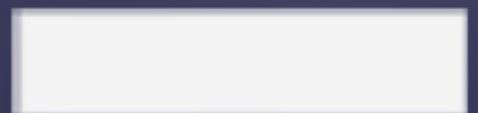
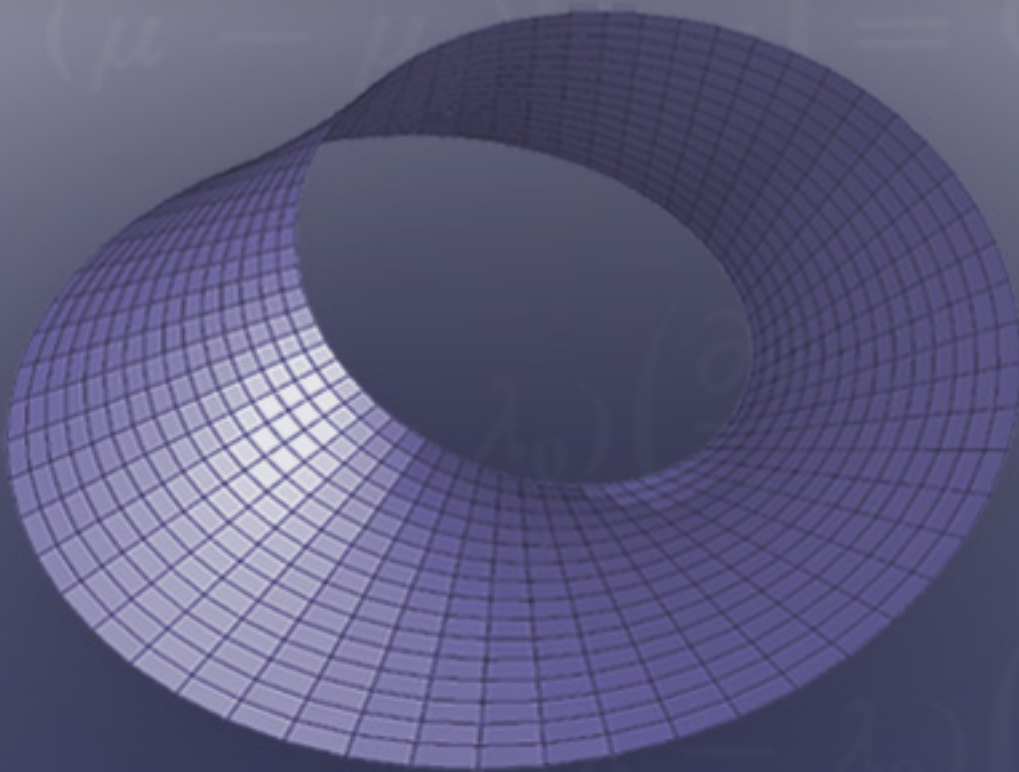


Animating DGBL in Pre-School, Primary and Special  
Education: Three Case Studies



