Alternative Teaching of History Subject in Primary School: The Case of the 3D HIT Playful Activity

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Abstract. History as a school subject is difficult for young pupils, especially when teaching is based on bulky texts and lacks audio-visual auxiliary material. This paper presents a differentiated teaching proposal based on the use of the playful activity '3D Heroes Introduce Themselves' (3D HIT). It is based on the projection of 3d models on mobile devices as augmented spreads on images included in a worksheet. Together with the manipulation of 3d models, students are invited to create digital stories with relevant information. Thus, a final video is created in which heroes and mythical figures from the History subject introduce themselves with the voice of the pupils. The contribution of the activity to the students' performance and the level of engagement and participation was examined in this study. Also, whether the production of digital narratives in combination with the manipulation of 3d models reinforced the expressiveness of pupils was examined. Observation-based data indicated interesting positive results.

Keywords: Serious games · Digital Storytelling · Augmented reality · History

1 Introduction

Teaching History in Primary School has many difficulties since pupils are not used to process bulk tests and to critically work with the information in them. On the other hand, historical knowledge is valuable both in terms of knowledge acquisition and skills development. The choice of teaching methodology is an important criterion that influences and shapes the general attitude of students towards the course of history. A differentiated teaching scenario for the chapter of Greek mythology in presented in this paper. Greek Mythology is taught in the small classes of elementary school in Greece.

The scenario includes a playful/gamified educational activity with the use of ICT through which pupils themselves innovatively are required to present history characters from their school books that have been taught in previous sessions. This activity falls within the context of serious games utilization in education so it will be referred to as '3D Heroes Introduce Themselves' (3D HIT) game or gamified activity, hereinafter.

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This paper initially presents the theoretical background of the study. The contents of the gamified educational activity are then described. Finally, the results of a short research study conducted to evaluate the contribution of the use of 3D HIT game in gaining knowledge and developing skills are discussed.

2 Background of the Study

2.1 History Teaching in Primary School

Teaching History aims to transmit knowledge that connects the past with the present and provides students with useful information about the place in which they live [1]. At the same time, the study of the historical evolution brings out the relations between people and the impact of their actions over a wide range of time [2]. Students have the opportunity to compare facts and compose information that lead, in combination, to logical results [3].

Thus, they can understand historical elements as reasonable implications of human behaviour. Analytical and compositional thinking is one of the most important and useful skills for modern pupils since they come into contact with a vast amount of information at school or through the internet [4]. The development of analytical and synthetic thinking presupposes the study of many historical resources and the search for historical truth through detailed check and intersection of these sources [1]. Students should be encouraged to look for authoritative resources and filter the content of their findings [3]. This filtering is implemented individually or at group level as part of a team activity. This effort is greatly enhanced by easy access to digital material and collections with audio-visual historical content.

The extraction of conclusions follows the search and analysis of historical information. The oral or written wording of these conclusions completes the cognitive processes of the pupils by reinforcing the communication with others and the ability to transmit knowledge through the reasoning of the meanings [5]. The narrative of historical events with a synthetic and critical sense is a particularly difficult learning objective [2]. Learning style and characteristics of pupils must, therefore, be taken into account in every step of the learning process.

ICT changes the way History is employed and studied. The visualization of historical facts and the ability to easily access and manage/manipulate historical material impose new teaching forms [3]. Exploring the capabilities of digital tools and the extent to which they affect the way history is studied, is the main question for planning teaching activities using ICT. The contribution of learning theories developed in recent years have significantly influenced the design of ICT learning environments for the study of history [1]. Most of them are mainly based on the theories of Behaviourism, Cognitive Constructivism and Social Constructivism [6]. In addition, some basic principles of the modern learning activities in History field [3] demonstrate that:

- Learning focuses on pupils' interests and abilities.
- Knowledge is discovered and acquired by students driven to it by different pathways and through varied sources of information.

- Teachers facilitate the linking of knowledge with reality by presenting information in authentic activities.
- The learning process is based on social interaction and cooperation.

New technologies contribute to these guidelines, mainly to the ability to visualise historical elements and create interactive social environments [3]. Digital applications and serious games with educational context create opportunities for dialogue and knowledge building through activities in authentic environments that require students' research and active participation [5]. In this case, the support of the learning process is achieved through new cognitive tools that support narration and reasoning skills [6].

