Gamifying Early Foreign Language Learning

Using Digital Storytelling and Augmented Reality to Enhance Vocabulary Learning

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Abstract. DS (Digital Storytelling) and AR (Augmented Reality) applications offer opportunities for the creation of a multimodal and interactive learning environment, making the learning concept more appealing and exciting than traditional or more conventional instructional tools. The overall objective of this work is to assess how DS and AR can contribute to the enhancement of children's vocabulary in the FL (Foreign Language) through a number of gamified activities. To this aim we restructured the classroom environment utilizing tangible interfaces to create a multimodal learning framework, where 6-year-old learners could play, collaborate and interact. Twenty (20) first grade children of a Primary School in Greece (experimental group) were engaged in digital activities learning about Greek mythology and ancient history, while eighteen (18) children of the same grade and school (control group) were taught the same context in a more traditional learning environment. Both qualitative and quantitative data was collected by means of: a) non-equivalent posttest only, b) the teacher/researcher's journal and, c) semi-structured interviews with the experimental group members. The results indicated that a higher vocabulary retention rate was observed when DS and AR were incorporated.

Keywords: Digital storytelling · Augmented reality · Gamified early foreign language learning

1 Introduction

Today's children are very efficient in operating machines and, at the same time, develop skills, knowledge and understandings about the world they live in [1]. Research often highlights that education is bound to change if learning is to meet the challenges and opportunities of the mobile age [2]. Thus, teaching and learning approaches must be up-to-date and in line with our daily lives changes to support the learners' needs [3]. Due to the need for increased understanding of the role and place for educational technologies even in early childhood educational contexts [4] there is a shift from traditional teaching and learning to more innovative approaches. Regarding technology integration in the context of English as a Foreign Language (EFL) technological devices seem to hold significant value providing FL/L2 (foreign/second language) learners with a valuable

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language experience, enhancing positive experiences and attitudes toward the FL [5]. In line with the above come the observations of others pointing out that vocabulary presented in more than one medium facilitates the development of a number of strategies for acquiring vocabulary knowledge in a FL/L2 [6, 7].

This paper focuses is on early foreign language learning in a national context (Greece), integrating DS and AR in a first grade classroom. We attempted to shed light into the development of young EFL learners' vocabulary in a multimodal and interactive environment through a project focusing on elements of Greek mythology, history and culture. To that aim, an experimental and a control group were formed in order to study potential differences in terms of vocabulary acquisition and retention when storytelling is used for educational purposes.

The paper is structured as follows: initially, a brief overview of the literature regarding gamification practices, DS and AR in early EFL is presented. Then the conducted study is described. The findings of the study are summed up, while the last section is a concluding discussion which attempts to explore the effects of the DS and AR technology on very young learners' vocabulary development.

2 Background of the Study

2.1 Gamifying Early Foreign Language Learning Using Mobile Devices

It has been observed that gamification engages learners [8, 9] by using game-like techniques to motivate them or influence their behaviour [10]. Deterding [11] established five levels of game elements that should be included in a definition of gamification, namely interface design patterns, game design patterns and mechanics, design principles and heuristics, game models and game design methods. Gamification does not necessarily include every element concluded in the above levels. Point scoring, competition with others, challenges and rewards are employed to combine intrinsic with extrinsic motivation, so as to raise engagement [12].

Stanley [13] state that introducing technology in language learning has created new opportunities for learners and teachers, underlining the benefits of real language use in class and the creation of more interactive classroom environments. Learning is made more interactive, lively and flexible through technology [14]. Young learner's motivation is also enhanced by letting them accomplish tasks successfully and gain self–confidence during the learning process [15]. This observation is of critical importance for FL/L2 learning, as motivation has consistently been linked with learning [16]. ESL learners, even the more reluctant ones, can greatly benefit by assessing learning content using mobile devices. Research has found that mobile devices can be effective for both educators and children [17]. They have a positive impact on learning, allowing learners to build their confidence, persistence and independence [18, 19] while offering opportunities for personalized learning by offering more control to learners themselves [20]. Moreover, mobile devices offer interaction opportunities to learners, enabling them to use body movement to interact with the environment and gain knowledge through a kinesthetic learning approach. In that way, the cognitive process is deeply connected to body's interactions with the world [21].

2.2 Digital Storytelling and Augmented Reality

Storytelling is an effective educational approach greatly contributing to language and literacy development [22] while more recently, such activities supported by technology and media aspire to improve learners' engagement [23]. Researchers have focused on integrating DS and AR to make the storytelling process more interactive and game-like for young learners [24–26].

