

Player Transformation of Educational Multiplayer Games

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ABSTRACT

Children's great interest in multiplayer games has led to attempts to design educational multiplayer games. In this study, we have studied a test of an educational multiplayer game designed for mathematics education for children aged nine to twelve. In our observations, it became clear that pupils transformed the game to accommodate social interaction. With these transformed ways of playing the game, they managed to get to the top of the high score list while avoiding the educational parts of the game. Players transforming educational games to escape learning elements can be a problem when these games are used for formal education. In this paper we argue that player transformation of educational games can, however, be the basis of exciting and unconventional learning of valuable things, such as how to transform information technology to better accommodate social interaction.

Keywords

Transformation of games, Educational Multiplayer Games.

INTRODUCTION

Multiplayer games have come to dominate the digital entertainment industry and have increasingly become the dominant form of entertainment, particularly for children and adolescents. The games also incur an increasing interest from researchers and educators that look to use this highly popular form of entertainment as educational tools. As a result of this, the first educational multiplayer games are now appearing.

Multiplayer games have obvious learning potentials, and studies have focused on which types of learning these games supports (Steinkuehler, 2004, Herz, 2001). This research suggests that "the mechanisms for learning entailed in gameplay in virtual cultures/worlds are contingent on the game not only as a *designed object* but

also as a *social practice*. This moral of this story is a long familiar one for Learning Science researchers: Designing learning environments is not merely a matter of getting the curricular material right but is crucially also a matter of getting the situated, emergent community structures and practices "right" (Steinkuehler, 2004). The social learning is central in the understanding of the learning that these games support. A central element in multiplayer games is that the interaction enables players to communicate and collaborate in the game sessions (Manninen, 2003).

Despite the fact that the learning potential in multiplayer games attracts growing academic attention, studies have so far mainly been concerned with describing the informal learning processes that players go through when they enter, play, and eventually master a multiplayer environment. When it comes to applying the learning potential of games in formal educational settings, focus has so far been on using games as a vehicle to deliver educational content, rather than using the social learning potential inherent in multiplayer games for educational purposes.

Design of games that unite two different elements, education and gaming, obviously involves an inherent conflict. Education can easily come to be seen as the boring part as the fun part - gaming. In games where the learning aspects and the game aspects are not fully integrated, students will often try to bypass the educational part to spend time on the fun part (Baker et al., 2004). One of the greatest challenges in creating educational games is therefore to determine which game designs support what types of learning. In developing educational multiplayer games, gameplay can be an unpredictable partner for learning.

Play can overflow and overwhelm the rigid structure of the game, generating unpredictable results. Sometimes this force is so strong that it can change the game structure and these changes can eventually become a part of the larger cultural structure. Salen and Zimmerman define this form of play as *transformative play* (Salen & Zimmerman, 2003). Transformative play is a "special case of play that occurs when the free movement of play alters the more rigid structure in which it takes shape. The play doesn't just occupy and oppose the interstices of the system, but actually transforms the space as a whole" (Salen & Zimmerman, 2003:305). Transformative play can also be viewed from a social perspective, a phenomenon Salen and Zimmerman define as *transformative social play*. In transformative social play, players use the game context to form social relationships: They manipulate the rule system in order to shift, extend or subvert their relations with other players (Salen & Zimmerman, 2003 p. 475).

A tendency to transform educational software has been observed empirically in connection with "Cognitive Tutor Systems" (Baker et al., 2004). Here, the rigid structures of the software leads to students 'gaming' the system by using the structure of the system to get as far as possible without spending time on the educational content. There are several possible explanations for this, but one hypothesis posits that the introduction of a quantitative goal (advancing in the system) competing with a more qualitative learning goal leads to a tendency among some students to concentrate exclusively on the quantitative goal. The study (Baker et al., 2004) suggests that the tendency to game the system is connected with low understanding as measured by the score in examination-like tests.

Learners' manipulation of educational games may turn out to be a problem in traditional school environments with narrow definitions of learning content and

methods. From this perspective it is considered a failure of the educational part of the game if students avoid doing the mathematical calculations in a game that supposedly teaches particular math skills. In this paper, we argue that student transformation of educational games can serve as the basis for exciting and unconventional learning of valuable skills, such as how to transform information technology to accommodate social interaction.

The Game

This paper describes observations of a test of an educational math game. In this study, we look at a project that was intended to create an educational multiplayer-game for mathematics education and on how the pupils transformed the game. The game was developed by a group of teachers in collaboration with a Danish software developer. The basic idea was to develop a computer game that should teach mathematical competencies and “be as fun as regular computer games”. Thus, the aim was to develop a game that could compete with the games the children play in their spare time away from school, but one they would learn mathematics from. The result was an educational multiplayer game where players could form teams to compete against other teams. This is a description of the very first prototype of the game and we should make it clear that we are not reviewing the final product of the development, but the version we were invited to observe a test of.