# Animating DGBL in Pre-School, Primary and Special Education: Three Case Studies

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**Abstract:** This paper reports on three digital GBL pilots which have taken place, respectively, in pre-school, primary school and special education settings, for project assignments of the “ICT in Education” MSc program jointly run by the University of Athens, the University of Thessaly and the Technological Educational Institute of Piraeus, Greece. The pilots reported have involved 9 educators and 44 students in total and have been based on freeware micro-games, some new games developed from scratch as well as the “Magic Potion” digital adventure tale developed by the University of Athens Laboratory of New Technologies in Communication, Education and the Mass Media within the EPINOISI project. Interventions have focused on animating the application of DGBL material in class and effectively documenting student reactions and attitudes. Conclusions have been drawn on the learning potential of successfully animated DGBL interventions and on the expectations of young learners towards the games employed. The first pilot concerns a pre-school intervention for learning basic math concepts. Four sessions have been organised with the participation of 10 pre-school students, using freeware micro-games from the Up To Ten and Poisson Rouge web sites and the Minisebran suite, as well as a simple Flash game designed ad hoc. A prototype code of conduct during gameplay has been put in place and a number of conclusions have been drawn by observing and evaluating student reactions and opinions, expressed by the students through drawing and talking about their likes and dislikes. The second pilot has involved application of DGBL material on linguistic topics, in order to investigate whether digital games can enhance the functional-communicational perspective of language. The intervention involved two primary schools with a group of 15 students each, and observation/discussion were employed for evaluating results. Conditions of communication were created in which the students used the language, collaborated to seek clues and information, formulated and evaluated hypotheses and expressed opinions. During the last part of the pilot each student group was asked to describe a language game that would serve as a challenge for the other group, and two such prototype games were developed in Flash. This activity gave the students the opportunity to express themselves and apply their knowledge on structure and use of written language, while at the same time providing a frame of communication and “competition” between the two schools. The third intervention focused on DGBL material for children with autism disorders (AD). Four children with AD were given access to DGBL material in order to investigate the potential of digital games to activate their attention, bring a playful character to the learning process and make more amusing the achievement of objectives. The material employed includes online freeware games and commercial edutainment software, as well as parts of the “Magic Potion” digital adventure tale, whereas the educators created an additional Flash game for social/emotional skills. A number of remarkable outcomes have been observed during this pilot, whereas interesting issues were highlighted regarding game usability, student collaboration and the role of the educators.

**Keywords:** Digital games-based learning; case studies; pre-school; primary school; special education

## 1. Introduction

The use of digital games as educational tool created new capacities of growth of innovative elements in the training process.

Even though the digital games, according to researches, based their main characteristics - rules, objectives, results and feedback, conflict, challenge, interaction, script - can support the process of learning because they help in the growth of new cognitive faculties (Prensky, 2001) they continue to cause mixed sentiments of enthusiasm and concern amongst the teachers in favour of active teaching, as it always happens when facing every technological innovation.

Taking in consideration these issues, we realized that the educator should play a more integral part on the DGBL procedure. Instead of being solely the final mediator between the game and the student,

the educator should be the designer and implementer of the game having thus full control of the gaming experience in the classroom.

This paper, investigates the integration of the DGBL in the primary education, based on a case report of 3 DGBL pilot projects designed and applied in classroom settings by primary education teachers. These field implementations and studies were practical assignments for the course "Design and creation of Digital Applications" for the academic year 2008-2009. The course is part of the Joint Masters (MSc) Program "ICT in Education" jointly run by the National and Kapodistrian University of Athens, the University of Thessaly and TEI of Piraeus, Greece and is addressed to primary education teachers with main interest in ICT, digital media and especially in digital games.

The educators designed the DGBL procedure, designed and implemented the games and chose their additional sources. They were in total control of the practical issues during classroom usage and they made small scale research during the DGBL experience of their students. They were free to design their own applications and conduct different types of studies depending on their teaching experience and approach. It is worth noting that these interventions had two main keynotes: the development of the process of integrating digital games in the teaching process and on the other hand the investigation of how much the enrichment of traditional ways teaching action with the use of digital material influences the response of students in their active participation in specific educational matters.

## **2. Integration of the digital games in the primary education**

### **2.1 Pre-school intervention for learning basic math concepts through digital games**

#### *2.1.1 Case study*

The first case reported in this paper concerns a pre-school intervention for learning basic math concepts. Four sessions have been organized with the participation of 10 pre-school students, using freeware micro-games from the Up To Ten and Poisson Rouge web sites and the Minisebran suite, as well as a simple Flash game designed ad hoc. A prototype code of conduct during game play has been put in place and a number of conclusions have been drawn by observing and evaluating student reactions and opinions, expressed by the students through drawing and talking about their likes and dislikes.

#### *2.1.2 Rationale and planning of the intervention*

The teaching of mathematics in the preschool education intends to help the children interpret the world that surrounds them; it also helps in the categorisation, the correlation, the classification and finally the organisation of their surroundings. In kindergarten a suitable environment should be created so that the children can start to think in ways that define the science of mathematics and in the same time realise its social dimension. The new Cross Thematic Curriculum Framework for Compulsory Education of 2003 enhances this dimension in mathematic education and taking into consideration the technological developments it includes the use of PC as well.

