

“Voulez-Vous Jouer?” [Do you want to play?]: Game Development Environments for Literacy Skill Enhancement

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Abstract: This paper reports the results of a case study that examined the impact on literacy skills of students who developed and played computer games. Two environments were used in this study – a web-based game shell, and an advanced videoconferencing game playing environment ENJEUX-S. Two elementary classes of French-speaking students were observed while they engaged in game development and play. In each class students created games on the topic of their interest in groups of 2 or 3. As a culminating activity, students in one class played against each other using the videoconferencing environment. The findings suggest that advanced gaming environments serve as successful vehicles for fostering language and literacy skills, and developing new digital literacies. The study demonstrated that flexible non-linear pedagogies of technologies allow teachers to use computers in the classroom effectively.

Introduction

The notion of literacy in contemporary education extends beyond traditional print formats, and a rethinking of what it means to be literate in the 21st century is well under way. Yet schools for the most part still view literacy from a traditional perspective, emphasising print-based reading and writing (Squire, 2008; Tyner, 1998). Outside of school the new generation of learners are regularly immersed in a wide variety of activities involving new digital media and as a consequence are developing knowledge and skills different from those valued in school (Lankshear & Knobel, 2006). In light of these dramatic changes and because of the failure of schools to respond, educational and media scholars are calling for the inclusion of multiple media of communication into traditional literacy curricula (Cope & Kalantzis, 2000; Kress, 2003; New London Group, 1996).

Among the many media artefacts of the digital era computer and console games stand out as examples of extremely popular and successful media. Educational theorists argue that gaming embodies a new kind of literacy (Gee, 2003; Squire, Giovanetto, Devane, & Durga, 2005), one that emphasises experiential learning, collaboration, problem-solving, and taps into both traditional and digital literacy competencies (Beavis, 2002; Lotherington, 2003).

To address the need to develop both traditional and the newer, digital forms of literacy in students within a school setting, and to more fully engage students through interactive learning experiences, we conducted a field study to examine the effects of student online computer game development and play on literacy skill acquisition. Students researched and developed curriculum-based questions which they then incorporated into digital versions of popular board games. Once students completed their games, they played them against their classmates using an advanced videoconferencing environment.

Gaming in education

Educational researchers argue that successful recreational games employ many principles of effective learning (Federation of American Scientists, 2006; Gee, 2003; Mitchell & Savill-Smith, 2004; Prensky, 2006). Games facilitate situated learning by providing immersive and motivating contexts for players to engage in a wide variety of activities and to develop and practice the skills necessary to be successful in those activities (Gee, 2003; Shaffer, Squire, Halverson, & Gee, 2005). Games provide opportunities for identity exploration and play through the inclusion of narrative and role-playing (Gee, 2003; Squire et al., 2003); and create a sense of pride and accomplishment through structuring the game play in complex ways that challenge the player and allow for progress through trial-and-error cycles (Gee, 2003). Research also supports the benefits of game playing for developing social learning strategies, including team work and group problem-solving (Kiili, 2007; Mitchell & Savill-Smith, 2004). McFarlane, Sparrowhawk, and Heald (2002) conducted an evaluation of educationally relevant games in elementary schools and found that while playing these games students engaged in deductive reasoning, collaborative problem-solving, cooperative learning, and peer-tutoring.

The research on the effects of computer game development—as opposed to game play—as a pedagogical activity is scarce. Initial evidence suggests that giving students opportunities to input their own content into a game can be a powerful motivational tool that contributes to a sense of pride and accomplishment, and facilitates learning (Gee, 2003). A major roadblock to utilizing game development for learning in a school context is the lack of expertise on the part of students and teachers who may not possess the complex skills required to design computer games. A solution to this problem lies in using a web-based game shell such as the one employed in the present study. Game shells do not require any sophisticated hardware or software, and developers do not need to have advanced programming skills in order to create games using these shells.

In addition to the learning benefits of computer gaming, game development and play are seen as vehicles for increasing motivation and engagement. Student engagement is an important factor in academic achievement, especially in relation to reading and literacy (Learning Point Associates, 2005). Studies show that academic achievement is associated with engagement in reading and learning activities (Finn & Rock, 1997). In order to foster literacy skills, the game development activities selected for this study had a strong language component. Students developed web-based board games by inputting series of questions into game shells. We hypothesized that creating game questions would be a literacy-rich task that allowed students to engage in reading, writing, and speaking in the language of instruction – French, while staying engaged in a motivating activity. Research suggests that questioning as an instructional activity increases students' comprehension and literacy skill (Rosenshine, Meister, & Chapman, 1996).

