

Evidence of Technical High School Students'
Development of Contemporary Learning Abilities
in a Game Design Program in Rural West Virginia

Globaloria Student Case Study Series, **Pilot Year 3**

Rebecca Reynolds, Ph.D.

Assistant Professor

Rutgers University

School of Communication and Information

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rebecca.reynolds@gmail.com

Executive Summary

In Pilot Year Three of the Globaloria initiative, from August, 2009 – June 2010, Globaloria was implemented in twenty-two locations throughout the state of West Virginia with 534 students. As students engage together in situated learning in the Globaloria program, we propose that they cultivate 6 contemporary learning abilities that are becoming more and more necessary for successful participation in today's technology-infused work and professional cultures. These abilities are the main learning objectives for the initiative, and are briefly summarized as follows:

- 1. Invention, progression, and completion of an original digital project idea** (*e.g., an educational game or simulation in the Globaloria context*)
- 2. Project-based learning and project management in wiki-based, networked environment**
- 3. Posting, publishing and distributing digital media** (*e.g., creating and uploading digital graphics, interactive designs, videos, notes, prototypes, and games*)
- 4. Social media learning, participation, and exchange** (*e.g., forming and sharing ideas, process notes, programming code*)
- 5. Information-based learning, research, purposeful search, and exploration** (*e.g., researching the subject domain of a game; exploring design resources*)
- 6. Surfing and tinkering with web services and web applications** (*e.g., game examples, wikis, blogs, web apps*)

This study posed two research questions at the outset:

- How are high school student participants in the Globaloria program learning game design, in the context of the co-learning model?
- To what extent did high school students develop new skills and learning abilities through their participation in Globaloria in Pilot Year 3 (2009/2010)?

These questions are addressed in the qualitative case study findings of two RTC students. The case studies were developed using several data sources including wiki activity, student project artifacts, videotaped presentations, and qualitative responses to the pre-, mid-, and post-program surveys.

One case study student, Vanessa, was 17 years old and a senior in high school. The other student, Craig was a 15-year-old sophomore. The students participated in Globaloria daily for 80 minutes. Mrs. A was the teacher and was in her third year as a Globaloria educator.

Executive Summary of Results

When we compare the cases of Vanessa and Craig, we see two quite different types of student. Vanessa is a high-achieving year-long participant, and senior in high school with significant prior technology experience and an incipient interest in a career in game design, who easily picks up computer programming and runs with the opportunities afforded in the Globaloria program to leverage her skills and interest at a pivotal moment in her transition to college, to award-winning results. However, she is quite unilateral in her focus on the mechanics of game design, largely ignoring several other activities the program encourages, including the subject and message of her game.

In contrast, Craig is a young sophomore level student with very little prior experience in technology use, who has never seen a blog at the start of the class. Through his participation in an inconsistent program implementation in the first semester, in which there was a significant mid-term interruption and shift in modality to an emphasis on civics (a school subject in which the instructor does not hold a strong interest), he experiences several ups and downs. Once situated in a game design context motivated by a competition, and partnered with a student who he sees as “a whiz,” he experiences a shift in attitude and becomes an enthusiastic online researcher of the political parties, and blogger. He also continues to actively complete his online learning log and attempt to learn programming. It seems he enjoys the social media tools, and he does well in his teamwork. His educator indicates that he completed the artwork and some of the coding for parts of his final game (it is unclear what specific programming skills he himself gained however in comparison with his teammate, using the available data).

While Vanessa received an A in the class due to her programming skills, Craig received a C. If students’ progress is to be graded for their mastery of the full range of 6-CLAs, then these results indicate that perhaps some changes are needed in the assessment of Globaloria students. It appears that the educator privileged programming over other skills.

Overall, it appears that the close of Year 3 provides a productive moment for reflection by the program founder, as to the central goals of Globaloria. Should a goal be for all students to learn programming? If so, it appears that at RTC, students are not achieving this objective. Without a very clear consensus on the program objectives, it may be that educator’s assessment strategies are somewhat unfair. Is programming privileged (which appears to be the case with the RTC instructor), or are all activities and CLAs equal?

If the latter is the case and all CLAs should be weighed equally in grading, it may be that Craig was not assessed appropriately. This is why clarity in specifying the exact learning objectives for the program, by program leaders coupled with participating teachers is key. Objectives should also be made clear to students. Perhaps objectives will be different and evolve based on educator experience. If Craig was not being well-supported in his game design, and if objectives were not clear, perhaps he should not have received a C, especially at this experimental phase of the program implementation.

In the context of the co-learning model, care must be taken in assessing students. We have observed that novice educators tend to be very liberal with A and B grades, possibly because they are still not confident themselves in the course objectives and feel it is unfair to grade lower. Indeed, as we learn about the evolution of educators across years of experience in the program, it may be that first year educators will have a different set of objectives for themselves and students, than fourth year educators, and, different ways of assessing student performance, because the greater the expertise of the educator, the more he or she might expect from students' learning, based on the level of scaffolding capabilities.

Further, it seems that our results continue to reveal that a certain subset of students participants experience significant difficulty in discovery-based learning, and need more hands-on scaffolding and guidance to learn computer programming in this game design class. However, it appears some do gain skills in other domains such as online research and/or blogging. If introductory programming skills are indeed a goal for all students, then we need to learn more about characteristics and early class behaviors of the students who struggle with programming, so that we can anticipate their needs early on, and offer greater support up front.

On the other hand, some students clearly thrive in and enjoy the independent work context (yet still reveal frustrations in discovery-based learning). It appears that these students have, or find, individual capacities that support autonomous perseverance. Based on the case of Vanessa and some others we have studied, it does appear that Globaloria may be succeeding in helping select, individual creative shining talents find an outlet in productive game design work. Further, the peripheral opportunities afforded in Globaloria (competitions, funding, connections to higher education institutions) appear in some cases to enable the funneling of certain talents into relevant career paths that would not otherwise be available to them. While it is still too early to know what her own career outcomes will reveal, Vanessa, who held a longstanding interest in game design, appears to be on a very promising path to success.

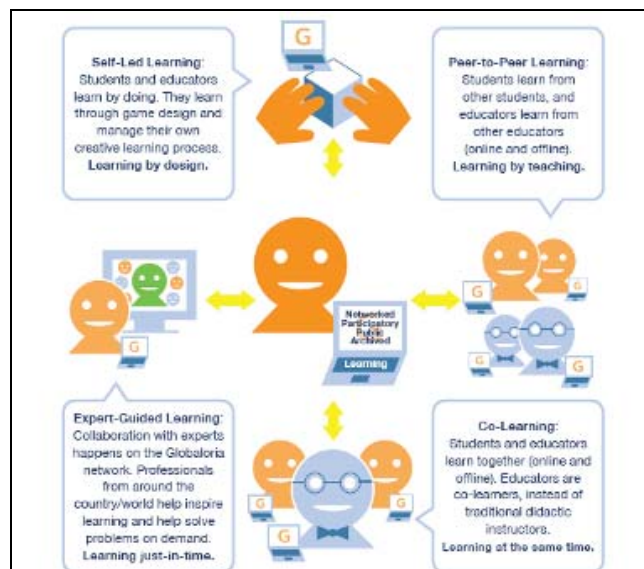
Introduction

In 2006, the World Wide Workshop Foundation in NYC established the Globaloria network. The Globaloria program's broad mission is to help close the digital-literacy and online participation gaps that exist in the United States (and worldwide) by empowering young people in disadvantaged communities to engage in workshop-based game design projects facilitated through the use of a Web 2.0 social learning network and virtual collaboration and support.

In 2007, the World Wide Workshop Foundation partnered with the West Virginia Governor's Office of Technology to establish the Globaloria-West Virginia pilot, as a model for a state-wide network and curriculum to transform public education, especially in its poorest rural locations. The organization has developed a technology platform and a curricular program that is being offered daily in public schools throughout the state as a year-long elective game design course, for credit and a grade.

Figure 1 depicts the Globaloria learning formula, in which teachers and students learn together, using online tutorials and resources for game design and Flash programming, along with live, synchronous virtual and in-person technology trainings and "virtual office hours" provided by leading figures in game design and development. Funding and support is provided by the current office of the WV Governor Joe Manchin, the WV Department of Education, Benedum Foundation, Verizon, the Knight Foundation, and the Caperton Fund. The goal is to increase the number of students in WV to 10,000 in the next few years, and then start replicating the program in other states.

Figure 1. The Globaloria learning formula: Project-based, Student Centered, Social Learning



Globaloria Program Components

Globaloria-West Virginia involves students and educators throughout this state in participation in virtual and in-school design studios where they learn game design using Web 2.0 creative media and resources offered on the organization's web platform, MyGLife.org. West Virginia middle school, high school, and community college students, as well as educators, learn to program interactive web games using Flash Actionscript, following a curriculum provided to all school partners via an online collaborative wiki-learning environment. From Pilot Year 2 (PY2) to Pilot Year 3 (PY3), the number of project participants doubled, to involve 68 educators and 534 students throughout West Virginia. Twenty-two PY3 partner locations have implemented the curriculum as an in-school game design course elective offered to students for credit and a grade during the regular school day.

Considering today's technology advances, Globaloria leverages several Web 2.0 social media capabilities. Specifically, Globaloria actively employs wikis and blogs in the classroom experience, and also facilitates students' use of free and open source online Flash programming tutorial resources. On the wiki, students engage in online collaboration and sharing of programming code and assets, document their in-progress work, and then publish their in-progress and final artifacts. Any visitor to the game galleries at MyGLife.org can play students' final games.

Additionally, in many of the schools where the program is implemented, educators encourage students' choice of a game project topic based on their own particular interests, further enhancing the possibility of meaning-making, project appropriation, and 21st Century skills development (e.g., Joseph & Edelson, 2002; Hidi & Renninger, 2006). Further, at some locations the program encourages students to create games with a social mission – in line with the trend in “Social Issues Gaming” being fostered by organizations such as Games for Change and the Serious Games Initiative. And at other locations, students create games about core curricular topics such as math or science. To-date, students in our program have chosen to create games that reflect topics in the following genres: a) educational games about core curricular topics (e.g., a game about math), b) games that provide a social message (e.g., bearing themes related to health, nutrition or global warming—often educational, too), or c) games that could be classified as entertainment (for example, a fantasy game about ninja pandas).

Purpose of this Study

This paper reports findings from Pilot Year Three (PY3) of this model implementation in the state of West Virginia. In this report, we present qualitative case study results for a single pilot location, Randolph Technical Center High School, which is a high school we have been studying since Pilot Year 1 of the project. The report addresses two main Research Questions:

- How are high school student participants in the Globaloria program learning game design, in the context of the co-learning model?
- To what extent did high school students develop new skills and learning abilities through their participation in Globaloria in Pilot Year 3 (2009/2010)?

