



An alternate reality game for language learning: ARGuing for multilingual motivation

Thomas M. Connolly, Mark Stansfield*, Thomas Hainey

University of the West of Scotland, School of Computing, Paisley PA1 2BE, UK

ARTICLE INFO

Article history:

Received 27 May 2010

Received in revised form

10 January 2011

Accepted 11 January 2011

Keywords:

Alternate reality game

Motivation

Web2.0

Moodle

Language education

Quests

Puppetmaster

ABSTRACT

Over the last decade, Alternate Reality Games (ARGs), a form of narrative often involving multiple media and gaming elements to tell a story that might be affected by participants' actions, have been used in the marketing and promotion of a number of entertainment related products such as films, computer games and music. This paper discusses the design, development and evaluation of an ARG aimed at increasing the motivations of secondary school level students across Europe in the learning of modern foreign languages. The ARG was developed and implemented as part of a European Commission Comenius project and involved 6 project partners, 328 secondary school students and 95 language teachers from 17 European countries. The collaborative nature of ARGs provides a potentially useful vehicle for developing collaborative activities within an educational context. This paper describes the educational value of ARGs, in particular the ARG for supporting the teaching of modern European languages and the specific activities that were developed around Web 2.0 and gaming that underpinned the ARG and helped promote cooperation and learning within an educational environment. An evaluation of the ARG was conducted using an experimental design of pre-test → ARG intervention → post-test. 105 students completed the pre-test, 92 students completed the post-test and 45 students completed both the pre-test and post-test questionnaires. In general, student attitudes towards the ARG were very positive with evidence suggesting that the ARG managed to deliver the motivational experience expected by the students. The majority of students who completed the post-test either agreed or strongly agreed that they would be willing to play the game over a prolonged period of time as part of a foreign language course. In addition, through using the ARG, students believed that they obtained skills relating to cooperation, collaboration and teamwork.

© 2011 Elsevier Ltd. All rights reserved.

1. Introduction

Serious games and games-based learning have made progressively significant contributions in helping to promote enhanced learning experiences within education in recent years. According to Connolly, Stansfield, and Hainey (2007) games-based learning can be defined as the use of computer games-based technology approach to deliver, support, and enhance teaching, learning, assessment and evaluation. Prensky (2001) argued that learning was unengaging as compared to media such as computer games and that younger generation 'digital natives' have grown up in a technologically sophisticated environment which has led to changes in their attitudes and expectations which has created fundamental differences with the pre-digital generation of 'digital immigrants' which include many of today's educators. According to Shaffer, Squire, Halverson, and Gee (2004) computer games "bring together ways of knowing, ways of doing, ways of being, and ways of caring: the situated understandings, effective social practices, powerful identities, and shared values that make someone an expert". Gee (2003) identified 36 different learning principles as to why games are good for learning which include: identity (how a game captures and immerses a player); interaction (appropriate feedback providing additional problems based on player decisions); production (players seeing the consequences of decisions they make); risk taking (allowing a player to experience a minimal of real world consequences or no consequences at all); customisation (players being allowed to customise their own desired attributes providing a sense of ownership over what they are doing). O'Neil, Wainess and Baker (2005) highlighted the perceived instructional usefulness and benefits of computer games

* Corresponding author.

E-mail address: mark.stansfield@uws.ac.uk (M. Stansfield).

as providing complex and diverse approaches to learning processes and outcomes, interactivity, the ability to address cognitive as well as affective learning issues, and what they regard as most importantly that of motivation for learning.

With the increased adoption and use of Web 2.0 or social software applications within the classroom environment, there have been increased opportunities to use technology in a much more collaborative and participatory manner in promoting enhanced information access, sharing of ideas, information and knowledge exchange and content production (McLoughlin & Lee, 2008). This paper explores the use of one such technology – an Alternate Reality Game (ARG) that involves multiple media, interactive narrative among participants, and story telling and gameplay that is affected and influenced by the actions and ideas of the ARG participants. Although ARGs have previously been developed and implemented as promotional and marketing tools for entertainment related products, ARGs can provide a useful educational context and platform through their collaborative nature and opportunities for students to explore ideas and views with each other, search for relevant information and engage in problem-solving tasks related to learning modern languages. The ARG project was part of a European Commission Comenius project that ran from 2007 to 2009 entitled 'ARGuing for Multilingual Motivation in Web 2.0' and comprised 6 European partners, with 328 14–16 year old students and 95 language teachers participating in the study from 17 European countries. The ARG itself was developed through adapting the open-source Learning Management System, Moodle, into a multilingual gaming environment. This paper explores the design, development, implementation and evaluation of the ARG, highlighting its potential value within the context of modern language learning.

