

Epistemic games to improve professional skills and values

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In *The World is Flat*, Thomas Friedman argues that technology, economics, and population growth have created a global economy where competition favors countries with trained workers willing to accept low wages.[1] The science and technology necessary to produce and sell mass-produced goods and services has spread across the globe, and the high-wage economies of developed countries reward those who can do innovative work and punishes those who can not.

As a result, workers face a new challenge. In the old industrial economies of developed nations, graduates who had mastered basic skills in reading, writing, and mathematics were able to find good jobs. But young people in such countries today need to think less like assembly line workers and more like professionals who solve problems that do not have easy answers. They need to learn judgment and discretion rather than obedience. Skills that once were the preserve of the elite are increasingly the prerequisite for entry-level work of any kind. In the digital age of global competition, schools and universities have to train young people for creative thinking, collaboration, and complex problem solving.

Are our educational institutions up to that challenge?

In the 1970s and 1980s, MIT Professor Donald Schön asked a fundamental question about higher education: is the current curriculum, he wondered, the right way to train young professionals? Schön's answer was that professional education in the late 20th Century was outdated. It was based on ideas about thinking, learning, and professional expertise that were not appropriate for preparing students to work in complex and uncertain domains that demand autonomy, judgment, and the ability to solve problems in action and on the spot. [2, 3]

Now, at the beginning of the 21st Century, we need to ask a similar question about all education: is the current system the right way to prepare young people for life in a world where new technologies of information and communication place a premium on creative and innovative thinking? My answer is in two parts. The bad news is that the technologies of the digital age bring the same problems and issues that Schön identified in *professional* education to *all* of education. However, the good news is that the same technologies that make innovative and creative thinking critical skills for the future also make it possible for students to prepare for that future through well-designed and sophisticated computer games for learning.

Computer games, in other words, may be a critical part of the future of education in the digital age, and while in this analysis, because of my own particular expertise I draw examples primarily (though not exclusively) from the United States, the issues and analysis holds for any nation that wishes to prepare itself and its citizens for our changing world.

The challenge of innovation

Innovation is by definition something that *cannot be standardized*. That's why standardized tests of isolated pieces of knowledge—and the school classes that prepare students for them—are not a good route to creative thinking.

But while innovative work can't be standardized, the people who do innovative work are not simply “doing whatever they want.” Innovation doesn't happen in a vacuum.[4-6] Innovative and creative solutions to problems that matter in the world almost always come from working in and around some *community of practice*: a group of people working on similar problems in similar ways. [7, 8] Creativity is a conversation—a tension—between individuals working on individual problems and the communities of practice to which they belong.

Lave and Wenger [7] describe a community of practice as a group of individuals with a common repertoire of knowledge about and ways of addressing similar (often shared) problems and purposes. This collection of practices is made accessible to newcomers through the *reproductive practices* of the community: the activities through which individuals develop ways of thinking and reframe their identities and interests in relation to the community. The training and apprenticeship of doctors, lawyers, midwives, and tailors are the reproductive practices through which the next generation of doctors, lawyers, midwives, and tailors is developed.

Elsewhere [9, 10] I have argued that participation in a community of practice involves developing that community's ways of doing, being, caring, and knowing—and critically, the community's distinct way of thinking. That is, practice, identity, interest, understanding, and epistemology are bound together into an *epistemic frame*. Different communities of practice (for example, different professions) have different epistemic frames. Lawyers act like lawyers, identify themselves as lawyers, are interested in legal issues, and know about the law. These skills, affiliations, habits, and understandings, are made possible by looking at the world in a particular way—by thinking like a lawyer. And, of course, it is a two-way street: thinking like a lawyer is made possible by these skills, affiliations, habits, and understandings. The same is true for doctors, but for a different way of thinking. If a community of practice is a group with a local culture (what Jim describes as an ideology or way of “seeing, valuing, being in the world”), then the epistemic frame is the grammar of the culture: the conventions of participation that individuals internalize when they become acculturated. The reproductive practices of the community are the means by which new members develop that epistemic frame.

Clearly epistemic frames are not hegemonic any more than identities are. Lawyers don't *only* think like lawyers. They may also be parents, and videogamers, and sports

fans, and amateur carpenters. They are able to take on these other epistemic frames and to think and act in these ways as well. But the linkages between epistemology and practice that make up an epistemic frame are potentially quite powerful in the design of instructional games because one way to create thickly authentic learning contexts using new technology is to adapt the reproductive practices of valued communities of practice.

Dewey argued that knowing and doing are tightly coupled [11-13]. Learning happens in the context of activity when a person is trying to accomplish some meaningful goal and has to overcome obstacles along the way. Schon [14] describes professionals as people who make this link between knowing and doing through *reflective practice*. They think in action. Schon further suggests that professionals develop this ability to reflect-in-action in the *professional practicum*. Professional practica are environments in which a learner acts as a professional in a supervised setting and then reflects on the results of his or her action with peers and mentors. Ways of knowing and ways of doing become more and more closely coupled as the novice progressively takes up the epistemic frame of the community. Think of internship and residency for doctors, moot court for lawyers, or the design studio for architects. The reproductive practices of reflective practitioners (what Jim refers to as “authentic professionals”) are thus inherently distributed. Reflective practice is developed in the progressive internalization of an epistemic frame through action in a practicum scaffolded by the knowledge, skill, and values of peers and mentors.

