Press play: Designing an epistemic game engine for journalism

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Abstract: Epistemic games are one approach to creating educational games that give players skills that transfer beyond the game world by helping young people become fluent in valuable social practices. Epistemic games are immersive, technology-enhanced, role-playing games where players learn to become—and thus to think like—doctors, lawyers, engineers, architects, and other members of important practices and professions. In what follows we look at the design of Byline, an epistemic game engine behind science.net, an epistemic game of science journalism. In particular, we argue that rather than simply recreating the technological conditions of the profession, an epistemic game engine like Byline can encode key elements of a professional practicum and thus help young people learn through participation in simulations of the training practices of socially valued professions such as science journalism.

Introduction

On PCs and consoles, students immerse themselves in games simulating everything from civilization planning (Civilization) to life in a west coast gang (Grand Theft Auto: San Andreas). In these games players learn sophisticated material in complex ways (Gee, 2003). But the challenge for designers of educational games is linking ‘in game’ learning with skills players can use beyond the game.

Epistemic games (Shaffer, 2005a) are one approach to creating educational games that give players skills that transfer beyond the game world by helping young people become fluent in valuable social practices. Epistemic games are immersive, technology-enhanced, role-playing games where players learn to become—and thus to think like—doctors, lawyers, engineers, architects, and other members of important practices and professions, and we have developed a number of such games for a variety of professional practices (Beckett & Shaffer, 2005; Svarovsky & Shaffer, in press; Shaffer, 2005a).

Each of these games consists of an activity structure (the things players do) and a computer-based epistemic game engine (the technology players use) that together simulate the process by which adults become fluent in a particular professional practice. It is the latter—the game engine—that we explore in this paper by looking at science.net, an epistemic game based on the profession of science journalism.

Historically, science journalists have worked to increase public awareness and understanding of science through news stories that explain and contextualize scientific and technological developments, thereby enabling the public to be more involved in how science and technology affect their lives (Nelkin, 1995; Blum and Knudson, 1997). Thus, science journalism presents a compelling model for an epistemic game in which players can learn to think about science and technology and their impact on society.

In what follows, we focus specifically on the design of Byline, the epistemic game engine behind science.net, and on how this technology helped players of science.net develop the professional perspective of science journalists. Our goals are (a) to illustrate the development process by which we created a tool that deliberately simulates the conditions of journalism practice in a game context, and (b) to show how the designed features of the tool supported students’ development of journalistic knowledge, skills, and values.

Theoretical Framework

Epistemic games (Shaffer, 2005a) are games that simulate the learning practices, or practicum, of a particular profession. That is, instead of simulating the actual or “ordinary” work practices of a profession, an epistemic role-playing game lets players experience the process by which members of a profession are trained. Building on Schon’s (Schon, 1987) work, we have argued elsewhere that the participant structures of a professional practicum are designed to develop the unique epistemic frame (Shaffer, 2005b) of a profession: the values, identity, and epistemology of a practice that organize the knowledge and skills of the community. Through the practicum, novices come to see themselves as particular kinds of people, people who know particular kinds of things, who are
able to perform particular kinds of activities, who judge the success and even importance of their activities based upon particular values.

Designing an epistemic game and epistemic game engine thus begins by conducting an ethnographic study of the means by which a particular practicum develops the epistemic frame of a profession (Shaffer, 2005b). This understanding then guides the creation of a role-playing game that recreates the elements of the practicum essential to developing that frame.

Science.net is based on an ethnographic study of Journalism 828 (J-828), a practicum course in the undergraduate Journalism curriculum on the campus of the University of Wisconsin-Madison (Shaffer, 2005b). In J-828, students engaged in the practice of writing to formula, which involves developing journalistic skills and knowledge such as writing story leads and using inverted pyramid story models. These profession-specific writing structures are part of the highly formulaic writing that differentiates journalistic writing from other genres. In J-828, reporters also practiced writing as a watchdog, which involves developing journalistic values such as catching the readers’ attention and writing to inform the reader. In other words, reporters in J-828 learned to internalize an awareness of the reader—a generalized representation of the news consuming public—and to align structured story writing with “the reader’s” interests and information needs. By learning to write to formula in order to more effectively write as a watchdog, students in J-828 cultivated their journalistic identities and realized the profession’s fundamentally democratic mission “to provide citizens with the information they need to be self-governing” (Kovach & Rosenstiel, 2001, p. 17).

