

Nash, P., & Shaffer, D.W. (2012). *Epistemic Youth Development: Educational games as youth development activities*. Paper presented at the American Educational Research Association (AERA) annual meeting, Vancouver, BC.

Epistemic youth development: Educational games as youth development activities

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Introduction

In this paper, we examine an educational game that makes an explicit connection between developmental and learning theory. Recent trends in developmental theory have focused on the relationship between individuals and their social context. In emphasizing this relationship, researchers theorize an explicit pathway: adolescents who have an active relationship with their community, said to be “thriving,” become adults who make valued contributions to their community.[1] For example, examining the fit between developmental needs of adolescents and their educational environments reveals mismatches that handicap healthy adolescent development.[2] More positively, researchers have found that participation in youth organizations predicts positive civic outcomes.[3]

In recent decades, learning theory has similarly examined the connection between learners and their social context(s). Again, researchers theorize an explicit pathway: a tradition of sociocultural and socio-cognitive studies describe how young people learn by engaging in purposeful action within a social setting.[4] For example, researchers argue that learning is socially situated and transmitted, and describe how knowledge and cognition are not the property of individuals but socially distributed among agents in the

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individuals' environment.[5, 6] More specifically, instructional programs have been guided by the development of situated learning theory.[7]

This study proposes to bridge these parallel lines of research by examining how game-based learning environments can link the development of pro-social skills and knowledge to the particular values associated with important social practices. We look at how educational games can create opportunities to connect positive youth development with meaningful academic content. This study focuses on Urban Science, a game where young people learn about the interdependent systems in their city by role-playing as urban planners.[8, 9]

We explore this theoretical connection through a particular psychological hypothesis, described elsewhere as *epistemic frames*, and through a learning environment designed on that hypothesis: an *epistemic game*. Epistemic games are computer-based simulations of professional practices that are designed to help young people learn to think like professionals.[10] By measuring players' development of the epistemic frame of a profession, epistemic games can show how youth can begin to adopt a set of adult values.

Theory

Much contemporary developmental theory and research analyzes the relationship between individuals and their various social contexts. From this perspective, healthy development involves a positive change in the relationship between youth and their communities; further, this positive relationship prepares them to become adults who make generative contributions to self, family, community, and civil society.[1]

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Some researchers have examined the relationship between the experiences of adolescents and the requirements of the adult world. Finding that adolescents' activities in school and time with friends do not prepare them for adulthood, researchers see a solution in structured programs that offer skill-building activities and challenges.[11, 12] These activities instill the competencies necessary for negotiating the real world.[13] Larson describes studies of youth organizations in which participants seem to internalize ways of thinking and talking that are aligned with adult life, such as Rogoff, Baker-Sennett, Lacasa, and Goldsmith's girl-scout study, in which a group of girls learn to operate a sales organization.[14] This ability to think beyond basic knowledge and skills characterizes professional thinking.[15]

Professional thinking is developed and used in *communities of practice*: groups of people who have defined a set of collective knowledge as a result of working together over time.[5] They make decisions based on a set of professional values.[16] To learn to participate in a community of practice, novice professionals learn to adopt values consonant with the purposes of their profession.[17]

Shaffer's epistemic frame theory describes the process of learning to participate in a community of practice in cognitive terms.[8] He argues that epistemic frames, the complex of skills, knowledge, identities, values, and epistemology that professionals use to think, are not merely collections of unrelated elements, but "the combination—linked and interrelated—of values, knowledge, skills, epistemology, and identity." [8] By emphasizing the connections between frame elements, Shaffer casts this learning as a process of connecting capability to context.

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Professionals use their epistemic frame in the context of professional action.

Professional training experiences, such as practica and some types of internships, simulate professional action in a safe environment. Epistemic games simulate professional training for the purposes of developing an epistemic frame.[10] How well players of epistemic games link the professional actions and knowledge to the set of that profession's values, then, is a rough measure by which we can determine how individuals begin to adopt the values of an adult community of practice. If players begin to connect knowledge and skills to values, it suggests that epistemic games may serve as useful educational designs for both proponents of positive youth development and learning scientists.