There is considerable theoretical and research support for using computer games to increase student engagement in learning, their task persistence, motivation to learn, collaboration, and foster the development of traditional and contemporary digital literacies. Game development and play then serve to mediate improved achievement, as well as promote the development of social learning strategies. In this study, we examined how intensive game development and play impact both traditional and digital literacy skills of students whose language of instruction is French.

Method

Research design

We conducted the study in two public school classrooms in Ontario, Canada. One class was a combined grade 5-6 class in a French first language school, referred to as Class A. The second class, referred to as Class B, was a grade 6 French immersion class. Students in the latter class were native English speakers, however they received all of their instruction in French. Both schools were located in predominantly English-speaking suburban neighborhoods and all students spoke English outside of school.

The project had two main phases. In phase one, students in the two classrooms used the Education Games Central (EGC) game shells to develop interactive computer games. After the students were introduced to the game environment by the teachers, they were divided into groups of 2 or 3. The groups then selected a topic of interest to them, and created a set of questions on that topic, later inputting these questions into *Tic Tac Toe*, *Snakes and Ladders*, and *Trivia* game shells. In phase two, students engaged in competitive game play using the ENJEUX-S advanced gaming environment. Since the teacher from class B could not continue to participate at this stage of the

study, the students in class A engaged in play against their classmates. Two groups of students took turns to play against another team in the classroom, selecting a game that has been created by a third group to avoid unfair advantage.

Gaming environments

Education Games Central (<http://www.savie.qc.ca/carrefourjeux2/>) was the game shell used in the study. This web-based shell simplifies the construction of electronic versions of popular board games. To create a game, students develop a set of questions and answers and enter them into online forms. Each game requires a different minimum number of questions for the game to function properly, ranging between 16 and 54. Game developers have the option of specifying the feedback a player receives when a question is correctly or incorrectly answered. They can also embed links to web resources in the questions. A step-by-step wizard-like guide down the left side of the game creation page verifies whether all questions are entered correctly and if the game is ready to play. When playing the game, players are competing against each other in an interactive board game environment. The game shell was originally created in Quebec, Canada, and its operational language is French. It was later translated into English and Spanish. For the purposes of this study the original French-based game shell was used. (Fig. 1) shows a *Tic Tac Toe* game developed by a group of students in this study.