As a teacher knows how to use the capabilities of the digital games, he has the potential to contribute to the upgrading of the knowledge and improving methods of teaching. However, its use does not automatically solve all problems and to overcome any difficulty that one encounters in the classroom. Teaching by using digital games requires a creative manner of teaching in conjunction with the appropriate educational intervention. There are several aspects of educational use of digital game. However, through a structured and organized teaching, digital game can be smoothly integrated in the educational process and create innovative learning conditions, with more fun and playful nature.

Our research focuses on the investigation of the interest that a digital game can provoke and its usefulness as an educational tool in a kindergarten classroom.


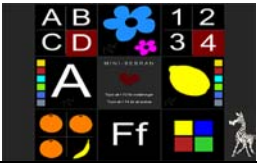

Before our intervention we had: (a) to choose what educational goals of mathematics we would want to observe, (b) then had to find digital materials that could achieve our educational goals and while taking into consideration that it should be compatible with computers that would be used in the interventions, (c) almost in the same time with the first two steps of the preparation we made contact with the teachers of the private school in order to show our interest in cooperating in this research,

finally (d) we organized the way of recording the key steps of the activity and organized the computer room in the kindergarten classroom.

The outcome of this research is based on (a) the record of our observations during the participation of the children in the activity, (b) the collective assessments done at the end of every activity, (c) the individual drawings that the children made in the end of all the activities to show what they liked and disliked and (d) the transcription of the individual assessments of the children which were recorded using a PC.

*2.1.3 Educational material*

**Table 1:** We used the following games, each one of which served specific goals

GAME	SOURCE	EDUCATIONAL GOALS
INTERNET		
Messy Drawer-Up To Ten 	<a href="http://www.uptoten.com/kids/kidsgames-mixedbag-tidieddrawer.html">http://www.uptoten.com/kids/kidsgames-mixedbag-tidieddrawer.html</a>	Counting of objects
Poisson Rouge 	<a href="http://www.poissonrouge.com/123/index.htm">http://www.poissonrouge.com/123/index.htm</a>	- Reciting the numbers from 0 to 9 - Reading of the mathematical symbols - Correlation
	<a href="http://www.poissonrouge.com/board/index.htm">http://www.poissonrouge.com/board/index.htm</a>	- Sequence of numbers - Correlation
	<a href="http://www.poissonrouge.com/dottodot/index.html">http://www.poissonrouge.com/dottodot/index.html</a>	Sequence of numbers
STAND ALONE APPLICATIONS		
Minisebran 	<a href="http://www.wartoft.nu/software/minisebran/">http://www.wartoft.nu/software/minisebran/</a>	- Reciting and writing of numbers - Correlation
GAME DESIGNED BY OUR TEAM		
Let's play with numbers 	Game designed in Macromedia Flash	- Reciting the numbers from 1 to 10 - Reading of the mathematical symbols

#### *2.1.4 Organization of the classroom sessions*

We realised four educational interventions in a private school of Athens. The sample of students taking part in the activity comprised 10 students.

#### *2.1.5 Conclusions*

We should mention that the duration of our research was limited and as a result it could not come to some conclusions of universal value. Our sample was chosen by the kindergarten teachers of the school with which we collaborated. In addition we should point out that the children of the school had already used computers in other activities. Their previous acquaintance with computers helped our research. While processing the answers of the students we realised that the digital game can contribute positively in the mathematical education of pre-school children and contribute in the growth of social dexterities. It familiarizes the students and the teachers as well with the new technologies and finally, it strengthens the positive attitude toward the new ways of teaching. The children - players enjoyed the games but at the same time criticized those were less interested. The collaboration between them was quite good and there was an intense debate amongst them in order to solve problems during the game. We noticed that the games that we considered to be less interesting to play, stirred the children's interest.

Finally we would like to emphasize on the essential role of the human participants in response to a digital game and the effectiveness - in relation to the anticipated objectives of the designer- is determined by the response it gets from the players and the people that bring the player in touch with the game, which in this case are the teachers.

