Using Massively-Multiplayer Online Role-Playing Games to Enhance Collaborative Learning and Teaching in the Australian High School Classroom

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Abstract: Following the large uptake of Internet access and e-learning resources in high schools, the authors believe that the fusion of computer-supported collaborative learning (CSCL) with games design and play theory can be tested and applied to teaching practice. This paper reports on the status of a two-stage project to develop and test the use of massively-multiplayer online role-playing games (MMORPGs) for promoting CSCL through instructional gaming in schools. It presents the findings of the first stage of the project, in which teachers and students of English and Science at a high school in Western Australia were involved in a pilot study as “proof of concept.”

Introduction

In a massively-multiplayer online role-playing game (MMORPG), large numbers of players – up to thousands or tens of thousands – form groups, clans or guilds to take up a role-play in a dynamic, virtual world. The Research into Professional Practice, Learning and Education (RIPPLE) research centre at Charles Sturt University has funded a project involving the development, testing and investigation of the use of MMORPGs in K-12 (secondary) teaching practice, based on the authors’ existing work with virtual learning environments.

Many educators wonder if the instructional gaming is worth the effort required by teachers and students. The authors contend that instructional gaming that combines CSCL and game design theories can be easily integrated into the professional practice of educators. This paper reports on the progress of the two-stage project, including the design, implementation and use of a MMORPG for a pilot study culminating in the findings the first stage of the project. The pilot study involved developing a “proof of concept” involving two classes studying Medieval Times at Swan View Senior High School.

CSCL and instructional gaming: A brief literature review

The youth of today have modern information and communications technologies (ICT), including computer games and the Internet, finely ingrained into their culture. In the words of Prensky (2001): “[t]he Games Generation has been raised with, and become accustomed to, the worldwide connectedness of email, broadcast messages, bulletin boards, user groups, chat, multiplayer games, and instant messaging” (p. 57).

Consequently, high school students now readily adopt new technologies for communication and entertainment, and are often more technically competent than their teachers. Buchanan (2003) urges educators urges educators not to react negatively or with apprehension; rather, he calls for them to bravely leverage and “co-opt” the technologies students already play with to engage them and help them learn better. He asserts that computer games are a particularly powerful medium due to the true interactivity they offer. Education and games share many values, such as teamwork and creativity; in addition, according to Papert (1998): “The basic skill today is the skill of learning…the best use of games is to leverage the tendency to enhance it” (para. 11).
Play theory is based largely around the observation that humans – like other animals – learn more through the games they play in their early years than they do in any other corresponding time in their lives (Van Eck, 2000, citing Lepper & Chabay, 1985). Games are the natural means by which socialisation and other life skills are learned. This view is echoed by Piaget (1951), who called play “the work of a child,” and Rieber (1996), according to whom “[h]aving children play games to learn is simply asking them to do what comes naturally” (p. 52).

Successful players master a variety of skills and knowledge in the course of game play. Gee (2004) suggests that what makes the games themselves deep is actually the learning players engage in, whether this is done consciously or not. He claims that “[u]nder the right conditions, learning...is biologically motivating and pleasurable for humans (and other primates)” (Introduction section, para. 7). Similarly, Atari Game Designer Chris Crawford states that “[g]ame-playing is a vital educational function for any creature capable of learning...the fundamental motivation for all game-playing is to learn” (Crawford, 1982, pp. 16-17). As such, Gee (2004) proposes that good game designers use methods similar to principles being discovered in recent research on human learning.

In a well-designed game, players learn because they need to in order to play the game – Motivation is built in to the game itself. Lepper and Malone (1987) identify seven theories for game design, divided into four kinds of “intrinsic motivation” that can be presented in any learning situation, even those involving one person: Challenge, Curiosity, Control and Fantasy. The next elements of intrinsic motivation were categorised as “interpersonal motivation.” These three theories of game design are of particular interest in the application of MMORPGs to collaborative learning and teaching practice in schools: Competition, Cooperation and Recognition.

Computer supported collaborative learning (CSCL) focuses on the use of ICT as a mediating tool for collaborative virtual environments (CVE), and as such can serve as a theoretical paradigm for online role-playing games to support learning. Founded in the social constructivism, collaborative learning in general emphasises an understanding of language, culture and the social setting. Closely related are the positive effects that the social phenomenon of community can have on learning and knowledge construction, as highlighted by the work of Dewey (1929), Vygotsky (1978), Kafai & Resnick (1996) and Cunningham (1996). Online gaming communities such as MMORPGs are excellent manifestations of this, since new players are immersed into the community’s socio-cultural practices and master new knowledge and skills through interactions with others.

