

2013

## You Have Died of Dysentery: A First Attempt at Navigating a Course in Educational Games

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### Recommended Citation

Decker, Adrienne and Simkins, David (2013) "You Have Died of Dysentery: A First Attempt at Navigating a Course in Educational Games," *Journal of Interactive Humanities*: Vol. 1: Iss. 1, Article 1.

DOI: 10.14448/jih.01.0001

Available at: <http://scholarworks.rit.edu/jih/vol1/iss1/1>

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# You Have Died of Dysentery: A First Attempt at Navigating a Course in Educational Games

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## Abstract

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*This paper describes our experiences developing and piloting a course in educational games. We discuss the structure of the course, the topics we included in the course, as well as the final projects the students created for the course. Of particular interest to non-technical educators interested in exploring games in their courses is the fact that our course incorporated many critical thinking skills as part of the coursework. We felt that an important part of the student's immersion in this material was not just the production of the game, but also a deeper understanding of the issues surrounding education and educational games. Also included are suggestions for the course with the video game production aspect removed.*

## Key Words

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*Course Development, Educational Games,  
Practitioner Report*

## I. Introduction

Many effective constructivist methods of teaching seek to invite and continually elevate the level and sophistication of student engagement by encouraging students to become active developers within their topic. Through creating products that are both interesting and in keeping with the subject to be learned, students must not only understand facts about their topic, but must see how those facts interact to create systems. This invites the student into increasing complexity and can nurture

deep understanding of concepts in an environment where greater difficulty means greater challenge and authenticity, not greater chance for catastrophic failure [1]. This paper is a description of one combined undergraduate and graduate seminar taught on the Rochester Institute of Technology campus focused on the design and development of games for learning.

Recently, a grassroots effort has begun at our institution to blend humanities and technical subjects together to engage all students in a more interesting way. Faculty from both sides (technical and humanities) have worked together to create these types of experiences and inform each other in the process. Technical faculty have begun to infuse humanities topics and techniques into their

courses as a way to expose the students to different ways of thinking about the problems of the course. Humanities faculty have brought in technical aspects to illustrate many of the topics in their courses digitally. While early evidence suggests that this combination may be an extremely effective teaching method, it is not always clear to either humanities or technical faculty how one might best incorporate the combination. It is within this environment and with this question in mind that the idea for the course in educational games came about. While the version of the course described in this paper is entrenched entirely in a technical department (with majors in Game Design and Development and New Media Interactive Design) and whose main deliverable was a fully developed digital educational game using humanities content as a guide for good game and instructional design, it is not without reason that one could teach a similar course in a way that divorces it from technological development. The focus instead would be on the analysis and design aspects of educational games and how they enrich content understanding on the part of designers themselves, as well as the players of their games.

The particular blend of technical and humanities followed in this course is informed by a trend in education emphasizing constructivist learning environments, such as DiSessa's work with student creating scientific models in logo and other relatively simple programming languages [2]. It is also informed by learning theory seeking to tap into and cultivate participatory culture [3]. The intent was to create an environment in which the students became legitimate peripheral participants in the topic [4]. The students do not just study others, but themselves become designers of learning games. To this end, students read and discussed general learning theory, played and critiques games, and then created a learning game in small groups.

The two instructors of the course are from the same department, Interactive Games and Media, but have quite different paths into the discipline. They were each at all class meetings, worked together to form the syllabus, to create and grade assignments, and to lead the discussions. One instructor has a background in technical issues (primarily computer science and programming) with an interest in using games and game-like experiences to teach. The other has a background in education with a focus on using digital games as tools for learning. The collaborative nature of the course allowed the instructors to leverage their diversity in the development of materials and in the moment to moment discussions that formed the bulk of this seminar-style class. This was not an accident, and one of the core themes of the course was on leveraging diversities within the classroom and within small groups. Students were encouraged in development to find and focus on their complementary strengths to create the best possible product.

In the course, an effort was made to focus on not only technical skills (building an actual digital game), but also on other skills important to the study of education issues and educational games, particularly critical thinking skills. The course incorporated critique, analysis, and close reading of games along with the actual design and building of a game. We wanted to emphasize to the students when creating the game that they needed a deep engagement with the material that the game was going to teach. Only through careful planning and immersion with that material could the game truly be a success.