This question is addressed through analysis of two case study students, Vanessa¹, a 17-year old senior in high school, and Craig¹, a 15-year-old sophomore in high school, who each participated in Globaloria daily for 80 minutes. Vanessa participated for the entire year. Craig participated for the first semester only.

Literature Review

Principles Applied in Globaloria Program Development

The Globaloria program was conceived and produced over the past four years by a small team at the World Wide Workshop Foundation, a NYC-based educational non-profit founded by Dr. Idit Harel Caperton, who in the 1980's and 90's collaborated with MIT Professor Seymour Papert to establish the technology-driven learning "framework for action" Constructionism. Constructionist learning is inspired by the constructivist theory that individual learners construct mental models to understand the world around them. However, Constructionism holds that learning can happen most effectively when people are also active in making tangible objects in the real world. In this sense, Constructionism is connected with experiential learning and builds on some of the ideas of Piaget. Constructionist principles were applied in projects occurring in selected schools in Boston, Costa Rica, Australia, and other cities and nations, and also informed development of one of the first Internet companies with web services for children (MaMaMedia, Inc.), founded by Harel Caperton.

Globaloria is unique in that it applies constructionist principles for learning in a curriculum of game design offered via a Web 2.0 technology environment called MyGLife.org. Some of the traditional Constructionist principles applied in Globaloria include the following (e.g., Papert, 1980; Harel & Papert, 1991):

- Workshop-based learning in an informal classroom setting where students can talk openly, share their learning, collaborate, and work in teams with their peers, creating a community of practice;
- Students' use of programming languages and computational design tools to create complex representational digital artifacts such as games with a goal to help younger learners understand a concept in a given subject domain (the game's topic);
- Affording students with significant time daily, across many months, to pursue the completion of a final design artifact;
- Frequent student reflection upon and social expression about their work in progress;
- Sharing and presentation of final work in the team and group context.

¹ Student names have been changed.

Research has found that programs applying Constructionist principles provide opportunities for students to develop a sense of meaning and purpose in creative work on a digital artifact, while developing deeper knowledge and understanding about the subject domain of the artifact than that elicited by more instructionist, top-down types of lessons (e.g., Harel & Papert, 1991; Harel, 1988, 1989, 1991, 2002; Kafai, 1995, 2006; Lawler, 1984, 1985; Wilensky, 2003; Klopfer, 2008; Seely Brown 2005, 2006; Collins & Halverson, 2009; Dede, Ketelhut, Clarke, Nelson, and Bowman, 2009; Reynolds & Harel, 2009a & b). Globaloria gives students hands-on experience in becoming active users and creators of new technologies, in ways that we expect will be integrated in their future professional lives. This sense of personal meaning results in a greater “appropriation of the project” (Harel, 1991), and gives learners a feeling of ownership over the work they create and share.

Supporting this goal is John Seely Brown’s research (2005) in which he discusses the importance of digital literacy and collaboration in networked, evolving, technological environments. Seely Brown notes that “since nearly all of the significant problems of tomorrow are likely to be systemic problems – problems that can’t be addressed by any one specialty - our students will need to feel comfortable working in cross disciplinary teams that encompass multiple ways of knowing” (p. 2). As such, he emphasizes the importance of “learning to be” active users of technology, in contrast to “learning about” technology. He further states (p. 6),

Today’s students want to create and learn at the same time. They want to pull content into use immediately. They want it situated and actionable - all aspects of learning-to-be, which is also an identity-forming activity. This path bridges the gap between knowledge and knowing.

Situated learning is learning that occurs in the same context in which is applied. This has also been called “epistemic learning” or learning by role-taking experimentation by scholars such as Shaffer & Gee (2007).

The Globaloria program provides a model for situated, epistemic learning in which both students and educators engage in game design activity in a workshop setting in school, in which students take on the role of a real game designer. Globaloria can be considered a social learning system, in which Wenger (2003) suggests that competence is socially defined, and knowing is a matter of displaying competences defined in social communities. Wenger (2003) diagramed four areas of social constructivist learning that is achieved in communities of practice (which make up social learning systems). These areas are shown in Figure 1 (derived from Couros, 2006, p. 8; Wenger, 1998, p. 5).

Figure 2. Social Learning in Communities of Practice, from Wenger (2003)



Student engagement and meaning-making are constructs integral to social learning systems (Wenger, 2003). Wenger (2003) defines engagement as “doing things together, talking, producing artifacts” (p. 78). In engaging together, members “identify gaps in their knowledge and work together to address them” (p. 82). In addition to engagement, two important facets of a social learning system are realistic imaginative activity, as well as alignment (the extent to which activity can be effective beyond the local engagement). Wenger (2003) suggests that every social learning system involves all three to some degree or another.

In Globaloria, students share language, tools, artifacts and methods. Globaloria also builds in realistic imaginative activity in that students practice professional roles. Further, students create games that are published online and playable by others – which reflects Wenger’s third attribute of alignment (effectiveness beyond the local engagement). Wenger (1998) suggests that meaning-making activities bring about learning and change.

6 Contemporary Learning Abilities

As students engage together in situated learning in the Globaloria program, we suggest that they cultivate 6 contemporary learning abilities that are becoming more and more necessary for successful participation in today’s technology-infused work and professional cultures. These abilities are the main learning objectives for the initiative. Table 1 outlines the 6-CLAs and some examples of activities in Globaloria that are designed to cultivate these abilities. Their development and conceptualization is presented in greater detail in papers by Reynolds and Harel Caperton (2009a & 2009b) resulting from Globaloria--West Virginia’s PY1 implementation.

Table 1. Contemporary Learning Abilities (CLAs)

Contemporary Learning Ability:	Examples of Globaloria activities that cultivate CLA:
1. Invention, progression, and completion of an original digital project idea (e.g., an educational game or simulation in the Globaloria context)	<ul style="list-style-type: none"> • Choosing and researching a subject for a game design project • Writing an original game narrative and a proposal to explain the game’s purpose and main subject • Programming and completing a final game

2. Project-based learning and project management in wiki-based, networked environment

- Coordinating and managing the process of building the game (design document, user flow, budget, schedule, introduction, overview, treatment, competitive analysis, teamwork, planning, managing implementation process)
- Managing the team work (defining and assigning team roles, coordinating tasks, and executing one's role within the team)

3. Posting, publishing and distributing digital media (e.g., creating and uploading digital graphics, interactive designs, videos, notes, prototypes, and games)

- Creating a wiki profile page and project pages
- Integrating and publishing text, video, photos, audio, programming code, animations, digital designs on the wiki pages
- Posting game design iterations and assets to wiki

4. Social-based learning, participation, and exchange (e.g., forming and sharing ideas, process notes, programming code)

- Collaborating by using Web2.0 tools, such as posting to wikis, blogs, open source help forums, Instant messaging
- Exchanging & sharing feedback & resources with others by posting information, links, source code questions and answers
- Reading and commenting on blogs and wiki pages of others

5. Information-based learning, research, purposeful search, and exploration (e.g., researching the subject domain of a game; exploring design resources)

- Searching the Web (using Google, wikipedia and other sources) for answers and help on specific issues related to programming games
- Searching and finding resources on MyGLife.org network, website, and wiki
- Searching the Web for new Flash design, animation and programming resources

6. Surfing websites and web applications (e.g., game examples, wikis, blogs, web apps)

- Surfing to MyGLife.org starter kit site and other game sites and playing games online
- Keeping track of and bookmarking surfing results that are relevant to projects
- Browsing Web2.0 content sites such as Youtube, Flickr, Blogs, Google Tools

The CLAs are a working framework that we are continuing to refine through our research and development in the Globaloria-West Virginia pilot project. They serve as outcome objectives and are key drivers for the continued program design and curriculum decisions made in developing the program. Through participation in Globaloria, we expect that students' 6-CLAs develop in parallel, contribute to each other, and can be achieved in an integrated way through

constructive, project-based activities that engage learners in a wide spectrum of technology uses. We will address results in the context of this framework.

Digital Divide in West Virginia

A primary reason we chose an initial pilot implementation in the state of West Virginia was to test our learning innovation with a population experiencing the effects of the digital divide, and provide immediate benefit to disadvantaged students. The U.S. state of West Virginia has a lower median household and per capita income, and higher poverty level as a percent of the population in comparison to figures for the nation as a whole. As a rural and mountainous state with a higher poverty level than most of the country, West Virginia's residential broadband diffusion has been challenging, due to geography, infrastructure and cost. This is evident in the lack of broadband coverage for rural, under-served communities located in poorer, remote pockets of the state. The population is at greater risk of the effects of the digital divide, at both the first and second levels (access due to cost, and sophistication of use), limiting the potential for technology learning by young learners in the home context.

RTC, One of Twenty-Four WV County-Level Regional Technical Centers

Among the Pilot Year 3 participating schools was Randolph Technical Center (RTC), a regional vocational high school offering programs to students from Elkins, Harman and Tygarts Valley. Students specialize in one of several programs, such as Automotive Technology, Mill and Cabinet, Business Education, Masonry and Power Equipment Systems and must take at least four classes in their specialization. Some RTC classes are also offered at the high school and all students in the Globaloria-RTC program were enrolled there. Students at Elkins High have their time divided into 4 blocks of classes each day and can schedule a class at RTC during any of these blocks. Approximately 90% of Elkins High students take at least one class at RTC during their high school career.

Most counties in West Virginia offer technical education via regional centers, high schools, colleges and specialized facilities.² Career and Technical Education programs utilize over 300 schools and are available to students in every county. The program operates 34 high schools, 24 county centers with five or more occupational areas, 7 multi-county centers, 16 colleges/universities offering career/technical education and 3 specialized facilities. The US Perkins Grant program subsidizes some of the state initiatives.

RTC has a computer lab, with about 25 recent-model desktop Mac computers.

² See WV Department of Education website, <http://careertech.k12.wv.us/>.



Figure 3. Randolph Technical Center (RTC), Elkins, WV

Randolph Technical Center,
<http://ravic.org/>

[RTC] opened its doors during the 1976-77 school year. During the past two and a half decades, literally thousands of students have received training, developed leadership skills, and grown into productive citizens via the Center. Virtually every area of employment in Randolph County can boast a graduate of the Randolph Technical Center. Graduates have become employed in professional, non-professional, technical and skilled careers. Approximately 56% of our graduates continue their education; another 42% become employed within the first three years following graduation.

Globaloria integration into RTC Course Schedule

RTC was a returning pilot location in 2009/2010 having also participated in the 2008/2009 and 2007/2008 school year. Prior to Globaloria's inception at RTC, no high school classes about game design, Web 2.0 activities or social networking had previously been offered at RTC.

In the Fall semester, Globaloria was implemented as an elective course called *Game Design I*, offered for credit during school hours to students in grades 9 through 12 and integrated with the Business Education curriculum. Twenty students participated in Pilot Year 3 in the fall semester, taking a Game Design I course. In the month of October, the class shifted from being open-topic to a focus on Civics games. This was due to a request from the World Wide Workshop Foundation, where schools in the Civics track would be funded by a new grant from the Knight Foundation.