DS consists a potent tool that can be used for educational purposes [27–30], combining the art of telling stories with multimedia material [31, 32], so as to engage learning by implicitly highlighting the language elements aimed to be learnt. Research indicates that multimedia help students retain new information and aid difficult material comprehension [33]. DS in educational settings is a process of short stories' creation, allowing students and educators to enhance information gathering and problem-solving skills, and to facilitate the ability to work collaboratively [33]. Digital stories can be utilized by educators to deliver instructional content, to present ideas, to enhance understanding and reinforce learners' meaning making processes.

AR actually offers an interface between reality and digital information, enabling learners to get engaged in using language to convey their ideas [34]. It is a technology that allows computer-generated virtual imagery information to be overlaid onto a live direct or indirect real-world environment in real time [35]. The literature supports that AR technology is a favorable tool to enhance language learners' motivation [36].

For the needs of this study, laptops and tablets were used to integrate DS and AR concepts in early FL teaching sessions. Gigliotti et al. [37], Murphy [38] and Bratitsis et al. [39] present arguments to illustrate why such tools are effective for teaching and learning. Even in primary classroom settings they serve as a logical extension of children's already extensive e-learning. Thus, aiming at making the learning process more engaging and effective young learners' educational needs were weighed so as to create a learning environment where young learners could engage in gamified activities for vocabulary learning, exploring the educational opportunities offered by DS and AR.

3 The Study

The present intervention was introduced to serve the dual goal of: a) developing young EFL learners' vocabulary in a multimodal and interactive environment through a project focusing on elements of Greek mythology, ancient history and culture, and b) measuring the effect of the implementation of these activities on the learners' vocabulary learning in the FL. More specifically, the research questions were:

- to examine whether educational technology applications can serve as a useful tool for early FL vocabulary introduction and retention
- to exploit the possibilities offered by technological applications to increase motivation and engagement in language learning.

3.1 Sample

Thirty-eight (38) 1st graders of a Greek Primary school participated in the study, all Greek speaking and attending a school in an urban area of a provincial city. The experimental group learners (12 boys, 8 girls) were engaged in digital learning activities (digital narratives, interactive game-like activities, AR contents), while the control group learners (9 boys, 9 girls) were taught about Greek history in a more traditional learning environment, using printed books and more conventional media.

3.2 Research Design

The experimental CLIL syllabus was developed on the basis of Willis' task-based language teaching [40] and Coyle's pluriliteracies approach for CLIL, integrating learning beyond the 4C's (content, communication, cognition and culture as cited in Coyle's 4Cs-Framework) and understanding interconnectedness of the elements of CLIL [41, 42]. Content only becomes meaningful when it is understood or conceptualized in order to increase learners' meaning-making potential and lead them into deeper learning of subject disciplines [43]. In line with Coyle's observations, the pilot intervention was designed by the researchers (one of them was also the teacher of the class) to favour the use of different modes, such as spoken and written texts containing ample visual stimuli and graphic representations. Focus was placed on oral speech, however written texts were also used by the teacher to gradually enable children become aware of the connections between oral and written language. In the experimental group, children were encouraged to conceptualize vocabulary meaning by understanding the multimodal messages and involve other learners in responding appropriately to the tasks using simple oral target language. A pilot intervention was implemented in two 45-min teaching sessions. Technology facilitated learning through listening and speaking activities, engaging learners in communication, games and storytelling activities. The aim was to keep learners motivated, so as to aid them achieve personal learning goals together with the accomplishment of the group's goals.

3.3 Research Process

The research process was focused on the use of mobile devices and multimodal material that responded to children's curiosity and imagination. Language learners at an early age have a short concentration span [38] facing difficulties in attending the teaching session. The fact that there is a great number of alternatives, much more interesting for them than being seated in a classroom, was taken into consideration, engaging them into a number of activities that were compatible with their playful nature. The mini-syllabus for the experimental group consisted of two broad thematic areas, each one including a number of digital interactive activities, as presented below.

1) *The story of Jason and the Argonauts*. Activities:
   i) Geography and history in the Argonautic Expedition story
   ii) The myth of Jason and the Golden Fleece: DS and the ARgo ship
   iii) The digital dragon: an interactive drawing activity

2) *History and culture in Ancient Athens*. Activities:
   i) The Acropolis Museum tells us a story about Ancient Greece: DS and the pARthenon experience
   ii) A digital tour in the Acropolis Museum
   iii) The Peplos Kore: an interactive drawing activity

Learners of the experimental group completed the activities in pairs or groups of four. The pilot intervention lasted about two months (April-May). Ten (10) 45-min teaching sessions took place for each group, experimental and control. Learners were being taught English as a FL from the beginning of the school year (September) and they had also attended an early start EFL program during the previous school year. The project procedure went through three basic stages, implemented for each of the aforementioned two broader thematic areas:

a) Pre-stage

All along this stage the experimental group learners were introduced to the topic of the thematic area, exploiting the opportunities developed in a multimodal learning environment. Before the narration of the central story for each thematic area children of both groups were engaged into a discussion and were encouraged to express their ideas, thoughts or knowledge on the topic to be explored. Thus, with the support of digital (experimental group) and non–digital media (control group), learners came in contact with information and vocabulary regarding the present–day position of Colchis, the geographical features of the area (the Black Sea), historical information (Medea, the Golden Fleece), as well as of the power of Athens, today's Greek capital, in the past and in present, the ancient Gods, the Goddess Athena and her symbols.