Participant interaction in cooperatively designing, building and using a MMORPG affords specific cognitive advantages to student learning. Typical gaming communities or guilds display a similar pattern of to and fro, cooperative problem solving behaviour, according to a study of online gaming communities named Project Massive (2004). Activities performed during gaming sessions can be classified into four types: game playing and building; coordination and scheduling; support and advice and social interaction. All these are important interpersonal communication skills for the workplace and life in general. Seay et al. (2004) discovered interesting patterns through interviews and surveys involving 1836 informants, of ages ranging from 12 to 68 (Table 1).

| Average time per week with preferred game | 15-21 hours |
| Percentage of gamers involved playing > 40 per week | 12% |
| Percentage of gamers who communicate “outside” the game with other gamers | 69% (28% have none) |
| Most frequently used method of out of game communication | Forums (message boards) |
| Main activities for out of game communication | coordination and scheduling 57% support and advice 55% social interaction 53% |

Table 1: Online gamer behaviour patterns (adapted from Seay et al. 2004)

Research has shown that learners can have surface or deep learning strategies. Biggs (1987) suggested a close association of deep learning strategies with active interactive participation and social interaction in an “affective” environment. Educational value is defined as the change and positive experiences in learners, involving seamless movement to and fro between moments of surface and deep learning, cooperation with others, contributions to the dialogue and feelings of self-worth. This sense of educational value of instructional gaming has inspired this project:

Play offers a means for understanding motivation and learning in a holistic way. Serious play is not easy to achieve, but the reward is an intense and satisfying experience for both students and teachers. (Reiber, 2001, Abstract)
Research Methodology

The methodology involves an Action Research (AR) case study in two cycles or stages. Stage AR-1 was used to show “proof of concept” through a pilot study involving Swan View Senior High School teachers and students. The research in this stage followed a reflective pattern, leading to a revised plan, identified by a title and questions leading to further actions, observation and reflection in the next stage, as per Kemmis and McTaggart’s (1988) iterative model of action research. Further work in Stage AR-2 will see the project expand to more schools, as result of the findings in AR-1. AR-2 will also see the development of a curriculum plan and resources kit for the use of MMORPGs in high schools.

Proof of concept: Pilot study using Rochester Castle MMORPG

The pilot study in Stage AR-1 of the project involved Year 8 and Year 9 English and Science classes taught by Diane Hobbs and Mark Weber, who engaged in MMORPG game design and game play to learn about Medieval Times. The aims and significance for all participants was novel. At the end of the pilot study:

- Students had joined with another class curriculum to achieve joint learning outcomes by creating their own storyline, built and played in a MMORPG, and achieved new skills in learning collaboratively online;
- Teachers had developed new ICT skills and enhanced teaching practices by joining collaborative learning and games design theories, across subject boundaries;
- Researchers had investigated the effectiveness (educational value) of the MMORPG scenario that used the theme of a Medieval Castle had on collaborative learning of two classes.

Short history of Rochester Castle

Students “built” Rochester Castle (1087-1100 A.D.) in Kent, England in order to explore the outcomes in the Year 8 Society and Environment (S&E) unit “The Changing World” in an interactive way. To set the scene: During the reign of Richard the Third, Prince John took over the throne of England, while King Richard was fighting the Crusades and then was subsequently taken hostage. Prince John allowed allies to build a series of castles to strengthen his position. The Bishop of Rochester was one such ally and he petitioned John for permission to build a castle. He needed to recruit a work force to build this castle along strict rules of the time, then staff it with soldiers to defend it against attackers. Rochester Castle was attacked and was under siege in 1215 A.D. It was the longest and best-documented siege of the time. (Cook, 2001).