In the spring semester, Game Design I was offered again to a new cohort of nine students. Game Design II was also offered in the spring semester, to just one student who had participated previously in the Game Design I class earlier that fall. This student, Vanessa, is one of the case study students of focus in this report.

Mrs. A³ was the educator for this class during both semesters of Pilot Year 3. She has been working in the program since Pilot Year 1, and has served as an expert mentor to the community of participating educators since her enthusiastic and successful participation in the first year. At the end of last year, she was hired to become the state Program Manager, and is now an employee of the World Wide Workshop Foundation. She maintains her office in the RTC

³ Pseudonym

school, however, and serves as a trainer for the new educator at RTC who has replaced her in Pilot Year 4.

Regarding educator training, in the summer prior to the school year, and again in the winter, participating educators across WV were provided 2-day workshop trainings at a central location conducted by the World Wide Workshop called the Globaloria Academy. Students were subsequently supported throughout the year by their educators, and they also learned through use of online resources and tutorials, and participation in periodic virtual training offered by the World Wide Workshop through Webex and Skype. Participants also learned through interaction, sharing and collaboration with their peers in class as well as students at other locations, via communication on the wiki.

The following table presents the syllabus topics covered by Mrs. A and her classes during the four quarters of game design in Pilot Year 3. In addition, we include a selection of her reflections on her own and her class’s progress during each timeframe. The source of this data is her Year 3 quarterly progress reports. The comments provide insights into the evolving mindset of the educator, as she continues enhance her knowledge of game design, and her strategies to guide and manage students’ game design learning in a workshop-style social constructionist environment. As it is organized by quarters, this table parallels the chronological presentation of the case study findings below. This table serves as a reference for the quarterly research findings presented in each case study.

Table 2. Syllabus Topics by Quarter, and Mrs. A’s Aligning Reflections

Timeframe, Syllabus Topics and Tutorials Covered	Selected Reflections from the Educator on Class Progress
First Quarter: Late August – September 10, 2009 Course Overview Create Your Profile Create Your Blog Participation Guidelines Playing to Learn Choosing a Topic Mini Game Project	The bunny tutorial really helped me understand coding and I have been able to help students as they did that lesson. I have been learning the changes in the wiki, which I like.
Second Quarter: September 10 to October 16 Imagining Your	I have been learning while doing research for my students. I will help look for coding and help proofread that code. I also have started working on my personal game. I took a state map and divided it into

<p>Game Paper Prototyping Planning Your Game Drawing in Flash Adding Navigation Adding Animation Adding Sound Adding Interaction</p>	<p>counties. Now I want to put drag and drop coding in for each county so that students can drag and drop the county in the state where it belongs. I have not started the coding. Ian Martin who worked in the game design industry for three years in California visited our class. The students did presentations and he made comments on their progress and gave a few suggestions. Relearning civics has been a challenge. Civics is not an area that I am “passionate” about but it is something important that I think my students should be aware. Because it is not an area of strength for me it has taken time for me to look and relook students’ game to give them suggestions for improving. In some ways it has been a good setting because I will tell the students, “It has been a long time since I had civics but I think that is correct so do some research to make sure that is correct.” It has all of us double checking information to make sure it is correct.</p> <p>I worked at the new teacher training sessions. I talked to two teachers in a game design session in Nashville, TN about the Globaloria program. I gave them the web site to look at the program and encouraged them to contact me or anyone if they had questions. My students presented their game ideas to David, Rachel and Shannon through WebEx. My students presented game ideas and progress to David, Rachel and Abby Taylor when they visited the classroom.</p>
<p>Third Quarter: January 12 – March 21, 2009 Moving on a Path Special Effects Scrolling Background Score Keeping Collision Detection Sound Effects Timer Character Effects Drag and drop Platforms Running and Jumping Coding “enemies”</p>	<p>As first semester students were finishing their games I was proofreading code and looking through the wiki for codes they may need. I have learned that even if I don’t know how to do the code I can check certain things for errors. I can also look at the students’ tutorial they are following and proofread the code that way. I am learning to be more organized in my teaching because I have two classes at once. I was not scheduled to have a Game Design I class during 4th block but some students were interested so we set up one. Fourth block I have 7 Game Design I students, 1 Game Design II student, and 7 business computer application students. It is important that I stay organized and keep the wiki assignments updated so the students stay on task. I also received and downloaded Flash CS4 and I have been learning the differences in the upgrade.</p> <p>Since I have started a number of things have been added. At times (especially with all the snow days) it sometimes feels like it is too much. I don’t think it is at this point but if more elements are added some adjustments may need to be made in other areas of the program.</p>

<p>Fourth Quarter: March 22 – End of May, 2009 Students worked on different units as indicated by their needed skills pertaining to specific games.</p>	<p>I spent lots of time proofreading code and helping the students trouble shot things that were not working. This helps me improve my coding skills as I learn to look for errors. I think overall this was one of the hardest times for me to teach Globaloria. I was teaching during my planning and during another class which was difficult. Also I am not strong in Civics nor do I like Civics so it was really hard for me to help the students. That was extremely challenging for me. That being said I think this group of students produced the best educational games of any group I have had so far. Being in the civics track made them concentrate on one area and really add the educational element to a fun game play</p>
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Method

In this paper, we use case study method to explore the performance of three students. The data sources utilized in the case studies are described as follows.

Case Studies

In the 2 case studies, for each student we present findings as they emerged in chronological sequence in the data across Semesters One and Two. The data sources for each case study are as follows:

- 4 Educator Progress Reports submitted quarterly to the World Wide Workshop Foundation, presenting a brief synopsis of each student’s performance;
- Students’ pre-program survey responses to 5 open-ended questions (late August);
- Students’ mid-program survey responses to 13 open-ended questions (early January);
- Students’ post-program survey responses to 9 open-ended questions (June)
- Wiki posts (including text, video, game design files, graphics files, Flash project files, code);
- Blog posts

To make sense of all the extensive data and develop the student case studies, we batched the disparate data from all of the sources by student, and by chronological order, and developed observations about student performance across time based on the content observed and reviewed. As we batched the data together and reviewed student performance across time, certain longitudinal trends and findings emerged for each.

Chronologically, Semester One data sources used were as follows.

First Half of Semester One (September/October, 2009):

- First Educator progress report (September, 2009)
- Students' pre-program survey responses to 5 open-ended questions (late August);
- Student Wiki activity and blog posts for this timeframe

Second Half of Semester One (November 2009 - Early January 2010):

- Second Educator progress report (December, 2009)
- Students' mid-program survey responses to 13 open-ended questions (early January);
- Students' post-program survey responses to 9 open-ended questions
- Student Wiki activity and blog posts for this timeframe
- Post-hoc interviews with the Educator

Then in Semester Two, the data sources were as follows.

First Half of Semester Two (January 2010 – Early March 2010):

- Third Educator progress report (March, 2010)
- Student Wiki activity and blog posts for this timeframe

Second Half of Semester Two (Late-March 2010 – June 2010):

- Fourth Educator progress report (June, 2010)
- Student Wiki activity and blog posts for this timeframe
- Students' post-program survey responses to 9 open-ended questions

In the case studies that follow, we present observations, evidence from the data, and summarized findings for each individual student, related to the study's two research questions on student engagement, and contemporary learning abilities gained. The resulting cases present a narrative of student engagement, and in many ways the data presented tells its own story.

The wiki served as a valuable data source in that it offers a history of all student actions. Students must login each session in order to contribute anything to the site, so their actions are recorded and searchable in the Wiki history and archives. Further, the wiki provides automated overall metrics for each individual student's activity (number of wiki edits and uploads). It was

very useful for case study generation by researchers who were working remotely and using students' produced and posted work as a main data source.⁴

That said, there are several limitations to our use of these data sources for retrospective analysis. In particular, not being present to watch and observe student learning at the local level hinders us from seeing and observing phenomena as it unfolds. The wiki provides a host of historical data and actual student artifacts including some video, that creates a trace impression of the learning processes that we can speculate occurred within the margins. However, this remote analytic approach hinders us from validating our observations, which can only occur through direct observation and interactions with students and teachers themselves as they experience the program across time. Thus, we recognize that a lot has occurred outside of this picture that we are unable to know and analyze and report upon. That said, the case files still provide a chronology and narrative to the learning from which we can glean important findings.

Vanessa



Vanessa was a 17 year-old senior in HS when she participated in Globaloria at RTC. In the fall of 2009 she was a student in Game Design and in the spring of 2010 she participated in Game Design II. In March of 2010, she was accepted as an intern in Globaloria.

Vanessa's individual interest in game design motivates her continued efforts in Globaloria. In the pre-survey, Vanessa discussed her long-term personal goals, which include game design:

i want to design or program video games or work for a gaming magazine. I hope to achieve a basic understanding of the process used to create video games.

In addition to being an adept coder, Vanessa has a sense of playfulness and creativity about possibilities for educational video games. In her pre-survey ideas for video games, Vanessa wrote that she would like to,

create an educational game that features the super hero "Super Failure Man" who comes to school to make children fail. instead of choosing the correct answers for questions, the player will choose the wrong answers and also fight against good grades.

Although her game will ultimately result in a very different premise, Vanessa's clever and humorous approach to educational game design demonstrate some of the qualities she brought to Globaloria, both as a student and an intern.

⁴ In Pilot Year 3 we did not conduct site visits and thus rely upon the actual work they produced and posted online to the Wiki environment as data sources.

By the end of the year Vanessa had participated in the construction of two games, both of which were entered into two different game design competitions. As a case study student, Vanessa provides an example of a student with creativity, perseverance and a prior interest in pursuing a game design career can succeed in Globaloria, and even leverage participation in the program to advance her life opportunities.

Vanessa's Participation in the First Semester of Game Design

Vanessa is eager to develop her technological expertise. From the start of the school year, Vanessa is quite specific in an early blog post summarizing her development. On 9/9, she describes some graphics effects she is experimenting with in Photoshop, stating,

This week I learned how to use the lasso, feather, crop, layer, blur, smudge, and text tools in Adobe Photoshop. I learned how to use text tools such as warp text to create pictures of me with my name in them. It was really easy. Also, I lassoed, cut, and pasted my face onto nick's body and used the smudge, blur, and color and contrast tools to make the picture look realistic. I also put his face onto a picture of my body. I liked doing those two pictures the most. I've also made pictures that look like sketches by using layers and drawing on them. Creating the sketches are really tedious, but they look really cool.

Vanessa's blog post reads almost like a to-do list of actions. Working with the game design curriculum, Vanessa seeks to shape course requirements to fit her personal interests and ambitions for game design. Early on in September she also described her experience playing other games in a review posted on her blog:

I also played a game called Sammy the Salmon. It is an educational game that teaches the player facts about the Coho Salmon. It's not exactly the most exciting game in the world, but there's only so much you can do with an educational game.