These elements provided supplies for our course preparation, but it is only the beginning. As Matt tells the player before they set out on the Oregon Trail, "Well then, you're ready to start. Good luck! You have a long and difficult journey ahead." [5]

## II. The Trail (Our Course)

The debut of the Seminar in Educational Games course was Winter Quarter 2012-2013. The quarter runs for 10 weeks with a one-week exam period immediately following, for a total of 11 weeks. The course met twice a week for one hour fifty minutes each meeting. The course was a co-listed undergraduate and graduate seminar that required graduate standing to take the graduate version and completion of our department's Game Design and Development II course. This course was chosen as a pre-requisite to ensure that the undergraduate students in the course were of junior or senior standing in the department and would therefore come in with some degree of competency in the design and production of digital games. A more humanities-focused course could do away with the technical requirements. As an advanced seminar, the course could take advantage of the greater maturity and experience of upper class students, but this kind of course could be changed to effectively serve as a first year seminar.

There were 27 students enrolled in the initial offering of the course. As expected, all of the students were majors in the Interactive Games and Media department, meaning that their backgrounds were of a technical nature. Due to the nature of the degree programs our department offers, the students are required to know how to work with and create technology artifacts. The students take many courses in digital programming and design and at the point of this course in the curriculum have designed and built some substantial digital games in previous courses. Within the first week when we began discussion about educational games, the students actually had a fairly clear picture about what an educational game was and also about learning from games that were not purely educational in nature. This provided a good starting point for our discussions in the class.

All students completed the course and received a letter grade.

### *A. Attempt to ford the river (Class structure)*

The class meetings were mostly discussion sessions in the style of a humanities seminar. Students were expected to complete weekly readings and come prepared to discuss the readings during the class time. Some of the discussions were conducted in small groups and shared with the class. Otherwise discussions involved the entire class. Most often, we began discussions by asking for student questions about the readings and used those to help all of us guide the discussion. Questions generally either sought clarification about what was meant by a reading or they were about the implications of the readings. Discussions of implication often led to discussion of subjective matters raised by the reading, and we encouraged this trend, allowing the students to engage with us and one another about their own personal opinions on the topics, but with an attempt to keep the scope of the discussion relevant to the readings at hand. The course did not use class discussion time to discuss technical issues relating to the creation of digital games. Students in this department could be expected to have this background knowledge coming into the course. As we will discuss in the next section, the course was quite packed with content, and teachers of less technical students may decide to focus on critiquing digital games for learning, but instead of developing a digital game have student work focus entirely on design or, perhaps more effectively, on the development of a game that could be played in class - a board or card game, for example. Assignments for the course were a combination of individual and small group work.

### *B. Travel the trail (Course topics)*

The first four weeks of the course introduced the concepts of learning, learning games, and learning

from games. Before the course started, we asked the students to complete the reading of the book *What Video Games Have to Teach Us About Learning and Literacy* by James Paul Gee [6]. During the first week, we discussed the issues Gee raises in his book and how that can inform our further exploration of educational games.

We then discussed cognition and learning using as primary reference Greeno, Collins, and Resnick [7]. In these discussions, we introduced the students to the concepts of learning, transfer, cognition, motivation, engagement, and the various theories that exist about how all of these things best happen. Throughout this time, we also spent class discussion on the learning games that students have played and what they learned from them and how these theories related to that learning.

The next two weeks of the course discussed issues surrounding the testing and analysis of educational games. We started by introducing the concept of human subjects research. We discussed some of the more famous experiments (Milgram Experiment, Tuskegee Experiment, Stanford Prison Experiment) that led to the formations of the Institutional Review Board (IRB) system and engaged the students in discussions of the lessons learned from experimentation on human subjects. We then discussed the differences between qualitative and quantitative research as it pertains to educational games and educational interventions in general. We wrapped up this entire section of the course with discussions about experimental design and how to design an experiment around an educational intervention like an educational game.

The last two weeks of class time not devoted to project work time or demos involved the discussion of games for learning in non-traditional classroom settings. We discussed learning that comes from

games not designed explicitly for learning, learning as an adult learner, and ended with discussions about gender and learning and gender and games.

This may seem like an eclectic grouping, but remember that the intent of the course is to introduce students not only to content of developing games for learning, but also to the practice itself, including its methods and norms. By not just talking about products, but also studying the kinds of considerations that must go into doing educational research and making learning games, we provided an initial introduction into how to be a learning games developer. We believe this is a vital part of a course such as this, and one that could be used in any humanities discipline to move students beyond being a consumer of humanities and digital content to becoming a producer of both, if only at an apprentice level initially.

### ***C. Continue on trail (Individual projects)***

The first assignment (other than readings) for the students was to provide an analysis of an educational game designed for children. The students were free to choose whatever educational game they wished, be it modern or from their own primary school years. The only restriction was that they needed to be able to play the game in the present day. They could not rely on memory of the game for the assignment. For the analysis, we asked that the students give a thorough description of the game play. That is, not a walkthrough of the game, but rather a close read of the game play that looks at the game from a structural and thematic level. The students were given one week to complete the assignment.