2.2 Serious Games and Playful Activities for Teaching

A 'serious' game is one that is applied in the context of a teaching scenario and emphasizes the cognitive content and benefits that students gain after playing [7]. Such games maintain their pleasant and relaxed character on the one hand, but on the other they serve clear educational purposes [8]. Thus, they hold a constant educational value. Serious games are played on electronic devices using digital media and applications. The use of ICT is nowadays very widespread in educational context, mainly because digital applications are used by educators to differentiate teaching methodology and activate pupils [5]. Playful activities and games in their devices inside the school context is supposed to activate pupils since they match their desires and suit their characteristics [3].

The focus of using ICT and specifically serious games is to integrate them into teaching in a scientific and pedagogical way [9]. Digital media should be suitable for the age of the children and tailored to the educational needs of all pupils. Also, the selection of applications must be targeted and linked to the learning objectives [5]. Knowledge gain should always be the core axis when designing or choosing a game for teaching purposes. This way, the risk for pupils being distracted by the use of the game is reduced. Still, it is important to allocate the time that children will use the game. Playing the game can be done individually or in groups. In both cases it is important to give all children the opportunity to equally participate in the process. In addition to the knowledge that children can acquire, it is also important that they develop digital skills [4]. Thus, the teacher must guide the realization of teaching activities in a way that promotes interaction between pupils [10].

Finally, it is important for children themselves to know the educational purpose for playing the game as part of their lesson. At any age, from very early, children are capable of understanding the link between each activity and the content of their textbooks. This is a skill that is cultivated with their experience. Educators can strengthen this characteristic by providing clear instructions and references before starting the gamified activity [10]. Students, in this way, feel more confident since they understand that educators want to involve them actively instead of only treating them as listeners.

2.3 Digital Storytelling and Augmented Reality in Playful Activities

One of the main objectives of primary education is to enable pupils to express themselves with structure and clarity [4]. They should also be able to present their perspectives to others in a clear and comprehensible manner [3]. When achieving such goals, the confidence of students is significantly enhanced and teamwork within the classroom is facilitated [6]. The skill of communication is considered, after all, to be among the most important ones for the pupils of the 21st century [10].

It has become increasingly clear nowadays that the ways pupils are communicating and expressing themselves evolve and become more digital [11]. These changes are consistent with the evolution of technology and society itself [6]. In the school context, the ability of pupils to record their stories digitally should additionally ensure greater productivity since this practice keeps up with their daily out of school habits [3].

In terms of content, storytelling is characterised by freedom and flexibility, thus ensuring the disconnection with the traditional oral storytelling and the rigorous structure of an evaluation [12]. Digital Storytelling (DS) is one of the educational methods using technological devices allowing computer users to become creative storytellers by developing their own interesting stories [13]. It constitutes a creative process used to capture personal stories in a 3–5 min digital clip [14]. Lately it has been utilized as a teaching approach in many disciplinary areas and education level [15–18].

The 3D HIT playful activity is based on cutting-edge technology and features that confront the characteristics of the commercial digital games that children play. Augmented reality technology follows the above judgement. Integrating digital elements into the real world introduces impressive possibilities to modern electronic devices [11, 19]. In education, the use of augmented reality can add interactivity to educational materials by converting, for example, a 2d image into a 3d animated model. This practice can then be utilized for the design of serious games in educational context. The use of augmented reality can transfuse the sense of surprise and subversion to serious gamification activities [3]. Thus, mystery and exploration among pupils are increased.

The 3D HIT playful activity, is a combination of augmented reality with DS. This combination enhances educational quality as it ensures the ability to use and configure the three-dimensional models with the digital recording of students' descriptions. Moreover, the aim was to diversify History teaching in order to allow the pupils to perceive it as a digital, serious game. The activity is described in the next section.

3 Methodology

Within this study a playful, game-like activity was designed, following the principles of serious games. It cannot be characterized as a game, as no application was implemented by using a software development tool (e.g. a programming language or an authoring tool). Also, it cannot be characterized as a gamified activity exactly, as it didn't involve fundamental gamification elements, such as score tracking, etc. Rather, it was a differentiated, playful activity for teaching History, focusing on divine and mythical creatures, as explained in the next subsection.