It appears here that Vanessa has an initial impression of educational games as limited in their ability to also entertain. It appears this perspective changes as Vanessa and her team develop their game.

As the first month progresses, Vanessa's work begins with her team which is initially called the Dirty Sturgeons, and on 9/18 she discussed some of the dynamics of the team members, as well as her team's initial ideas for their game.

It is a bit difficult getting the entire group to agree on some concepts, but we eventually started working together. We finally decided to make the game a side-scroller in which a white blood cell kills germs inside a man named Deer T. Steve. There are three levels in which Steve contracts different types of diseases, each more serious and difficult to

destroy than the previous. The concept looks like it will make a really fun game, and I hope it will turn out as good as we imagine it to be.

Vanessa's post demonstrates some of her familiarity with game design using terminology like "side-scroller" and presenting a relatively clear outline of the game's initial concept and progression. Although her team's game concept will undergo significant evolution from these initial ideas, Vanessa shows a confidence about coding and game construction skills from the beginning of the school year.

Vanessa's Role as Project Manager

Vanessa takes on the role of team manager, and in a September 25 blog post, she described her role.

I am the project manager and artist for The Dirty Surgeons. My job as project manager is to keep everyone on task and make sure we meet all of our deadlines. I think being the game artist will be fairly easy because I am pretty good with flash and I also have good skills in Photoshop (I'm in digital imaging). It's been fun imagining what we want the game to be like, and I'm really excited to see how the finished product will turn out.

Vanessa presents confidence in discussing her role on the team. At this early phase, she appears to enjoy graphic design in particular.

Teamwork

Although the Dirty Surgeons team had initially planned on making a game about preventing cold and flu through education about germs, in October, the team shifts to a new topic, and assigns themselves with a new team name, The Smelly Closets. This was due to the class shift to a Civics focus, which they decided to do as a group, in response to a new annual game design competition for civics games, announced by the World Wide Workshop Foundation in October 2009. Vanessa outlines the new concept for Smelly Closets in an October 27 blog post:

Our new game is called "What Are They Thinkin'?" It helps the player learn about the basic philosophies of the political parties. There will be two or three levels, each with a candidate from a different party. One candidate of a certain political party will give a speech that tells the general beliefs of that party. After the speech is over, there will be a "Where's Waldo" type search for items that relate to that party's beliefs. This makes the game both fun and educational, two aspects that most games can't usually combine.

Smelly Closets' Game Pitch

Vanessa and her team post their game pitch was posted on the wiki as follows:

Learning Topic: "What Are They Thinkin'?" is a civics based game that teaches the beliefs of the political parties.

Audience: Our game is aimed toward a Middle/High School audience to educate them about the political parties.

Game Play: There are three levels in the game. In each level there is a presidential candidate of a certain political party (dem, repub, etc). The candidate gives a speech, and the player must find clues in the speech as to what that party believes. Then the player must find items related to those clues in an "I Spy" - like puzzle. You win by finding all of the clues and items.

Fun Factor: The puzzles make the game fun for the player.

Smart Factor: Our game teaches the beliefs of the political parties to the players. This helps them make educated decisions when choosing a political party and when voting.

Originality Factor: Our game is very original because most of the "I Spy" - like games are not educational. Ours teaches important facts about political parties.

Team Introduction: Travisx- republican party level 1 creator, LDaugherty7227- democrat party level 2 creator, VMal- independent party level 3 creator

Rather than dividing the work by role (for example, by audio person, artist or team manager), Smelly Closets assigns each member a level of the game, which is associated with a particular political party. As a result, each team member can gain an in-depth understanding of a political party as well as experience with coding. It appears that the team will no longer involve a team manager role.

From the data we had available, it does not appear that this transition brings about any conflict or difficulty for Vanessa or her team, though this shift does reduce the amount of time in the first semester that the team has to work on it. Towards the end of the first quarter, the Smelly Closets begin to develop a sense of cohesion as a team. In a late October blog post, Vanessa offered an optimistic reading of the team's progress.

I really had fun thinking about what my game will be like. I hope it turns out similar to what I imagined. I'm really excited to find out what the final product will be once our whole group puts our ideas together.

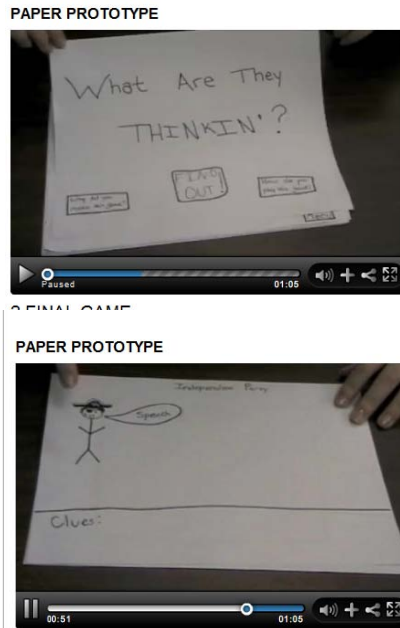
Paper Prototype

Posted to the wiki on November 2, the Smelly Closets' paper prototype outlines the levels of "What Are They Thinkin'?" The team's approach to civics aims to provide a basic familiarity with major political parties in the United States. Each level introduces the key components of a political party and then a player plays a mini-game involving facts about the party's platform. As the team explains on their game page:

"What Are They Thinkin'?" teaches the player about citizenship by introducing them to the political parties and their general beliefs. It is our duty as citizens of the United States of America to be well informed of our rights. One of the most important rights we have as citizens is choosing who governs us. The people in government control many things in

our lives, so we must be informed enough to choose who we want in those political positions.

Figure 4. Screenshots From Paper Prototype of “What Are They Thinkin’?”



The team’s presentation is short, less than two minutes, and although their game has a clear outline with established core components, some of the details are still to be worked out. Nevertheless, the key features of the game are in place and Smelly Closets seems well positioned to continue developing their game.

Vanessa’s Blog and Progress Notes

Because the team intends to take two semesters to complete their game, Smelly Closets divides the work of game design into two distinct halves – during the first semester, each team member is responsible for the illustration of a game level (where each level represents a political party) in Flash. During the second semester, the team plans to code the game and add sound. Because of this division between illustration and coding, the majority of the fall semester is based on illustration skills for Vanessa and her team. In an October 9 blog post, Vanessa describes learning how to use Adobe Illustrator as part of her work on creating images for *What Are They Thinkin’?*:

My favorite activity was creating the greeting cards because I've always wanted to make a greeting card. I think that several professions such as greeting card creators and logo creators use Adobe Illustrator. Vector can be enlarged without blurring the image at all, but raster images are blurred when they are enlarged too much. Adobe Illustrator uses vector images, and Photoshop uses raster images.

A recurring theme in Vanessa's blog posts centers on wanting to develop skills associated with professional design. Having mastered the basic components of Flash, Vanessa is eager to gain additional fluency in design applications and languages.

By the end of the first quarter, the Smelly Closets have a clear plan for the completion of their game, and Vanessa is a dedicated participant in the illustration for "What Are They Thinkin'?" In her first quarter progress report evaluation of Vanessa, the RTC educator states simply, "Vanessa is doing well and all assignments are complete."

In the second quarter of Game Design, students in the Smelly Closets continued the illustrations for *What Are They Thinkin'?* In describing the process of learning how to use flash to incorporate music into her team game, Vanessa's blog on 10/23 offers a kind of microcosm on the experience of learning coding in the classroom:

Creating the start and stop buttons for music was lengthy and practically impossible my first few tries. Eventually a useful fla example was uploaded to the wiki to make it easy and comprehensible. I have to say that I did end up learning a lot about flash through this experience and taught a few others what to do as well. Without on and off buttons for the music, a game would get either really annoying or really boring, so I'm glad I learned how to do this.

In the midst of a blog post on 11/6 about the development of her team's game, Vanessa expressed frustration with some of the required components of classroom curriculum:

Our game is progressing pretty well, we've gotten a lot done for just one week, but it would go a lot faster if we didn't have to stop to do all these stupid blogs and game uploads.

For Vanessa, creation of the game itself is the primary goal of the class. Rather than seeing blogs and wiki uploads as integrated facets of skill development or competency, these tasks (at least some of the time) strike Vanessa as intrusive rather than an integrated component that facilitates game design.

As the quarter progresses, Vanessa reflects upon the subject of her game, noting that while she is creating a game about civics, she does not feel like it is helping her expand her knowledge of this learning domain per se. Vanessa addresses the topic of what she's learned about civics thus far in a blog post on 11/13:

I really haven't learned much about civics this week, but the game is progressing pretty well. I'm having trouble making the puzzle, but hopefully it'll work out.

This take on civics is repeated in a blog post one month later, suggesting that Vanessa's attitude towards the subject remains fairly constant through the second quarter.

12/14 As far as civics goes, I haven't learned much. I just learned some facts about the Green Party.

It seems that each member of the Smelly Closets learned primarily about one political party. Vanessa's reflection presents a critical perspective on the process. It appears she knows she is supposed to be learning about the game subject, and she is giving feedback indicating that she doesn't feel she is. Given Mrs. A.'s comments that she doesn't have experience teaching civics as a topic of study, it may be that students are not as supported as they might be in the content domain of their game. Or, Vanessa may not be particularly interested in her game topic.

As a whole, Vanessa's participation in Globaloria continues to be active in the second quarter of the semester. Mrs. A provided the following comments in her second quarter evaluation:

Q2 Comments and Grade: Vanessa is doing well. She wants to go into the game design field. Vanessa did artwork and coding for one level.

Summary, Semester One

The Smelly Closets make significant progress in the design elements of their game during the first semester, assisted by a clear plan for individual responsibilities and a strong game concept. At this point in the course, Vanessa maintains her enthusiasm for coding and design, but seems less engaged in civics as a topic. Vanessa's interests lead her to focus on technological development, in which the topic of civics feels incidental. She sets very high expectations of herself, consistently evaluating her coding abilities in terms of professional standards. Although she works cooperatively with her team during the first semester, the second half of the school year affords the chance to work more independently on more advanced programming.

Semester Two

During the second semester of Globaloria, the team has completed illustration for "What Are They Thinkin'?" and Vanessa progresses to coding the game. In the spring, she works alone on the project as the only student participating in Game Design II. At the start of the second semester, Vanessa evaluated her work thus far in a January blog post:

If I were to receive a grade on the progress I have made so far, I think I would get at least a B. I've put a lot of effort into creating the pages I have done so far, and I think that they're top quality.

This post includes an additional reference to Vanessa's ability to assess critically her own work. Vanessa sets high standards for herself, looking to create products that look as professional as possible.