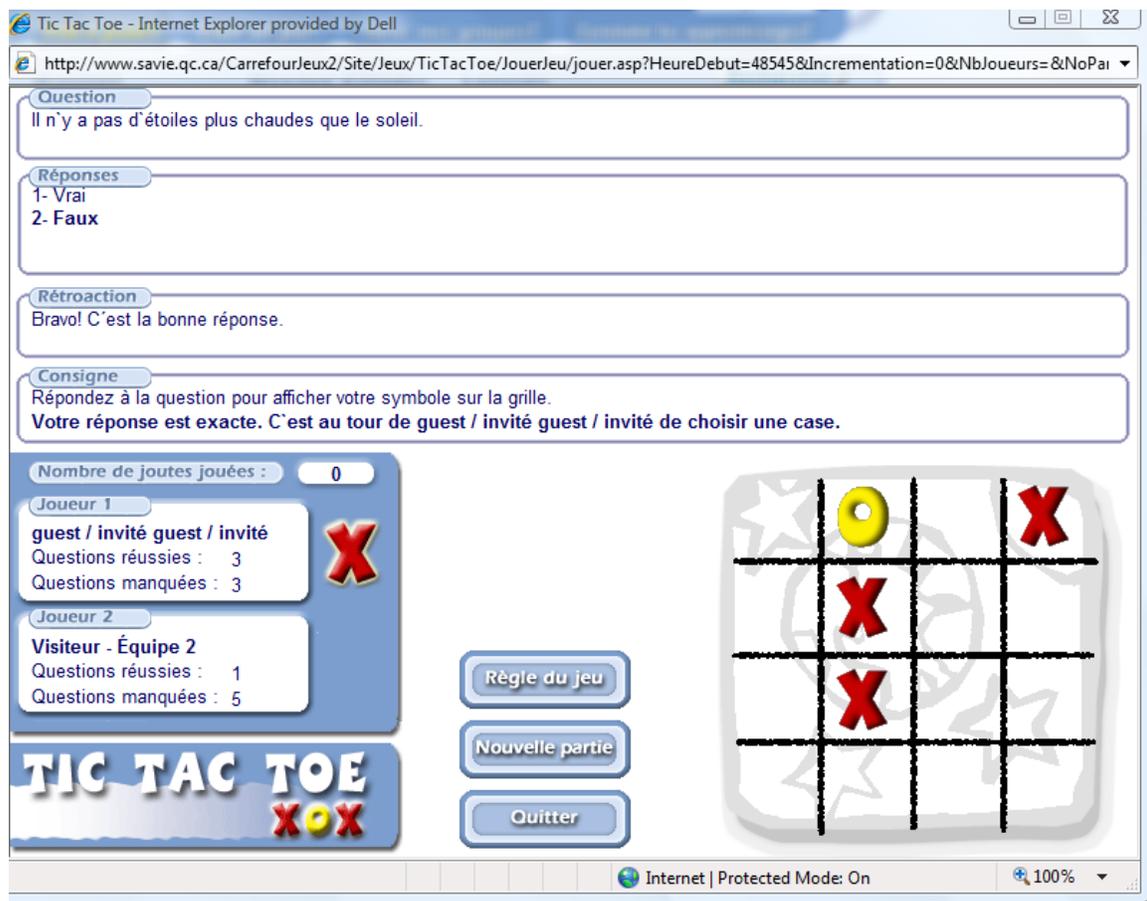


Figure 1: Educational Game Central environment: *Tic Tac Toe*

ENJEUX-S, the advanced gaming environment allows players to participate in the EGC game play (as above), but in multiplayer, multimodal environment supported by built-in videoconferencing (see <http://www.savie.qc.ca/enjeux/>). The players log into the environment with their unique ids, and set up a meeting or join an existing meeting. Once in the meeting space, they can engage in a variety of activities, game playing being

the principal one. The features of this environment include video and audio conferencing, a live chat, as well as an interactive environment in which the games can be played in real time.

Methodology

This qualitative study was conducted in the two schools using a case-study methodology (Yin, 2003). Data were collected during the two phases of project implementation. In the first phase of game creation by the students, two observations were carried out in each of the two research sites. Field notes and photographs were taken at the sites, and student-created games were used as data. During the second phase of the project implementation, observations were conducted in the school where videoconferencing was taking place, and field notes and photographs were taken.

Qualitative data which included field notes from our observations, transcripts of interviews with the teacher and the students, photographs, and students' games were coded based on our initial research questions. The data were then analysed using Atlas.ti qualitative software. We identified key themes and issues pertaining to issues of gaming for literacy development, collaboration and engagement, and pedagogies of technology. The emergent findings are summarized according to the most salient outcomes of the project: impact of game development on language and literacy; digital literacy skills; student motivation, engagement and collaboration; and pedagogies of technology use in the classroom.

Findings

Impact of game development on language and literacy

Creating the games using an authentic French-based game interface proved to be an effective approach to encouraging interaction in French, the language of instruction in both schools. The EGC environment allowed for the use of French pertaining both to the curricular content, and the technological vocabulary describing various functions of the Internet browser, and the computer. Teachers consistently used French with their students, whether for providing instructions about the game, feedback about the content of the game, or for classroom management. Students' use of French for interaction during game creation was less consistent. French was used in whole-class contexts or when addressing the teacher. In small-group work a mix of French and English was used, with English emerging in moments of high engagement or frustration; when students were referring to experiences that they have had in English, especially in relation to technology; when the students did not know how to say something in the target language; or when using English-language material for their game creation. In comparing the materials that students used for their game development, most students in class A used French-language sources, including educational websites, Wikipedia articles, textbooks, and recreational reading materials. In class B however students used materials, such as websites, which were primarily in English, and were translating them with the help of an online translator, Babel Fish, or called on the teacher to translate vocabulary they did not know.

Students made an effort to create questions that were challenging and motivating for the other players. In class B one student inquired whether it was possible to create 'trick' questions. However, in the same class one group of students was observed completely disengaging after finishing the 'required' number of questions. Students were also observed paying attention to grammatical and orthographic correctness. The analysis of the game content revealed that most students focused on factual (Who? Where? What? Which? When? How many?) questions that mostly required recall of previously acquired information. Questions in class A were for the most part grammatically correct, with correct spelling and sophisticated use of vocabulary pertaining to the topics of the games. In class B students had more problems with grammar and spelling.

Game play using videoconferencing software offered an effective and authentic environment for developing language skills. The videoconferencing component allowed the players to communicate between each other, and the students in the study used this functionality for a number of purposes. They interacted about the game set up and the administrative problems that occurred during game set up and play (e.g., if they couldn't hear, or if the game wouldn't start on their end). Students also directed much of the interaction towards teasing the other team and boosting their own competitive spirit. The game play encouraged some skills of language decoding (in reading the questions and the answers) and production (in discussing the correct response). The observations revealed that answering questions quickly was the most important factor in most teams' game play, often at the expense of accuracy of their responses. The teacher encouraged the teams to communicate amongst each other, and discuss the

responses before they chose the final one. However, frequently the response was chosen before all members of the team had a chance to share their opinion. As with the game development, game play seemed to be accompanied by a mix of French and English conversations.