For their second assignment, we asked them to re-write the analysis of the same game. This re-write assignment was given one week after the first assignment was due. Prior to the assignment, the students engaged in an in-class exercise where

they exchanged papers and discussed in small groups about their assignments. This exercise was followed by an instructor-led discussion of the subtle differences between an analysis, a read of the whole of the game focusing on its educational content, and a walk-through, a play-by-play summary of the game. One of the key points that many students missed was the fact that they discussed game play strategy, which does not really belong in an analysis we asked them to write.

For the third and final individual assignment, given in the final third of the quarter, we asked them to critique the game that they wrote their first two papers on. We defined critique for this assignment to be a narrow and deep look at a particular aspect of the game play. As an example, one could look at the pass mechanism allowed in certain games and how that affects the overall game play and possible strategy in the game.

All of these assignments were to be between 2 and 3 pages in length. We were looking for short, but careful analyses of particulars about the game and game mechanics.

#### ***D. Change pace (Group projects)***

The group project, which was the main project in the course was assigned during week 4 of the quarter and had a final submission during the exam period (the 11th week). The project was to design an educational game about any topic that the group wished. The students self-selected their groups in all but one case. In the last case, students who were essentially left over formed the last group.

The first part of the project was for the teams to come up with a “one sheet” for their game. The one sheet is a standard game design document that condenses the key aspects of the game into one written sheet of paper. Sometimes the one sheets

are used for marketing purposes, but ultimately they are used to convey the game that will be created in a nutshell accessible to those outside of the design and development team. The teams were to turn in the one sheets to the instructors for review and feedback about their game ideas.

The second part of the project was a five minute group presentation where the groups needed to take their idea and do what essentially amounted to a literature review. We asked the groups to find other games that are similar in some way to their game. Ideally, they should have presented games whose content area is similar to their game. They also could present games whose game mechanic is similar, but whose content area was vastly different. It is an important part of the game development process to ensure that you are not creating a game that is too similar to games that already exist. These presentations forced the students to go out and find other games in their domain of interest and report back on them.

The third part of the project was to complete a prototype for peer review and critique for week 9 of the quarter. During class time of week 9, all students played all of the prototypes. The class time was broken up into equal sized segments for each game. First, all students played the prototypes and answered the following questions about each in an online survey.

- Give at least one good point about the demo you just played.
- Give at least one example of a place where you can see room for improvement.
- Feel free to add any additional comments about the demo here.

The survey responses were recorded by each individual, but the responses to these questions were

provided to the development teams anonymously by the instructors after the week 9 demos. After the play/survey time, there was time allotted for each group for an informal classroom discussion of the game where the developers could respond to critique and also hear from the students directly about the game. After the in-class discussion about the game, the entire class moved on to the next game.

The last part of the project was to use the feedback given from the week 9 demos and to finish and polish the games created to be turned in during the exam week (week 11). After the projects were submitted, the students were asked to rate their peer's performance on the project and in the group which was used to adjust individual grades for the project component.

#### ***E. Press RETURN to size up the situation (Final grading breakdown)***

Final grades were assigned by weighting the various components of the course using the following weights: project (40%), peer review from project (10%), literature review presentation from group project (10%), demo week participation and feedback (10%), individual assignments (15%), class participation and attendance (15%). In calculating the final grades, all students passed the course, with all but one student receiving an A or B.

### **III. Learn about the trail (Analysis)**

In taking a look back on the course, there are many aspects that we feel went very well and others that we could have improved upon. In this section, we will present a brief analysis of the aspects of the course.

As far as topical coverage for the course, we felt we did a reasonable job of discussing the main issues surrounding educational games. We worked

to focus not only on games for typical educational settings, but also on learning games that extended beyond the classroom. One should note that within these discussions and topics, we did not devote class discussion time to technical aspects of designing digital games. While some time was spent in one-on-one discussions with groups about their specific projects and technical issues at times outside of class, class time was spent on discussing the non-technical aspects that our students would not have been as familiar with. In fact, other than the week of demos, the students were not required to use the computer or any other technology during the class time.

Overall, the students did well with the individual assignments. As usual with technically-oriented students, their writing was not as strong as we would like. Part of the impetus for the re-write assignment was to allow time for students to focus on that aspect using the critiques of their peers. Some of the students were very successful in their re-write. Others did not either participate or take the advice of the peers and simply did not re-write.