Thus, the ways in which reflective practitioners develop their epistemic frames may provide an alternative educational model. Rather than constructing a curriculum based on the ways of knowing of mathematics, science, history, and language arts, we can imagine a system in which students learn to work (and thus to think) as doctors, lawyers, architects, engineers, journalists, and other valued reflective practitioners—not in order to train for these pursuits in the traditional sense of vocational education, but rather because developing those epistemic frames provides students with an opportunity to see the world in a variety of ways that are fundamentally grounded in meaningful activity and well aligned with the core skills, habits, and understandings of a postindustrial society.

That’s the good news. The bad news is that adapting those reproductive practices is a non-trivial task. First, one has to uncover the structure of a reproductive practice, which means understanding how activities bind epistemology, practice, identity, interest, and understanding to form the epistemic frame of the practice. Second, one has to develop tools to adapt those activities to the skills, habits, understandings, and abilities of young people. That is, we need to know how professional learning practices work, and how to use technology to bring those practices within young people’s grasp. Both of those things are hard to do, but understanding how a professional epistemic frame is created makes it easier to adapt reflective practica for younger students. Some parts of the reproductive practices are more central to the creation of an epistemic frame than others, and analyzing how the epistemic frame is created tells you, in effect, what it might be safe to leave out. Such an analysis makes it possible to develop what I refer to as an *epistemic game*.

Epistemic games for learning innovation

Vygotsky [15] argues that “pleasure can not be regarded as the defining characteristic of play” [15p. 92]. Rather, play is the world a child enters when he or she learns to resolve in imaginary form desires that can not be immediately gratified. In play, we participate in a simulation of a world we want to inhabit, and epistemic play is participation in a simulation that gives learners access to the epistemic frame of a community of practice. When it succeeds, it is fun, not because fun is the immediate goal, but because interest—linked to identity, understanding, and practice—is an essential part of an epistemic frame, and thus of an epistemic game.

More than a decade of research on epistemic games has shown that players can learn concepts and principles, and acquire practices and ways of thinking by learning to solve real problems the way professionals do. For example, in the epistemic game *Urban Science*, players become urban planners and redesign their city. They use a geographic information system (GIS) model to propose land use changes (e.g., turning a parking lot into a neighborhood park and playground, or rezoning commercial lots for mixed commercial and residential use) to improve quality of life in the city. In the game they do what urban planners do in their training: They receive materials urban planners use, such as a city budget plan and letters from concerned citizens, that provide information about revenue, pollution, waste, housing and other issues. They conduct a site visit and interview virtual stakeholders. They use a GIS model to create preference surveys and construct proposals for redevelopment. [16, 17] Similarly, in the epistemic game *Digital Zoo*, players learn physics and engineering by working as biomechanical engineers to help design characters of the kind seen in computer-generated animation films like *A Bug's Life*. [17-22]

Kirschner et al. [23] argue that turning learners loose in an educational environment—no matter how cleverly designed—is a poor instructional strategy. They argue, rightly, that too many interventions naïvely assume that students will learn if they engage in “authentic” practices of experts in domain—forgetting that what experts do and how experts learned to do what they do are not necessarily synonymous. So throwing students into a complex environment and asking them to figure out the underlying rules is a bad theory of learning because “learners are novices [and] leaving them to float in rich experiences with no support triggers the very real human penchant for finding creative but spurious patterns and generalizations.” [24]

The kind of guidance that learners need varies depending on the domain in which they are learning [17]. Different kinds of experts develop expertise through different kinds of guided experiences, and we can make educational games that recreate these experiences—and this guidance—for students. Epistemic games thus work because in epistemic games players develop expertise not by playing as experts, but by playing as novices training to be experts of a particular kind: engineers, urban planners, journalists, and so on. Because direct mentoring by experts is part of any training for expertise, explicit guidance is part of any epistemic game. But it is the kind of guidance that real experts get in their practicum experiences, rather than the traditional direct instruction of school-based learning.

Any well-designed game has to do more than merely immerse a player in a virtual world. A good game has to teach players the rules of its virtual world—otherwise no one could play. And because no virtual world can accommodate every possibility, a good game has to lead players toward certain kinds of actions and away from others.

In other words, a *game* is always *more* than a computer simulation [17]. A game is all of the things we do with, in, and around a simulation: the roles we play when interacting with a simulation, the norms we follow, the rules we obey. The game provides the framework in which we make sense of what happens when we interact with the simulation. Educational games—not simulations for discovery learning but simulations that contain and are set within a framework of expert guidance—are powerful learning environments precisely because they recognize that students need to be a part of rich activities that build on their own goals, backgrounds, and interests, but they also need explicit guidance to find the underlying “rules of the game”: the knowledge, skills, values, and ways of thinking in a domain of expertise [25].

Computer and video games make it possible for more people to learn about the world by participating in a wider range of meaningful activities than is possible with real-world experiences alone, or through games that do not use a computer to create a virtual world. *Epistemic* games make it possible to take good practices for learning and make them more widely available and more powerful—to learn by doing, and emphasize the value of tacit as well as abstract ways of knowing. They may not be the only way to accomplish these ends, but epistemic games lower the cost of failure by placing action in a simulated world, and thus make it possible to learn to innovate without risk, to step into other cultural and intellectual settings in a guided and protected way, and thereby learn to think about things that matter in a global economy by doing things that matter in virtual worlds.

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Footnotes