In this study, we examine the outcomes of Urban Science, an epistemic game in which players learn to think like urban planners. We ask two questions:

1. Do players reference planning skills, knowledge, and values more often after playing Urban Science?
2. Do players reference planning values *in conjunction with* either skills or knowledge more often after playing Urban Science?

Methods

Study Design

Urban Science was designed to simulate an urban planning practicum experience [28]. When the players sign into an office intranet portal, they begin to receive emails from a non-player-character (NPC) supervisor who is controlled by their mentor. These emails provide instructions throughout the game.

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In the game, players produce land-use plans for their local community. To make these plans, players conduct research during a “virtual site visit,” in which they learn about a group of stakeholders’ goals for the site. They conduct preference surveys, in which they work with their colleagues to learn more specifically what their stakeholder group wants. To create these surveys, they use a geographical information system (GIS) software program called iPlan that allows them to see how land use changes might impact the social and environmental issues that the stakeholders care about. These issues include things like traffic rates, number of jobs and sales, available housing options, and pollution levels. Their stakeholder group provides feedback on the players’ surveys, which allows the players to triangulate just how much change to the site will please their stakeholder group. Finally, players create a final land use proposal that attempts to meet the needs of both the stakeholders they researched and the groups of stakeholders that other teams of players studied. In the final proposal, they create a model a proposed redeveloped site using iPlan and write a final report in which they describe and justify their recommendations, as well as the limitations and compromises they needed to make. Throughout the game, mentors are available to help the players if they struggle and to guide players’ reflection on their work.

Participants

As part of a summer program, fourteen middle-school age students with no prior urban planning experience played Urban Science for 80 hours during the summer of 2007. The mentors were graduate students who attended one day of training.

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Data Collection

Data were collected through individual interviews before and after the game. Pre and postgame interviews from the game were recorded and transcribed. Matched-pair questions asked were:

- What do you think urban planning is?
- Do you think urban planning is important?
- What do you think it means to be a planner?
- How would you say urban planners get information for the plans they propose?
- Do planners ever work with other people?
- Do you think environmental issues are important to cities?

Data analysis

Coding

Transcriptions from individual interviews were segmented into units representing one complete answer to a question, and included any follow-up questions or clarifications between the player and the interviewer. A single rater coded all excerpts for references to urban planning skills, knowledge, and values. \

Statistical tests

We used paired t-tests to determine whether players' references of the urban planning skills, knowledge, and values significantly increased between the pre and post game interviews. We then used a paired t-test to determine whether players linked planning skills and knowledge with planning values significantly more often in the post interviews.

Results

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In the matched pair questions of the post interviews, players referenced more elements of the urban planning epistemic frame than they did in the pre interviews. As seen in figure 1, they referenced significantly more planning skills (mean pre: .083, mean post: 1.67, $p < 0.01$), knowledge (mean pre: .75, mean post: 3.58, $p < 0.001$) and values (mean pre: .58, mean post: 4.17, $p < 0.001$).