Designing the game

Gee (2004) emphasises the benefits of employing “co-design” to empower learners, by giving them direct input into the creation of the world they are in and the experiences they undergo. The Kid Designer project (Rieber, Luke & Smith, 1996) and Yasmin Kafai’s book, Minds In Play (Kafai, 1995) are other classic works that advocate placing learners in the roles of producers rather than consumers of games. Following in this vein, a constructionist (Harel & Papert, 1991; Kafai & Resnick, 1996) approach was taken to embed educational content into the game design. Leah Irving provided the story outline as a starting point for the teachers and students to collaboratively re-construct the castle and characters of the time. They worked over six weeks in the computer lab, and doing research and preparation for the game in the regular classroom. Students were given a plan of the castle as a fortified manor house (keep). Each student had a specific role to play based on the medieval society. They needed to access information to construct their own model of the castle within the game environment. For example, they accessed information on the historical events, planned and designed how to find access to the drawbridge, cellar and dungeon. Some students created their own secret rooms without any instruction from the teachers, which they would later use as hiding places during game play, when the King’s army invaded the castle. Meanwhile, technical support and developmental (programming) assistance was provided by the Internet Special Projects Group (ISPG) at Charles Sturt University.
MMORPG game architecture and topology

A MOO (Multi-User Dungeon, Object-Oriented) was used to provide the environment for the game. In a MOO, players have the appearance of being situated in an artificially-constructed place (social space) that also contains others who are simultaneously connected. MOO facilitates polysynchronous communications, that is, it accommodates a hybrid model comprising both synchronous and asynchronous elements. For instance, players can interact and chat in real-time. In addition, their actions can impact and have a lasting effect on the state of objects, even after they have logged out – Notes can be left on notice boards and signs erected which allow messages to be left behind for others; objects like weapons and tools can be created, used, moved and otherwise manipulated; etc.

Each person’s avatar has a class or level. At the bottom are temporary avatars called guests who can only move around and chat to other avatars. A player has a more permanent identity but can still only move and chat. A builder can create new objects (except avatars) and give them attributes such as a description. A programmer can create new verbs (commands) for objects using the scripting language provided. Wizards can create and control other avatars and change attributes such as location, password or quota. They can gag, disconnect or even recycle avatars.

Rochester Castle MMORPG is hosted on the ISPG server at CSU (see Rochester Castle MMORPG, 2004). The system is run using open source software: enCore Xpress 4.0.1 (see Holmevik & Haynes, 2004) under the FreeBSD operating system. In the castle, the curtain wall featured as the great corridor, from which all other rooms in the castle come off. The central hall is where life takes place, and the big grassy area (Fig. 1) is called the common. MUD maps and layout diagrams are used to show gamers how to move throughout the castle and its surroundings.

Building player avatars

Gee (2004) points out that good games create deep learning by engendering extended commitment on the part of players, through having them take on a new identity they value and in which they become heavily invested. One way of achieving this is to offer a relatively empty character whose traits are left to be determined by the player, but in such a way as to allow him/her to develop a profound life story for the character in the game world. The MOO allows players to build and customise their own unique avatar, including textual descriptions and multimedia representations that provide an online image and identity for the character (Fig. 2). As applied to Rochester Castle MMORPG, this also challenges them to exercise their creativity while maintaining a level of historical accuracy.
Figure 2: Part of the multimedia representation of an avatar for the player Sir Eramus.

Playing the game

The game started with the Archbishop of Rochester petitioning King John for a Cantenation. This was granted and the Bishop had to recruit his building force. The guilds involved were Stonemasons, Blacksmiths, Farmers, etc.; student groups took these on as allocated by ballot. Students were rewarded for participating in the game by acquiring barter tokens and gold. Any disputes were settled first by the Bishop of Rochdale or in the extreme by King John. Daily law enforcement was carried out by the Bailiff.

The castle was built by students creating rooms in the MOO. To build anything, they needed to get permission from the Archbishop of Rochester to be allocated permission as a builder (or programmer). The students that were part of the attacking force had to research the engines of war for medieval times and needed to organise themselves into teams, then attack and lay siege to the castle.

Analysis of online gamer activity in Rochester Castle MMORPG

An analysis of gaming participation showed that 53 student online gamers used Rochester Castle MMORPG for a total of approximately 223 student hours. Table 2 below records the general participation statistics for the game over all sessions. Fig. 3 reveals the pattern of time spent playing the game by the students.

The student player called “Charles the Squire” had almost double the average playing time of the next 5 highest in the list of top 25 gamers by time spent at Rochester Castle. The gradient of the curve gets significantly steeper after the player called “Simon the Steward.” An ethnographic study of the Rochester Castle game community (Eustace, 1998) will make an interesting follow up analysis.

383 sessions [1] were held at Rochester Castle MMORPG from August 12 to October 4, 2004. Of the total of 223 hours of session time for data collection, 102.9 hours (46.16% of all sessions) involved 2 or more multiple players interacting with the MMORPG. The 102.9 hours were recorded for 63 of the 383 sessions or 16.45% of all sessions, while the average time per multi-player session was 1.63 hours. The number of sessions with 10 or more players was 16 and the average number of players per multi-player sessions was 6.86 players per session.