After that, DS was used to support language learning of the experimental group. Reading and enjoyment were promoted, creating an innovative learning environment. Specifically, Greek history and mythology stories were integrated with technology with the teacher reading out loud the digital stories, scaffolding learning and supporting understanding by using visual stimuli, body language, facial expressions and the power of her voice. Yuksel, Robin and McNeil [44] concur that DS draws its power through weaving images, music, narrative and voice together. Dörnyei [45] emphasizes the importance of presenting a task in a way that motivates learners and suggests that task preparation should involve strategies for activating young learners perform the task. Therefore, DS as well as multimodal material (interactive flashcards, digital maps, videos and 3D projections) were used to arouse interest and create a framework to enhance learner's interest and participation, practice the target language vocabulary and learn the content - aspects of Greek mythology, history and culture- in a natural way.

Emphasis was put on developing learners' listening skills in the target language, by listening to the story, flipping through its digital pages, and paying attention to interactive image and sound elements. AR technology was introduced during DS to aid learners in the construction of meaning, by encouraging creative, innovative and autonomous practices. For the purposes of this study, each group of learners was provided with a tablet, which they used when asked during the storytelling process, to scan prototypes directly linked to the story topic (e.g. the Argo ship, the Acropolis). On the other hand, children of the control group were provided with relevant printed books

(*Jason and the Golden Fleece* by Claudia Zeff, *Jason and the Argonauts* by Jessica S. Gunderson, *Let's go to the Acropolis* by Aliki Ammerman), as well as visual aids (flashcards, printed maps) to further promote understanding of the stories.

b) Task-cycle

During this main stage, children of the experimental group were encouraged to help each other and collaborate, with the aim of maximizing opportunities for meaningful interaction. The emphasis was primarily placed on enabling them to learn and use the FL indirectly, focusing on having fun while acquiring vocabulary in the target language. The participants of the experimental group were asked to sequence a number of printed pictures, re-narrating the stories they had listened to, during the pre–task stage. QR codes were embedded on the pictures, for them to be recognized by a computer program which contained a set of recordings describing the pictures provided in a simplified manner. Children worked in pairs, enjoying the use of laptops, also getting feedback concerning the accuracy of their answers and rewards for every correct answer. This way, they could follow rules, take turns or collaborate to find the solution to a "problem" in a given time. They were encouraged to use vocabulary in the target language, at the level of words or short phrases, to describe what they could see in the pictures, as well as to repeat vocabulary they listened to from the recordings.

In the next teaching session they were divided into groups of four. Some were asked to draw the story scenes on the interactive whiteboard, using a painting application and then synthesize them into a digital story, with the teacher's help. Others were supported to use a DS application to create picture stories. The teacher recorded short phrases in the FL together with the children, which were embedded in the digital stories. In such a learning context, learners worked together, shared their work and learned from each other, also recognizing the value of storytelling as an art form.

In sum, learners managed to accomplish a number of tasks and create various products. A representative sample of the work of the experimental group contained digital picture stories, digital drawings and audio recordings.

On the part of the teacher, attention was paid to support learners in using language for authentic and communicative purposes. The teacher also encouraged learners to reflect on their work, monitor and evaluate their learning, therefore enhancing their metacognition and motivated them to reflect on their performance. All in all, the teacher/researcher was the facilitator and coordinator of children's work, creating opportunities for children's active participation in a relaxed and playful learning environment and helping them overcome problems arising during group work.

On the other hand, the children of the control group used more traditional material (paper, color markers, paperboards) and presented drawings created on paper, arts and crafts related to the story topics (e.g. a paper Argo ship) and mini picture storybooks, in a learning context following traditional teaching practices.

c) the Language Focus and Feedback Stage

During this stage, children of both experimental and control group presented their group work in class, having opportunities to further practice oral skills and use the vocabulary acquired during the previous stages. They exchanged views, discussed what their classmates presented, communicated their feelings and ideas in both the FL and their mother tongue. Learners of the experimental group participated in digital interactive games and physical games, such as:

- Dramatizations of the stories and role play games, acting out short dialogues;
- Interactive simulation games, paying digital visits to Acropolis archaeological museum;
- Digital interactive games (e.g. The Peplos Kore, playing and coloring a 3D computer-generated image of the original ancient work).
- Bee - Bot quests (Finding the Golden Fleece) and Bee - Bot sequencing routes (Finding the way to Acropolis).

