Playing in the special education school: from gamers to game designers

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Abstract: In a one year old study, students with mild and moderate intellectual disability, used serious games in their educational practice. Communication, interaction, participation and motivation have been documented in a qualitative study using two different classrooms as case studies. In this paper we describe the documented process of these endeavors, as students turned from gamers into game designers. During the study we were able to document changes in the educational atmosphere, including change of roles and communication re-enforcement between students and teachers. Co-operative game design workshops were organized, as part of the European Project Code RED[1], targeting students in the risk of early school leaving (ESL), by using game design workshops as a tool of motivation and inclusion.

Keywords: games based learning, intellectual disability, motivation, playfulness, game design, communication, route learning

1. Introduction

Games have been documented in the literature review as important and highly dynamic educational motivators, able to involve users in immersive experiences, provoke reflection and improve cognitive capacity (Juul, 2010; Flanagan, 2009; Salen, 2008; Habgood, Ainsworth & Benford 2005). Learning and interpersonal communication tools have changed, becoming more and more digital and centered on logics of production, exchange and sharing of contents (Bertolo & Mariani, 2013). Learning, is both an emotional and cognitive process and according to researchers and teachers worldwide, when players are engaged in activities that are intrinsically motivating, they are more prone to demonstrate deep learning (Habgood, Ainsworth & Benford 2005).

Therefore, if games and Games Based Learning (GBL) can be used as tools of motivation and enhanced educational experience, how beneficial could be proven as a support to students who, according to the literature, present high levels of demotivation, low self-esteem and self-regulation, while their teachers report higher rates of burn outs (Emery & Vandenberg, 2010).

2. Intellectual Disability and Motivation

The purpose of special education for students with intellectual disability is not only to introduce and improve academic skills but mainly to enhance the quality of the students' life in their route towards autonomy and motivation. Children and young adults with intellectual disability face limitations in their mental functioning seen in below-average intelligence (IQ) tests and in their ability to communicate, socialize, and take care of their everyday needs.

Students with intellectual and developmental disabilities often have limited opportunities to make choices and decisions, typically resulting in limited development of choice making skills (Cannella et al, 2005), while creating opportunities to choice making in this particular population, has been characterized by Shevin and Klein back in 1984, as "relatively uncharted territory". According to Ryan and Deci (2000), "to *be motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated. (p. 54)".* Sternberg (2005) believes that motivation is very important for academic accomplishment and according to Newmann (1992), students who are engaged are involved in their own learning. For a truly engaged learner, the joy of learning inspires a persistence to accomplish the desired goals even in the face of difficulty (Schlechty, 2001) and this is an extremely important value for special education. Engaged students are more able to transfer "class" knowledge in order to solve everyday issues and this is a main focus of special education.

Motivation has been identified as an area of particular difficulty for individuals with intellectual disabilities

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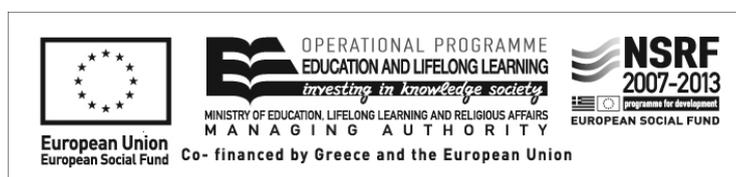
(Bennett-Gates & Zigler 1999; Ruskin et al 1994; Wishart 1991). Students with intellectual disabilities tend to exhibit below-average academic motivation and self-determination (Kunnen & Steenbeek, 1999), following the general rule that individuals with disabilities tend to expect negative outcomes in coping in domains directly affected by their disability (Varsamis & Agaliotis, 2011; Marsh, Papaioannou, & Theodorakis, 2006). Whether inherent to intellectual disability or acquired over time through reinforced reliance on others, motivational deficits are likely to further endanger learning and development in children who are already vulnerable because of their impairments in cognitive and adaptive functioning (Gilmore et al, 2009).

Since 1981, when Malone used digital games as a medium in order to analyze intrinsic motivation, digital games have been reported to stimulate the students' interest, while motivating them to deploy control, curiosity and imagination (Malone, 1981; Lepper, & Malone, 1987; Staalduinen, 2011,). Serious games are hypothesized to address both the cognitive and affective dimensions of learning and enable learners to adapt learning to their cognitive needs while providing motivation for learning (Wouters et al, 2009; Gee, 2003). Studies have shown that GBL can have a positive effect on some of the core development needs of people with intellectual disabilities and associated sensory impairments (Brown et al, 2011; Brown et al, 2008; Saridaki et al, 2009). However, in a recent study, teachers characterised the process of playing the game is as being "too distracting and [...] reported that the balance between gameplay and actual instruction has not been demonstrated to them successfully" (Ruggiero, 2013).