In the next section, we discuss the use of games within language learning and, in particular, discuss the use of ARGs both as a marketing tool and as an educational tool. In the section thereafter, we examine the design of an ARG for language learning and the design of the *Tower of Babel* ARG that we have produced. We then provide an evaluation of the *Tower of Babel* ARG and future directions.

2. Previous research

2.1. Games and language learning

As noted by Crookall (2007), language teachers make great use of simulation/gaming methodologies and there are many supporting textbooks and research papers that present various forms of role-play, games, simulations, and other exercises (e.g. Garcia-Carbonell, Rising, Montero, & Watts, 2001; Gaudart, 1999; Halleck, 2007). While many of the simulations/games used are non-computer based, during recent years the computer game has become an important development in popular culture. There have been a number of projects that have used computer games to support the teaching of modern foreign languages and we briefly give examples of three:

2.1.1. EverQuest II

Rankin, Gold and Gooch (2006) use an MMORPG (Massively Multiplayer Online Role Playing Game) called EverQuest II to support the teaching of English as a second language. This game was preferred to the more popular World of Warcraft MMORPG because everything in the game was labelled, so students have an opportunity to obtain visual reinforcement of information. In addition, the quests in the game are documented and displayed on the screen. As students complete these quests, they develop an appreciation for verbs, adverbs, and colloquial meanings. An 8 week pilot study was carried out with 6 students – four men and two women – who were either Northwestern graduate students or spouses of Northwestern graduate students. Two of the subjects were native speakers of Korean, two spoke Chinese, and two Castilian. They all played the game for at least four hours per week. The study was “highly preliminary” but the results suggested that EverQuest, and possibly MMORPGs in general, reinforce language acquisition for a number of reasons. The pursuit of quests, for example, requires players to become “active learners” who engage with other players and the gaming environment. The study also supports the conclusion that the games are inherently motivating.

2.1.2. Second life

Second Life (SL) is a persistent online 3D world or “metaverse” (Rymaszewski et al., 2007). Users, called “residents”, access the system with a downloadable client program called the Second Life Viewer and interact with content and other residents through a customisable avatar. Second Life has parks, shops, schools, museums, islands and beaches, all designed and maintained by the residents. It is also supported by an economy and a virtual currency. Residents can buy virtual land, build a virtual house and fill it with virtual furniture and they can explore, meet other residents, socialise, and participate in individual and group activities. SL provides simple tools for constructing 3D objects and scripting tools for creating interactive content. Of importance to this paper is that SL has been used for educational purposes and several colleges and universities have virtual classrooms. In the context of foreign language learning, there are a number of institutions and commercial organisations providing language education. For example, Spain's language and cultural institute, Instituto Cervantes, has an island on Second Life. The social aspect of learning is usually an important factor, indicating a social constructivist approach to teaching and learning. While there are several projects aimed at learning languages, the approach is relatively new and there is a clear lack of empirical evidence or even experience to demonstrate the effectiveness of the approach.

2.1.3. Tactical language and culture training system

Johnson (2007) describes the Tactical Language and Culture Training System. A version of the system, called Tactical Iraqi, has been developed to help military personnel communicate effectively and safely in Iraq through a combination of interactive lessons and games. It focuses on spoken communication, non-verbal communication and cultural knowledge relevant to face-to-face communication. The system consists of three modules:

- The Skill Builder, which consists of a one-to-one interactive tutoring environment that focuses on task-oriented communication skills (vocabularies; pronunciation; and cultural behaviours, their meaning and uses).
- The Arcade Game, which is set in a maze and the streets of an Iraqi town and comprises a set of interactive arcade-like games to practice and learn the Arabic vocabularies for colours, numbers, and understanding and giving directions. It supports two modes of play: listening, where learners follow spoken instructions spoken, and speaking, where learners speak the instructions.