For the group projects, we found a diverse set of interests among the students as far as their choices of game implementations. We did not instruct the students explicitly on how to implement their vision for their game. The groups had free choice over the style of game and game mechanics. We were pleased to see that a majority of the groups chose to use narrative as a key element of their game. In discussions with groups that used narrative heavily, they told us that the narrative was a key component of their game to engage the player in the content area they wished to explore in the game. We feel that another positive of the choices was the fact that a majority of the groups chose to work on games whose topics were outside of the traditional science, math, and technology disciplines. The free choice allowed the groups to pick topic areas of interest

to them and clearly at least part of their interests lean towards humanities topics. We feel this is an important part of making the students more well-rounded game designers by being able to reach outside their comfort zone and explore other areas.

We present here the games using the educational subject each game addressed and provide a brief synopsis of the games, some screen shots, and example age ranges of players in parentheses.

- Chemistry: A game that asked players to create chemical compounds out of the molecules presented to them. As the level progressed, compounds increased in difficulty. (High School)



Figure 1: Chemistry Game submitted by Nathaniel Denman, Jason Ferreira, Aaron Zurawski

- Discrete Math: An adventure game where the player explored an ancient temple full of puzzles designed to expose them to various concepts in discrete mathematics as they played. (Middle to High School)



Figure 2: Discrete Math Game submitted by Matthew Kauffman, Anthony Saxon, Daniel Wild



- Drones: A game that used mini-games and narrative to give both sides of the issue of using drones in military combat. The player progressed through the narrative and mini-games and was left to decide for themselves about their position on using drones. (Adult)
- Geometry: A game to help players understand how to compute the angles inside of geometric shapes when given incomplete information about the other angles. (Middle to High School)



Figure 3: Drones Game submitted by Matthew Ferguson, Kyle Haas, Ryan Reich

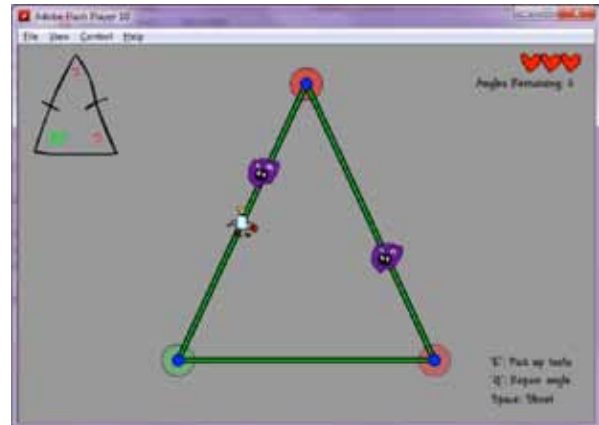


Figure 4: Geometry Game submitted by Alexander George, Matthew Kissel, Prasant Nanisetty

- History: A point-and-click exploration game designed to allow the player to help make sure some historic events of impact take place as planned. There is a villain trying to make sure that they do not so as to alter the course of history. (Elementary to Middle School)



Figure 5: History game submitted by Elijah Bigsby, Robert Massaro, Shannon Zagst

- Music Theory: A game that wanted to teach the player about intervals by having them construct their own intervals and identify intervals in music. (Any, but requires some reading)

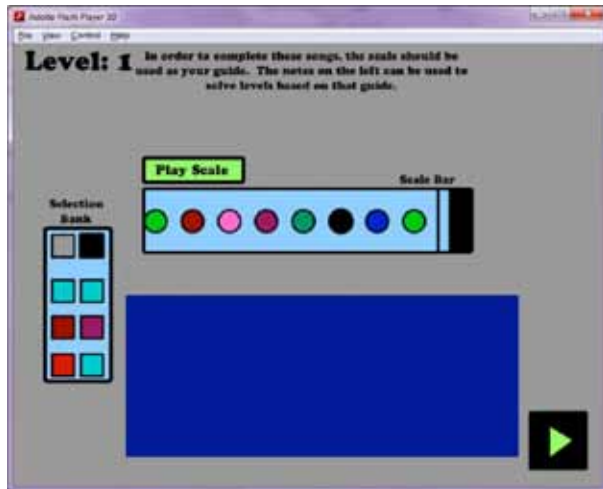


Figure 6: Music Theory game submitted by Nathaniel Borland, Blake Gross, Andrew Hall

- Plagues of Moses: A game to teach players about the order and types of plagues of Moses as described in the Bible through the use of mini-games and narrative that described each of the plagues. (Elementary)



Figure 7: Plagues of Moses game submitted by Edie Niswonger, Allyson Sadwin, Colin Videlock

