ABSTRACT

In this case study, we document the development and user-testing of Epidemic: Self-care for Crisis, an online educational resource that invites users (aged 14-20) to develop game-based knowledge and practices around prevention, self-care and (mis)information in the face of contagious diseases – a timely project, given the ongoing anxieties, and false (and not so false) alarms, over SARS, Avian Flu, and H1N1. Contagion, the forerunner to Epidemic, mobilized the conventions and mechanics of single-player adventure games to engage players ‘experientially’ with health- and disease-related understandings: we configured the same basic self-care information as “narrative knowledge” [27] intended to mobilize players’ attention and intelligence voluntarily, using narrative as a rhetorical strategy. We were using narrative’s traditional, paradigmatic function within literate cultural forms of interpellation—stories of playful, pleasurable persuasion designed to engage players.

Epidemic takes a decidedly different tack towards delivering the same educational content. Reconfiguring digital play within social networking conventions affords us a design-based platform for fundamental theory development in game-based learning. Epidemic’s modular, Flash and XML-based design allows for accessible and straightforward creation and editing of educational ‘content’, both textual and visual: players can generate and publish their own virus-like avatars, stop-motion animations, and disease-related public service announcements. Some interesting divergences in play-based education on community health/self care, between interactive narrative and social-networking configurations for ludic knowledge representation, appear noteworthy.

Our user-testing, we argue, signifies a further innovation in the field of educational game design, leaving behind the clichéd concern over ‘what did you learn today’ in favor of focusing on when and how laughter, engagement and attention are most at work. Taken together, these innovations instantiate an approach to digitally-mediated learning that construes and practices assessment differently than in traditional education (and in educational technology design), which are more concerned with propositionally identifiable learning outcomes. In the case of Epidemic, however, we are more concerned with how play-based learning design can best support the cultivation of responsible and critically-informed attitudes towards public health.

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Keywords
e-Learning, educational gaming, user-testing, games for health

1. INTRODUCTION

This case study reports on the design, development and initial implementation of an online educational resource entitled Epidemic: Self-Care for Crisis, available at http://contagion.edu.yorku.ca/epidemic-dev/login.php. Epidemic represents the continuation and extension of an educational game design experiment, one that involves building and testing different environments for imparting to players critical health-related knowledge: the transmission vectors and symptoms of particular contagious diseases, and the methods, practices and habits for avoidance and treatment. The impetus was the recognition that few public school curricula, even those that embrace ‘health promotion’, explicitly address disease prevention and self-care in the face of new contagious disease strains, some of which have in recent years threatened to become global pandemics (SARS, Avian Flu, and H1N1, for example). We identified a set of understandings and abilities vital to protecting oneself, and one another, in the face of contagious outbreaks: practical information for self-care (identifying and treating symptoms, managing contagion and prevention), but also scientific facts (epidemiology and virus structure) and social science-related understandings (i.e., relating to historical or ongoing misconceptions).

Our experiment began in 2003 with the creation of Contagion, a Flash-based, narratively-driven adventure game. More like an interactive narrative with embedded but narratively related ‘game-lets’, Contagion asks players how they will save a futuristic city-state from a mysterious outbreak, and to perform rudimentary epidemiology, treat the sick and comfort the dying, and navigate the city’s restrictive social and political hierarchies as they do so. As we report elsewhere [7], Contagion represents an attempt to build an environment where educational ‘content’ is not recognizable as such (that is to say, in a textual and propositionally-organized form), but is distributed across multiple modalities – narrative, as well as character and environment design and game mechanics. In contrast, Epidemic: Self-Care for Crisis is, paradoxically enough, a social networking site delivering content, in a decidedly ‘old school’ manner, with a series text-based ‘Fact Sheets’ that offer information on 30 individual contagious diseases. Where Contagion appropriated single-player, narratively-driven gaming conventions to create an environment in which educational content is both everywhere and nowhere, Epidemic purposely invokes the interface, architecture
and functionality of social networking tools: its didactic Fact Sheets constitute just one interlocking module among several that users can voluntarily engage with, alongside a poster-creation game, comic book/stop-motion animation maker, and fictitious disease creation tool. Moreover, where the Fact Sheets employ a dry and straightforward tone to ‘serious’ content, Epidemic’s authoring tools feature palettes of disease-themed characters, objects and backgrounds presented in a deliberately irreverent style. The goal here is to capitalize on the kinds of informal distributed and collaborative learning opportunities made possible by Web 2.0 technologies [25], while still encouraging a significant amount of “serious play” [5, 30].

