broader frames: *Homo Sapiens* (human as knower), *Homo Faber* (human as maker) and *Homo Ludens* (human as player).

While Huizinga focuses on the notion of playing (*Homo Ludens*), rather than knowing (*Homo Sapiens*) or making (*Homo Faber*), it is our contention that it is the combination of all three and their interaction within a social and participatory context that deserves critical attention. In what follows, we map out the affordances of these three fundamental domains and then provide a model for how we might understand their interactions in the networked world.

Homo Sapiens

As the term itself suggests, *Homo Sapiens* or "knowing (hu)man" or "(hu)man as knower" is a fundamental statement about what it means to be human. It is also an ontological statement about learning. The past decade has ushered in substantial changes in how we think about what it means to learn, based primarily in the context of rapid change in our networked world. There are three senses in which learning happens in relation to change. The most basic sense is "learning about" which corresponds to contexts in which information is stable. We learn about things which are stable and consistent and not likely to change over time. The second sense is "learning to be," which requires engagement with an epistemic community and provides a sense of enculturation in practices which allow one to participate and learn how to learn and even shape practices within that community. The third sense, which emerges out of a context of rapid and continual change, is a sense of *becoming*. This sense of learning is itself always in a state of flux, characterized by a sense of acting, participating, and knowing. Like the changes we describe in the structure of knowledge above, becoming (unlike learning about and learning to be) is responsive to context, rather than content. As the context changes, so does one's sense of becoming.

There are two elements of new media which are worth pointing out, both of which depend on realizing the ways that, as Henry Jenkins discusses, new media is at base a participatory culture. The first requires us to think more directly about what we mean by "knowing," particularly in the context of the 21st century.   New media provides a sense of agency. In an Internet based world, how we know things (e.g. what sources of information we give authority) is become increasingly complicated. In a context where knowledge is ever shifting and in a process of continuous flow, how we know things (and

how we know what we know) has become more important to us than the factual status of information itself. In most areas of human activity, knowledge is both contingent and in flux. We expect "facts" to change on a continuing basis, because they are facts about a changing world and because we have a technological infrastructure that can support rapid updating of information without high material costs. This shift demonstrates an increasing importance to the context of information. Much of the 20th century information infrastructure focused on accuracy, the *what* of information. New media technologies, while not losing site of the *what*, force us to consider both the *where* (what is the authority behind the information) and the *when* (is the information current and relevant to my particular problem). This warranting of information signals, again, the importance of the tacit dimension of knowledge, the things which cannot be rendered explicit, but which form a large part of the basis of what it is that we know. Equally important, these factors depend almost entirely on the social context of the information, which is also the driving force for shaping one's sense of becoming.

As a result, we would argue that there has been a shift in the practices around these new forms of learning. While the traditional model of learning has been grounded in the concept of "learning about," the idea that knowledge is something to be studied and accumulated, new theories of learning have begun to understand the affordances in the networked world that privileges notions of "learning to be," the ability to put the things we learn into action, often within the context of an epistemic community or community of practice. But neither of these has yet embraced the concept of "becoming" as an epistemic foundation for knowing. Futhermore, although the tightly bounded social context of communities of practice and communities of interest facilitate a sense of perceived permanence or continuity over time (established by and communicated through shared practices), the relatively unbounded space of the networked world unmoors learning from a particular trajectory. Where a participant in a culture who is learning to be a doctor may not know exactly what that entails, they have a sense of being enculturated into a set of practices that are generally shared among group over a period of time. In the case of today's world, with the continual sense of becoming, there is no telos directing that sense of learning. The learning itself is the practice of participating and that participation is constitutive of the social context in which the learning takes place. It is not only the act of participating that is valuable, but it is the ways that participation allows one to respond to and even construct the context in meaningful ways through the imagination. The purpose, then, is defined by the context, which is continually changing and being remade with each act of participation. These communities of becoming themselves are rich constructs that fuse notions of interest, technological infrastructure, and co–presence (often in the form of joint work) into the idea of a "networked imagination." Thus this sense of becoming is both afforded by and amplified by *participation in the networked imagination*.[3]