In another third quarter blog post she again discusses the civics content of *What Are They Thinkin?* stating,

I really didn't learn much about civics in this class. All I learned about civics are some facts about the Green Party. I learned a lot about the process of designing a game, though. I didn't know how much effort was put forth in order to make some of the simplest games. I'll probably use some of the skills I learned in here in my future education in game design.

Throughout January and February, Vanessa continues making some final improvements to the game, *What're They Thinkin*. Then in March, she discontinues her work on it, and shifts gears. The final game file is posted on the team page, and she begins to work on a new one. She offers no reflection about this final phase in her work continued from the previous semester. This demonstrates some of the limitations of retrospective analysis of remote data. Mrs. A.'s third quarter evaluation summarizes Vanessa's work from the first semester, her adeptness as a programmer and her acceptance as an intern:

Q3 Comments and Grade: Vanessa did the coding for her teams game and put together the presentation. She has a good concept of all areas of the course. Vanessa created the presentation and did a good job during the presentation. She applied and was accepted as an intern.

Vanessa's Internship

In March, Vanessa takes on the role of intern in addition to participating as a Game Design II student. As she explains in a March blog post:

I'm currently in game design 2, and as an intern my job is to help all of the students in game design 1, my teacher, and students from other schools with their work. I get paid for this internship and get school credit because I do a lot of the intern work during class. So I'm basically getting paid for being smart and going to school. I am so lovin' this.

During the second semester, Vanessa and Mrs. A. decide that as part of her internship, Vanessa will create a game for entry in the FBLA competition. FBLA is a national student organization for students in middle school and high school interested in business, and the contest requires students to submit a five-level game that incorporates core tenets of FBLA's institutional mission to encourage students to gain entrepreneurial and professional skills. According to the competition guidelines, the game must incorporate the following factors as part of its content:

You will develop an entertaining simulation/game where the protagonist navigates hazards/obstacles involving lack of knowledge, confidence, or experience that can be overcome with FBLA inspired powerups. Powerups should highlight FBLA benefits that increase the player's knowledge, confidence, and/or experience needed to overcome

realistic challenges a student might face at school, college, or the workplace. The audience is for middle and high school.

With these requirements in mind, Vanessa begins working on a game called “Save the World FBLA Style,” in which aliens have descended to planet earth and a player must defend the world against alien attacks that have rendered the population stupid. The creation of five levels proves to be a challenge, but one that she meets successfully.

Vanessa’s Second Game, “Save the World”

Vanessa developed a second blog to track her progress as an intern, separate from the blog she kept in the first three quarters of Globaloria (and in fact as a student from 2008-2009). In contrast to the consistency with which she posted on her initial blog, Vanessa makes only two entries as an intern. Reasons for this drop off are made in her last entry, which is also in late March.

Things are getting to be a bit too much to handle. I haven't spent much time on my internship lately because of all the other things I have to do. I'm entering in an FBLA competition, and I had to create a game with 5 levels and all these other specifics. It was really a pain, but I'm pleased with my finished product. Right now I'm working on the presentation for my game. It's not really that fun, but I suppose I'll be happy if I win. I've also just completed my demo for the civics game competition. Hoorah! That took forever! With school work, my internship, and my job, I really don't have time for anything else. I just can't wait for summer to get here!

At this stage Vanessa is finalizing her demo for the previous Civics game created in semester one, in anticipation of the Globaloria Civics Game Competition hosted by the World Wide Workshop Foundation with participation from the state Department of Education with Senator Rockefeller as honorary chair. She has also created a new game for the FBLA competition. Vanessa indicates that she is multi-tasking and is feeling somewhat overwhelmed.

Her subsequent drop off in blogging corresponds not only with the workload of being an intern and working on two game presentations, but also to the fact that she is no longer required to blog as a part of her coursework. This indicates that although Vanessa completed blog posts in compliance with the curriculum, when the requirement was removed, she almost immediately stops posting on her blog. While we have seen several student cases in which the reflection occurring during blogging has helped students advance their design work, for Vanessa, it is not an activity that she naturalistically enjoys, enough to carry on with it when it is not required.

In addition to the decline in blogging, the wiki page that Vanessa develops to archive and track the progress of her FBLA game is decidedly sparse in comparison to the team page for “What Are They Thinkin’?” Vanessa presents her FBLA game under the name “Exploding Egg,” and

creates a wiki page for the game, but the page lacks a game pitch, presentation links or explanatory commentary. This lack of additional context for the game is a parallel indication that although Vanessa completes supplementary tasks such as blogging and wiki uploads when they are explicitly a part of the Globaloria curriculum (and thus, her grade), she fails to keep up with these protocols as soon as they are no longer required. This may also be a function of the time crunch she indicates she is experiencing.

The Challenge of Self-Learning

Given Vanessa's aptitude for game design, and the extent to which she independently advances her skillset in Semester Two, it is not surprising that she experiences a degree of frustration when looking for instruction on coding. Vanessa remarked on this subject in her post survey:

The most difficult thing is when you have a problem with coding and no one knows how to help you, you're pretty much stuck. It sucks.

Even as a motivated, talented programmer, Vanessa nevertheless periodically encountered instances in which she was stuck with her coding. She mentions a particular tutorial that was helpful, stating,

Online tutorials were extremely helpful. I found several tutorials that cover more advanced actionscript that I needed. Without those tutorials (like the one on Kongregate.com) I don't think my game would be anything like it is now.

In her final evaluation of Vanessa's work in the course, Mrs. A references the fact that Vanessa's coding skills have progressed beyond the educator's own.

Vanessa did a great job with her game for the civic's competition and for her FBLA competition. Her coding skills are so far above me that there is no way I could help her.
Final Grade—A

Vanessa indicates that she was at times frustrated and challenged because her coding had advanced to a level beyond her instructor. Although capable of finding ways to educate herself about coding issues as necessary, Vanessa is still occasionally left to improvise techniques for finding information about coding. Her frustration sometimes translates through in her reflections. On the whole, however, resolving coding issues independently, and gaining valuable research experience in the process, provides Vanessa with useful life skills. As the game design expertise of educators is increased every year through their experience, it is the expectation that a greater level of individual scaffolding for students will become possible.

Vanessa's Final Presentation of the Smelly Closet's Team Game

At the end of Semester Two, Vanessa creates a video presentation for "What Are They Thinkin'?" She outlines the team's progress over the past year, explaining that during the Game Design I class, the team did artwork in Flash, and the additional coding that took place in

Game Design II. Vanessa pointed out that in addition to creating original illustrations for the game, music in the game was also completely original and created in Garage Band.

Although the illustrations for the game were created with her team, Vanessa was largely responsible for the majority of the coding, and presents the final product alone. She uses a SmartBoard to show the game during the presentation and confidently navigates the screen. She first explained the team's disclaimer, which outlines the Smelly Closets' approach to describing political parties:

This game satirizes the characters that represent each political party. Our intention is not to offend, but to represent the general stereotype for each party.

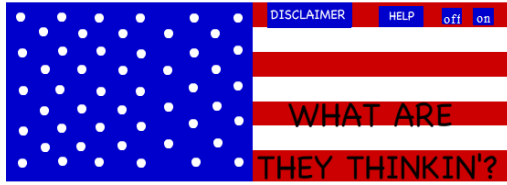
The team's approach is thus a fairly nuanced one that attempts to take very polarizing and controversial issues and position them in a way that is educational and neutral. In addition, the disclaimer page points players to online resources that provided information for the game, providing a source for further research.

The game involves three levels, each of which offers a caricature of a political party, followed by a "mini-game" that involves material from the introduction to the party's core political beliefs. Level one introduces the Republican Party platform through a series of screens addressing key political beliefs. A player moves through the content by selecting a highlighted word or group of words, and Vanessa explains that selecting the highlighted terms are meant to help the player remember key ideas related to each party. The Republican platform level is followed by a word search using the highlighted terms. Level two focuses on the Democratic Party, and then moves on to a game in which the player is presented with a political issue or stance (such as "pro life" or "pro choice") and identifies the party with which the term is associated. The third and final level addresses the Green Party, which Vanessa explains in her presentation is one of the largest of the many independent parties in the American political system. The third mini-game involves a crossword with Green Party platform terms.

Screenshots from Vanessa's presentation video posted on the wiki, and from the final game are presented as follows.

Figure 5. Screenshots of Vanessa's final presentation of Team Smelly Closets' Game, *What Are They Thinkin?*





DISCLAIMER HELP off on

WHAT ARE THEY THINKIN'?

Level 1

Level 2

off on

This game satirizes the characters that represent each political party. Our intention is not to offend, but to represent the general stereotype for each party.

Also, all of the content of this game has been thoroughly researched and is completely factual (but vague). Our intention is to teach those who play our game some of the general beliefs of each party and create further interest in them.

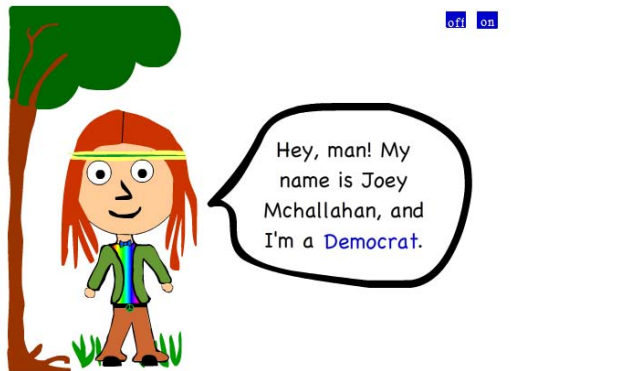
Democrat Party Website: <http://www.democrats.org/>
 Republican Party Website: <http://www.gop.com/index.php/>
 Green Party Website: <http://www.gp.org/index.php/>

Word Search Help Words off on

A	G	E	G	Y	J	S	E	W	O	X	H
C	R	N	J	D	E	C	D	A	S	H	E
D	H	E	K	Y	Z	B	A	R	D	A	A
T	E	R	R	O	R	I	S	M	W	D	L
G	A	G	S	R	V	B	J	L	H	D	T
E	E	Y	H	E	M	N	E	S	C	S	H
R	F	H	H	N	C	O	F	O	C	C	C
S	H	F	C	E	S	X	A	C	J	S	A
T	A	X	E	S	G	F	W	D	F	F	R
P	R	O	L	I	F	E	D	A	J	W	E

WAR
 TERRORISM
 TAXES
 PROLIFE
 ENERGY
 HEALTHCARE

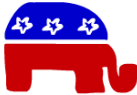

Finished!






off on

social healthcare

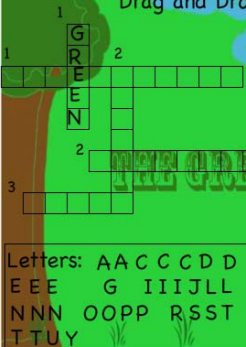
off on



Each **independent party** has its own set of beliefs and standars separate from that of the other political parties.

off on

Drag and Drop Crossword



Letters: AACCCDD
EEE G IIIJLL
NNN OOPP RSST
TTUY

Down:

- 1 A color of a political party
- 2 The study of the relationships and interactions

Across:

- 1 A type of political party
- 2 A belief of the Green Party
- 3 Political _____

Answers! Finished!