The writing technology used by reporters in J-828 was primarily a WYSIWYG word processor, the writing tool used by professional journalists. From 1974’s Bravo—the first word processor that displayed a representation of the final printed form of a document in the editing window onscreen—to today’s Microsoft Word, WYSIWYG word processors provide implicit, syntactic, and generic support for writing (Press, 1993). Formatting tags, though present, are hidden: the author sees only a representation of how the document will look when printed or posted online. These implicit tags also primarily specify the text’s graphical format. This syntactic functionality lets writers define their own styles without specifically supporting any particular genre.

In a vocational education context, an authentic training recreation would adopt the technologies used in the profession because early access to professional tools speeds the development of student skills as well as their readiness to enter and be successful in the workforce (Falling, M. 2004; Reese, S., 2004). In this paper, we explore an alternative hypothesis: that an effective set of computational tools for epistemic games—an epistemic game engine—does not recreate the technological conditions of the profession; rather, it helps build a bridge between the learning practices of the practicum and its product, the professional epistemic frame.

To explore this hypothesis, we focus on the design of Byline, the epistemic game engine that recreates in silico elements of Journalism 828 that help novice reporters come to think like journalists. In particular, we look at how Byline provides explicit scaffolding for the structures of writing to formula and the sense of audience central to writing as a watchdog.

In what follows, we describe players’ experience of science.net and ask: (1) Did the science.net epistemic game help players develop journalistic skills, knowledge, and values? (2) If so, how did the specific design features of the epistemic game engine help players enter into the authentic learning practices of journalism – and thus develop these skills, knowledge, and values?

Methods

Epistemic game

During two experiments in the spring and summer of 2004, a total of fourteen middle school students (five female, nine male) from an after school enrichment program on the University of Wisconsin-Madison campus played the science.net game. Each group played for a total of approximately twelve hours in three to four hour segments per session. During each experiment, players engaged in a series of three publishing cycles, alternating between collaborative group work in news and desk meetings and individual work on story research, interviews and writing/copyediting. Following the practices of Journalism 828, professional journalists modeled aspects of
journalism such as interview techniques, writing with leads, and writing with the inverted pyramid organizational model. Each player wrote three stories that were published in the game’s internet-based newspaper.

**Epistemic game engine**

Byline, the game’s internet-based publishing and editing tool, was designed to simulate elements of Journalism 828 that helped novice reporters learn to write to formula and write as a watchdog.

**Writing to formula.**

Byline provides reporters with a set of custom-developed markup tags for the rhetorical structures of writing to formula (Coombs, Renear, and DeRose, 1987). These tags, such as lead{}, body{}, and jump_line{}, have computational effects in the tool: the text they mark is interpreted and rendered according to print newspaper conventions to produce realistic-looking internet newspaper stories. By marking genre-specific story elements, Byline’s tags also make explicit the organization and structure of the story. We hypothesized that Byline’s markup tags would give players opportunities to use and reflect on their developing journalism writing knowledge while bridging graphical and layout issues to produce realistic newspaper stories.

**Writing as a watchdog.**

Byline provides a preview panel, which displays the two ways readers are able to see finished stories. Reporters can see what a story will look like on the front page of the section with other stories, and how the story will appear when displayed in full and alone after a reader has followed the story’s jump-line (the link from the section front to the full story). We hypothesized that Byline’s preview panels would help players see their stories as a newspaper reader would, developing players’ awareness of the reader as a guide for writing.

**Data collection and analysis**

**Data collection.**

Data were collected using clinical interviews conducted with each player before and after the game. Interviews included open-ended questions about science, technology, and journalism. Interviews also included novel science scenarios in which players were asked to read and discuss one of two randomly assigned isomorphic paragraphs describing a potential scientific breakthrough from a discipline not covered in the game. Post-interviews also included questions about the game and players’ experiences during game activities. Byline also preserved all saved versions of all stories produced in the game for review and analysis.

**Data analysis.**

Data were analyzed using a grounded theory framework (Glaser, 1978; Lincoln & Guba, 1985; Strauss & Corbin, 1998). Pre- and post-interviews from the game were transcribed and broken into excerpts. Each excerpt represented one complete answer to a question, and included any follow-up questions or clarifications between the player and the interviewer. Excerpts and story versions were analyzed using the following codes:

**Table 1. Codes from analysis of interview and story data**

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Specific vocabulary, or terms of art from the domain of journalism</td>
<td>“[A good lead is] something that would tell .. the who, what, when, where, why and how … right away and that also got the reader interested so they would want to finish reading the whole article.”</td>
</tr>
<tr>
<td>Skill</td>
<td>Use of journalistic writing techniques including sourcing story information, presenting balanced perspectives, and using the neutral voice</td>
<td>“Some algal species, like cyanobacteria, produce toxins that, when ingested, can harm the neurological systems or liver of people, pets, livestock and wildlife, according to Mark Werner, a toxicologist with the Department of Health and Family Services.”</td>
</tr>
<tr>
<td>Value</td>
<td>Things that matter to the practice of good journalism</td>
<td>“As a journalist] you try to inform people of what’s going on and the facts and you find things out yourself and let everybody else know about them.”</td>
</tr>
</tbody>
</table>