Development of digital literacy skills

Games have been seen throughout this study as a strong vehicle for developing not only traditional literacies, but contemporary digital literacies. These literacies include the ability to interact with computers, access and navigate different digital environments, trouble-shoot problems, as well as access and evaluate information online.

Students had a varied level of comfort with technology. In class A, some students showed an extreme proficiency with computers, accessing different web resources for their research (such as Cyberqu@rtier <https://cyberquartier.csdco.on.ca/cyberquartier/Anonym/Accueil/Accueil.aspx>, a collaborative environment for students, or educational websites in French). Several students were very independent, attempting to trouble-shoot problems with computers themselves; others were extremely insecure with technology, constantly calling on the teacher for assistance. In class B students showed a more consistent level of independence, relying on their own skills and the skills of their peers to navigate the online gaming environment and trouble-shoot the problems with the machines. Students also used the Internet as a reference source for their games. Class A students were observed using Wikipedia in French, as well as printouts from educational websites in French. Students in class B used a variety of websites, all of them in English. They also used Babel Fish online translating website to translate their questions from English into French. This resulted in a number of grammatical and vocabulary errors which the students did not notice, trusting in the accuracy of the online translation. As this instance demonstrates, online tools should be approached with caution in language learning contexts, and students should receive training in using online tools such as translating websites.

The ENJEUX-S videoconferencing environment combined many aspects of sophisticated sociable technologies that are particularly appealing to students. The students were deeply engaged with the environment, and appreciated the interactivity, the video and audio components, and the gaming itself. The experience of using an advanced gaming environment with many digital functionalities had a lot of benefits for learning new digital skills. Particularly, students learned how to control and be in charge of sophisticated digital technologies. As a result of this activity, the students had an opportunity to familiarize themselves with the technologies of the future; technologies that up to this day remained in the 'adult' realm. They experienced video and audio possibilities of online interactions, and understood the working principles behind webcam communications. They also used these skills to engage in authentic competitive game play.

Student motivation, engagement, and collaboration

The game development was a means of motivating students and engaging them in literacy activities on several levels. First, the technological aspect was a motivating factor: students in both classes were eager to go on the computers, use them independently to produce content, and engage with new digital environments with their partners. The gaming environment also added to the excitement of using computers, since many students were familiar with interactive gaming, and appreciated the use of tools that are traditionally considered recreational in formal instructional settings. Second, in both classes students have developed games on a topic that was of interest to them. Most students were observed working hard on creating game questions, bringing in additional materials and conducting their research both at home and in class to ensure a good quality of questions. The students were also very motivated by the competitive aspect of the game.

Collaboration was a key component in the game development activity, and students were collaborating effectively in trying to create challenging games. Students were observed collaborating not only within their group, but also across groups. In class B, for example, students were offering each other assistance when there were problems with technology. The groups in both classes seemed to have worked out the roles that each team member would play: in some groups one person was typing, while the other was reading the questions; in other groups, the students switched roles to give each team member an opportunity to do every task.

In the game play phase of the project, students showed extreme levels of motivation and engagement in the activity. Given that they had put much effort into creating their games, they saw the final activity as a culmination of their efforts. The opportunity to compete against other teams was also a strong motivating factor. There seemed to be an inter-gender rivalry as well as the inter-team rivalry. The competitive aspect also translated into the students

making sure that the game play was fair. They used the webcam functionalities to observe the other classroom, and made remarks using the microphone if they suspected that someone was cheating. (A webcam was required for the ENJEUX-S environment.) The students were visibly motivated during the game play, cheering each other on, teasing the other team. The technology itself served as a great motivating factor. Not many students, it seemed, had prior experience with a web camera, and the first few minutes with every team were spent exploring its functionalities.

Pedagogies of technology use in the classroom

Teachers in both classrooms had excellent rapport with the students, and showed remarkable skills in classroom management. Both teachers had a very comfortable, hands-on approach to teaching with technology. In both classrooms technology had become part of the classroom ethos, where the teacher in class A routinely included computers into his practice, allowing students to work independently on the computers, while the teacher in class B used a mobile laptop cart and projector as part of her classroom routines.