Following, we will present our methodology and findings when using digital games in a special education school. In order to maintain natural class settings and document our endeavor, different games and different empirical tools (interviews, focus groups, observation) were used, in order to gather information, document possible change in the experience and compare free gameplay as opposed to teacher controlled gameplay.

3. Methodology

3.1 User Groups and Tools
For the purpose of our study, two different pre-vocational training classrooms, for students with intellectual disability, embedded digital games in their educational routine for a period of 10 months. Twenty-three students with mild and moderate intellectual disability and their four educators, used games in different educational settings. We also interviewed 10 special education teachers and also organized a focus group.

In classroom A (TA) games were used freely without the direction of the educator, while in classroom B (TB) the games based learning experience was controlled by the educator.

In both groups we used the same games and same empirical tools (interviews, focus groups and systematic observation) in order to gather initial information, document possible change in the experience of the students as well as in students' self-determination, engagement and motivation.

Different types of educational games and edutainment software with a specific educational goal were used such as Sebran[2], Magic Potion[3], Poisson Rouge[4], My Appearance[5], Travel training etc, in order to document the experience of the students and the educational scope of the educators. The academic goal was autonomous travel and travel training. For the purpose of the study a digital game called "Street Pirates" was designed and developed, and was used in pairs of students, during observation, video analysis and pre and post interviews. The game is a platform game when players must create a safe and fast map route, combined with narrative.

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[2] http://www.wartoft.se/software/sebran/

[3] http://www.media.uoa.gr/epinoisi/tmf/tmf20.rar

[4] https://www.poissonrouge.com/

[5] http://goet-project.eu/materials/myappearance/

Figure 1: Street Pirates, an educational platform game for route training and street safety

3.2 Research Design

Both in TA and TB educators were given a catalogue of free educational games and edutainment and in TA educator was asked to use them as standalone tools allowing students to chose the educational game and control solely the duration and quality of the experience. TB educator was asked to playfully integrate games in the educational scenario. In TA each session involved 2 students in one pc, while in the integrative sessions of TB each session involved the entire classroom in an integrated playful educational process. In TB teacher would create an atmosphere of game with goals and different roles between peers before and during the actual GBL application.

Before the sessions researchers interviewed the students and educators and also performed the self-measurement tool with the students regarding autonomous travel.

During the sessions, students were free to speak and communicate with each other, after the session, students would be briefly interviewed about their experience.

In the end of each week teachers were briefly interview in order to gather to document point of views regarding communication, motivation and participation of the students.

For the last two months of this research and as a result of the GBL applications students requested to participate in a game-design experience and created a co-design group that would design location based games using the ARIS © and facilitated the game design and development process. ARIS, (short for Augmented Reality and Interactive Storytelling), is an authoring tool as well as an iOS application that work together to create mobile, locative, narrative-centric, interactive experiences (Gagnon, 2012). For these sessions, students were observed systematically and interviewed.

Even though game design workshops were a derivative of the GBL sessions as an initiative of the students, they will be continued at the following year as part of the European Code Red Project , targeting students in the risk of early school leaving (ESL), by using game design workshops as a tool of motivation. The research groups expressed their will to participate in this project during the GBL sessions and as ESL is over-represented among pupils with disabilities (61%), emotional, behavioural problems and migrants, it was decided to include them in the project, as they took the initiative to be a part of a game design workshop. The project aims at working with these groups of students who are particularly at risk of exclusion from education or drop out

Empirical material has been collected via transcripts, audio and video recordings. The video recordings are those of students engaged in gameplay in pairs of two, or three. Transcripts derive from systematic participatory observation and interviews and conversations. Data were gathered with the use of systematic observation, focus groups and semi-structured interviews. Different focus groups pre and post the games based learning application presented the opinion of students. Data were also gathered with the use of semi-structured interviews with students, educators and caretakers. Data were transcribed and analysed, using analytic induction.