The prototype consisted of two game levels. The first one was a 3D game universe where the players moved around as avatars, first in an underground base and later in a pyramid. The setting is adventure-like (players are searching for hidden doors to enter, treasures or tools), though the possibilities of interactivity were very limited at the time of the test. The avatars did have similarities to first-person-shooter games with superheroes in combat costumes, but they carried no weaponry.

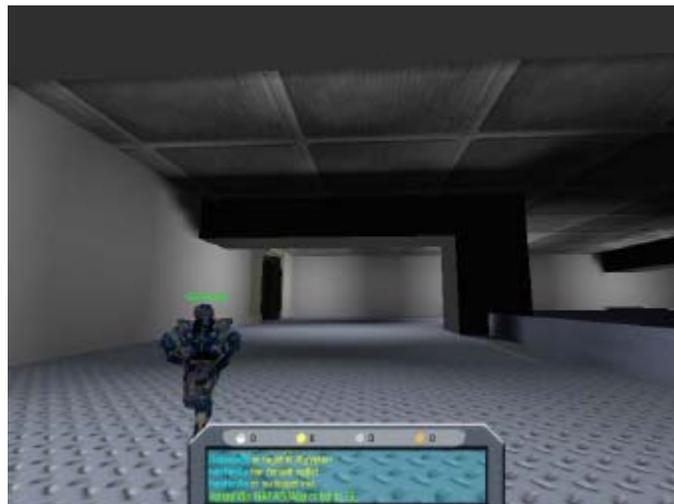


Fig. 1: 3D Underground base

We will not go in to lengthy descriptions and analysis of the 3D game universe here, as it was unfinished at the time of the test and had no obvious in-built educational goal. The sole purpose of the game was that players should find an entrance to the

2D sub game 'Matematrix'. We will focus on this part of the game as it was the educational part of the game and the most finished part.

Matematrix is a 2D game where players form teams and compete against each other in an innovative educational version of Tetris.



Fig. 2: MateMatrix. Interface where players produce pieces for the Tetris player

First, the player enters a lobby where they form teams with other players at their own level. An initial test determines who you can team up with – players at the same level are grouped. After having formed a team, the team compete against another team in Matematrix. Matematrix is a math based real-time Tetris combat game. The rules are that one member of the team plays regular Tetris while the others produce pieces for the other team to cope with. The player playing regular Tetris has a different interface than the players producing the pieces. The goal is to produce so many pieces for the other team that their Tetris player loose. The winning team earns a bonus and the teams can either battle again or choose another team to battle against.

The educational part of the game lies in the production of the pieces. The players who produce the pieces see an interface where every Tetris piece have a number (see fig. 2). The challenge in the educational part of the game is to fill holes in Tetris pieces (centre fig. 2) with the right numbers (in the circles to the right on fig. 2). Only numbers that is a multiplier of or equals the number connected to the Tetris piece will earn the player bonus points. A correctly filled Tetris piece disappears from the production interface and appears as a falling piece on the opposite team's Tetris interface. That team's Tetris player now has to place it in the Tetris wall. If a Tetris piece is incorrectly filled out by the production team the team loose points and the Tetris piece goes to their own Tetris player.

The overall educational goal with the game was for the children to learn alternative ways of handling numbers that wouldn't just be division and multiplication done with pen and paper. The time factor should force the children to invent and use their own strategies for handling numbers.

The play test

The research team conducted three sessions with three different classes, and the initial aim was to examine the learning potential of the game and how the educational aspects of the game was integrated in the gameplay based on how the children used the game.

The tests were done at the same school but with three different classes. The game was thus tested on three age groups: 8, 10 and 12. We did video observations with two cameras – one pointing at the screen and one pointing at the players. We used the think-loud method where the user is asked to express what he or she thinks while playing the game (Sigchi, 2003).

The overall conclusion from the test of the 3D game universe was that the educational aspects of this part of the game was not fully integrated in the game play, and the game play – at the time of the test – didn't provide meaningful play. We will not go into lengthy descriptions of these conclusions; we shall instead describe some interesting observations we made in a group of four girls playing the game.

Four girls transforming the game

The activities took place in a game session in a 4. grade class with children aged about 10. The pupils were forming teams with or competing against the other players in the room. The class had played the game several times before and quickly made it past the initial levels of the game to get to Matematrix.

We found that one group in particular did extraordinarily well. In this group, which consisted of four girls, all the members were on the high score-list and thus did best of all players from all the schools in the district. We decided to focus our observations on this group to identify the reason for their success, and, if possible, get a picture of what strategies the pupils used in the process of rapidly deciding if one number is a multiplier of another.