Participating in a networked imagination throws the distinction between learning to be and becoming into relief. Learning to be involves enculturation into a set of practices rather than stockpiling knowledge. Becoming involves a rich and deeply intuitive

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[3] For a more detailed explanation of networks of imagination see, Thomas, D & J S Brown, "The Play of Imagination: Extending the Literary Mind," *Games & Culture* Vol. 2, No. 2. (1 April 2007), pp. 149-172.

understanding of the tacit, by engaging knowledge, construction and imagination through the act of participation. The end result is not knowledge per se, but a new set of tools for looking at the world and engaging in inquiry, hopefully productive inquiry. Becoming, then, becomes a powerful subject position from which to manage and embrace the flux and constant change which is beginning to shape and define the world of the 21st century.

Homo Faber

In contrast to *Homo Sapiens*, *Homo Faber* is "(Hu)man as maker," stressing our ability to create. This is perhaps the one of the most important and transformational elements of the networked world and provides a unique set of affordances for understanding the relationship between new media and learning. As new media has evolved it has increasingly tended toward providing agency to users, allowing them to creatively express themselves, often within a context that allows for commentary, feedback, and criticism. *Homo Faber* is more than simply making; it is making within a social context that values participation. It is akin to what Michael Polanyi has described as "indwelling," the process by which we begin to comprehend and understand something by connecting to it and, literally, living and dwelling in it. In that way, making also taps into the richness of becoming. We learn through making, building, and shaping not to produce something static, but to engage in the process of participation. In fact, we may go so far as to say, there can be no sense of becoming, particularly as it relates to learning, without the dimension of *Homo Faber* as indwelling.

The richness of Polanyi's concept marks a fundamental transformation in what we think learning is. Rather than thinking of learning as an accumulation of knowledge with as an object or endpoint, Polanyi's framework invites us to think about the process of learning as *knowing*, exploring both the explicit and tacit dimensions of knowledge. As he writes, "We may identify, therefore, our knowing of something by attending to something else with the kind of knowledge we have of our own body by dwelling in it" (Polanyi, 1974, p. 142). Polanyi posits that we come to understand and to comprehend the particulars of an object only when we dwell in the "coherent entity" that they, the particulars, jointly constitute. Or put differently, *Homo Faber,* constitutes *knowing* as an embodied set of experiences that we create through our practices of being in the world and attending to things in the world through our experiences with them. To know something *deeply* is to understand the explicit dimension though our embodied engagement with its tacit dimension.

New media opens up the possibility of this kind of deep knowing by providing the agency to participate, create and build, with the recognition that building is always being done within and also continually creating and remaking a social context. Most critically, within the context of a networked imagination, making is a creative process which shapes the social context in which the creation itself has meaning.

In doing so, we can begin to see *Homo Faber* as creating an epistemology which is centered on *knowing and becoming*, rather than knowledge and being and which takes

practices of fabrication, creation and participation as the cornerstones of learning. Accordingly, *Homo Faber* no longer divorces knowledge from knowing, or explicit from tacit understanding. Instead, *Homo Faber* invites us to think about the ways in which the two are inherently connected and supplemental to one another. Through creating we come to understand and comprehend the world, not merely as a set of object, artifacts, or creations, but as coherent entities which we come to dwell in and which we make sense of the "jointness" and interconnection of the parts that constitute the whole, both at the explicit level of the object itself and at the tacit level in terms of its social context and relations. It is this level of tacit knowledge, that which is known, embodied and most importantly *felt* that begins to constitute a basis for a new understanding of learning.

Homo Ludens

The third element, *Homo Ludens*, "(hu)man as player," is perhaps the most important, yet overlooked, element of understanding our relationship to new media. Huizinga's thesis is that play is not merely central to the human experience; it is constitutive of all that is meaningful in human culture. Culture, he argues, does not create play; play creates culture. In almost every example of what he describes as the sacred, play is the central and defining feature of our most valued cultural rites and rituals. As such, for Huizinga, play is not something we do; it is who we are.

