Epistemic games

In an article in this issue of Innovate, Jim Gee asks the question “What would a state of the art instructional video game look like?” Based on the game *Full Spectrum Warrior*, he concludes that one model is “to pick [a] domain of authentic professionalism well, intelligently select the skills and knowledge to be distributed, build in a related value system as integral to game play, and give explicit instruction only ‘just in time’ or ‘on demand.’” That is, he describes a good instructional game as an adaptation of “authentic professionalism” in video game format.

Here I’d like to give a more detailed account of this idea by looking more closely at the terms “authenticity” and “professionalism.” I begin by connecting these concepts to some of the theories of learning on which they are based: ideas about *communities of practice* (Lave & Wenger, 1991; Wenger, 1998), *reflective practice* (Schon, 1987), *epistemic frames* (Shaffer, 2004a) and *pedagogical praxis* (Shaffer, 2004b). These theories link games, simulations, and professional practices. In so doing, they provide tools and techniques to guide the development of games for learning. To show how this works, I’ll give an example of one such game that, while still a prototype, demonstrates how a deliberately constructed simulation of professional practice can be both an engaging activity and a compelling learning environment.

**Epistemic frames and reproductive practices**

As Gee suggests, what we usually think of as the content of a knowledgedomain comes “free of charge” when learners pursue meaningful ends within a coherent practice. More than that, though, when learners engage in socially-valued practices toward ends
they value—that is when learners can use real tools and methods to address issues they care about—motivation and learning tend to follow. Resnick and I have described learning contexts in which this kind of connection takes place as thickly authentic, meaning that activities are simultaneously aligned with the interests of the learners, the structure of a domain of knowledge, valued practices in the world, and the modes of assessment used (Shaffer & Resnick, 1999). In thickly authentic settings, content is free, and motivation is easy. Creating thickly authentic environments, though, is hard.

The problem of developing thickly authentic learning environments becomes more manageable when we recognize that such rich contexts for learning always involve becoming a participant in some community of practice—whether local or virtual. Lave and Wenger (1991) 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. The reproductive practices of the community help newcomers develop these practices. The reproductive practices are the collection of 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 (Shaffer, 2004a, 2004b) I have argued that participation in a community of practice involves developing that community’s ways of doing, being, caring, and knowing, and that this way of doingbeingcaringknowing is organized by and around a 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.\(^1\) 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. In other words, epistemic frames are 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.\(^2\)

The connections 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—an idea I have described elsewhere in some detail as the theory and method of *pedagogical praxis* (Shaffer, 2004b).

*Pedagogical praxis*

Dewey argued that knowing and doing are tightly coupled (Dewey, 1915, 1958; Menand, 2001). 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 (1985) 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 adopts the epistemic frame of the community. Think of internship and residency for doctors, moot court for lawyers, or the design studio for architects. 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.

The good news, then, is that existing communities of practice have already done a lot of work for us. Doctors know how to create more doctors; lawyers know how to create more lawyers; the same is true for a host of other socially-valued reflective practices. 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.

To accomplish this end, one has to analyze the structure of a reproductive practice, which means understanding how activities link epistemology, practice, identity,
interest, and understanding together to form the epistemic frame of the practice. Because some parts of the reproductive practices are more central to the creation of an epistemic frame than others, analyzing how the epistemic frame is created tells you, in effect, what it might be safe to leave out. That analysis thus guides the development of tools to adapt the activities that are used to train professionals in ways that are appropriate to the skills, habits, understandings, and abilities of young people.

The result of such a process is a simulation that preserves the connections between knowing and doing central to an epistemic frame—a form of simulation that I refer to as an epistemic game. An epistemic game is not necessarily a game that one plays strictly for pleasure. As Vygotsky (1978) suggests, “pleasure can not be regarded as the defining characteristic of play” (p. 92). Rather, he argues, 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 thickly authentic 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.

Madison 2200: an epistemic game

To illustrate the idea of an epistemic game, I’ll describe Madison 2200, a learning environment developed here at the University of Wisconsin by a student of mine, Kelly Beckett, using the theory of pedagogical praxis. In Madison 2200, high school students
learned about urban ecology by working as urban planners to redesign State Street, a
downtown pedestrian mall popular with young people in Madison.

Urban planners take a central role in keeping urban ecological systems in balance. They develop land use plans that meet the social, economic, and physical needs of communities. As in many professions, urban planners use technology to develop solutions to these problems, including geographic information systems (GIS) that make it possible for planners to ask “what if” questions and get feedback to informs their decision making process. Urban planning is thus a valued reflective practice though which ideas in ecology impact the environments in which students live, and urban planning practica involve learning to use GIS models and other tools to solve real-world problems.

In the Madison 2200 project, eleven high school seniors from a summer enrichment program worked with a graduate student for ten hours over two weekend days in an urban planning workshop. The students had no prior experience with urban planning before the workshop. At the start of the workshop, students received a project directive from the mayor, addressed to them as city planners, to create a detailed re-design of State Street. An informational packet included a city budget plan and letters from concerned citizens about issues such as crime, revenue, jobs, waste, traffic, and affordable housing. Students watched a video about State Street, featuring interviews with people about the street’s redevelopment, then walked to State Street to conduct a site assessment. Next, students began to work in teams to develop a land use plan using MadMod, a custom-designed interactive GIS model of State Street that let them assess the ramifications of proposed land use changes. For example, if a student was interested in raising the number of jobs available on State Street, she might make the decision to
place a new retail business on State Street (see Figure 1). The model would show whether that proposal would raise or lower the number of jobs predicted for the neighborhood. However, the model would also show how other issues were affected by the same land use choice, thus leaving students with a decision to make regarding the overall impact (and therefore the utility) of alternative land use proposals. After completing a land use plan in MadMod, students entered their decisions into an interactive map of the State Street area. In the final phase of the workshop students presented their plans to a representative from the city planning office.