The teacher provided feedback on their work and reviewed what was presented, also assessing their participation and use of the acquired vocabulary. Their "products", as well as their interaction with peers and the digital media facilitated the recording of their progress.

3.4 Research Instruments

Both qualitative and quantitative data was gathered to assess the effect of the intervention on learners' vocabulary learning, as well as their motivation during the learning process. The following instruments were used

a) a non-equivalent group post-test-only [46], as digital media and applications used for vocabulary acquisition in the experimental group were not used in the control group. The productive vocabulary of the participants was assessed by a one word vocabulary test, containing vocabulary items as presented in Table 1. Children were shown a picture and were asked to produce the appropriate word in the target language.

Table 1. Non-equivalent posttest only

Question	Item
1	Ship
2	Sea
3	Dragon
4	Golden fleece
5	King
6	Tall
7	Big
8	Strong
9	Acropolis
10	Hill
11	Statue
12	Athens
13	Museum
14	Ancient

b) semi-structured interviews after the teaching sessions, to examine the attitudes of the experimental group towards the methods employed and the L2.
c) a teacher/researcher's journal, to better evaluate the applicability of the intervention, was kept once a week in order to record and reflect on its impact. It was based on the observations of Burns [47] and Wallace [48] as far as journal keeping is concerned.

4 Findings

The quantitative results of the post-test (see Table 2, Table 3) indicated that a higher vocabulary retention rate was observed when DS and AR were incorporated.

Table 2. Non-equivalent posttest only

Group	N	$\bar{x}$	Std. Deviation
Experimental	14	14,71	3,87
Control	14	10,64	4,29

Table 3. Leven's test for equality of variances

t	Df	Sig. (2 tailed)
2,636343	26	0,014
2,636343	25,7313	0,014

Table 4. Qualitative analysis of the eacher/researcher's journal

Typology	Categories
A. Educational process	Mobile learning Language skills development Multimodal learning environment Interactive activities Presentations Collaborative work Problem solving activities Learning about Greek history and culture Opportunities for differentiated learning
B. Learners' Attitudes	Engaging in AR Engaging in digital storytelling Learning the target language in a pleasurable way
C. Communication and interaction	L2 use Translanguaging Inferring meaning Multiliteracies meaning making

Additionally, the qualitative data collected by means of the semi-structure interviews showed that learners of the experimental group considered the experience as *"exciting"* or *"fun"*, also reporting that they *"easily learned a lot of words"*. Children also stated that *"English is fun"* or *"English is game, not a subject because we play with tablets"*. The qualitative analysis of five (5) journals led to the formation of three typologies, and several categories under each one, as presented in Table 4. It was observed that the learners used the resources with ease and were offered with opportunities to learn new vocabulary in a playful manner. In that way differentiated instruction became easier, with learners working at their own pace and being provided with feedback, rewards or scores by the relevant programs. It also revealed that employing multimodal material and having learners participate in DS and AR activities promoted the development of their oral skills in the target language. Young children's attention was captured by the use of multimedia, while the learning process was motivating, enabling them to develop a positive attitude towards FL learning. Cultural knowledge gains were also recorded. Children came across historical and cultural information through a virtual environment, being offered opportunities to explore authentic material (historical maps), go on a digital tour in a museum, discover the Argo ship and the Parthenon through AR applications and compose their digital stories using a bank of relevant pictures.

5 Discussion

This paper explores the potential of integrating mobile learning activities in a gamified story based context to explore gains regarding early English as a FL learning. Results of qualitative and quantitative analysis revealed the positive effects of DS and AR approaches in children's oral skills, as well as cultural knowledge gains to a certain degree. The multimodal context, the digital narratives and the gamification pedagogy integrated in the mini syllabus triggered high levels of engagement and motivation, coming in to agreement with that of previous research [12, 15, 49].

Meanwhile, researchers reported opportunities for differentiated instruction through engagement in motivating and novel digital learning experiences. Figg, Gonsoulin and Mccartney [50] also observe that incorporating DS activities into learning experiences not only engages students in acquisition of the 21st century skills, but also provides teachers with opportunities to differentiate instruction. Research has shown that when technology is properly integrated in language learning, young learners' motivation is enhanced, thus they are having more learning opportunities [51–53]. All in all, the results of this study come into agreement with the conclusions of previous research supporting that if educational fields and DS or/and AR technologies are brought together, learners can experience and learn while having fun; as a result, educational effectiveness can be maximized [54, 55].

This study has several limitations such as the small size and the sample representativeness. Although it provides positive suggestions for future research the applicability of the project in other contexts, considering variables such as children gender, school area etc. is necessary to determine further beneficial effects DS can AR can have during an early start in the FL classroom.

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