4. Qualitative Results

Educators' focus groups and interviews demonstrated high levels of motivation in using educational games in their educational scenarios, however they all expressed their fears and lack of information especially regarding the educational outcomes and practical consideration.

In TA, two educators used the games as standalone tools without integrating them to their educational scenarios. Students were willing to play educational games as long as they were free to choose the game and the type of collaboration between peers. All students presented high motivation to continue playing games with educational content. Teachers felt that students were "motivated and focused much more than they usually are" and were surprised by the communicative power of games and the need of the students to discuss gaming experiences with the rest of the classroom during and after the gameplay session. In TA students preferred the Street Pirates and Magic Potion games as they had *"much better graphics and story"* and they felt as "fairytales" and "*stories that you can play*" according to the students.

In TB educators integrated the games in a playful way in their educational scenarios using the games as a reference for classroom learning. Both educators in TB designed the educational scenario and provided students with rules such as "we can all use tha laptop to play the game, whoever makes a mistake has to give the laptop to the next students, whoever helps gets two points, etc". Educators' described the experience as highly motivating, educational and dynamic. They also preferred to involve more students in the educational games based learning scenario as they described the process as highly communicative for the students.

4.1 Communication and Interactions

Both in TA and TB, teachers documented various anecdotal moments that surprised them in a positive way regarding student's abilities. Teachers in TB group characterized the games as a dynamic reinforcer able to change the educational atmosphere. Role changing of rich communicational value was observed in the TB integrated classrooms as teachers and students were willing to change roles and dependencies.

According to interviews, students preferred storytelling and adventure games, when used the games without supervision (TA), however were more than willing to use simple drill and practice as long as they had their educator's facilitation and support (TB). Students with mild and moderate intellectual disability described the process as fun, reinforcing and empowering, demanding more games. In some cases, students demanded teacher's participation in order to empower their learning outcomes.

In TA even though students felt motivated and had individual change in peer to peer communication, group dynamics did not altered in any way, nor classroom atmosphere had any changes. On the contrary in TB, during the gaming sessions students and teachers were clearly more open into changing the power dynamics, trade roles and share experience.

In both groups students were more than willing to participate, with TA students to be highly communicative when playing in pairs and TB students to make questions and take educational initiative during the gaming interventions. As expected, TB teachers were more willing to share information and felt more involved that TA teachers. However TA educators highlighted that games had serious communicative results between peers regarding tension in their relationship. They also mentioned that in some cases would use the gameplay as a way to reveal and smooth possible tension between students or in order to allow better communication flow between two friends.

4.2 Learning Motivation

In TA students felt that games were not part of the educational scenario and in some cases referred to the games as a way to" learn without the teachers" or a "way to learn on my own". However they presented lower scores in educational motivation from their TB peers especially regarding the educational content. The obvious way to analyse it is that TB students were guided by the educator and made proper connections between learning content and gaming content. On the other hand TA students would chose their own games and could seldom make any connections between games' educational content and the educational content during the actual lesson.
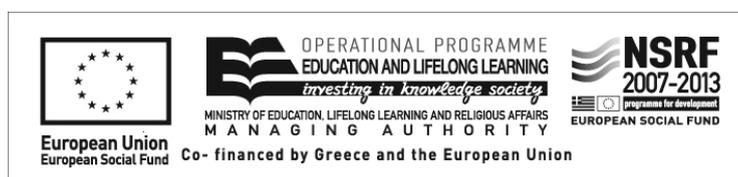
In TB, students realized that games were part of the educational process and requested further learning content or even changes in the educational strategy in order to "learn in a better way" or "understand better" or "remember easily" as they stated.

In TB students used the route learning game as a motivator as well as an opportunity to discuss and share experiences, ask travel tips and discuss issues of autonomy and self-assessment. Students described that they felt "empowered" using games that involved "doing things on my own, and decide how to do it" and self-assessment and educators revealed their surprise regarding students abilities and motivation.

In both groups and according to their verbal prompts, questions and discussions, students increased their personal interest towards travel abilities, route design and travel training, discussing safety issues with their peers, educators and family. In group TB students were more able to understand that route learning games had a connection with real life issues as this connection, was supported by their teacher during the playful sessions.

4.3. From gameplay to game design

During the observations and interviews of TA and TB students it became clear to the researchers that TA students requested to change the game content as it did not suit their needs or abilities. In TB classroom, educators would make sure to facilitate the gaming experience in a proper way so as to fit their students' abilities and their own educational scenarios.