## **2.2 Applying DGBL material on linguistic topics in two primary schools**

### *2.2.1 Case study*

The second intervention presented has focused on applying DGBL material on linguistic topics, in order to investigate whether digital games can enhance the functional-communicational perspective of language. The intervention involved two primary schools with a group of 15 students each, and observation/discussion was employed for evaluating results. Conditions of communication were created in which the students used the language, collaborated to seek clues and information, formulated and evaluated hypotheses and expressed opinions. During the last part of the pilot each student group was asked to describe a language game that would serve as a challenge for the other group, and two such prototype games were developed in Flash. This activity gave the students the opportunity to express themselves and apply their knowledge on structure and use of written language, while at the same time providing a frame of communication and "competition" between the two schools.

### *2.2.2 Rationale and planning of the intervention*

The co-existence of traditional ways of teaching language skills together with the investigation of new approaches and with rapid social changes that have emerged due to modern applications of ICT, give rise to important developments in the didactics of language. As modern instructive theories for language show, a simple apposition and memorization of grammar and syntax rules does not constitute sufficient grounds for learning (Frances, 1999). A positive attitude towards the process of linguistic learning needs to be developed, which involves the active solving of language problems as well as utilization of the students' ideas. As a result new approaches have emerged for linguistic teaching, emphasizing the functional-communicational dimensions of language.

In this line of thought, digital games can be employed as a tool for teaching of language based on two important features: (a) their flexible communicational approach towards language and (b) their ability to accommodate training activities that contribute to the growth of students' communication skills.

Keeping in mind the above, two educational interventions have been designed for teaching language in the second grade of a public and a private primary school, located in neighboring areas of Athens with somewhat different socio-economic status. The main research question underlying these interventions concerned the extent to which traditional ways of language teaching can be enriched by employed digital games-based material, as well as the influence that such an approach can have on the active involvement of students.

The sample of students taking part in the interventions comprised 15 students (11 boys and 4 girls) in each one of the two schools involved, separated in three teams of 5 students in each school. The instructional topics of interest included word accentuation, article-adjective-noun agreement, conjugating nouns and verbs as well as forming the basic structure of a sentence.

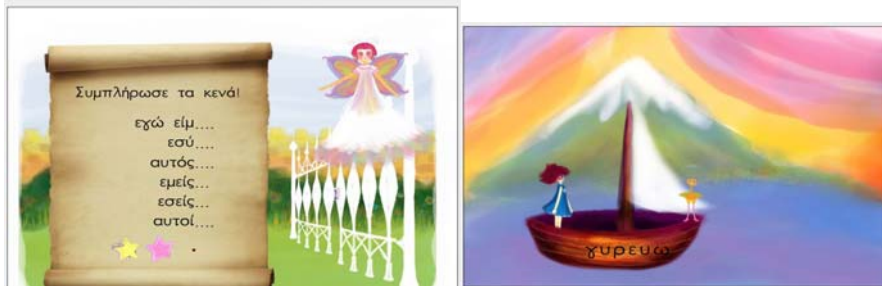
The methodological tools employed to gather student feedback were (a) observation (collection of qualitative data through the observation of student behavior and reactions to classroom events) as well as (b) conversation with the students.

The pilot interventions took place for a period of two weeks, during which four sessions were realized in each of the two schools involved.

### 2.2.3 Selection of the educational material

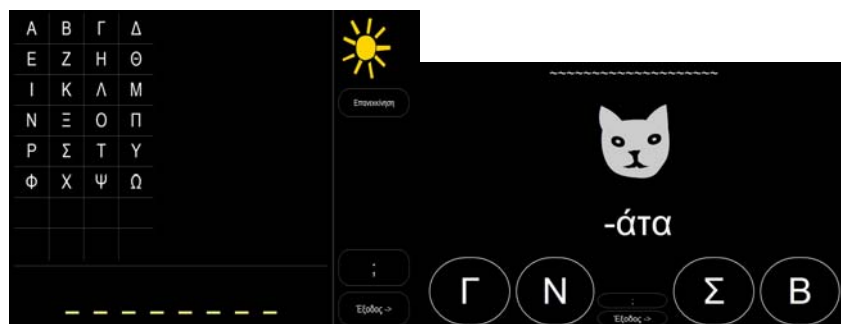
The digital games-based material employed in the intervention comprised the following applications:

- Activities about language skills selected from the “Magic Potion” game (<http://www.media.uoa.gr/epinoisi>), executable as autonomous applications that incorporate instructor-defined educational content. The intervening authors provided content corresponding to the learning curriculum of the second grade of greek primary schools on the instructional topics mentioned above. This material was selected due to a number of reasons: (a) it incorporates elements of fairy tale able to attract and activate the pupils’ interest; tales constitute an instructive tool in that they allow a teacher to approach the intellectual world of children and bring them in contact with social and natural phenomena in an unsophisticated way, thus providing an affective framework that can enhance the childrens’ oral expression without making visible the educational objectives behind oral and written grammar and syntax phenomena; (b) the game’s story narrative constitutes a way of communication in itself, enhancing the pupils’ perception of the significance of linguistic structure in a practical and amusing way; and (c) it allows adaptation of the language exercises at the level and contents appropriate for the specific instructional case.



**Figure 1:** “Magic Potion” game

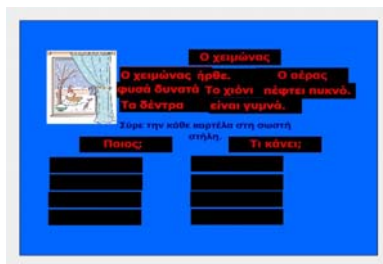
- Activities from the Sebran game suite (<http://www.wartoft.nu/software/sebran/>), and more specifically the “Find the letter” and “Hangman” activities to practice the structure (analysis, composition) of words. These activities have been used in a complementary manner, to provide an amusing atmosphere based on games that were already familiar to the participating students. This choice has allowed to save the class time needed for explanations, while providing a level of difficulty proportional to the students’ skills as well as situations of victory. As a result, these activities created a frame of competition between the student teams, while at the same time offering a sense of relaxation.



**Figure 2:** Sebran game



- Additionally, two new game applications were developed using Flash, through the students; own guidance and feedback. These two applications were designed in a way to allow students apply their knowledge about the structure and use of written language and, in the last part of the interventions, they served as a frame of communication and competition between the two participating schools.



**Figure 3:** New game applications were developed using Flash

#### *2.2.4 Organization of the classroom sessions*

During the first session of the intervention, the teams were structured, roles were distributed within the members of each team and the students familiarized themselves with the “Magic Potion” game, browsing the game’s menu. This has also allowed making an indirect assessment of the students’ familiarization with computers and digital games and identifying potential difficulties at this level.

During the second session, students in both schools looked forward to realizing activities similar to those of the introductory session, but through playing the game this time. A frame of competition was established between the student teams, employing specially shaped evaluation cards with stickers.

At the beginning of the third session in each school the winning school team of the previous activities was announced. Sebran activities were employed as teaching material and the factor of time was employed as a frame of competition. The objective of all teams in that session was to identify the most correct answers in the “Find the Letter” and “Hangman” activities of Sebran, within a given amount of time.

Finally, during the fourth and final session of the intervention we made use of the Flash applications that had been developed based on the students’ ideas, presenting the teams of each school with the application designed by the students of the other one, and thus establishing a frame of competition between the two schools.

#### *2.2.5 Conclusions*

Given the limited scale of this intervention and the number of participating students (30 in total), it is not so easy to demonstrate some conclusions of universal value for the in-class application of digital games-based learning. Nevertheless it can be asserted that electronic games can be used - even in the environment of formal learning - for comprehension, deepening and combination of existing linguistic knowledge, as well as for discovering new knowledge on the basis of concepts and skills already established.

At the same time, DGBL has facilitated active attendance of students through their engagement in communication activities and events. These in-class activities have created communicational conditions in which the students have used the language and collaborated in order to seek elements and information which afterwards they have evaluated and categorized. In addition students have been able to make assumptions and then try to verify or deny them, formulating and supporting their views. More specifically:

- The students of both schools were excited with the “Magic Potion” and Sebran games, as well as with the in-class process in general.
- In the frame of competition and curiosity for the development of the “Magic Potion” tale the students focused on that particular knowledge, discussed it and then made a decision; at the same time they managed to apply their knowledge and develop their ideas by creating their own linguistic activities.