In this paper, we report on the theoretical innovations we think that our design and development of this small-scale educational resource might represent. Specifically, we discuss the Flash and XML-based architecture of Epidemic in terms of the pedagogical affordances this modular configuration of content makes possible. We then highlight when and where we draw from social networking tools as well as commercial game design in building a series of interactive components to be included in the resource, where users can either individually or collaboratively explore information and build narratives around contagious diseases, their symptoms and transmission vectors, and public (mis)conceptions of them. Finally, we describe our user-testing process, documenting how we looked to user engagement and affect for evidence of how, where and when users learned from playing Epidemic, rather than asking them to answer “what they learned” [32]. We think this approach embodies an understanding of education as more concerned with outcomes – with Epidemic, the cultivation of awareness and understanding with regards to contagious diseases – rather than assessment. While Epidemic certainly does not meet the requirements for a ‘game’ according to most ostensive definitions [31], we believe it more successfully enacts a play-based mode of learning – a “ludic epistemology” – than many conventional approaches to educational gaming. That is, unlike many educational resources that call themselves ‘games’, Epidemic does not check whether players get their facts right, but rather invites them to engage with serious issues in a playful way - through trying out new roles, understandings, and behaviors.

We begin with an overview of scholarship related to educational game design, noting some of the more persistent conceptual pitfalls that arise from trying to reconcile digital games with conventional curricular content and delivery.

2. BACKGROUND

2.1 The State of Play in Educational Game Design

Most approaches to educational game design are keen to appropriate those elements of commercial games that are most amenable to ‘good’ learning. Here, we briefly recap dominant conceptions of what and how educational game’ designers can learn from commercially successful game design, in order to identify how our own approach in designing Epidemic differs from this more canonical approach to educational game design.

Until quite recently, the dominant approach to discussions of games and play has been an “extrinsic” one: games and play are (by definition!) “fun.” Thus teachers can use games as motivational tools, whether directly as a reward for doing one’s work well (“and now you get to play for 20 minutes”), or as a FORM, (actually more accurately as a disguise) to make learning more palatable: “the spoonful of sugar that helps the educational medicine go down” [30]. In this view, learning is structurally posited as unpleasant and the challenge is to determine what forms of “sugar” are both most effective for learning and most rewarding for learners. A good deal of effort in this approach is devoted to carving out typological distinctions among entities, and fitting different kind of educational “content” into them. There is a pre-occupation with ontology in this view, asking questions such as: “What is a game? What is a simulation? What is a puzzle? What is a simulation game?” Then evaluation is pursued: “Which of these is best suited to this (or that) kind of learning/content, and how can we meaningfully measure and report relative effectiveness?” From this standpoint we are most likely to learn that games are good for teaching low-level content and skills, while puzzles are good for teaching mathematical reasoning, simulations are good for teaching social and communication skills and strategic reasoning, and so on. Here disciplinary knowledge is again more or less held constant. Proponents of this view pay little attention to volition: that we would and should require players to play games found to be educationally effective is not something over which much sleep is lost [19].

This approach, we believe, rests on a critical misunderstanding of the relationship between attention and education. For both the education and digital entertainment industries, the attention of the learner/player is central, and is the primary currency – though arguably, digital games have a far better handle on this “attention economy” [6]. In contrast to formal schooling, as well as conventional educational game design, commercial games rely upon their ability to elicit attention voluntarily [5, 12, 13], and for prolonged periods. In games, player attention is central: the player must first choose to play, and then the game encourages her to continue through both sophisticated and simplistic reward structures that help her learn quickly. The player has agency, and, in more than a trivial sense, significant meanings have ‘play,’ What we see represented in video games, therefore, is the fundamental principle at work in theoretical research on attention and learning [22, 23]: that intelligence is always adverbial to attentive action.

In keeping with classic definitions of what counts as play [16], the challenge we set out with in Epidemic, was to create a ludic environment that invites, rather than demands that users pay attention: In going ‘viral’ we wanted to design a pedagogically distinctive environment that does not rely on the formal framework of the interactive narrative, but which similarly rewards continued engagement rather than penalizing users’ lack of interest with tests and grades.