3.1 Gods, Demigods and Mythical Creatures

One of the chapters included in the History subject, in primary school is Greek mythology. The study of Greek mythology is of great interest to students because it includes the action of Gods, Demigods and various forms of mythical creatures, as shown in Fig. 1. The main focus are the 12 Olympian Gods who are presented as regulators of people's lives. At the same time, there are the Demigods, such as Hercules, who have half human and divine qualities. Finally, very often many supernatural creatures emerge that complicate human actions and reveal the intentions of the Gods. People, Gods and mythical creatures take part in adventures with unexpected evolution and great twists.

Through these adventures the relationship of people with the divine element is presented together with the consequences of human acts that contradict the will of the Gods. They also capture the feelings of people and their efforts to meet the rules of the ethical order, in times when life was not developed in organized societies [2].

All the above transfuse attractiveness to the study of Greek mythology. Historical events are presented in the form of myths and understanding of historical meanings becomes easier for young learners. This is crucially important since it reinforces the positive attitude to the study of History subject in general [1, 3].

Fig. 1. Captions of 3d models used in 3D HIT. Trojan Horse, Neptune, Athena, Apollo, Hercules, Minotaur, Labyrinth of Knossos and Prometheus were some of the historical characters and constructions pupils described in their digital stories.

3.2 The Implemented Teaching Approach

The teaching scenario includes the production of digital stories through the 3D HIT playful activity. It is about creating digital narratives related to mythical figures of the Greek mythology in the context of the 4th Grade History Subject (Fig. 1). These narratives should describe these characters and provide information about their lives. Stories are created and recorded at the same time that students manipulate 3d models of these characters. At the end of each activity, each child has created a video with the recording of the 3d characters' movements along with the story narrated by him/her. The 3d models are displayed through portable electronic devices, with Augmented Reality software. Using their devices, pupils choose and scan images in an enriched

worksheet prepared by the teacher. The enrichment of the images involves their connection with the 3d models which is realized with Augment, open Augmented Reality tool. Thus, from each image, the 3d form of a character is displayed in real context.

The selection of images for the design of the worksheet and the 3d models follow the historical knowledge that has already been taught in previous lessons, during the same school year. Therefore, the use of the game aimed to assess the acquired knowledge and to create an incentive for pupils to express themselves freely and creatively [20]. Pupils are informed from the beginning that their stories will be recorded and presented in the classroom. Therefore, the criterion of quality and reliability of the content is automatically determined. Methodologically, the innovative element lies in the ability to narrate stories *in tandem with the manipulation of 3d digital mode* while moving 3d History models in pupils' mobile devices. Moreover, digital stories together with the recorded videos (through screen capturing software) were compiled into a digital repository that can be further utilized at any time.

The search for the 3d digital material and the preparation of the worksheet was carried out by the teacher. The sources were mainly existing collections of 3d models and personal web pages of 3d digital content designers. The age of children who played 3D HIT in this teaching intervention was 10–11 years. Their age only allowed an experimental use of the game designed by the teacher.

There were three stages in the implementation of the activity (Fig. 2). The first, the design stage which was carried out by the teacher. It included research for material, the creation of the activities' worksheet and the synthesis of the gamified activity 3D HIT.

Then, the stage of implementation followed, in which children chose images from the worksheet, they displayed and manipulated the 3d character that corresponded to the image and finally composed their final video. This final video was in the form of presentation of each character. That's because it looks like he/she is introducing him/herself while moving and spinning around.

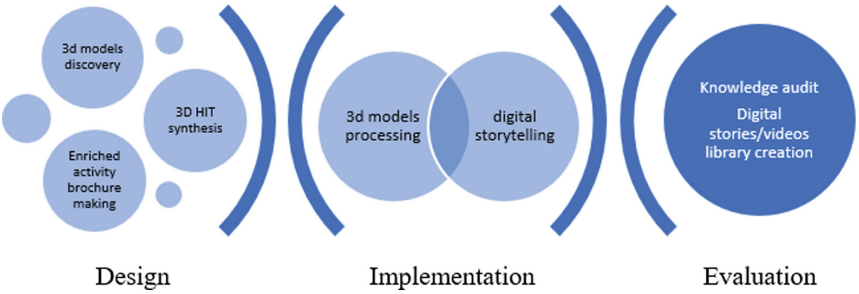

Fig. 2. Stages of the activity.

Finally, there was the evaluation stage in which the videos were played with the integrated digital narratives of all children and discussed within the classroom, in a plenary session. During this process the teacher had the opportunity to assess children's knowledge and attempted to further facilitate knowledge acquisition through dialogue.