- The Mission Game, is an immersive, interactive 3D world that simulates authentic social situations in an Iraqi town where spoken dialogues, gestures and non-gesture cultural interactions are practiced with “socially intelligent virtual Iraqis”. A player wins by convincing the sheik to support their reconstruction project, which requires the player to develop rapport with him and other Iraqis. Their trust and cooperation depend on the player’s knowledge of spoken Iraqi Arabic, and the courtesies, customs, body language and other idiosyncrasies of Iraqi culture.

AI techniques are used to process the learners’ speech, interpret and evaluate their actions, to control the responses of NPC (non-player characters), provide hints and assess the learners’ mastery of the language skills. Johnson and Wu (2008) report on a study that suggests there is strong evidence of the game’s effectiveness. The study examines the experience of the 2nd Battalion and 3rd Battalion, 7th US Marine Regiment (2/7 and 3/7 Marines), who trained with the game prior to a tour of duty in Iraq. In particular, 3/7 Battalion did not suffer a single combat casualty during its most recent tour of duty and, in the opinion of the 3/7 officers, the training with the game greatly increased the battalion’s operational capability as it enabled it to operate more efficiently, with an increased understanding of the situation and better relationships with the local people. They also felt that the marines who trained with the game achieved a substantial level of language proficiency.

2.2. Lack empirical evidence underpinning games-based learning

The issue of evaluation is an important one in relation to serious games and games-based learning, with several authors highlighting the general lack of empirical evidence and studies analysing the use of such applications (e.g. Connolly, Stansfield, & Hainey et al., 2007; de Freitas, 2006; O’Neil et al. 2005; Squire, 2002). Leemkuil (2005) also highlighted the lack of studies that compared the effectiveness of computer games to other forms of instruction such as lectures, tutorials, labs, role playing etc. In addition, a situation where most educational computer games have been developed with no underlying body of research or coherent learning theory was also pointed out by Shaffer et al. (2004). Hays (2005) conducted a review of 48 empirical research articles and summarised 31 theoretical articles and 26 review articles on the effectiveness of instructional gaming. The main findings from this work were that the empirical evidence was fragmented containing methodological flaws and ill-defined terms, generalising from the effectiveness of one game to the effectiveness of all games is not advisable, and no evidence existed to indicate whether games were a preferred method of instruction in every situation.

However, despite the lack of empirical evidence highlighted by several authors, there are examples of work undertaken where more extensively planned evaluation studies have been conducted that demonstrate the effectiveness of games-based learning. For example, Griffiths (2004, 2005) noted that research into the effects of playing video games on players, both positive and negative is often trivialised and some of the research needs to be taken seriously. Griffiths (2004) provided an extensive literature review and described the role of video games both positive and negative in the healthcare such as pain management through attention, as well as helping concentration and memory in patients with brain damage as a result of strokes or trauma. Examples of high level design experimental studies are provided through the work of Green and Bavelier (2003, 2007) who found that playing action video games enhanced several different aspects of visual processing, as compared to people who do not play video games and that by training non-video game players on an action video game, a causative relationship between video-game play and augmented spatial resolution was verified. An example of the use of randomised control trials is provided by Standen and Brown (2006) and Standen, Rees, and Brown (2009) who found that people with intellectual disabilities have difficulty making decisions which in turn may hinder their independence and inclusion in society. Standen and Brown (2006) assessed the effect of playing a switch controlled computer game with a time limit for responses on choice reaction time. This study found a significant decrease in choice reaction time in the intervention group as compared to the control group who, for the same amount of time, played the game with no time limit. Standen, Rees et al. (2009) further investigated whether interactive computer games may provide people with intellectual disabilities the opportunity to practice the underlying components of decision making using a Tetris like game. The findings found that the intervention group showed a significant improvement in two paper based tests of decision making, with the decrease observed in the control group failing to reach significance.