3. MODULAR DESIGN

As we have remarked in relation to previous educational technology projects [17], Flash is a cost-effective and accessible means for developing digital learning tools, despite its technical limitations. Not only is it cheap compared to other commercial game development engines and educational content delivery systems, but developing content for free, online delivery means that educators can make use of applications without installing new software on computers –often a significant barrier to entry for digital learning tools in formal schooling.
Here, we identify two technical decisions related to the Flash architecture we deployed in Epidemic. We see these decisions as noteworthy not because they mark any particular innovation with regards to educational game design, Flash-based or otherwise, but because they represent particular pedagogical choices. Here, we describe how two particular ‘rhetorical’ decisions enact very distinct environments in which educational content can be differently modified and reconfigured by users, and, in neither case, simply ‘delivered’.

First, the extensive employment of XML in the architecture of Epidemic’s components supports, in particular, the ‘Hall of Infamy’ where historical and current contagious diseases are profiled on various Fact Sheets: ‘FluTube’, where users create animated comic strips about contagion and self-care; ‘Propaganda Maker’, an activity for making public service announcement-style posters; and the avatar creation tool, where users create their own viruses which they then use to represent themselves to other users. While the interfaces for these components are built in Flash, the content is coded and accessed dynamically via XML files, meaning that new content (for instance, new background images for the Propaganda Maker, or new Fact Sheets for the Hall of Infamy) can be added quickly and without much technical know-how. This means that content for the central, interactive parts of the Epidemic resource can be updated and edited independently of a trained programmer.

The second significant decision in terms of architecture concerns the deployment of Flash to embrace ‘Web 2.0’ capabilities – i.e., functions that allow users to actively produce or modify web-based content, rather than just reading, watching, and ‘pointing and clicking’. This is used effectively in Epidemic’s FluTube application, where players select from an array of backgrounds, characters and props to build animated comic strips frame-by-frame, as well as view and edit other users’ FluTube creations.

The significance of these programming decisions, we argue, is to enable non-programmers (e.g., educators and researchers) to contribute to the already sizable pool of textual and visual disease-related content the tool offers. This inclusionary design represents a significant pedagogical affordance, giving educators access to a shared ‘design grammar’ that they can contribute to and draw from [15, 21]. This sort of adaptability has for some time now been identified as among the most important goals of learning object design [2, 8, 15]. While XML-based approaches of the kind described in these studies, where primarily textual content is coded in easily-editable XML documents rather than hard-wired into the resource itself, work towards this goal, they generally do so at the expense of divorcing educative concerns from questions of design. As we have described elsewhere [4, 17], template-driven instructional resources, though efficient in their capacity to “deliver” different content do different contexts, deny instructors and students agency in determining how they engage with educational material. Looking at design itself as a pedagogical exercise in the development of on-line learning capabilities means asking what kinds of pedagogical choices we forgo when opting for resources which so efficiently deliver content but over which we have no control in terms of how that content is enacted and delivered.

4. LEARNING FROM COMMERCIAL GAMES AND SOCIAL NETWORK SITES

While Epidemic: Self-care for Crisis is not, in any traditional sense, a ‘game’, we have appropriated ludic features within a social networking frame to support the overall goal of keeping learners engaged and involved. This was the reasoning behind three key design decisions, which, as was also demonstrated in our user-testing and evaluation, represent the tool’s preliminary success as a learning resource. The first involves our choice to implement a scoring system diametrically opposed to what is otherwise, largely, a tool for the delivery of propositionally organized content related to educational disease. Users are scored more ‘contagion points’ and their fictitious disease avatars grow from outbreaks to pandemics the more information they access, stories they publish, posters they create, and friends they make. As they do so – literally, as they become more ‘viral’, they are able to unlock more content in the form of characters, backgrounds, and object palettes in ‘FluTube’ and ‘Propaganda Maker’. In doing so, the goal was to create an environment where the reasons to progress through activities are intrinsic, and virally ‘organic’.