![Possible choices](image)

![INPUT ORIGINAL ADDRESS](image)

![Figure 1](image)

Figure 1. A student makes a land use change in the shaded cell in the decision space on MadMod (a). The change is numerically reflected in the deltas column (b), and spatially on a map of State Street (c).

Data collected in pre and post interviews show that in playing this game students began to develop ways of thinking and doing characteristic of urban planners: they formed—or started to form—an epistemic frame of urban planning. Students developed their understanding of ecology and were able to apply it to urban issues. More important, the urban planning practices and GIS model that the game was built on played an important role in shaping the development of that understanding. During post-interviews,
all of the students said the workshop changed the way they think about cities. One student commented: “I really noticed how [urban planners] have to... think about building things... like urban planners also have to think about how the crime rate might go up, or the pollution or waste depending on choices.” Another said about walking on the same streets she had traversed before the workshop: “You notice things, like, that’s why they build a house there, or that’s why they build a park there.” Students consistently referred to the MadMod simulation model and urban planning practices when explaining their understanding of the interconnectedness of urban ecological issues.

Perhaps this epistemic game doesn’t seem very game-like—not as game-like, say, as SimCity, or Full Spectrum Warrior. The students in Madison 2200 did enjoy their work. But more importantly, the experience let them inhabit an imaginary world in which they were urban planners. They first entered that world because they had volunteered to participate in an experimental workshop. But the world of Madison 2200 recruited these students to new practices, identities, interests, and understandings, as part of a new way of seeing the world. Urban planners have a particular way of identifying, evaluating, and addressing urban issues. By participating in an epistemic game based on these practices, students began to appropriate the epistemic frame of urban planning. This was play. Most serious play. Epistemic play. And as a result, it was fun, too.

*Epistemic games as a new paradigm for learning*

Madison 2200 is clearly just in the pilot stage, and 10 hours of activity are hardly enough to produce significant and lasting epistemic changes. As in other projects in pedagogical praxis, the next step in this work is to conduct a more intensive study of the reproductive practices of urban planners that will support the development of a more
extended and authentic simulation of those practices—some 40-60 hours of activity, which approaches the amount of time a student spends in a semester of a high school class, or that a player invests in learning a new video game. And of course one would really only expect to see truly transformative effects in an extended collection of such experiences organized as a full curriculum. My goal in describing Madison 2200 here has been to illustrate in a much more limited way how designing an epistemic game based explicitly on professional learning practices has particular advantages.

Madison 2200 is one example of a collection of projects that my students and I have undertaken to explore how the reproductive practices of reflective practitioners such as architects, journalists, mediators, and engineers can form the basis for compelling, computer-supported learning environments for middle and high school students (Shaffer, 1997, 2000, 2002, 2003, 2004a, 2004b, in press). Although we are still early in the quest to create a large-scale implementation of a full-fledged epistemic game, these projects already collectively show three things: First, that one transformative effect of new technologies is that they support the creation of epistemic games. Second, that such games can be developed by analyzing how the epistemic frames of professionals are created. And third, that creating epistemic games depends both on developing appropriate simulation technologies—what I have referred to elsewhere as the game engine or simulation engine (Shaffer et al., 2000)—and on developing an appropriate system of activities that utilize that game engine. That is, what matters is the things learners do, the people with whom they work, the tools they use, and the context in which all of this takes place.
Of course, even with the theory of pedagogical praxis, creating effective epistemic games is far from easy. The developers of epistemic games based on professional practices need to combine the insight of a skilled ethnographer, the intuition of a skilled teacher, and the expertise of a skilled game developer. But the concept of epistemic frames does provide a theoretical and methodological context to guide the integration of these areas of expertise. Pedagogical praxis is not a recipe for making epistemic games, but it is a useful outline for orchestrating the skill sets needed.

The implications of epistemic frames and their role in developing epistemic games are thus quite profound. They suggest that the ways in which professionals acquire their practices may provide an alternative model for organizing our educational system. Epistemic games make it possible for students to learn through participation in authentic recreations of valued reflective practices, and thus give educators an opportunity to move beyond disciplines derived from medieval scholarship constituted within schools developed in the industrial revolution—a new model of learning for an era of dramatic social and economic transformation brought about by new technology.
References


Author Note

I’d like to thank the researchers in the Games and Professional Practice Simulations (GAPPS) consortium, as well as the many students and colleagues at MIT, the Harvard Graduate School of Education, and the University of Wisconsin-Madison who have collaborated with me on projects in pedagogical praxis. This work was supported in part by a Spencer Foundation/National Academy of Education Postdoctoral Fellowship, a grant from the Wisconsin Alumni Research Foundation, and by a National Science Foundation Faculty Early Career Development Award (REC-0347000). Any opinions, findings, or conclusions expressed in this paper are my own and do not necessarily reflect the views of the funding agencies or cooperating institutions.
Footnotes

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1 Of course, this is a two-way street: thinking like a lawyer is made possible by these skills, affiliations, habits, and understandings.

2 It is important to note that 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.

3 There may be debates about whether such reproductive practices are optimal, or about how to adapt such practices for new social and technological conditions. But no one seems worried that we are going to run out of lawyers any time soon!

4 Collins and Ferguson (1993) use the term *epistemic games*, as well, but in a more limited sense than I am describing here, to refer to the ways in which certain forms of knowledge (*epistemic forms*) can be manipulated in the context of a particular domain of inquiry.