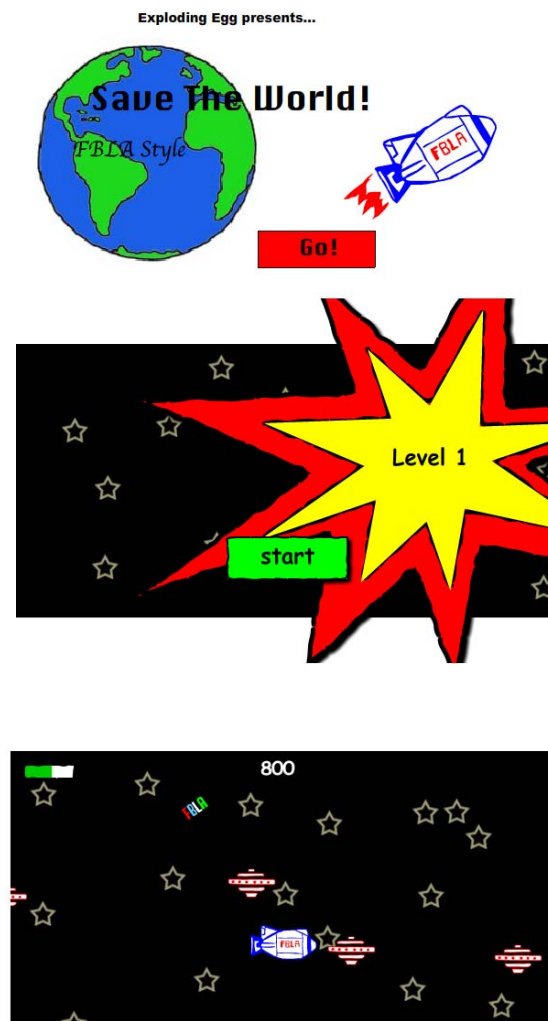
Vanessa's FBLA game

Although her blog posts are few in number and communicate a sense of feeling a great deal of pressure to complete her FBLA game in time, Vanessa's diligent Semester Two work on "Save the World" yield spectacular results. "Save the World FBLA Style" is a five-level game in which a

player controls a space ship that must be navigated (using keyboard commands) through space, avoiding alien space craft. The game premise is that aliens have made the planet dumber, but that the player's FBLA knowledge will enable defeat of the invaders. Instead of a life meter, Vanessa's game involves a knowledge meter, which are depleted by enemy stupefaction rays. For support, players can collect FBLA power-ups, providing shields, weapons or a knowledge boost.

Vanessa's game is impressive in its illustration, which is very professional and her game in fact requires a degree of skill to play successfully. The premise of the game is a playful take on the alien invasion narrative. Screenshots from the game are presented as follows.

Figure 6. Screenshots of Vanessa's Final Individual Game, *Save the World, FBLA Style*



In July of 2010, Vanessa was named the West Virginia State Champion of Computer Game and Simulation Programming by FBLA. Vanessa advanced to compete in the national competition held in Nashville, Tennessee. In the national competition, she competed against 39 other

student finalists from across the country, and earned 6th place in nationals. Vanessa was the only female contestant to rank, and in fact one of only two females to have entered the competition. A World Wide Workshop Foundation press release on her success stated,

With such a dearth of young women entering S.T.E.M. vocations, Vanessa's accomplishment demonstrates the power of Globaloria to transform young women's attitudes about S.T.E.M. thinking. "I've always known I wanted to pursue a career in the field of game design, but I was hesitant to chase after my dream because I didn't really know what creating a game entailed," states Vanessa. "Through Globaloria classes at my high school, I developed the skills and talents necessary to create Flash games. To my surprise, I enjoyed the game creation process immensely, and my skills have even surpassed all but five others in the nation!"

Summary of Results, Vanessa

Having made the transition from student to intern, Vanessa has a particularly in-depth and multi-layered perspective on Globaloria in her post survey. Vanessa's interest in becoming a programmer and focusing on game design in college remain unchanged, and are in fact more solidified and concrete. In her pre-survey, Vanessa wrote:

I want to have a career in game design. I would like to go to the University of Advancing Technology for college and major in game design.

After a year of game-design, Vanessa's continued ambitions of pursuing game design as a subject in college and in a future career are outlined in her post-survey:

For my freshman year of college I am attending Marshall University where I will be majoring in Computer Information Sciences and specializing in Game Design. Since the Game Design program at Marshall is limited and not a major, I will probably transfer out of state after my first year of college.

For Vanessa, Globaloria provided an opportunity to develop skills required for her course of study, which she intends on pursuing with a degree of specificity that indicates a sense of self-direction and confidence. As a Globaloria student, Vanessa's summary of her experiences the program are listed in her post-survey:

- 1. I've learned how to use flash.*
- 2. I've learned how to program certain actions into my game.*
- 3. I've learned how to cooperate within a group on a daily basis.*

This synopsis encapsulates the signature components of Globaloria – flash, game design and teamwork. Vanessa elaborates on these components throughout her post survey. In terms of group work, Vanessa wrote that:

I really enjoy working on the computer, and I like working in a group. I dislike that, because of group work, a portion of my grade is dependent upon the work of others. I also don't like the fact that we have a lot of programming problems that can't be solved.

It appears that Vanessa might have felt held back by some of her team members. Additionally, by Mrs. A's own admission, Vanessa's coding skills exceed that of her instructor's, which occasionally frustrates her. However, as she writes in the post-survey, she also indicates that independent work is a hallmark of the course, and here she seems to speak positively about this:

This class is more of an independent style of learning than any other class. Most of the other classes are structured book work/note taking/test taking type classes, whereas this class you have the opportunity to discover more things on your own. The independent style of learning and working on a computer.

Interestingly, although Vanessa showed a consistent adeptness for coding and her enthusiasm resulted in successful game production both as an individual and as part of team, in her post-survey Vanessa wrote that she does not see the skills learned in Globaloria as extending into other areas of her life:

I suppose that certain skills learned in this class can be used in other areas of my life, but under usual circumstances I really don't think these skills would apply to other areas of my life.

Vanessa responds ambivalently to this question, which may not have been clear to her. It may be that she is too close to the experience at this point to reflect adequately on how her involvement may relate to her other schoolwork for instance.

In her post survey, Vanessa elaborated on her greatest frustrations with the class in response to the question asking what she may have disliked. Here she states,

Keeping up with the deadlines for blogs and such. When I'm trying to focus on my game, it's really hard to keep track of all the blogs and game uploads and everything else. I know that's basically how we get graded in this class, but it all seems a bit tedious.

This is in keeping with Vanessa's previous comments, and her keen focus in the second semester on completing two games in a short amount of time. It seems that in Vanessa's case, the reflective benefits of blogging that we have seen in other students were not realized.

Summary of Results, Vanessa

As for Vanessa's development of the range of CLAs, it appears that her level of engagement was strongest in the areas of CLAs 1 (creation and completion of an original project) and 2 (project management). To some extent she reflects positively about the teamwork portion of CLA 4

(social-based learning and teamwork), but she does not appear see a benefit to blogging or publishing on the wiki (CLA 3) and engages in this only to the minimum it is required. This may be due to her independent style and advanced skills, making peer feedback less useful towards her game design purposes. As for CLA 5, she engages in inquiry of game design resources, as well as some extent of inquiry into her Semester One game design topic but she expresses more interest in the design itself and not the topic. Overall, for Vanessa the emphasis is on design and creation in Flash. She has a personal interest in programming and design, and these remain her focus.

Vanessa is clearly a student who excelled in the Globaloria program, and was afforded pivotal experiences during her last year of high school that provided her with an introduction to game design and project based work, and prepared her well to embark on continued study of game design in college at Marshall University, a program that is also affiliated with Globaloria. Vanessa's success in winning the FBLA game design competition in Pilot Year 3 and placing 6th in the national competition strengthened her college portfolio and gave her valuable recognition to support her personal perceived competence. She and her team the Smelly Closets also place within the top 5 finalists of the Globaloria Civics Competition. Clearly for this student, the program afforded Vanessa with opportunities to realize and actualize her individual career interests in game design that she held already prior to entering the program.

Some of the research themes emergent in Vanessa's case that invite further exploration relate to the challenges inherent to self-driven discovery-based learning, and Vanessa's stated frustrations. It appears that in the co-learning model, Vanessa occasionally felt under-supported in her learning and overwhelmed by the frequent need to pursue design resources on her own. This is an area that has begun to be explored (Reynolds & Harel Caperton, 2011) and needs greater focus. At the same time, interestingly, she appears to enjoy the independence the program afforded. Nonetheless, the approaches and resources made available in Globaloria's co-learning model appear to need continued refinement to enable students to gain direct help with they need it.

Further, Vanessa signals to the program managers at several points in her feedback that in the context of her first game, her subject knowledge and learning of civics was incidental to her game design. It appears that the range of CLAs were not mastered, nor were they a focus for Vanessa. That is, her own educator did not require her to blog or update the wiki, especially in Semester Two, and she was still able to achieve top grades. It appears that educators adopt pragmatism in their implementation of the program, awarding grades based on the educator's perception of effort the students put forth. This result invites further investigation, given that the full range of CLAs remain the program objectives.

Craig



Craig, a 15-year old sophomore, participated in one semester of game design at RTC in Fall of 2009. According to his pre-survey, Craig was a sport enthusiast and aims to be an architect in the future. A late arrival to the class, Craig struggled at the start of the semester to catch up with his class.

Craig's stated interest in Globaloria from his pre-survey states simply that he "wanted to make a game." However, while it did not appear to be a problem for Vanessa's team, Craig and his team experienced some initial difficulty in the class's transition in focus to civics in mid-October. As a result, he switches topics and team mates and has a reduction in the time available to complete the team work.

Being a single semester student, gaining a full range of programming skills was not the goal. For Craig, the focus would be on learning all of the topics in the Game Design module of the syllabus, which provide an initial introduction to Flash. By the end of Semester One, Craig learns some key skills, in particular as a result of researching his final game topic in November and December. While the shifts early on (and somewhat of a negative attitude) initially set him back, he appears to finish the class at least an average level.

Craig's Participation in the First Semester of Game Design

Prior to participation, Craig evidences a fairly low base of prior technological experience. In a September 2 learning log post, from Craig's language it appears he is new to online social media structures:

i did my classroom blog today and got shown by the teacher how to see the other people's pages in the class.

Whereas some students enter the Globaloria classroom already in possession of some basic coding skills and gaming experience, Craig is much less comfortable with coding specifically and with technology more generally, making his experience in Globaloria more of a personal challenge.