The second significant game-informed design choice involved the development of a user interface and, in particular, a character creation tool. The overall interface and functionality of the Epidemic user home page invokes a Facebook-style networking resource where users befriend each other and view each other’s disease-related stories and posters. Unlike Facebook, however, we encourage users to create alternate identities – specifically, ‘fake’ viruses that become their avatars for the site. Research on other games and virtual environments [10] report users spending considerable time and attention on selecting and ‘customizing’ avatars, so we elected to mobilize this affordance educationally. Epidemic’s character creation tool allows users to select their ‘body’, each representing a different family of viruses; this decision as to what kind of virus the player chooses informs what kinds of symptoms, transmission vectors, and weaknesses users can attribute to their virus – all of which is based on actual epidemiology. Thus, in developing their own fictitious avatar for use throughout the Epidemic tool, users are engaging the acquisition and consideration of legitimate epidemiological knowledge (see Figure 1 for a screenshot of avatar creation in Epidemic).

![Figure 1. Epidemic’s virus creation screen](image-url)
5. USER-TESTING

The user-testing we report on here took place over 4 weeks with approximately 50 students enrolled in a summer camp at York University. Students were divided into four groups of 10-16, and we saw each group, each week, for 45 minutes to an hour. Our lesson plans during these sessions involved having students work in pairs from a particular and randomized ‘Fact Sheet’ from Epidemic’s Hall of Infamy (our database of over thirty various contagious diseases, from Hantavirus to Chicken Pox) and develop posters or animated comic strips that demonstrated their understandings of their assigned disease (we used Ebola, Influenza, West Nile, and HIV/AIDS).

For these sessions, we purposely avoided asking students to answer (either through interviews or questionnaires) questions around what they learned from playing Epidemic. As has been pointed out in other educational research, such questions invariably ask students to “ventriloquite” responses [3] – that is, to provide answers that they think we, as researchers and educators, want to hear. Moreover, this line of questioning demands that we reduce the complex affordances of multi-modal, interactive learning [1, 20, 24, 26, 28] to singular, propositionally organized statements. The ‘evidence’ we draw from here in illustrating Epidemic’s educational possibilities, by contrast, includes indicators of high student attention and affect (drawn from our qualitative observations), as well as students’ actual FluTube and Propaganda Maker productions.

5.1 Diagnosing Engagement

Despite the time constraints of these sessions, and the persistence of certain glitches in the FluTube tool at the time of testing (particularly around saving projects), our analysis of students’ activities in these sessions suggest that FluTube and Propaganda Maker enabled students to deploy, experiment with and work through ‘real life’ considerations around the transfer and prevention of contagious diseases, but in a way that was irreverent and playful [14]. Our findings, based on qualitative observations by the three graduate research assistants present at each session, show evidence of high engagement and attention - including laughter, significant periods of uninterrupted screen looking, and a willingness to stay ‘on task’ without supervisor intervention.

Students’ FluTube stories demonstrated that not only had they appropriated the language in the disease ‘fact sheets’ they were given, but that they were able to mobilize the underlying understandings of disease transmission and prevention, showing how and under what conditions different viruses can be spread from one person to the next. These sessions demonstrated that for a group of students who had little preliminary understanding of considerations around self-care in relation to different diseases – that is, anything beyond an ability to rehearse ubiquitous public health care messages (‘wash your hands frequently’, for instance) – these lesson plans involving content and resources developed for the Epidemic project proved to be a highly effective and engaging means of communicating deeper understandings of various contagious diseases.

5.2 “I didn’t know you could show that in schools”

The following stories from our user-testing sessions demonstrate the potentials of Epidemic to enact enjoyable and educationally rich forms of collaborative learning. In our second session with Propaganda Maker, we organized students into a friendly competition over who could most effectively persuade others that the imaginary disease represented in their poster was ‘real’. In pairs, students volunteered to stand in front of the class and presented their poster creations using a digital projector, describing in detail the kinds of side effects, transmission vectors, and methods of treatment their imaginary diseases entailed. We see this as a highly significant learning outcome for several reasons. Firstly, even though the ‘content’ they presented was made-up (i.e., they were discussing wholly imaginary diseases), the terminology they used to describe their diseases (‘vectors’, ‘self-care’, etc.) was accurately modeled on and paralleled ‘real life’ diseases. Through this play and the appropriation of disease-related concepts it involved, students demonstrated a working knowledge of how many real life diseases are spread, classified, and represented. Secondly, their eagerness to show their posters to other students and to voluntarily articulate how their fake disease works illustrates how this kind of resource, which invites students to both produce and share their creations, can enable collaborative learning opportunities where students can (and with very little educator/researcher intervention) engage with, support and critique one another’s work. Third, and educationally perhaps most importantly, the discursive critiques which formed the basis for students’ accepting or rejecting a presented disease as ‘real’ involved substantive knowledge and authentic understanding of the substantively correct particulars their imitative discourse accomplishment needed properly to be populated [11].