To truly understand the connection between play and learning, we need to fully grasp how play puts us in a different mindset. Play is a complex and complicated idea, which is usually held in opposition to most of what have been considered the most stable pillars of learning in the 20$^{\text{th}}$ century. Play is thought of as the opposite of work. It is fun, rather than serious. Its connection to learning is often seen as secondary or incidental.

Play, we want to argue, pace Huizinga, is probably the most overlooked aspect in understanding how learning functions in culture. It is easy to identify spaces in which networked culture provides opportunities for play, video games being a clear example. But thinking about play as a cultural disposition, rather than as merely engaging with a game, reveals something more fundamental at work. Much of what makes play powerful as a learning environment is our ability to engage in processes of experimentation, which becomes the gateway to opening up the imagination. All systems of play are, at base, learning systems. They are ways of participating in complicated negotiations of meaning, interaction, and competition, not only for entertainment, but also for the making of meaning. Most critically, play reveals a structure of learning that is radically different from what most schools or structured learning environments create, one which is almost ideally suited to the notions of flux and becoming that we have outlined throughout.

In play we are presented with yet a third perspective on learning in a world of constant flux. In the case of play, the process is no longer smooth and progressive, but is constituted by a gap between the facts or knowledge we are given and the end result or outcome we wish to achieve. This dynamic accelerates in the context of flux and rapid change, where stable paths and linear progression are no longer viable. As Espen Aarseth describes the dynamic it is one of *aporia* and *epiphany*. As Huizinga lays out the

framework, it follows the structure of a riddle. In both cases, the information provided is insufficient to reach a conclusion about meaning or knowledge. What play provides is the opportunity to leap, to experiment, to fail, to fail and continue to play with different outcomes or to "riddle" one's way though a mystery. That leap that you take is more than simply a means to cross the chasm between what you know and what you want to achieve. It is as both Aarseth and Huizinga suggest an *organizing principle*. Figuring out a riddle is more than simply getting the right answer. It is an answer which organizes and makes sense of the riddle. In that sense, our understanding comes not from a linear progression, but, instead, by imagining the problem from all angles, but ultimately seeing its logic only at the end. Riddles make sense only retroactively. That is the nature of an epiphany.

Likewise, for Aaresth, an *epiphany* is more than an answer. It is a moment which throws all that has come before it into sharp relief, by making sense of a progression which may have seemed disorganized, disheveled or even nonsensical up until the moment when some greater understanding is reached and its meaning is revealed *by* the player. And which couldn't happen without the playfulness of mind required to see things in a non-linear or non-causal way.

Perhaps most critical in this sense of play is the way in which the sense of agency emerges. Where traditional notions of learning position the learner as a passive agent of reception, the aporia/epiphany structure of play makes the agency of the player central to the learning process. How one arrives at the epiphany is always a matter of the tacit. The ability to organize and make sense of things is a kind of "attending to" characteristic of the tacit dimension.

The value of play is never found in a static endpoint, but instead in the sense that the player is always in a state of becoming. Whatever it is that one accomplishes in play, it is never about achieving a particular goal (even if a game may have an endpoint of end state). It is always about finding the next challenge or becoming more fully immersed in a state of play. What we do in play may best express the sense of becoming.

This sense of play then provides us with a third, and very different, sense of learning. One which is neither about the process of learning to be, or an embodied sense of indwelling (though it may be consonant with either or both), but which is structurally different in how it organizes our understanding and comprehension of the world. In play, learning is not driven by a logical calculus but, instead, by a more lateral, imaginative thinking and feeling. In sum, playing, like making and knowing, derives its power from the tacit dimension.