Stories written by students were coded for the number of Byline journalism tags used and for two elements of journalistic writing. We counted the number of journalism tags used in each version of the story and computed for
each player their average tag use on each story, as well as their total tag usage across all stories. We also computed the number of times that the initial and final version of each story presented two or more perspectives on a particular claim, point, topic, or issue (balanced presentation of information) and the number of times that each story presented a specific source for information (attribution of information to sources).

Paired t-tests were used to compare interview responses between pre and post interviews and stories produced at the beginning and end of the game. We used a correlation to compare player’s use of Byline markup tags to the ratings of their stories in terms of balanced presentation of information and attribution of information to sources.

Results

Data in this section support two claims about the experience of players in the science.net epistemic game. First, players began to develop journalistic skills, knowledge, and values. Second, the development of these skills, knowledge, and values was linked to the game engine, Byline.

Players developed a journalism epistemic frame

**Skill**

Players used more journalistic techniques in their final story versions than in their initial story versions. They presented a more balanced account of information (mean first=4.5, mean final=8.4; p<0.01), and attributed more information to specific sources (mean first=2.9, mean last=4.2; p<0.05), suggesting that they had acquired important skills of journalistic writing.

**Knowledge**

Players used more journalistic terms of art in post-interviews than in pre-interviews (mean pre=3.5, mean post=10.0; p<0.01). Players also used this knowledge when discussing what they had learned in the game. For example, the inverted pyramid model and the story lead are two important concepts in journalism writing. In the post-interview, one player explicitly uses both, while also providing detailed information about leads:

I learned actually how to write a good news story like the inverted pyramid structure and how to make a good lead... Something that would tell of the who, what, when, where, why and how that you could tell right away and that also got the reader interested so they would want to finish reading the whole article.

**Values**

Players began to develop a sense of the guiding purposes or values for journalistic writing. In particular, they developed the journalism values of capturing the reader’s attention and informing the public.

*Capturing the reader’s attention.* Players referred significantly more often in the post-interview than in the pre-interview to the journalism value of capturing the reader’s attention (mean pre=1.0, mean post=2.3; p<0.01). When asked in the pre-interview if the novel science scenario information would make a good news story, one player focused on how the information might be used by others:

I think it would because... other people... would be aware about it, and it may come up in, like a debate or something, and they would want to know all the information that they can get.

In the post-interview and in response to the same question, the same player focused on the information like a journalist, highlighting opposing points of view, the availability of information for a story lead, and how likely the information will fulfill the journalistic value of capturing reader attention:

Yeah... Because you’ve got the scientists` point of view, and you’ve got the people who don’t think it’s right to change the animals’ genes. And you’ve got pretty much all the information that you’d be able to use for a first paragraph... Like you could easily get your first sentence done. And. You could easily grab a reader’s attention with this.

*Informing the public.* From pre-interview to post-interview, players made significantly more references to the journalism value of informing others (mean pre=1.3, mean post=3.6; p<0.01). When asked “What does it mean to be a journalist?” in the pre-interview, 79% (11/14) of players referred to writing as the defining attribute, without any mention of external or public reasons for writing. For example, as one player indicated in the pre-interview:
A journalist is someone who would write because they want to but they get paid to do it, so [journalists] bring stories that they’re interested in and write something about it.

While in the post-interview, the same player replied:

To be a journalist [is] to inform people about current events by writing them.

Overall, players’ understanding of what it means to be a journalist changed; 65% (9/14) of players in the post-interview defined journalists as people who write to inform other people compared with 28% (4/14) in the pre-interview.

Thus, players developed particular knowledge and skill with journalistic writing structures, and began to consider writing and being a reporter in terms of journalism values. In other words, players began to develop epistemic frames for this profession.

This epistemic frame was linked to the game engine, Byline.

In this next section we examine linkages between the development of frame elements and features of the game engine, Byline.

**Markup Skill & Knowledge**

Comparing their first story versions with their final story versions, players made significantly more frequent use of the markup tags corresponding to journalism writing structures (mean pre=2.8, mean post=3.5; p<0.01). There was also a correlation between players use of tags across all stories and their use of balanced information in their final story (r=.69, p<.01) and a correlation between players use of tags and their use of specific source attribution in their final story (r=.56, p<.05), suggesting that the use of tags was associated with the acquisition of skills of journalistic writing. As one player explained in the post-interview:

I think .. Byline was better [than MS Word] because it was exactly for typing up… journalism stories… It has the heading and all the different parts of the story like the body, the byline, the lead.