2.3. Alternate reality games (ARGs)

ARGs, sometimes referred to as ‘immersive gaming’, are a form of online interactive narrative and puzzle-solving (Connolly et al. 2009) often involving multiple media and game elements to tell a story that may be affected by the actions and/or ideas of the players. The narrative is gradually revealed to the participants through a series of media that can include websites, instant messenger (IM) conversations, text messages, emails, as well as TV and newspaper adverts and telephone calls. A central role is played by the *puppetmaster* in the development and running of an ARG who steers players in different directions as the game’s story unfolds. A metaphor that is used to describe the separation between the puppetmasters and the players is known as *the curtain*, which can be either communicating indirectly through characters and the game design or involving absolute secrecy in relation to the puppetmasters’ identity and role in the game. Collaboration among players forms a key role as players must work together in solving puzzles and ultimately successfully completing the game, which is why as well as being a form of computer game, ARGs are also viewed as being heavily built around social networking (Connolly et al. 2009). The puppetmaster can adopt the role of an adversary to the players in placing obstacles in their path to solving a quest, or an ally in providing deliberate clues that enable players to find resources to overcoming obstacles. A *rabbit hole* or *trialhead* are terms that are used to describe the first contact or deliberate clue that enables the player to find the starting point for the ARG.

Typical cross media used to underpin and support ARGs are highlighted in Fig. 1. Such media enable opportunities for the formation of communities, as well as collaboration and cooperation among ARG players in exchanging ideas and working together in solving puzzles, problems and quests associated with the game. Since ARGs by their nature include rapidly changing gameplay and ever developing situations, it is important that players are able to communicate in real-time using media such as instant messaging. ARGs typically comprise

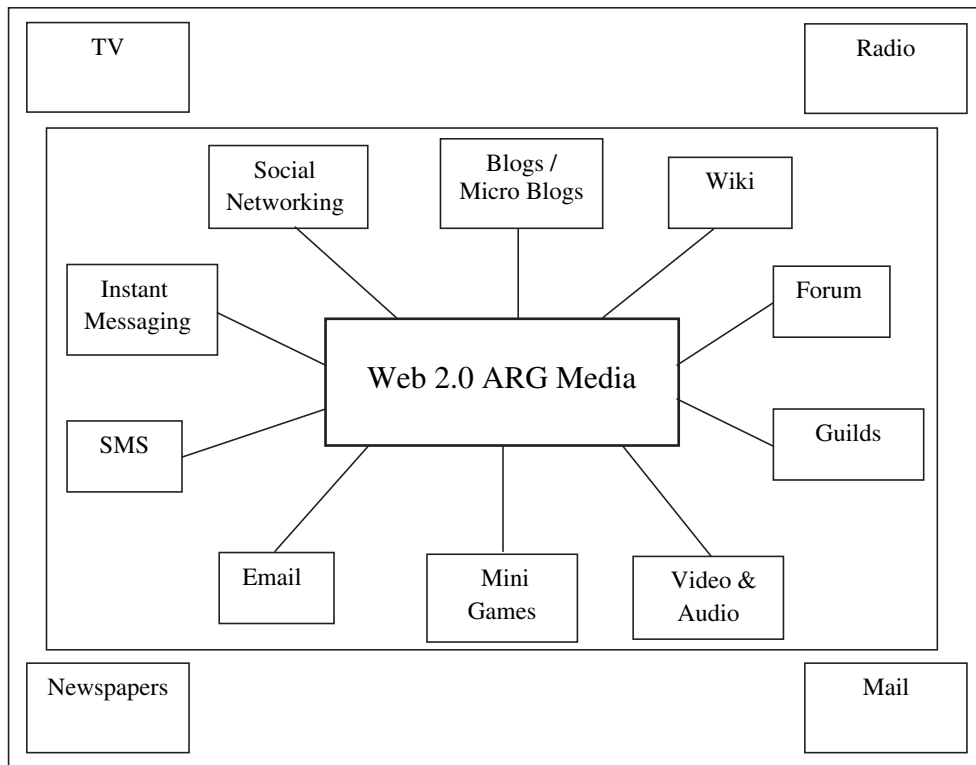


Fig. 1. Web 2.0 media used in the design and development of ARGs.

numerous media components in order to add to the challenge of the gameplay and provide as many opportunities as possible for players and puppetmasters to interact and influence the direction and outcomes of different scenarios and quests. Whilst the use of cross media can be somewhat broad in scope involving more traditional media such as telephones and mail, ARGs usually rely on the Internet as a means of centrally binding the different media together to provide and coordinate the different activities in a meaningful way.