Another illustration of Craig's lack of technological familiarity (or confidence) is his wiki page, which in comparison to some of his peers, offers minimal information about the student. A screenshot of his minimal profile is as follows.

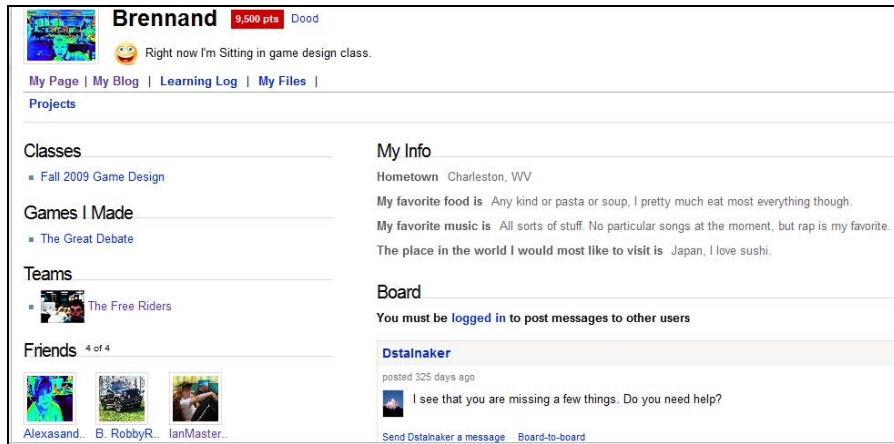


Figure 7. Screenshot from Craig's page

In contrast to many other students who use their profile page to develop an expressive online identity and presence, Craig's page is very sparse, suggesting a combination of disinterest in making his page highly personal and a lack of confidence with technological competencies.

Craig's Teamwork

Craig forms a team called the Free Riders with a student named Nick. Early on, the team members were interested in developing a game about the timely topic of swine flu, as he discusses in a 9/24 blog post:

My group and I have been thinking about our game lately and have finally come up with a topic for it, the almighty swine flu. We decided that since the swine flu is such a scare right now that a game about it would hopefully put away some of the fears.

The Free Riders' topic will eventually shift as a result of the shift to Civics.

As Craig and Nick start developing ideas for their game, dynamics of teamwork and collaboration start to take shape. In an 10/8 blog post, Craig describes some of the difficulties of group work in the classroom:

To tell you the truth, planning your game sucks, you want all your ideas to be a part of the game, but you don't want to hurt your partner's feelings by telling that their ideas just aren't up to par with yours. Good thing I have Nick A as a partner. He basically follows me in what I say, but he adds some good things. And, heck, he even did almost all the paper prototyping (which also sucks). Overall I feel like I got off easy with this plannin the game thing.

That the dynamic between Nick and Craig involves a somewhat unequal distribution of responsibilities is further supported by Craig's 10/9 learning log entry:

Today I got caught up on my learning log, while Nick got most of the research and stuff. It was a good day.

Craig's comments on the individual responsibilities within his team show less a sense of collaboration than an asymmetrical division of labor. It also suggests that while Craig recognized that he was not contributing as much as he could be to his team, he was unsure of how to remedy the issue. The posts reflect some negativity in attitude.

Regarding the topic of his game, as late as 10/12, Craig continued to discuss his interest in designing a game based on educating the public about Swine Flu:

The swine flu is a healthcare issue, and it is also a national scare. This is making the governments around the world spend money for swine flu vaccinations and other things. However, the swine flu is not really that dangerous and I hate that people don't even know what it is and they still are afraid of it. Oh well, i guess that the government can use it as a scare tactic so that they actually seem like they are doing something. Dumb civics.

In this post, there seems to be a disconnect between Craig's fairly nuanced understanding of epidemics and media scares, and his concluding statement "dumb civics." Although he appears to care about education on swine flu, Craig is also frustrated by the degree of unfounded fears perpetuated by media attention. Ideally, working on a game with a socially-charged element would allow Craig to further engage with these ideas.

It appears based on later decisions the team makes that in mid-October Craig was still trying to tie his original game idea to Civics so his team could maintain swine flu as their game subject. However, they ultimately opted against this and chose a more traditional civics theme.

Further, around this time, Craig makes the following series of learning log posts conveying his frustration in trying to complete Flash assignments:

10/13 We got a lesson on animation today from Ms. A and a video, the videos don't help at all!

10/15 I tried to get my sound button to work today, it didn't work out so well though.

10/16 Trying to get the sound buttons to work, so confusing!

10/19 Interaction is pretty dang hard, thats all i have to say.

These learning log entries depict Craig's difficulties with the process of learning Flash, and although he doesn't go into great detail about the specifics of his frustrations, it provides a clear picture of a student struggling to gain a series of technological skills.

In the first quarter evaluations, Mrs. A addresses issues of Craig's commitment to game design.

Q1 Comments and Grade: Craig came into the class late so it has been hard for him to catch up. He also is frequently off task.

Overall, Craig seems a bit lost in the class, perhaps a combination of starting the class late, and holding a personal struggle to stay motivated.

With the start of the second quarter, both Craig's team and the topic of his game were altered. As a result of classroom dynamics and class feedback, in late October, Craig was paired with Ian and started working on an entirely different game based on political parties and the election process. Craig describes these changes in a blog post on 10/27:

Well, now we must forget about all our old game stuff and start from scratch. (I am not complaining because it was the classes idea!) Anyway, i am rid of my old partner now also :), and am paired with the genius of the class, Ian. We hope to win the civics competition. Our game puts you in the feet of an up and coming senator running for president. The objective of the game is to win your debates with other delegates and eventually become the president of the United States. We have not quite got the nitty gritty details done, but it seems like a very good concept and we hope that we can accomplish what we want too, we probably will with wiz kid on my side.

It seems that in construct with their educator, the class decided to shift their game focus due to the opportunity afforded in the Globaloria Civics Game Competition. Craig's receptiveness to this opportunity builds his optimism about the class. Additionally, Craig's excitement about his new partner could also be serving as a motivator. As a whole, Craig seems enthusiastic to have a clearer sense of direction about his team's game.

The Free Riders' Game Pitch

Craig and Ian develop a game pitch for "The Great Debates," however unlike other teams, the boys do not upload their pitch to the wiki page, although it can be pieced together from their game presentation, which is posted to the wiki as a flash file. The goal is to teach players the views of different political parties. The gameplay involves a trivia quiz leading to the election of a president character in the game. Craig is designated as the main coder and game designer.

Audience: This game is made for kids in high school. It's more geared towards getting kids interested in politics.

Game Play: The player sees the debate site with the two candidates. The rules are you have to answer the questions that are asked and you have to appeal to the different parties. The goal of the game is to get elected president.

Fun Factor: The player gets to express their views and see how far they will make it the campaign.

Smart Factor: Our game teaches the different views of the political parties.

Style factor: Our style are simple drawings in flash since neither of us are very good at drawing in flash. We chose to use a song that isn't very upbeat so that the player won't be distracted by it.

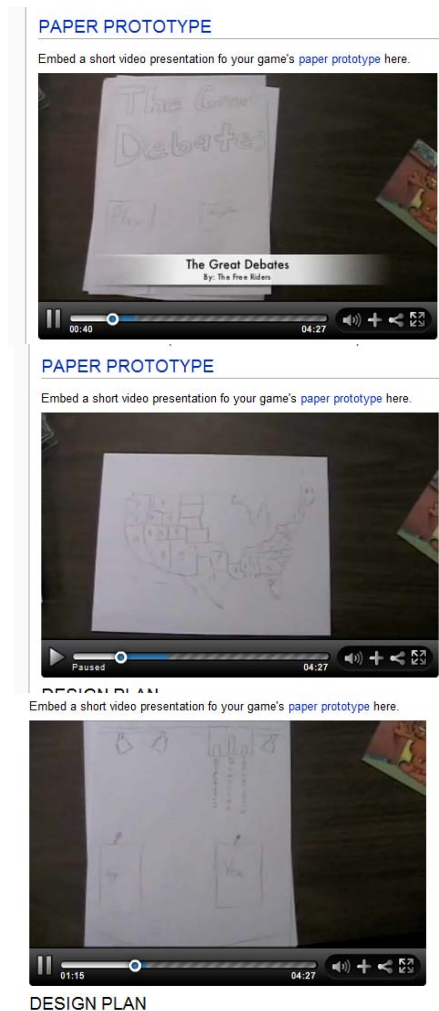
Originality Factor: I think our game is original because it isn't like normal games because it's relaxing, but has its own addictive attitude to it.

Team Introduction: Craig – main game designer and coder. Ian – co game designer and coder and main presentation designer

Paper Prototype

In the Free Riders paper prototype presentation, the team explains that the aim of the game is to be elected president. A player first chooses a state in which to debate. The player then attempts to win votes by choosing from a group of statements that matches the current political character of the chosen state. Players earn points by choosing a statement in line with the political party supported by the majority of the chosen state. Screenshots for the paper prototype assignment are provided as follows.

Figure 8. Team Free Riders' Paper Prototype of *The Great Debates* Game



The presentation is short, approximately two and a half minutes, and it isn't clear if Craig or Nick is doing the talking. Although the key components of the game are in place, the outline is still a little vague in terms of how a player earns enough points to become president.

In his blog on 12/14, Craig discusses some of the difficulties in incorporating civics into the content of his team's game. At this point in the semester, he and Ian are in the midst of researching political positions on a number of issues, and his comments reflect the process of trying to make sense of differences between party platforms.

Well, one thing is for sure, civics definitely is complicated. Politics and all of it is not an easy subject to learn about, there are too many opinions. However, i believe we have learned a couple good points a student should know about civics. Me and Ian's game is about the different parties and their views on certain disagreements in our country right now. We learned mainly about how each party stands on healthcare, foreign affairs, etc. etc. It was an enjoyable experience and an educational one also.

This blog post serves as a contrast to Craig's early blog posts that reflected somewhat of a negative attitude. It appears that his pairing with a highly skilled partner has enhanced his experience in the class. In trying to create a game that educates students about ideological stances of the two largest American political parties, Craig gains an introduction into differences between parties, and key issues that create critical divides between the two parties. Craig's post emphasized that the research process itself was an educational experience, such that these research skills might be transferable to projects in other contexts.