The teacher in class A seemed to have more flexible pedagogies around computers, not making a distinction between 'class time' and 'computer time'. Students in his classroom were observed using the computers when they needed something done. This pedagogical approach can be attributed in part to the teacher's experience with teaching combined grades, where pedagogies have to be flexible in order to cater to all students in the class. The teacher's experience and comfort with technology was another contributing factor. The teacher in class B had more controlled practices of computer use. For example, the teacher made sure that she was the one distributing and collecting the laptops, and students were allowed to start working only when the teacher instructed them to. This of course may be attributed to the fact that the class was relatively large and the teacher wanted to prevent off task behaviour. That difference notwithstanding, both teachers had a remarkable comfort with and control of technology. When faced with technological glitches and problems, both quickly found solutions that allowed for the productive work of the students to continue. In both classrooms the teachers were helping students with technology, checking their progress and assisting them with the content of their games. The teachers' pedagogies of technology use show a remarkable balance of hands-on and planned integration of computers into their everyday practice, which allowed the students to immerse themselves into technologies and make them part of their learning.

An interview with the teacher in class A revealed that he viewed this project as a useful activity for developing student literacy at the elementary level. While recognizing that the effects of this particular implementation were limited due to allowing students to create one game on the material that was already familiar to them, the teacher evaluated the gaming activity as an engaging means to incorporate interactive computer technologies into literacy instruction. He admitted that he would like to use the gaming activity for revisions of material in the future.

Discussion

This project investigated how the use of two game development and playing environments affects students' learning, literacy, and gained insights into an effective pedagogy of technology use. Our observations of students creating the games and playing them suggest that web-based gaming environments can serve as an effective and engaging means of developing literacy skills in French-speaking students. Primarily, the games provided an authentic French environment for the students to interact with, and allowed for the use of contemporary French in reference to the new digital media. On the flip side however, students were tempted to "shortcut" and use English whenever the situation allowed. This suggests that further work is needed in order to establish the points at which students are most prone to using English in dealing with digital technologies, and suggest ways to limit those situations.

Students also became more conversant in digital literacies. Students in the game creation classrooms had the opportunity to use new and engaging media to create interactive games. They have extended their skills of navigating the web environment, accessing the web, and using appropriate vocabulary to describe various digital artefacts and functions. In the videoconferencing activity the students had the opportunity to interact with and control the cutting-edge technologies that up to that moment were inaccessible to them, thus increasing their level of comfort with and interest in the versatile digital technologies of today. They also used the Internet to do research for their game questions. However, students in one of the classes did so uncritically, using the material in English and translating the questions into French with the help of a web translator, which resulted in poor question quality. This

finding can be used to further probe the critical dimension of using the Internet in the classroom, and investigate the possibilities for evaluating the content accessed online. The activity allowed the teachers to engage students in interactive and literacy-rich environments. Students were motivated by the novelty aspect of the game, by the use of digital technologies, and by being able to put their own interests and strengths into the game. Perhaps one of the most significant gains that we observed was the amount of team work and emerging collaboration that helped the students create better games.

In this study we also aimed at investigating what constitutes effective pedagogies of computer use in literacy instruction. In the course of the project the teachers demonstrated the use of various pedagogical approaches, and the most successful ones were non-linear and flexible. Effective use of technology in this project was characterised by the teachers taking ownership of the technology and its tools, incorporating them into their teaching practice, and most importantly, allowing students to explore and get comfortable with the technology. The most telling examples of how successful pedagogies of technology worked in this project came from instances in which the teachers had to deal with breakdowns or problems. Both teachers in the project took control over the technology, rather than had the technology control their classroom, and found ways to work around the technological glitches without negatively affecting their pedagogical goals.

Conclusion

This project examined how two gaming environments, a web-based game shell and a videoconferencing collaborative tool can be used to develop students' French language and literacy skills. Our findings suggest that both game development online, and game play using an advanced collaborative environment can be effective tools for fostering students' literacy through immersing them in rich language experience and offering them multiple opportunities for collaboration. The gaming activities were also seen as a successful vehicle for developing students' digital literacies through exposing them to diverse technologies which allowed the students to experience and develop sophisticated skills of browsing, accessing, and communicating on the web. However, we also found that students need more critical literacy skills in using the Internet, specifically in instances of using a web translator.

These preliminary findings warrant more research into the area of language and literacy development through the use of interactive web technologies. Specifically, when it comes to using a second language in the classroom, students interact both in the target language and in English. Further research could shed light on the influence of English-saturated Internet technologies on learning in languages other than English. Moreover, research into the possibilities of remote collaboration via videoconferencing can help determine the impact that advanced Internet technologies have on learning and literacy.

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