Over the last decade, ARGs have been used within non-educational contexts. For example, one of the earliest ARGs was developed in 2001 to market Steven Spielberg's film *A.I.: Artificial Intelligence* based on a series of Microsoft computer games based on the film. The ARG, which was based on a complex murder mystery played out across multi-channel platforms that included hundreds of web sites, emails, faxes, fake ads and voicemail messages, attracted over three million active participants worldwide (Kim, Allen, & Lee, 2008); in essence, it was a type of massively multiplayer online game (MMOG). Another successful ARG *Why I love bees* was developed by Microsoft in promoting the launch of the Xbox game *Halo 2* (Kim, Lee, Thomas, & Dombrowski, 2009). The game wove together an interactive narrative and a War of the Worlds-style radio drama set in the future, broken into 30–60 s segments and broadcast over telephones worldwide. The gameplay focused on tasking players from around the world to work collaboratively in solving problems with little or no guidance. For example, players were given 200 pairs of GPS coordinates and times with no indication as to what their meaning was. Thus, players had to work out that the coordinates referred to telephones and times that they would ring. Players who correctly answered telephone questions were rewarded with 30 s of new material. The ARG culminated in players being invited to visit one of four cinemas where they were provided with an opportunity to play *Halo 2* before its release date and receive a commemorative DVD. McGonigal (2008) argued that the gameplay within *I Love Bees* develops "collective intelligence" through three stages: a) collective cognition, b) cooperation, and c) coordination. She believes these distinct stages of collaboration occur through three aspects of game design, namely: a) massively distributed content, b) meaningful ambiguity, and c) real-time responsiveness, and "that these elements form a reproducible set of core design requirements that may be used to inspire future learning systems that support and ultimately bring to a satisfying conclusion a firsthand engagement with collective intelligence".

An ARG that was less of a marketing tool and aimed more at stimulating serious debate and serious discussion – a 'serious ARG' – was *World Without Oil* (WWO) that was created in 2007 and focused on key issues relating to a possible near-future global shortage of oil (Ash, 2008). This ARG outlined the realistic conditions surrounding a future oil shock and players were called upon to imagine and document their lives under such conditions. Players were invited to post stories as either blog entries, images, videos, or by emailing and phoning in their entries to WWO puppetmasters. The ARG's website contained the player material, as well as the game's characters documenting their own lives and commenting on player stories on community and individual blogs, as well as IM, chat, Twitter and other media. According to Connolly et al. (2009) the value of the WWO ARG was in playing out scenarios in a serious way, it aimed to apply collective intelligence and imagination to the problem in advance and create a record that had value for key stakeholders such as educators, policymakers and the public in helping anticipate realistic future scenarios and prevent their worst outcomes through building a community. Despite its educational purpose, *World Without Oil* has been criticised in the ARG community as not being an authentic Educational Alternate Reality ARG because the game did not contain a collaborative storyline with a trail of puzzles to solve (Brackin, 2008).

2.3.1. Educational value of ARGs

ARGs have mainly been applied within the field of marketing and promotion of entertainment related products such as computer games (e.g. *Halo 2*), TV series (e.g. *Lost Experience* and *FIND815* used to promote the TV show *Lost*) and music (e.g. *Year Zero Nine* – an ARG to promote the album of the band *Nine Inch Nails*). However, in recent years the value of using ARGs in the educational field has been recognised. Moseley (2008) highlighted a number of features that ARGs offer that could be of value within educational contexts, which include:

- *Problem solving at varying levels (graded challenge)* enabling students to select their own starting level to work up from.
- *Progress and rewards (leaderboard, grand prize)* which also could be used in assessment.
- *Narrative devices (character/plot/story)* can also be used for academic subjects that draw upon histories, themes, news etc.
- *Influence on outcomes* enables students to scaffold their path to becoming critical academic thinkers by influencing certain aspects of their course.
- *Regular delivery of new problems/events* helps maintain student engagement and interest.
- *Potential for large, active community* provides a means for greater engagement which is self-supporting/scaffolding as group numbers increase.
- *Based on simple, existing technologies/media* means that technology barriers in terms of cost and access are minimised.