Fig. 4 records the peak game playing attendance for the period of the trial with a duration peak of 6 players for 7 hours, 6 minutes and 12 seconds on August 31, 2004 and a players per session peak of 29 players for 58 minutes and

[1] A session may be defined as the contiguous period during which one or more players remain connected to the MOO.
19 seconds on September 28, 2004. The 3D chart in Fig. 5 compares the same pattern of statistical data for session duration figures (short buildings) with the number of multiple players per session (taller buildings at rear).

<table>
<thead>
<tr>
<th>Gaming Hours</th>
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</thead>
<tbody>
<tr>
<td>Highest participation</td>
</tr>
<tr>
<td>Lowest participation</td>
</tr>
<tr>
<td>Average number of hours</td>
</tr>
</tbody>
</table>

**Table 2:** Student participation statistics for Rochester Castle MMORPG

**Figure 3:** Rank order of the time spent (hours) gaming by all students at Rochester castle.

<table>
<thead>
<tr>
<th>Character</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Charles the Squire</td>
<td>20.55</td>
</tr>
<tr>
<td>2. Sir Eramus</td>
<td>13.27</td>
</tr>
<tr>
<td>3. Reginald the Squire</td>
<td>12.60</td>
</tr>
<tr>
<td>4. Claramunda</td>
<td>10.95</td>
</tr>
<tr>
<td>5. Andrew</td>
<td>10.46</td>
</tr>
<tr>
<td>6. Simon the Steward</td>
<td>8.27</td>
</tr>
<tr>
<td>7. Oliver the Don</td>
<td>7.66</td>
</tr>
<tr>
<td>8. Ralph the Squire</td>
<td>7.17</td>
</tr>
<tr>
<td>9. Bryan the Squire</td>
<td>6.88</td>
</tr>
<tr>
<td>10. Valentine the Cotter</td>
<td>6.83</td>
</tr>
</tbody>
</table>

**Table 3:** List of top 10 gamers by hours spent

<table>
<thead>
<tr>
<th>Participant type</th>
<th>Names</th>
<th>Hours</th>
<th>Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research team</td>
<td>Ophelia</td>
<td>87.87</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Castledog</td>
<td>25.86</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Bailiff Bill</td>
<td>7.78</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>121.51</td>
<td></td>
</tr>
<tr>
<td>SVSHS teachers</td>
<td>Langton</td>
<td>10.33</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>King John</td>
<td>8.40</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18.74</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4:** Summary of non-student gamers’ participation

**Figure 4:** Duration of each session (1 to 383) at Rochester Castle over the period of the pilot study.
Conclusion

The development, testing and investigation of the use of a MMORPG to facilitate collaborative learning has been a rewarding challenge and learning journey for the research team, teachers and students. The average time spent by teachers supporting the game (about 9 hours) is approximately double the average time spent by students and seems to be typical of normal lesson preparation time. This analysis suggests that instructional gaming with Rochester Castle and similar MMORPGs is about the same workload as conventional teaching where each hour in the classroom is matched by an hour of preparation, plus time spent mastering ICT, games design and research skills.

Future plans

The authors plan to conduct further analysis of data to examine:

- The number of sessions students spent gaming outside school, as an indication of motivation and reward;
- The different types of activity done in each session such as: game playing and building, coordination and scheduling, support and advice, social interaction;
- The ease of learning and use of ICT and MOO training resources for school staff, so that this form of instructional gaming can be part of professional practice.

As part of the second stage of the project, several high schools throughout the country will explore their local histories within the MOO. The authors plan to support truly “massive” numbers of students from these schools building a history of Australia from a local perspective. Students will build and role-play some significant event, possibly looking at various scenarios and their outcomes. Additionally, students will be able to visit each others’ historical sections to learn from them with coordinated synchronous sessions to build social networks and carry out collaborative role-play. A thorough navigation plan will be necessary to handle this level of complexity.

The research team is currently developing a CD-ROM “toolkit” and supporting website which will contain curriculum resources, HOWTO’s and solutions for overcoming firewall access restrictions in place in many schools. A Wiki will also be hosted on the ISPG server to support interaction of players outside the game environment. These resources are expected to be completed in mid-2005 – It is hoped they will contribute to promoting the uptake of instructional gaming in Australian high schools, as well as simplifying the integration of MMORPG-based collaborative teaching and learning into contemporary secondary curricula.

References


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