Three Perspectives as a Framework for Learning

If we examine each of these three perspectives independently, we can see how each might produce a framework for learning in a stable world.. *Homo Sapiens*, for example, is well suited to thinking about learning as reflection, while *Homo Faber* can be

understood as a constructivist approach a la Seymour Papert, which values putting the learner in contact with the tools they use to build. Likewise, *Homo Ludens* may fit into paradigms of situated learning, as has been suggested by Jean Lave and others. The framework we propose is an illustration of how each of these three elements needs to be understood and reinterpreted within the context of constant change and becoming. Accordingly, when merged, these three perspectives point to an increasing focus on tacit knowing as the key to understanding learning in the 21st century.

Our goal is neither to reinvent nor critique theories of relection, constructivism or situated learning. Instead, we see this world of constant flux as an opportunity to problematize the very notion of what it means to learn as well as to better understand what these kinds of new practices tell us about learning more generally. Put differently, each of these tells us something valuable about the process of learning, but there has been a tendency to view these almost exclusively as the transmission of explicit forms of knowledge. While each of these perspectives may identify and be identified with certain practices, none of them has fully considered the implications of tacit learning.

The potential revolution for learning that the networked world provides is the ability to create scalable environments for learning that engages the tacit as well as the explicit dimensions of knowledge. The terms we have been using for this, borrowed from Polanyi, is *indwelling*. Understanding this notion requires us to think about the connection between *experience, embodiment*, and *learning*.

While we have known that these elements are connected on a deep level from the early works on experience and learning from Piaget, Levi-Strauss, and Vygotsky, placing them at the center of a learning paradigm has proven elusive. We believe there have been two reasons for this. First, until now we have lacked any large scale or scalable infrastructure that has been capable of placing experience and embodiment at the center of a theory of learning. They have always been understood as secondary mechanisms to enhance learning, but never been thought of as the core of it.[4]

Second, taking the tacit dimension seriously conflicts with our fundamental urge to abstract and de-contextualize what is happening in the process of learning. Ironically, it has been precisely that notion of decontextualization that has traditionally seen as the mechanism through which we create scalable knowledge. Tacit understanding begins from the premise that every learning experience is different and bound to both the learner and the immediate context in which the learning takes place. The process and results are not replicable.[5]

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[4] One example of this kind of learning has been the revolution in open source with software such as the Linux operating system. Much of what has made Linux different, and we would argue successful, has been the ability to scale the tacit knowledge that surrounds the software and development process, rather than through the transmission of any explicit knowledge *per se*.

[5] Here we find one of the key productive tensions in 21st century learning, the individual nature of embodied, indwelling and the flow of tacit knowledge which is by its nature collective and constantly changing.

The lessons from the networked world allow us to tackle both of these problems at the same time. Large scale network structures now provide environments which not only allow for tacit knowing and understanding, they presume it. Engaging with digital media is almost always experiential. In most cases, we learn with digital tools by doing. More and more, we also learn by feeling and acting in an embodied way. It is that sense of engaging with the tools at hand which gives us access and insight not only into their immediate use, but also a set of possibilities for future action that may be revealed only by confronting new problems or situations, akin to what John Dewey called "productive inquiry."

The indwelling that we see happening in these spaces is a fusion of all three frameworks: knowing, making, and playing. The affordances of the digital worlds with which we engage determine the degree to which we engage in each element, but we are seeing with increasing frequency that digital worlds and virtual spaces are beginning to understand the importance of all three to creating a successful and sustainable sense of community.

This calls up the second problem, which is abstraction and replication. A theory of learning that is only able to describe what learning took place retroactively cannot serve as a paradigm for new learning. Focusing on the tacit, then, seems to relegate such a theory to a purely descriptive mechanism. But that is only true if your concern is what kind of *explicit* knowledge is transferred.

When we move to the tacit dimension our concern shifts. If we are concerned now with *indwelling* rather than explicit knowledge, then the proper area of inquiry is not on outcome or replication, but an *environment*. From this perspective, we can begin to ask, not *what* are they learning, but *where* are they dwelling or in what are they dwelling. Of concern then is the question of what is afforded by the spaces of digital and networked worlds. While results and processes are not replicable, learning environments are.