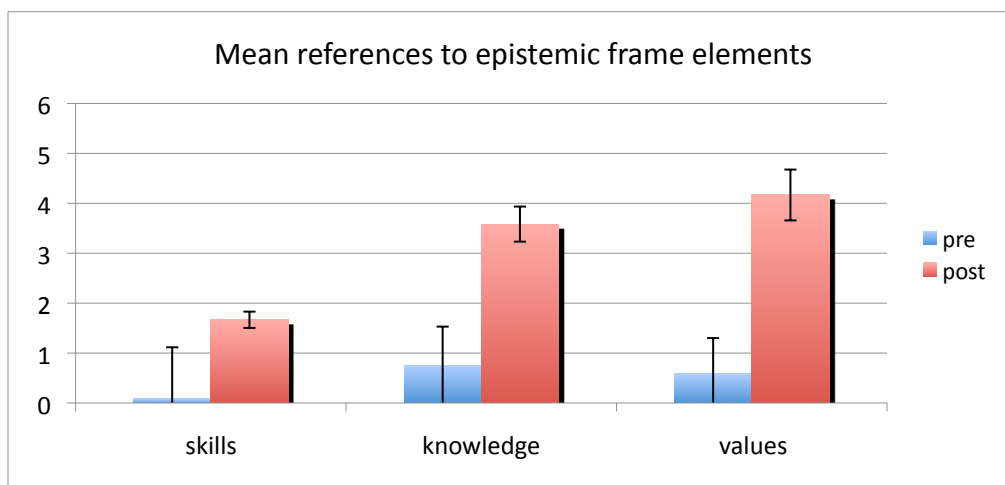


Figure 1: Players' mean references to epistemic frame elements, pre and post

Not only did the occurrence of urban planning frame elements rise from pre to post interviews, but the co-occurrence of either planning skills or knowledge and values also significantly increased. While they were never linked in the pre interviews for any of the participants, they were linked roughly half the time in the post interviews (mean pre: 0, mean post: 3.08, $p < 0.001$), as seen in figure 2:

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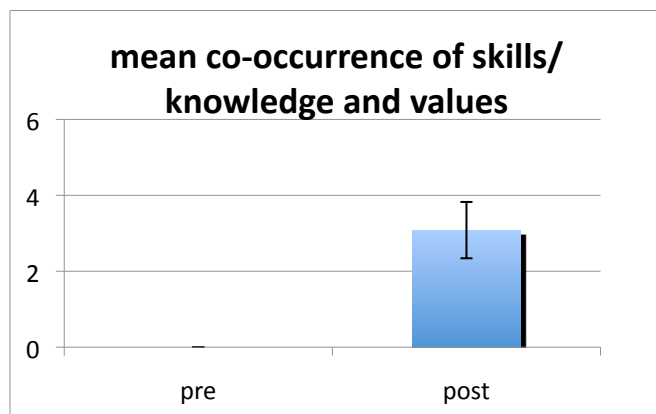


Figure 2: layers' mean references to epistemic frame elements together, pre and post

These changes corresponded to a qualitative difference between players' pre and post frames. For example, one player, when asked, "What do you think it means to be a planner" in the pre interview, replied, "You sort of sketch out and... visualize what will go where and how that will work out." In the post interview, the player answers the same question:

"I think it means collecting as much information as you can and it means listening to peoples' opinion and taking them into consideration. It also takes humor because you're not going to plan a place by yourself, you're going to have to collaborate with a lot of people and it takes a lot of compromising and coming up with justifications. The main goal is trying to plan and design a city and trying to improve it and making it the best you possibly can to fit the people's needs and what they want and trying to come up with a solution for all the different opinions and point of views."

Before the game, the player's answer is vague. After the game, the player's response links important elements of the urban planning epistemic frame, like research, collaboration, compromise, and justification in the service of improving a community for its constituents.

Discussion

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Current trends in learning and developmental research have focused on the relationships between young people and their social contexts. Preparing youth to become contributing members of society involves introducing them to the adult world. This study examined whether an educational game could provide players with the pro-social knowledge and skills of a valued professional practice.

Our results show that players talked about urban planning differently after Urban Science. Players made significantly more connections between planning skills and knowledge and planning values in their post interviews. If, as Shaffer suggests, professional thinking is characterized by linking knowledge and skills to the values of a profession, the players in this study appear to have developed a more professional way of thinking.[8]

Role-playing as urban planners, players began to think like urban planners.

Epistemic frame theory situates learning in a process of acquiring membership in a community of practice. While youth organizations tend to emphasize generic life skills and service-learning, an educational game like Urban Science simulates the time-tested training methods of a valued community of practice. With activities designed to reflect authentic professional practice, Urban Science provides a specific social context in which players learn to guide their actions with pro-social values.

These results have several limitations. As this preliminary study only describes a small number of students in 80 hours of game-play, there are insufficient grounds for making causal claims. Therefore, as Shaffer and Serlin [18] argue, the purpose of significance tests under such circumstances is to show that additional observations made under the same conditions would show similar results. More methods for measuring epistemic frame

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development are being developed; future studies not only examine the impact of epistemic games on players, but the process by which players develop epistemic frames.[19]

Despite these limitations, the results here suggest that epistemic games can develop and measure adolescents' adoption of valued adult ways of thinking, and thus provide an opportunity to enrich their cognitive and social development.

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