It became clear that the team members who produced Tetris pieces for the competing team often chose just to fill out the pieces with easy divisors: 2, 5 and 10, thereby creating pieces that the Tetris player on the competing team had to struggle to place in the Tetris wall. What really made the team successful, though, was that the Tetris player on the team 'ordered' pieces from the production team. By shouting to each other across the room, the Tetris-playing member could communicate what pieces she needed, and the production team members would deliberately produce such a piece, filling in the more difficult divisors, incorrectly and thereby deliver it to their own Tetris player. It was of course a lot easier to handle these pieces than the ones from the competing team, as the Tetris player was able to plan where the pieces should be placed in the wall. The Tetris wall would thus be easier to pack, providing better room to place the pieces coming from the competing team and thereby prolonging the game. In the end, the team would win by getting a lot of points from making a lot of pieces with easy divisors. The disadvantage with playing the game in this way was the negative score the players would incur from making incorrect calculations on purpose, but it was outweighed the high score the Tetris player got from being able to order pieces. The Tetris player would get to the high-score list, but the other players would do less well, but the position as Tetris player is chosen randomly by the game so all the girls eventually played Tetris. Overall, the strategy turned out to be much more successful than if the girls had sat down to

spend time on doing all the calculations correctly. The Tetris playing team member got a high score and all the team members got the advantage of helping each other in this way as the game shifts position as Tetris player among the team members.

The girls transformed the educational game to a game where they could avoid doing difficult calculations and still get the highest scores. This game included some new features, such as finding out whether it was profitable to lose a round by doing incorrect calculations on purpose in order to win in the long run. It also made use of the physical space in including the interaction between the girls shouting instructions and directions to each other.

Discussion

We have seen how a group of players manipulated an educational game system to a game with very little of the original educational content left. Instead of playing by the formal rules of the game and attempt to do all calculations right and thereby produce as many pieces as possible in the allotted time, the players manipulated the rules to make a game where you do the easy calculations and then chose which of the difficult ones to do in the broader picture of winning the game. Whether they actually transformed the rule system itself can be discussed, but their manipulations transformed the underlying educational project of the game into a game with no real educational content.

Obviously it is a problem to have an educational game where players don't learn the intended content and player transformation of educational games might be a general challenge. The educational idea behind Matematrix is to make a game that enforce practice of a simple activity by awarding point for correct calculations. The player will not have to reflect on solving these simple tasks and can play the game almost automatically. Cheating is a part of gaming, and in traditional educational games the player will very often try to avoid the learning process by manipulating the rigid structure of the game. But we would argue that the game manipulation situation created room for pupils to learn to manipulate information technology and the game media to accommodate their own needs for social interaction.

To look into that, we need to ask the question: Why did the players transform the game in this way? One obvious answer would be: simply to avoid doing math. This does not fully answer why the players in this case transformed the game in the complex manner they did. If they only wanted to avoid the educational part, they could just spend time running around in the 3D game world chatting with other players or lose Matematrix on purpose to waste time until class was over. The players were obviously caught up in the game, they were competing and were eager to get on the high score list. They interacted with Matematrix as a game and not a piece of educational software.

The transformed game structure has some interesting aspects that the original game does not have. In the transformed game, the players have included an element of conscious choice in the rules by including an action where they have to choose whether it is profitable to do calculations to make a piece. Making the right choices depends on cooperation and interaction between group members in the physical space. The Tetris player shouts guidelines to the production team and the production team shouts offers of the different shapes they have 'in store'. The game is played in real time so all these judgments have to be made very quickly. The players use the team idea of the formal game and extend it by using the physical space for

communication and interaction. This has expanded a rather automatic game with little need for player reflection, to one with a social aspect where team members have to work together, make choices, cooperate and communicate possible solutions to problems in order to win the game. These different types of interaction and cooperation are similar to what is seen in commercial multiplayer games and the girls thus created a game that was closer to the multiplayer games played outside school.

The valuable learning that is reported in studies of commercial multiplayer games (Steinkuehler, 2004) is typically social learning, where a community of players in cooperation learn and master a game. In these gaming communities, new strategies, norms and rules are developed, negotiated and inherited and this process seems to be central to the claimed potential for social learning. But such strategies, norms and rules can easily lead to transformations of the game, as in the case of the four girls playing matematrix. Furthermore, the cases where the game is manipulated can be strong cases of social learning, and the four girls are no exception. They showed creativity and developed strong cooperative skills in learning how to manipulate the game structure to accommodate the social actions.

The idea of using the learning potential in multiplayer games for an educational purpose is challenged by such transformations, but, as we have seen in this study, the manipulation processes can create room for an interesting learning situation. The resulting game can also give us important knowledge about what social structures these games should facilitate. The transformation of Matematrix is thus a coin with two faces because on one hand the girls avoid doing the calculation they are supposed to do, and on the other hand they develop the game in a way that supports social learning. The original educational content was lost in the transformation and it remains a challenge to create educational games with the openness needed to support social learning and transformations without losing clear educational goals. More open systems could also support a more modern understanding of learning and learning goals as systems that support broad IT- and science competencies rather than training of individual skills.

This study has shown that educators and designers of educational multiplayer games face great challenges in implementing the obvious learning potentials that lies in the game universe. More knowledge is needed about social structures, and about what types of learning goes on in these games, in order to produce a clearer picture of what type of learning these game designs support if we are to understand to what extent it is possible to integrate learning and game elements.

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