At the nexus of knowing, making, and playing is the idea that the tacit dimension of learning is grounded in understanding how we use the ideas of experience and embodiment to make small changes in our understanding, practices, and experimentation, to adapt what we know to a changing environment.

Mapping Learning to Participation: What Netpublics Teach Us about How We Learn

Tangentially, but in order to provide a glimpse of today's and tomorrow's students and how they are learning, we include here an overview of a critical ethnographic study of social media participation. Mimi Ito, now at the University of California, Irvine, and her cohorts in a large scale MacArthur Foundation DML project construct a typology of practices describing participation as: "hanging out," "messing around," and "geeking out." We believe that these three practices frame a (potential) progression of learning

that is endemic to digital networks. When we tie these notions of participation to the frames of reference we have outlined above, we can begin to see not only how each level of participation produces a richer sense of learning, but also how the affordances of digital media environments start to come into play in the construction of various knowledge communities.

Knowing: Hanging Out

At the most basic level, participation in digital environments requires a sense of *knowing*, of "learning to be." As Ito argues, "participation in social network sites like MySpace, Facebook and Bebo (among others) as well as instant and text messaging, young people are constructing new social norms and forms of media literacy in networked public culture that reflect the enhanced role of media in young people's lives." Digital networked environments provide not only an extension of real-world interaction; they provide an enhanced environment for sharing information and engaging in meaningful social interaction.

This notion of hanging out is what we see as the beginning of and essential to the process of indwelling. But the notion of indwelling, as Polanyi makes clear is much richer than simply having a feeling of presence or belonging. It goes beyond the process of enculturation and understanding of social norms, roles, and mores. The beginnings of indwelling in the digital world are rooted in the notion of "being with." What Ito's work reveals is that hanging out is more than simply gaining familiarity with the tools, spaces, and affordances of the digital. In fact, it is probably not an exaggeration to say it is not about the digital at all. Hanging out, in Ito's terms, is about learning how to be with others in spaces which are mediated by digital technology. Again, in this notion we find learning that applies to the digital world, but which is also building and foundation for learning that transcends the bounds of the virtual.

Hanging out, we contend, begins to develop the first aspect of indwelling: experience. That experience is governed by a central question: What is my relationship to others?

Playing/Knowing: Messing Around

The second notion of participation that Ito explores is messing around, which she defines accordingly: "When messing around, young people begin to take an interest in and focus on the workings and content of the technology and media itself, tinkering, exploring, and extending their understanding." Within this framework, we begin to see a second dimension emerge, one which not only engages a second frame of reference, playing, but which begins to bring the two frames of reference into contact with one another.

The function of play, above all else, is to problematize the familiar. We can see this in nearly every meaning of the word itself, but perhaps most directly on the sense of space opened up by use. For example, when we say a steering wheel in a car "has a little play in it," we mean there is some flexibility, a difference between how it should be and how it is. Those gaps become known through experience, through the process we discuss

above as hanging out. For some users in digital environments, hanging out leads to the next stage which is characterized by Ito as "open ended," "self-taught," and "loosely goal directed." That moment causes a shift in perspective, where the process of knowing is no longer about our relationship to others, but instead becomes about understanding our relationship to the environment.

What we see as critical in this second stage is the shift in agency that occurs. Where hanging out is about acquiring a sense of social agency, figuring out how to use technology to maintain or enhance social relationships, messing around is about the user's relationship with the technology or environment itself.

In hanging out, that relationship is easy to assess. Digital media are tools to facilitate social interaction. Their function is purely instrumental. The transition to messing around, as Ito describes it, is typically personal and involves the development of a sense of personal agency: "what is characteristic of these initial forays into messing around is that youth are pursuing topics of personal interest. In our interviews with young people who were active digital media creators or deeply involved in other interest-driven groups, they generally described a moment when they took a personal interest in a topic and pursued it in a self-directed way."