During the fourth month, TA students although less motivated to connect learning and gaming, requested to design their own games and actually requested to work with the rest of the classroom. When TB students were asked during interviews, seemed eager to participate in game design workshops but had no opinion on the way they could do it, the possible content or the number of the group. They felt less competent than their TA peers, but were more than willing to participate and create content.

In the last two months of the research, students would form a large group by active TA and TB students, who decided to form sub groups and design a location based game. This co-creative process was facilitated by researchers as part of the initial study and included design of analogue and digital assets, using drawings and then digitalizing them, location based games design and forming of a playful narrative. As Bowen describes, "the most engaging work allows for creativity, sparks curiosity, provides an opportunity to work with others, and produces a feeling of success" (2003).

Figure 2: Co-design Workshop, creating physical game assets

During these co-design gaming workshops, students played different tablet and mobile games and a location based game using ARIS (Gagnon, 2012). They first designed low-fidelity prototypes and then started working on different interactive narratives. Students were eager to participate at the gaming sessions and although initially in doubts regarding their abilities, were highly communicative and

requested to see the creative platform, "in order to understand how they can create games". Students were excited to contribute and in many occasions were eager to be in the workshop earlier than the scheduled time. Students during interview stated that "*I was not sure I could make it, but I wanted to learn how to design games. I need help but now I know how I ask for assistance*". Students stated that *"it is something we design together and we can say how we want it to be […]. Other students will play and learn as we learnt. It is fun as it is important".* Students designed mini games in ARIS and had the time to playtest their games. In the following year these game design workshops will continue as more students want to be involved in the development process and the finalization of their playful creations.

Figure 3: Students playtest their location based game using mobile devices.

5. Conclusion and Future Studies

This initial analyses of this empirical data, documents a strong dynamic of games in special education classrooms both as a communicative and as motivational tool. In both groups, teachers and students seemed eager to use games and in both cases valued the playful integration of the educational scenario with the serious games. Students presented willpower to further their gameplay session as well as their knowledge regarding gameplay content. Students also demonstrated positive change in their self motivation regarding educational content. In some cases, students requested alterations in the educational content or in the involvement of their educator in order to observe the positive change, reinforce the educational result and praise them.

However, only in our second group, games were used as a tool that changed the educational atmosphere, allowing change of roles and re-enforced communication between students and teachers. Educators and especially TB educators, characterized the sessions as informative, empowering and able to reveal potentials, while supporting creativity, communication and motivation at students with mild and moderate intellectual disability. According to educators of the TB groups, both emotion, memory and logic were demonstrated during and after the game sessions. The will of TA students to design their own games went beyond the scopes of this research, allowing the formation of a group of cooperative game design.

In TA teachers were surprised by the initiatives of the students and their ability to organize their own skills, while in TB, teachers highlighted the transformational dynamic of digital games in special educational setting, requesting further games and game development tools. In both groups students documented changes in their drive to learn and participate, but in a different way. Both groups also revealed the practical application to Newmann's (1992) finding that "students who are engaged are involved in their own learning", since in both groups, students made many comments regarding their learning abilities and in many cased proposed changes in order to learn in a better and efficient way.

Especially regarding the game design workshops, even though they requested them, students felt reluctant to take initiatives at first, considering their limitations. However soon this feeling gave its place

to a sense of empowerment that lead students to focus on their abilities and further their personal development. The process was described as creative and empowering and students felt motivated to participate and cooperate. During the entire process, students transformed from low-initiative consumers of educational instructions, into creators of playful educational content.

Following these results we will further analyze the data trying to observe different relations between parameters regarding learning outcomes, intrinsic motivation and self-determination especially regarding communication and soft skills. We will also continue the location based game design sessions as part of Code RED project, in order to observe and analyse the possible dynamics of game design co-operative methodology.

6. Limitations

There are study limitations to be considered when reviewing the preceding themes. The study was limited by a small sample size. The district's small sample size, limited ethnically diversity and the geographic region may have influenced the results of the study. One of the main fears when gathering qualitative data was the limited verbal communication between peers, however the amount of sessions was enough to gather valuable interactions and achieve saturation in our findings, regarding students' experience. Even though the study had many parameters and a relatively small sample, the number of interactions was high and the triangulation in different phases (data gathering and data analyses) increases the credibility and validity of the results. However, this methodology should be tested again in different groups of students and educators in order to compare results and test its validity.

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