

DevInfo GameWorks: Supporting inquiry-based game design

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Abstract: We report on a pilot of DevInfo GameWorks, a web-based system that allows users to create and play data-driven educational games. In particular, we focus on the challenges of scaffolding game creation, encouraging meaningful inquiry as the basis for game design, and supporting a community of learners. Preliminary findings point to several areas for continued investigation and development.

The promise and challenge of learning through designing games

Research over the past two decades has pointed to the power of engaging learners in designing their own games. At the same time that the idea of learning through *playing* digital games has gained currency (Gee, 2007; Salen, 2008), educators taking a “constructionist” approach (Bruckman, 1998; Papert, 1991) have pointed to the even greater potential of learning through *creating* games, especially when the goal is to create games with an educational purpose (Carbonaro, et al., 2006; El-Nasr, 2006; Kafai, 1996). Game-creation has the potential to support higher-level thinking and expression using multiple literacies, and to boost motivation and self-esteem for children who don’t consider themselves good at traditional literacy practices (Robertson & Good, 2005).

In this work, however, three persistent challenges remain. First, despite the increasing availability of tools designed to support game-programming by novices (e.g., Overmars, 2004), making digital games still generally demands substantial time and technical skills. Second, it is not easy for learners to create games that are satisfying to play, interesting, and genuinely educative. While we believe that games can provide a framework for meaningful inquiry, novice game-designers understandably tend to concentrate on the mechanics of their game rather than educational implications (e.g., Kafai, 1996; Overmars, 2004). Third, while a supportive, interested, and widely-distributed audience for learner-created games can provide crucial motivation and feedback (Resnick, et al., 2009), environments that support this kind of authentic community remain rare.

Background and Methods

We have attempted to address these three challenges through DevInfo GameWorks (“DIGW”), a system that includes game templates that allow easy creation of new game content; tools and resources to help learners focus on inquiry with real data; and tools for feedback, collaboration, and social networking so that there is a community of learners.

The center of DIGW is a website (<http://digw.org>) that has templates designed to allow easy creation of data-driven games that can be played in three formats: online in real time by multiple players, in solitaire mode, or in printed form offline. (The first game template is based loosely on tic-tac-toe, but with enhanced elements of strategy, knowledge, and chance.) Using databases of indicators related to the United Nations Millennium Development goals and other data sets, as well as user-created media, learners can design and play games that are based on inquiry into rich sets of information, and which focus on meaningful relationships among data. (For example, learners might investigate questions such as, “what is the relationship between GDP and HIV infection rates in Africa?” or, “What are the biggest health problems in my community, and how big are these problems regionally and globally?”)

At the same time, social-networking features help generate situations in which intentional learning becomes natural: learners are able to engage with serious content in playful ways; older users can mentor younger ones; and the community as a whole has an overarching goal of increasing the knowledge and engagement of the group.

Many DIGW users are students using the system as part of a class assignment or project, but the system is also available for use by the general public. Teachers who wish to use the system as part of a class have access to curriculum materials and guides, but no attempt has been made to standardize use of the system across all learning contexts.

Because of this variety of uses, and the range of educational aims that inform these contexts, our analysis has not focused on finding some sort of cause-effect relationship between DIGW and a predefined “achievement” measure; rather, we have looked at the extent to which the system supports new ways of engaging in higher-level thinking activities, especially those that involve so-called “21st Century skills” such as collaboration, “network awareness,” and critical consumption of information (e.g., Davidson, 2009; Wagner, 2008). To do so, we have examined the quality of engagement and learning, as measured by field observations, evaluation surveys, interviews with facilitators and participants, and a content-analysis of the games themselves.

Finding and implications

When DIGW was first proposed, the immediate goal was to increase awareness of global issues in general and the Millennium Development Goals in particular. An early pilot with urban sixth grade students established that DIGW can be an effective tool for this aim (Robertson, Baglin, & Kupperman, 2009). Since then, however, the system has been used to achieve a wide variety of different content goals: for example, a primary school teacher in South Africa was attracted by the opportunity for learners to practice English language expression in an authentic environment; a college professor used it to help her students learn literacy education concepts; and a high school journalism teacher saw it as a way for her students to do grass-roots journalism.

Across these varied contexts, it has become apparent that two aspects of the system are particularly relevant in terms of supporting high-level intellectual engagement and the 21st Century skills mentioned above. First is a strong sense of the audience – in other words, the potential players – during game design. In the most successful designs, this sense of audience helps shape everything from the game's topic to media choice and text phrasing. Ultimately, a good DIGW design must be interesting and appropriately challenging for players, and it also should convey some important information. Of course, a sense of audience is important in any kind of authoring, from traditional texts to blogs or video, but because a DIGW game is *played* rather than read or viewed, the player's perspective is especially compelling.

The second aspect we have found to be particularly relevant is the importance of a tangible artifact as a product of inquiry, along with opportunities for social sharing and feedback around this artifact. Having a concrete and public outcome seems crucial to fostering a sense of ownership and pride in the inquiry and design work. This second aspect closely echoes the findings of Resnick and colleagues (2009) about users of the programming environment Scratch: young people were able to do remarkably self-motivated and sophisticated work in an environment that supported personally meaningful projects and social sharing. DIGW pushes this idea further to include an additional emphasis on inquiry into real-world data (both from electronic databases and from local communities) and globally relevant issues.

All of that said, more work is needed to address the persistent challenges listed at the beginning of this paper. First, even though DIGW greatly reduces the technical knowledge necessary to create a game, it is still not trivial to make a game that is genuinely and uniquely interesting, educative, and challenging to others. (At the same time, the intellectual work of designing a game is important, and we don't want to shortcut that by making game creation "too easy.") We are continuing to work on ways to scaffold this process. Secondly, we need to better help participants frame interesting questions for inquiry and find rich data representations. Project participants are directed to a range of sophisticated tools that can be used to access, organize, and analyze data, but we know that access to tools by itself is not enough. We are developing a number of strategies to support deeper inquiry, including the creation of a library of "interesting questions" and related resources. Finally, when done in a school setting, even a task like game design can be reduced to schoolwork – an involuntary demonstration of knowledge for the teacher. Ultimately, then, success will depend not just on better technological tools and materials, but on better ways to think about teaching, school, and learning.

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