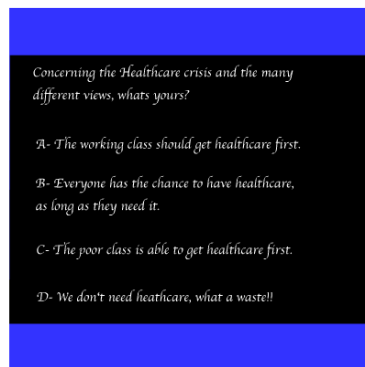
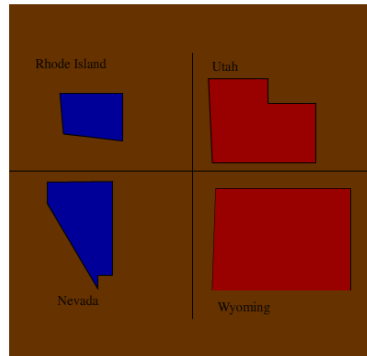
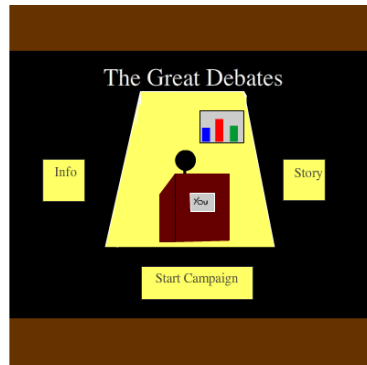
Craig's Role as Main Game Designer and Coder

Craig's role on The Free Riders is as main game designer and coder, which would ideally involve developing significant competency in Actionscript. Although the team now has a clear concept for their game, a significant challenge will be gaining enough proficiency in coding to complete their game. As the lead coder for his team, Craig is under pressure not only to gain a degree of mastery over these coding components, but to adapt them creatively for implementation in his game.

Final Work

Although Craig and Ian posted a final presentation of their game to their wiki as a Flash file, they did not post a video-taped presentation in front of their class and subject to Globaloria administrator feedback. The final version of the game that was uploaded is nevertheless a useful documentation of the progress of the Free Riders over the course of Ian and Craig's experiences in Globaloria. The following screenshots were created from the final game that the team was able to accomplish from late October 2009 through early January 2010.

Figure 9. Screenshots from Final Game, *The Great Debates*



In "The Great Debate" a player first chooses one of four states in which to participate in a debate. States are colored either red or blue, reflecting the political party that tends to be supported by that state. Having chosen a state, the player is then presented with a series of health policy question (such as "Concerning the Healthcare crisis and the many different views, whats yours?") and asked to choose from four responses. The response should be matched to the political party represented by the state. Each response can earn the player positive or

negative points, depending on how well it matches the associated political party. The same three questions are repeated for each state. The questions range from who should receive health care to distribution of swine flu vaccines to AIDS prevention policy. The mechanics of the game present simple buttons that take the player from screen to screen in a mostly linear progression.

Overall, their game subject ends up integrating Craig's previous interest and research into the health issue of swine flu. Included in the presentation file is a reflections page, in which the Free Riders asserted:

So far I think we have accomplished a lot on coding, drawing in flash, and our game is coming along. I think the hardest thing for us has been coding and staying on task since we get frustrated with our game and want to do something else.

This reflection offers frank insight into the experiences of building games, perhaps particularly when students are struggling to master basic Actionscript coding. At the end of the semester, Mrs. A's evaluation shows a continued concern with his ability to stay on task and keep up with assignments. In her Quarter 2 report she states,

Craig is not working to his potential. He is doing more work than last semester but not to potential. He has asked Meredith [World Wide Workshop Help Desk staff] questions. Craig did the artwork and coding for one section of the game.

Her final Quarter 3 report indicates an improvement in Craig's work at the end, stating,

Craig did artwork and coding. He received a "C" in the class because he didn't have a high grade the first grading period. Craig took part and did a good job during the presentation.

Craig's evaluation raises some interesting issues for the structure of Globaloria in the classroom. With his late start in the class, switch in partners, and shift in game focus, certain logistics were working against Craig in terms of his performance and development. Mrs. A. emphasized that Craig has improved in terms of completing some aspects of the project, specifically artwork and coding for one section. The overall picture that emerges, however, is of Craig being less than fully committed to his Globaloria project and struggling to keep up with the pace of learning new skills in flash coding.

In his final blog post, Craig summarized his experiences in Globaloria, addressing both the technological components and civics content of the curriculum.

Well, its hard to sum up all the things i learned in Game Design in one blog, but here it is. The main things i learned was more about computers overall, and specifically flash and civics. We had to make our flash game on civics, so that is why i learned most about

them. I have learned a lot about how to code, how to animate, and how to construct a flash game. I still have a lot to learn about it, but it was a great start. About civics, I learned a lot about the different political parties' views and also the stands that different parties take.

Summary of Results, Craig

Working with his teammate Ian, Craig developed a game that addressed relevant political issues, and even managed to tie in some of his original game ideas by including a question on swine flu vaccinations. Further, Craig was an active blogger in the class. By the end of the semester, Craig's blog is outfitted with a music player and a video. His frequent blog posts tended to be expressive and reflective. A screenshot of his blog is provided as follows.

Figure 10. Screenshot of Craig's Blog as of January, 2010



As a whole, however, Craig's experiences in Globaloria were marked by halting progress towards competency in programming. This is not to say that Craig's experience in game design was wholly negative. Craig evidences an overall shift from a negative to positive attitude towards the class, and learns key research skills, social media skills, and introductory programming skills, to the extent that he and his team mate program buttons in strategic locations in their game on a range of objects that give the game a somewhat interactive feel. It also appears he gained valuable experience working with his team partner.

Craig notes the following in his post-survey:

This class is mainly different because it is teaching us on the computer and about computer rather than conventional classes.

He goes on to discuss additional positive experiences in Globaloria, including:

I get to listen to music!!! Also, i really have enjoyed making my game and watching it come together. It has been really fun.

Interestingly, although one of the more advanced features of Craig's blog was the inclusion of a music player and he states in his post survey that music was a fun feature of the class, the audio component for "The Great Debates" was not built out. Perhaps audio components of the game represent an area of untapped potential that could have been used to engage Craig with a greater level of focus.

In his post-survey, Craig reported that in the course of researching for "The Great Debates" he had gained substantial knowledge about civics, which is quite in contrast to the case study of Vanessa who specifically highlights her minimal learning of the game subject. Craig states,

I learned about the views of each political party and other things about each party ... While researching for questions and answers for my game i learned a lot about the different social issues of the world.

Improved research skills and a basic understanding of political platforms mark an important outcome. Asked about how the skills in Globaloria relate to everyday life, Craig recognizes the applicability of technology in his contemporary surroundings:

Computers are major part of modern life and this has for sure improved my computer skills.

Craig here makes a recognition of the general applicability of technology skills he has learned.

While he seems to have enjoyed experiencing several of technology activities he was introduced to in Globaloria, when it comes to computer programming, Craig's overall development seems to have been fairly limited. At the close of his Game Design coursework, the inherent frustrations of trying to learn programming have dissuaded Craig from continuing with game design classes. Craig states,

Making games is extremely frustrating. There is ALOT of work to complete in the time given ... I don't plan on taking anymore Game Design classes simply because I have struggled with the game making process. I just don't think I am cut out for it.

Craig's sense of not being "cut out" for game design may be least partially informed by his grade of C, as well as his experiences of joining the class late, switching partners, and switching game topics all the way into late October. It appears that this beginner might have benefited from some closer scaffolding in the areas of game design and Actionscript programming.

Comparison of Cases

When we compare the cases of Vanessa and Craig, we see two quite different types of student. Vanessa is a high-achieving year-long participant, and senior in high school with significant prior technology experience and an incipient interest in a career in game design, who easily picks up computer programming and runs with the opportunities afforded in the Globaloria program to leverage her skills and interest at a pivotal moment in her transition to college, to award-winning results. However, she is quite unilateral in her focus on the mechanics of game design, largely ignoring several other activities the program encourages, including the subject and message of her game.

In contrast, Craig is a young sophomore level student with very little prior experience in technology use, who has never seen a blog at the start of the class. Through his participation in an inconsistent program implementation in the first semester, in which there was a significant mid-term interruption and shift in modality to an emphasis on civics (a school subject in which the instructor does not hold a strong interest), he experiences several ups and downs. Once situated in a game design context motivated by a competition, and partnered with a student who he sees as “a whiz,” he experiences a shift in attitude and becomes an enthusiastic online researcher of the political parties, and blogger. He also continues to actively complete his online learning log and attempt to learn programming. It seems he enjoys the social media tools, and he does well in his teamwork. His educator indicates that he completed the artwork and some of the coding for parts of his final game (it is unclear what specific programming skills he himself gained however in comparison with his teammate, using the available data).

While Vanessa receives an A in the class due to her programming skills, Craig received a C. If students’ progress is to be graded for their mastery of the full range of 6-CLAs, then these results indicate that perhaps some changes are needed in the assessment of Globaloria students. It appears that the educator privileged programming over other skills.

Overall, it appears that the close of Year 3 provides a productive moment for reflection by the program founder, as to the central goals of Globaloria. Should a goal be for all students to learn programming? If so, it appears that at RTC, students are not achieving this objective. Without a very clear consensus on the program objectives, it may be that educator’s assessment strategies are somewhat unfair. Is programming privileged (which appears to be the case with the RTC instructor), or are all activities and CLAs equal?

If the latter is the case and all CLAs should be weighed equally in grading, it may be that Craig was not assessed appropriately. This is why clarity in specifying the exact learning objectives for the program, by program leaders coupled with participating teachers is key. Objectives should also be made clear to students. Perhaps objectives will be different and evolve based on educator experience. If Craig was not being well-supported in his game design, and if objectives were not clear, perhaps he should not have received a C, especially at this experimental phase of the program implementation.

In the context of the co-learning model, care must be taken in assessing students. We have observed that novice educators tend to be very liberal with A and B grades, possibly because they are still not confident themselves in the course objectives and feel it is unfair to grade lower. Indeed, as we learn about the evolution of educators across years of experience in the program, it may be that first year educators will have a different set of objectives for themselves and students, than fourth year educators, and, different ways of assessing student performance, because the greater the expertise of the educator, the more he or she might expect from students' learning, based on the level of scaffolding capabilities.

Further, it seems that our results continue to reveal that a certain subset of students participants experience significant difficulty in discovery-based learning, and need more hands-on scaffolding and guidance to learn computer programming in this game design class. However, it appears some do gain skills in other domains such as online research and/or blogging. If introductory programming skills are indeed a goal for all students, then we need to learn more about characteristics and early class behaviors of the students who struggle with programming, so that we can anticipate their needs early on, and offer greater support up front.

On the other hand, some students clearly thrive in and enjoy the independent work context (yet still reveal frustrations in discovery-based learning). It appears that these students have, or find, individual capacities that support autonomous perseverance. Based on the case of Vanessa and some others we have studied, it does appear that Globaloria may be succeeding in helping select, individual creative shining talents find an outlet in productive game design work. Further, the peripheral opportunities afforded in Globaloria (competitions, funding, connections to higher education institutions) appear in some cases to enable the funneling of certain talents into relevant career paths that would not otherwise be available to them. While it is still early to know what her own career outcomes will reveal, Vanessa, who held a longstanding interest in game design, appears to be on a very promising path to success.

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