In another session with Propaganda Maker, students were asked to create one ‘real’ and one ‘fake’ poster, which would then be shown to the rest of the group (see Figure 2 for an example of a ‘fake’ poster). The goal here was not only to assess students’ knowledge of particular diseases but, as importantly, to enable them to meaningfully distinguish legitimate from illegitimate health-related knowledge through both creation and critique, and by re-mediating textual facts (from the Fact Sheet) into a visual and textual format. As with the Propaganda Maker exercise described above, we noted a high degree of affect and engagement among students as they collectively separated ‘real’ from ‘fake’ posters, even as they critically engaged with a domain of knowledge that is “deadly serious” [18].

Figure 2. An (intentionally) ‘fake’ poster design from a user-testing session

A third, predictably troubling, anecdote illustrates the important pedagogical affordances of a resource that, while it offers a fair
amount of didactic content, does not dictate how or whether users deploy this content in their use of FluTube and Propaganda Maker. In our early user-testing of FluTube in which we gave pairs of students a virus Fact Sheet and asked them to build a story about contracting that particular disease, we observed one pair of students disregarding their Fact Sheet and instead creating a narrative about zombie characters that drew heavily from the scatological imagery FluTube offers (images of feces and vomit; see Figure 3).

We can surely dismiss this as a frivolous and ‘un’-educational use of the application, however what matters here is how the narrative this pair created exemplifies the way the imagery made available to FluTube users constrains and directs what the narrative is ‘about’: people getting sick from other people’s bodily fluids. While it is certainly possible to make a FluTube narrative that is not about any disease in particular, it is far less easy, because of the thematically-constrained range of characters, props and backgrounds, to make a narrative that must in some way address or engage with concepts related to contagion, disease, and self-care. This is a far more engaging mode of prescribing ‘content’ than to demand from players that they commit to accurately portraying certain facts about particular diseases. What’s needed of course is more and further testing and analysis of student learning and engagement. Suggestive in this instance of “stealth” learning [29], the pair of students that created the zombie narrative clearly and explicitly portrayed the consequences of an unhygienic and unhealthy action, but in a way that certainly may not look particularly serious or ‘educational’: as one student in the pair remarked, “I didn’t know you could show that in schools.” Allowing students to give their attention in schools to what they are attending to in their own lives is surely the first large step towards making urgent knowledge, like self-care in conditions of crisis, transferable to able to be mobilized within their own lives.

Figure 3. A ‘zombie’ narrative in FluTube

6. CONCLUSION: ASSESSMENT OR OUTCOMES?
In previous works, we discussed the importance for educational game design to move away from the notion that ‘learning’ consists in the transmission of propositionally-ordered content [5, 7]. Here, in this discussion of our user-testing with Epidemic, we address a similar and no less limiting convention related to e-Learning, and to education more generally: the notion that the best evidence that learning has taken place consists in assessment-driven textual production. Even in this new world of “Learning 2.0” [9, 23, 36], where educators and instructors celebrate the capacity of tools like blogs and wikis, to transform learners from passive receivers of educational content to active producers, this discourse often continues to operate within an understanding that learning only ‘counts’ when students produce evidence of their learning in accordance with a prescribed and pre-determined template. In formal education, we have always demanded that students produce – whether test scores, essays, etc. – and these forms of assessment we take as proof that learning has taken place. The challenge for educators is to not simply demand differently-mediated (but still primarily textual) forms of production-based assessment (e.g. putting your essay on-line, with some pictures), but to return to a notion of education as the cultivation of dispositions and abilities for living meaningful and, in the case of Epidemic, slightly more health-conscious lives. When viewed in this way, the evidence for learning – digitally-mediated or otherwise – might consist less in whether and how students answer ‘what they learned’ from play, and instead in sustained and voluntary attention-giving, the cultivation of affect and excitement, and a desire to keep playing within an environment to engage students with culturally significant knowledge, and to understand how this can and should come in many and different forms.
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8. REFERENCES