Based on the work of Malone and Lepper (1987) on intrinsic motivation, Davies, Kriznova and Weiss (2006) suggest several guidelines for ARGs in order to promote challenge, fantasy and curiosity, which include:

- Players must be able to tangibly affect the outcome of the ARG.
- There must be an overriding goal/challenge as well as sub-goals and sub-challenges with positive and negative outcomes based on player actions.
- The ARG must require mental skill.
- The outcome must be uncertain at the outset.
- The ARG must require the player to develop strategies in order to succeed.
- The ARG must offer multiple paths to success.
- Players must be able to overcome most obstacles in the ARG.

An early example of the use of ARGs within an educational context was the eMapps project (Motivating Active Participation of Primary Schoolchildren in Digital Online Technologies for Creative Opportunities through Multimedia), which combined online games and mobile technologies to demonstrate how an enriching learning environment can be provided for children (9–12 year olds) in New Member States in Europe (Davies et al., 2006). The main objectives of the eMapps project included:

- Building communities of creative networking children in New (European) Member States, generating their own cultural content and communicating with peer groups in other countries.
- Developing adaptable interactive tools with which to deliver learning objectives and which help to integrate the use of ICT in the delivery of the school curriculum.
- Creating a child's living map of Europe, based on geography, history and heritage, accessible through mobile devices, which can be continuously expanded as an important and rich content resource for schools in New European member States and elsewhere.

For the gameplay, the students were divided into two groups. One group based within a school controlled and managed the 'game desktop' and sent challenges to players in the field to guide their activities, as well as receive information back in the form of photos, audio or video evidence that a challenge had been met. Another group used a range of mobile devices such as smartphones, PDAs, laptops, GPS devices to navigate the game territory while completing tasks and challenges within the game. The teachers' role was to monitor and control the activities of both groups. From an evaluation of a pilot of the project, teachers reported that the children learnt new transferable ICT skills from using the mobile technologies, as well as learning a range of skills such as teamwork, cooperation, analytical skills, planning skills and navigating in real and virtual spaces. Other outcomes included situations where passive children emerged as leaders in some games and shy children spoke up more in games (Brophy, 2008). Barriers to the effective use of the ARG included access to ICT facilities among project partners, teacher training, health and safety issues, linking games to the school curriculum and a lack of recognition in the assessment of social skills (Balanskat, 2008).

Another example of the use of ARGs within an educational context was the ARGOSI project funded by the Joint Information Systems Committee (JISC) in the UK, which was aimed at supporting the student induction process in a Higher Education Institution, as a more engaging and interactive means than more traditional methods. Areas that the ARG focused on included gaining library and information skills, creating social networks, as well as navigating the city and university campus. The ARGOSI project encouraged students to establish friendships and work within communities in undertaking challenges within the game (Whitton, Wilson, Jones & Whitton, 2008). From a series of interviews, the ARGOSI project identified six motivation elements of ARGs that may engage students, as shown in Table 1 (Whitton, 2009).

3. The design of an ARG for language learning

The ARGuing for Multilingual Motivation in Web 2.0 project was an EU Comenius project that ran from 2007 to 2009 and investigated the use of ARGs in motivating secondary school students to learn a modern foreign language. ARGuing was a cutting-edge project that addresses two fundamental needs in European education in an innovative manner. Firstly, how to bridge the widening technological gap between educators and their students and, secondly, how to motivate students to understand the benefits of learning languages at a level that impacts on their existing personal lives. Thus, the aim of the project was to develop an ARG that would allow groups of students from across

Table 1
Possible motivations elements of ARGs.