- Survival Skills: An adventure and resource game that expected the player to survive on a hike as long as possible by collecting the correct food and supplies while avoiding the poisonous or unhelpful items encountered along the way. (Any, but requires some reading)



Figure 8: Survival Skills game submitted by John Cognetti, Ryan Stush, Josiah Tyrrell

Overall, the quality of the games was good given the short time frame (six weeks of development). We were pleased in general with the outcomes, although several of the games would have benefited from more play testing to increase the fun factor of the experience. One of the comments we heard in feedback from the students who took the course was that the demo week was too close to the final deadline. This short timeframe did not allow them to make large changes to the game based on the feedback given at the demos. The groups really only had time for bug fixes and final touches to the game. Some groups indicated that they would have liked to take more time to integrate some of the suggestions given at the demos. Unfortunately, the short nature of quarters prevented this.

#### **IV. You are now at the end. Would you like to look around? (Future Work)**

Given that our university is transitioning to semesters, we are given the unique opportunity to expand the course in its next offering. This will provide us with a unique opportunity for growth in an area that was desperately needed in the course, testing and analysis of the projects.

With a fifteen week timeframe, we will be able to expand the development cycle of the game and include an explicit play testing stage with feedback that can be adequately integrated into the final product. That is, we would require a prototype be completed earlier in the semester that would be given demo time as before, but would allow for better integration of the critique into the final product.

Another goal would be to have a play test and analysis done for the target audience of the game. This would allow the students to actually create an IRB proposal and work to develop an experiment around their game experience that would include analysis of

the learning experienced by the participants.

From the non-technical perspective, more time would allow us to include more writing assignments with more possible re-writes to allow the students to become more proficient at their writing skills in the area of critique and analysis. As our students were primarily technical, this was their greatest area of weakness. However, critique, analysis, and written communication skills are vital for game developers and more practice in this area would always be useful to the students.

Lastly, a suggestion that was given by the students for the course was to have more analysis of educational games. They enjoyed the analysis that was assigned, but they would have actually liked to do more. One way that this suggestion could be implemented is to have analysis of games as part of the lecture time each week. In that way, fifteen educational games could be analyzed throughout the course of the semester as opposed to the one in-depth analysis that was performed in the first offering of the course.

#### ***A. Severe thunderstorms – lose the technology (A version for humanities faculty)***

We also believe that this structure could be used in a non-technical classroom. As stated before, the structure of the course did not require the use of computers other than the week that the students demoed the final projects. Therefore, if the emphasis on the development of a digital game was removed, the need for the technology in the classroom disappears entirely.

However, removing the emphasis on the creation of a digital game does not mean that the project about creating a game needs to disappear. There are several options by which students can engage in the exercise of creating a game without needing the technical skills to build one digitally. One option

is non-digital game creation where students build board, card, or role-playing games. Another is to have the students design a game and present either a narrative description or storyboards for the game and its important parts. Both of these techniques are actually used in the game development field even when creating digital games. Doing either requires deep thinking about the issues surrounding the topic and game play. Neither requires extensive technical expertise.

With that change, not much of the rest of the course needs to be modified. Discussions around learning, developing games for learning, and the assessment of those games would not need to be altered. Faculty from specific disciplines could choose to focus on a particular sub-genre of educational games (e.g. games for learning history), or could use the experience of educational games to teach various subjects from a different perspective. For example, one could ask questions like, “How does playing this game help you explore and understand history differently?”

The most complex situation may be when the class is starkly split between those who have extensive humanities experience and those who have extensive development experience. While complex, this may have some advantages as well, if carefully handled. It may be important to encourage the technical students, who are usually less familiar with and therefore less initially comfortable with humanities reading, writing, and discussion, to respect the expertise of the humanities student, but not to therefore opt out of participation. Similarly, those with a humanities focus should respect the development skills of the technical students, but not opt out of the design and development process entirely. If one can avoid silencing or marginalizing one group or the other, the result should have all of the advantages of a cross-functional team, or of

islands of expertise, in which quality and learning are both enhanced by a complementary array of competencies [8].

Overall, we believe that a course like this can be implemented by technical and humanities faculty to serve both populations of students and engage them in an exciting and new way.

## V. The End (Conclusion)

On the whole, we are extremely happy with how the course came together and are happy with the projects that the students produced. The feedback from the students about the course was very positive and we plan to offer Educational Games 2.0 in the near future.

## Acknowledgement

Many of the section titles for this paper (as well as part of the title) were inspired by or are lines directly from the game Oregon Trail, which is thought of by many (including the authors) as one of the first successful examples of an educational game that was fun, engaging, and resonated with students [5].

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