- The whole process was based on the linguistic expression of students. The students had the ability to use their knowledge on the structure of language but at the same time apply it on free speech, in order to practice their techniques for argumentative speech and dialogue.
- In both schools the students showed great enthusiasm and participated actively when the language exercises were realized through digital games. It is important to mention that weak students were not weak players when it came to digital game play.
- All-in-all, the students were active participants in the in-class process and exercised their skills for evaluating and applying information.
- Game playing has had a positive effect on the growth of dialogue, exchange of ideas and negotiation between the students.

## **2.3 Using DGBL material for children with autism disorders**

### *2.3.1 Case study*

The third intervention presented has focused on using DGBL material for children with autism disorders (AD). Four children with AD were given access to DGBL material in order to investigate the potential of digital games to activate their attention, bring a playful character to the learning process and make more amusing the achievement of objectives. The material employed includes online freeware games and commercial edutainment software, as well as parts of the "Magic Potion" digital adventure tale, whereas the educators created an additional Flash game for social/emotional skills. A number of remarkable outcomes have been observed during this pilot, whereas interesting issues were highlighted regarding game usability, student collaboration and the role of the educators.

### *2.3.2 Planning and application of the intervention*

The autism constitutes a serious and diffuse disturbance of growth. The term extensive (or diffuse) refers to the complex nature of the disturbance, as it influences three regions of growth: the social interaction, the communication and the imagination (DSM-IV, 1994).

For all of the above reasons the analytic programs are also extended in the instructive methodology that is suitable for students with autism. More specifically, the students with autism are in need of : a) a structured training environment, v) a constant daily program, c) one to one teaching (and less team teaching), **c) alternative ways of teaching (audio-visual instructive material, natural guidance)** and d) enriched educational activities with focused on their preferences and interests (Cross Thematic Curriculum Framework for Compulsory Education, 2003 )

The game and more specifically the digital game is an instructive methodology that meets the requirements mentioned above.

Our intervention was realized in the 1st Special Primary School Amarousiou.

This school employs 15 teachers and has 38 students with special educational needs, with ages varying from 4 1/2 to 14 years old.

In our intervention 4 children participated: 2 students with autism and 2 students with Mild Intellectual Disability and Down syndrome.

Most of the students were familiar with using computers since their school curriculum includes a special course for using a PC, in addition all of them had their own personal computers at home.

The DGBL experience took place as a parallel activity to the school program and its duration was 3 hours in 4 days, however the teacher of the classroom used our material for 4 additional hours.

As for technical considerations, the school possessed an IT laboratory with 10 computers, special keyboards with big keys and special lever instead of mouse and an internet connection.

The intervening educators decided to use specific games from web pages, the software of work EPINOISI: "The Magic Potion" and developed also a game using Macromedia Flash®, which are in



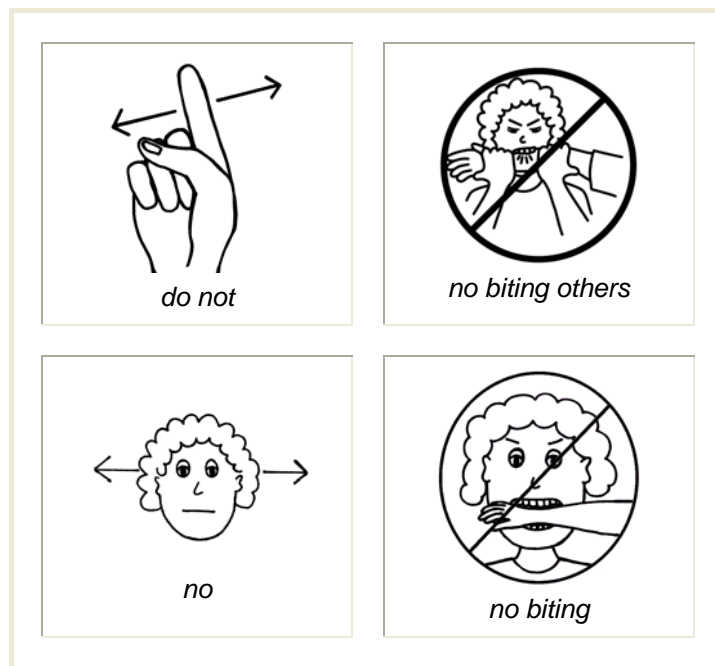
accordance to the National Curriculum for children with autism, creating for each student his own individualized program, adapted in his or hers dexterities.