This process, we would describe as moving from experience to embodiment, where the personal investment in digital media changes the focus from social agency to personal agency. Technology and digital media begin to be viewed as an extension of the self. Not surprisingly, most of the introductions to messing around that Ito describes involve things that are heavily connected to personal identity, such as personal videos and pictures, MySpace profiles, and gaming activity that is about player modification.

What messing around reveals most fundamentally is that the relationship between us and our environment is rich, complex, and changing. Our process of knowing is no longer instrumental; it is instead structured by a sense of play. As a result, understanding our relationship to our environment requires experimentation, play, and riddling. That subtle shift transforms our experience into a set of tools for understanding the environment. Playing serves as a frame of reference to problematize the familiar and the "play" we have in our own experience invites us to think through the possibilities of altering, shifting, and experimenting with the things we know as ready-at-hand.

The kind of tinkering that characterizes messing around is not instrumental, it is not intended to find solutions or make things work better. It is, instead, focused on helping us understand who we are in relationship to our environment.

Messing around constitutes the next step of indwelling: embodiment. In doing so, it asks the question: What is my relationship to the environment?

Playing/Knowing/Making: Geeking Out

The final stage of participation, "geeking out," is the most complicated. Within our framework, there are two aspects of "geeking out" that merit particular attention. First, the conditions under which geeking out occurs, the technological infrastructure that makes it possible: "For many young people, the ability to engage with media and technology in an intense, autonomous, and interest-driven way is a unique feature of the media environment of our current historical moment. Particularly for kids with newer technology and high-speed Internet access at home, the Internet can provide access to an immense amount of information related to their particular interests, and can support various forms of geeking out."

Second, and for our purposes, the most critical aspect of geeking out is the manner in which it extends both the social agency of hanging out and the personal agency of messing around: "Geeking out involves learning to navigate esoteric domains of knowledge and practice, and participating in communities that traffic in these forms of expertise."

It is the richness of experience and social agency produced by hanging out, the sense of embodiment and personal agency created by messing around combined with the third frame of reference, *making*, that produces what we think is the ultimate goal of indwelling: learning. Geeking out provides an experiential, embodied sense of learning within a rich social context of peer interaction, feedback, and knowledge construction enabled by a technological infrastructure that promotes "intense, autonomous, interest driven" learning.

It is the third frame of reference, the making, which values understanding joint work, including the ways in which the community functions of hanging out and the personal functions of messing around can be harnessed and compounded to produce the "specialized knowledge networks" and "Internet-base communities and organizations."

The learning taking place at the nexus of knowing, making, and playing, and making, is radically different from any learning environment we have seen before. It is an environment that emerges from a sense of indwelling, embodiment, and agency. As a result, it is a learning environment gains almost all of its power and benefits from the tacit dimension.

Conclusions

As each of these aspects come together to produce what we can think of as a new set of epistemological frames for understanding a world in flux, we can begin to see that we need a new, broader framework for understanding the processes of what learning and knowing look like. Where traditional models of learning have moved from models of direct knowledge transfer to broader notions of skills, we believe that neither of these is sufficient to explain and account for the fundamental epistemic shifts and new affordances that 21st century presents.

Accordingly, we believe that the best way to understand how learning, and indeed knowing, can be understood and harnessed for educational practices and institutions is by understanding these epistemological frames, why each matters, and ultimately, how they can all come together to create a new understanding of learning environments.

As the educational landscape changes in the 21st century, our paradigms for learning, knowing and education also need to shift. The tools of the digital world are just now beginning to open up new affordances, new possibilities, and new tools that make inquiry and process based learning not only possible, but what is likely to become the standard for learning. In a world where knowing, making, and playing are growing at an incredible pace, we need to develop the tools, practices and theoretical frameworks to understand that new world, and models to harness its power, build upon those ideas and be responsive to them.

We face a world today of almost infinite complexity, endless possibility, and near constant change. If our educational institutions and our informal learning environments are going to take advantage of these changes, our approach to education and learning needs to be as rich and complex as the challenges and opportunities we face.

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