**Readerly Values**

In post-interviews, 79% (11/14) of players indicated that seeing their stories interpreted in the preview panels played an important role in how they thought about their stories. In addition, 62% (8/13) of players indicated that Byline’s markup tags had affected how they wrote their stories. For example, this player sees an important link between the way the markup tags are interpreted in the preview panels and the journalism value of grabbing the reader’s attention:

…when I wouldn’t do tags, it would always look so plain. But after I … put in a couple tags, .. it actually looked like a regular newspaper story. [That was important] because I think it not only grabbed my attention, but it may have grabbed other people’s attention.

Thus, players’ developing journalism epistemic frames were linked to specific features in the game engine. Players recognized the utility of the markup tags for writing journalism stories, while also using the reader preview to reflect on whether the story was aligned with the journalism values of capturing reader attention and informing that reader.

In summary, these results suggest that a) players began to develop an epistemic frame of journalism by playing the immersive role-playing game, science.net, and b) the development of particular elements of that frame was specifically enabled by design features of the epistemic game engine, Byline.

**Discussion**

The goal of science journalism is to help the public make informed decisions about scientific and technological issues. To accomplish this end, science journalists need to learn to write to formula, using journalistic writing structures such as story leads and inverted pyramids to present information, while also learning to write as a watchdog, communicating science information that is both important and relevant to readers. Novice science journalists have to learn to use—and to see themselves as people who use—a particular set of skills and knowledge in pursuit of journalistic values, typically through a practicum experience in which they produce news stories using a traditional word processor and reflect on that work with peers and mentors. That is, they need to develop the epistemic frame of science journalism.

The epistemic game science.net was designed as a simulation of the process by which cub reporters develop the epistemic frame of science journalism, with two important differences. First, while the goal of a journalism practicum is to create the epistemic frame of science journalism for new professional journalists,
science.net was designed to develop this frame for middle school students to use for thinking about scientific and technological issues in school and in their lives outside of the epistemic game. Second, we hypothesized that an epistemic game engine designed to encode specific elements of the practicum in silico would be effective in helping these students develop an epistemic frame characteristic of a mature professional practitioner. Specifically, we designed and tested a tool that provides explicit support for writing to formula while linking that writing to an awareness of audience to reinforce the practice of writing as a watchdog.

Our results show that students did develop elements of the science journalism epistemic frame by playing the science.net epistemic game. They learned to write to formula, developing understanding of important journalism writing concepts and improving their ability to use those concepts appropriately after playing the game. They also learned to write as a watchdog, developing an awareness of readers’ interests guiding the reporters’ writing.

More important here, the epistemic game engine Byline played an important role in these developments, providing explicit support for learning particular frame elements. First, science.net reporters used custom-developed journalism markup tags in the Byline editor that were explicit, semantic, and genre-specific. Unlike traditional WYSIWIG editors, in Byline’s editing panel these tags visibly mark particular journalistic writing structures within a reporter’s story, structures which are then interpreted and formatted according to print newspaper traditions in the parallel preview panel. Linking the writing structure encoded in each journalism tag with the formatting consequences of each tag rendered abstract writing concepts more concrete and helped science.net reporters learn to write to formula.

Building on these explicit journalism markup tags, a second key Byline feature is the interpreted story preview. This view complements the structured view by showing the reporter what the reader will get, thereby helping the reporter reflect on what will catch a reader’s attention, and how best to present information to ensure the reader will stay with the story and understand its information and relevance. Because many readers decide whether to follow the jump-line and continue reading a story based on its headline and lead, reporters combine their structured writing skills and these previews to make sure the most important details are most prominently displayed.

In contrast to the singular reader-focused WYSIWYG view, this complementary dual display makes explicit how reporters need to simultaneously see from both perspectives. In other words, this display helped reporters learning to consider their stories both from a writing to formula perspective, in terms of the particular semantic structures, and from a writing as a watchdog perspective, in terms of the story’s importance and relevance for readers.

The results presented here have several obvious limits. First, this preliminary study was not designed to compare Byline with other writing tools. Second, and perhaps more important, the study only describes what a limited set of students did with one epistemic game engine in the context of a single epistemic game. However, these results suggest that epistemic game engines may make it possible to design games that are powerfully authentic. Rather than simply recreating the technological conditions of the profession, an epistemic game engine like Byline can encode key elements of a professional practicum and thus help young people learn through participation in simulations of the training practices of socially valued professions such as science journalism.

References