The final stage also included the creation of a digital library with all the pupils' digital material created through playing the 3D HIT game. This library was finally posted on the school's website in an open and easily accessible way for students and educators, using personalized codes.

3.3 Research Design

In order to evaluate the effectiveness of teaching history concepts through 3D HIT, a small-scale, qualitative ethnographical study was designed. The main objectives were to examine the level of students' previous knowledge on an already taught Greek Mythology chapter. Also, the aim was to investigate the contribution of the activity to the engagement and participation of pupils in the teaching process so as to cultivate better communication among them [15]. Therefore, three research questions were formulated as follows: (a) did pupils perform better than their usual mark rates indicate after playing 3D HIT, (b) was their engagement and participation level higher than in similar activities in the History subject, and (c) did pupils improve their ability to express themselves fluently and with clarity during the digital storytelling process of the activity?

Systematic observation was selected as a data collection tool. This choice was made because the researcher was also the teacher of the specific class for a long time and many different disciplinary areas (which is very common in Primary Education). Therefore, it was easier to record and understand the changes that occurred in the behaviour of the pupils during the game's performance.

Moreover, since it is not easy to quantify or accurately evaluate the gained historical knowledge in small age groups, it is equally important for educators to elaborate the skills development after each teaching activity [3]. This process is dynamic and constantly evolving. Therefore, the systematic observation and recording of pupils' behaviour is considered to be more accurate [21]. The teacher could be described as a 'participant observer'. At the same time, he facilitates the activity in technical needs.

The sample population of this study consisted of 24 students aged 9–10 years old. The duration of the study was 2 weeks, including five 45-minutes sessions in total.

4 Results

A positive contribution of the activity to knowledge and skills building was indicated by the results of the systematic observation.

As far as the level of knowledge of pupils is concerned, it was recorded that the majority (15/24) showed a performance improvement, compared to their usual average grades (Fig. 3). What was actually measured was the ability of pupils to use historical knowledge during the narration of their digital stories. That was compared with traditional evaluation processes in which they were also asked to orally narrate historical facts previously taught by the teacher. The mail difference lies to the fact that during the playful activity 3D HIT, historical Knowledge is processed and produced by pupils themselves. Eight out of twenty-four pupils performed equally to their usual grades and only one student performed worse than usually. A greatest improvement was recorded

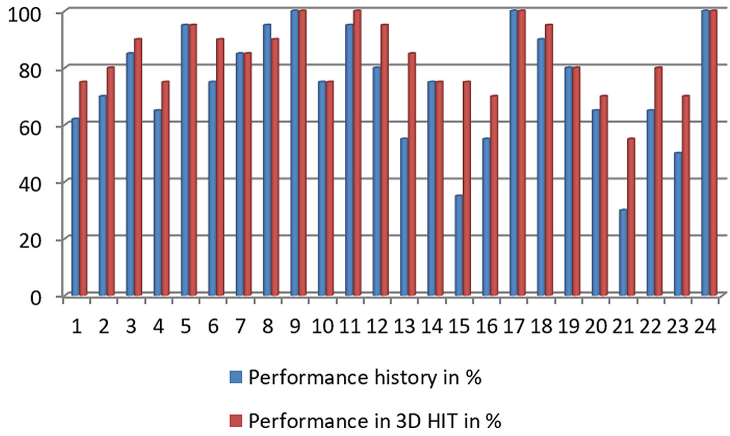

Fig. 3. Pupils' performance comparison after playing 3D HIT game.

for average students while those who had a very high performance, retained their scores after playing the 3D HIT game. Although grading in primary education follows the scale of 10, the percentage presentation is used for the needs of this study.

Moreover, according to the data, in all the five session that the game was utilized, the improvement of the pupils' participation level was equally increased (Fig. 4). A scoring rubric was used in which pupils' attitude and reactions during the whole activity were recorded in detail. This involved the objective evaluation of the teacher for these variables, based on the overview of the class status that he had developed over time. A 10-grade scale was used, following the normal grading approach of Primary School. It is important to say that any teacher is obliged to follow similar grading approaches through the year in order to report pupils' overall performance to parents and the School. There were no signs of leakage in stage of the game implementation while the pupils' interest and participation showed an upward trend as the sessions progressed. This is particularly important for the History subject since research shows high rates of difficulty and leakage, especially in younger ages [2]. Large and obscure texts discourage young learners while the supervisory material is often limited to two-dimensional images and historical maps [1]. The findings of this small-scale study indicate that the utilization of a differentiated teaching practice such as the 3D HIT gamified activity had boosted pupils' interest and desire to participate.