The basic goal was to make the students feel free to participate, have fun playing without any pressure or the fear of evaluation from their teacher. The intervening educators' role would be clearly the role of animator and instructor in order for the students to play the games. They expressed worries regarding students' reaction with persons that they were not familiar with or the refusal to participate in game, if they accomplished to include the children in the team they didn't want to disturb the daily school routine. The learning outcomes of the DGBL trial were oriented towards both cognitive and social educational objectives. As far as the cognitive objectives of the trial are concerned, games were chosen that would help students:

- In the socialization, in the acquisition of social dexterities, in the appropriation of social behavior, in the obedience and observation of rules (as rules of behavior).
- group and distinguish objects in categories
- put pictures in order /time sequence,
- recognize colors
- develop linguistic dexterities (oral reason).
- execute mathematic calculations.



**Figure 4:** DGBL software “The Magic Potion”, was chosen and used by the educators in curriculum areas of logical decisions, mathematic calculations, in the socialization



**Figure 5:** <http://www.do2learn.com/picturecards/printcards/2inch/imagegridswords/behavior1.htm>

This web site was chosen and used by the educators regarding curriculum areas of social behaviour.

The special school provided a warm reception for the project; the students showed great appreciation. The teachers were open to our intervention. They discussed with the educators the methods, computational digital, that could help the children with autism.

However the first day in the school, held a surprise for us. Two more children with intellectual delay wanted to come join us in the computer room.

During the application, the intervening educators recorded for every student, information such as age, cognitive and emotional condition, duration of playtime, games played and reactions, achievement of objective with or without help, preferences, difficulty or facility playing the games and general observations that seemed to be of significance. All students were finally able to participate in the trial application; 3 of them played all the games, while the remaining student played only games regarding rules of behaviour.

### *2.3.3 Conclusions*

According to the intervening educators, the most impressive observation during the entire trial was the eagerness of the children; they were enthusiastic about participating in the game and they corresponded without difficulties. They had fun with the games, they showed enthusiasm (as much as one can observe in children with autism a competition and appoint a winner.

In the educational intervention that concerns the social dexterities, the students were very pleased and they showed great will to collaborate, much more than in the previous instructive units.

For the intervening educators the application was an exceptionally interesting experience. The contact and the collaboration with the children were enjoyable apart from the initial distress. They felt pleased astonished and useful when 2 students with Mild Intellectual Disability asked them to participate in the application.

The intervening educators have considered this trial application to be quite limited and that it does not allow to reach some indisputable conclusions; however, in this particular case, the use of digital games in the education of students with autism has seemed to confirm some initial expectations, concerning the benefits of this effort:

- a) The training process became enjoyable
- b) Digital games functioned as a challenge, activated the children and changed the amusement into achievement of an objective!!!!!!
- c) Concerning the teachers elected: The interest and the "faith" in the help provided by computers.

## **3. Concluding remarks**

### **3.1 Findings**

According to some of the observations, we can conclude that the DGBL can be integrated successfully in the primary education. More specifically an improvement in students with moderate abilities or high records when they compared their results to previous traditional written evaluation test was noticeable. Concerning the students with previous low records, there was no significant difference. However, all students showed augmented interest regardless of their classroom performance.

Moreover, as it was mentioned in some case studies, the training process became enjoyable, while DGBL functioned as a motivational challenge, which activated the students and engaged them in the learning process. In some cases problems regarding students' attitude or emotional state that school teachers had not perceived before, were identified.

Especially for the children attending pre-school it can contribute in the process of integration in primary school. It was also noted games can also help children with Mild Intellectual Disability fit in a regular classroom and form social networks.

According to some of the educators involved in these trials, the experience of developing games has proven to be a particularly creative work, since apart from the development of the games themselves, they also had to devise an accompanying fantasy and plot. All educators involved in the trials were more than positive on using DGBL in the near future.

### **3.2 Critical success factors**

Digital games can be applied easily to supplement traditional teaching and reinforcing the collaborative learning. Digital games are an excellent example of multimodal literacy. It also motivates the student to learn which is far more important than the mere acquisition of knowledge. In addition the student takes charge over one section of the learning process.

A fairly big difficulty is to evaluate students in the games: there should be a distinction between skills and knowledge. Teachers should pay particular attention to the expectations of students' attitude regarding electronic games or their ability in playing them. Children should be trained in educational gaming as well, even if this means a simple set of rules.

Inclusion of such pilot interventions in the educational program should be designed in terms of minimizing the burden of students and non-harmful nature of the planned training activities. It is proposed to arrange such activities in a separate time slot, in order to avoid causing problems in the flow of daily schedules. In any case, the key to a successful outcome for intervention is the preparation of students by their teachers.

At the same time, this attempt also constitutes an exceptionally difficult work when the games in question are oriented towards educational purposes. Different types of knowledge and skills on behalf of the educators should be combined:

- profound knowledge of pedagogic theories and perceptions,
- the ability to effectively plan and implement the educational application of the game in the particularly limited and demanding time frame of the daily school timetable;
- the ability to devise games at the same time
- adapted to the intellectual, psychological and emotional profile of the pupils' target group
- attractive and engaging for the pupils
- able to meet the educational objective.

All the aforementioned factors make the work of the teacher, who engages in creating a digital game-based educational experience a successful DGBL application, extremely complicated.

### **3.3 Open issues**

It should be made clear that digital games, just as any other medium, can be of high quality or not. The educator seems to be responsible not only for the proper usage of the game, but for the selection of a game of suitable quality and adaptability to her learning scenario and goals. "The games development industry needs to understand the constraints on schools, teachers, parents and above all children, of time, resources, and the requirements of curriculum and examination if games with more direct educational value are to emerge" (Kirriemuir and McFarlane, 2004).

According to the educators involved in this study, an important factor is the inadequacy of public education in the promotion of innovative projects, as well as the IT inadequacy of many educators who seem hesitant to learn new methods. In addition it is necessary to move past the established opinion that there are means used for drill and practice and to regard them as educational tools which can help in the understanding of complex concepts. Moreover, an equally important parameter as far as success is concerned, is also the focus on explicit and evident educational objectives and the ability of the educator to adapt the game according to her students' needs and abilities.

However, is not only a matter of knowledge but a question of approach as well. According to a research made by John Kirriemuir one of the main faced is "an almost totally negative media impression of computer and video games influencing the opinions of school teachers, heads and parents" (Kirriemuir, 2005). This is complemented by the views of Dorn (1989) who states that the

attitude of the teacher towards games influences the outcome, and the teacher's knowledge and skill in using the game is also an important factor.

Accordingly it should be mentioned that in our trials, in the single case of a DGBL activity where the classroom educators were not part of the implementation process, they showed ignorance and lack of interest in using ICT or in the educational outcomes of the study. The intervening educators who designed and implemented the gaming experience made referrals of unawareness and indifference from the part of the classroom educators towards the experience of their students, which is only to be expected since local teachers were not positive regarding ICT and DGBL.

Finally, the educators involved in the above trials all seem to conclude that, research should turn to the development of tools and educational software, which will be based not so much on behaviourism but on interactive models of learning. Open source can also be adjusted in the needs of students as well as the capabilities of the teachers. To achieve this realistic goal it is of great importance that experts from technology and education work together. The profits from such an experience are of tantamount importance for the quality of their educational process as perceived by the children, in order to change the picture of the tedious and boring classroom, to that of a school that creates real motives and can directly address the interests of the children.

## **Acknowledgements**

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