Also, a corresponding improvement was recorded in the expression capacity of the children. This improvement gradually evolved from the first session to the completion of the digital stories and the final videos (Fig. 4). Although a two-week period is considered to be short for such an important research sector, in the case of text production for their digital narratives, a remarkable evolution was observed in pupils' stories. For data collection, a scoring rubric was used to keep track of pupils' oral expressions whether used in their digital stories or not.

The whole activity inspired them to express themselves more, since they found it particularly appealing that historical figures and heroes introduced themselves to the public using their own voice. In a sense, pupils' digital stories and the movement of the

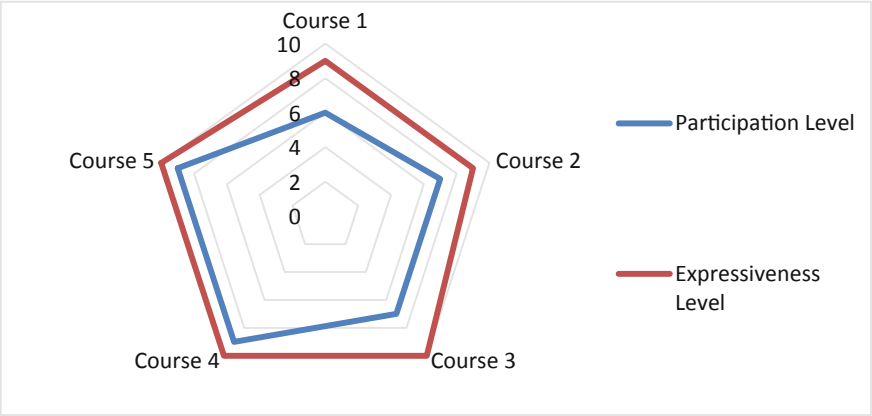

Fig. 4. Records of pupils' engagement and participation level during playing 3D HIT game.

three-dimensional model brought to life the characters of their own school books. This led them to continually enrich their texts with expressive elements. It also urged them to check the validity of the information used.

The lack of time pressure and the lack of evaluation by the teacher also contributed to the increase of expressiveness. Pupils were only given instructions for the game and the task to produce their videos. During their work there were no interventions or corrective remarks. Thus, the playful form of the teaching activity was maintained in every stage of it. All of the above contributed to reducing stress. This is particularly important since stress is very evident in cases where young pupils are asked to create stories and orally share them with classmates. Observation findings together with the comments of pupils themselves, showed that the fact that only their voice was used in the final videos and not their face also reduced stress and anxiety. On the contrary, the use of screen recording software made them feel comfortable and concentrated in their work. Finally, as the majority of pupils commented, the simultaneous exploitation of 3d models in their devices inspired them in the production of their digital stories, offering them visualisation of the historical content.

5 Conclusions

Within this study a playful, game-like activity was designed, following the principles of serious games, for teaching History in a diversified manner. The main objectives were to examine the level of students' previous knowledge on an already taught Greek Mythology chapter and to investigate the contribution of the playful activity to the engagement and participation of pupils in the teaching process so as to cultivate better communication among them [15].

The data indicate that the pupils performed better within this activity when graded in an ordinary manner (Fig. 3). Although at first the difference may not seem big enough, considering the disciplinary area, the perspective of the researcher (being also

the teacher of the class) and the fact that no significant preparation was applied, this difference is significant. Moreover, the engagement of the pupils was rather high (again considering the discipline), gradually reaching total immersion (Fig. 4). Similarly, the pupils were able to freely and fully express themselves by being involved in fruitful conversations and by applied already acquired knowledge.

The limitations of this study are many, as it was of a very small scale and restricted to 5 teaching sessions. On the other hand, the findings suggest that the potential of this approach is very promising, for two main reasons: (a) the pupils appreciated the approach highly and it seemed successful, and (b) it exemplifies a very simple way to diversify and transform into playful, game-like activity the teaching of a rather boring discipline, utilizing cutting edge technology. Thus, the future plans are rather obvious, including the design of additional activities of this kind.

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