Element	Possible Implementation
Community	Collaborative activities, communication tools
Competition	Prizes, leader board
Completion	Overview of complete structure, pieces needing filled in
Creativity	Creative challenges that involve making artefacts
Narrative	On-going storyline that contains a mystery
Puzzle-solving	Challenges based on puzzle-solving

Europe to work collaboratively in undertaking quests that could be puzzles, assignments and quizzes. Quests could also involve answering multiple choice questions, translating languages, as well as uploading files and sharing content on the Internet. The language learning focus of the ARG was provided through the situation that students had to communicate in the language they were learning in undertaking the quests. The role of the teachers was as puppetmasters, dynamically intervening to scaffold and further challenge students. In keeping with other ARGs, not all of the game was scripted before commencement.

There were a number of design challenges that the project team from across Europe (Scotland, England, Bulgaria, Spain, the Netherlands) had to face in relation to the ARG, namely:

- How to design an integrated set of multilingual, multimedia problems that require collect effort to solve?
- How to create an interface to communicate individual, differentiated roles within the collaborative structure?
- How to design for collective intelligence, rather than 'hive mind' or 'mob effect'?
- How to produce a replicable solution that can be used by modern foreign language teachers across Europe?
- How to ensure that the system is secure so that only authorised users can access the system – particularly important within the context of students?
- How to evaluate the usefulness of ARGs for learning a modern foreign language?

Our research indicates that the ARGuing project was one of the first globally to apply an ARG at secondary school level; to create an ARG that embeds multilingualism within its core framework; to use the techniques and technology, as utilised within an ARG to build a replicable educational methodology; to motivate language learning by placing language at the core of a game that appeals to and engages young students at a personal level.

A number of advantages of developing and implementing an ARG for language teaching were identified by Tsvetkova et al. (2009) as providing the potential to:

- Practice the chosen language in a near authentic situation not provided in a traditional classroom. The rationale for the development of the ARG is one based on providing a more interactive, engaging and meaningful real-world context within which students can learn another European language without being confined to a classroom. The importance of this factor is that students can sometimes read and write in a foreign language without great difficulty, however oral language competence can be a problem as a result of a lack of opportunity to practice the target language.
- Enable students to express themselves without worrying about mistakes due to the focus on the teaching, instead re-focussing on communicating in the language rather than being tested on the specifics relating to flawless grammar. As highlighted by Gee (2003) one of the benefits of computer games is their risk taking element in allowing players to experience minimal real world consequences. Thus, within the context of language teaching, students are more likely to try and communicate in their chosen European language without fear of worrying about failure, hence providing a more open and inviting learning environment.
- Be provided with an opportunity to learn from peers, which helps build a more friendly, supportive, encouraging and less intimidating environment than a traditional classroom environment. The rationale for the development of the ARG was to allow students to interact and collaborate with other students from across Europe. This allowed for a more interactive, relevant and real learning experience and environment that could be otherwise experienced from a single isolated physical classroom where students cannot as easily engage with other students who speak the language they are attempting to learn.
- Learn through undertaking tasks that invite the students to come up with more creative solutions to quests. The rationale for the development of the ARG was to provide a more interesting, engaging and stimulating learning environment than can be provided by the traditional physical classroom. Since many young learners throughout Europe engage in social networking via websites such as Facebook, as well as play computer games, the rationale for the development of the ARG was to provide a more familiar and stimulating learning environment and experience within which students could explore creative solutions to quests.
- Initiate conversations on topics relating to quests and occupy a leading position that helps build a student's self-confidence in mastering their knowledge of the chosen language. Through the development of the ARG, students from across Europe are able to interact more readily with each other in developing their knowledge in more of a student-led way such as setting up guilds or starting forums and blogs.

3.1. The Tower of Babel ARG

The scenario for the development of the ARG was based on a set of characters who collectively plan to build a contemporary *Tower of Babel*, which refers to notions and values well established in European civilisation. The characters, along with the game participants,

discover through the game how to build the foundations of the tower which are based on the principles and values of Europe including democracy, tolerance and respect, freedom and the rule of law, and access to education. The gameplay for the ARG centred around promoting plurilingualism in which the storyline is based around taking students to a future world in order to save languages that are under threat and can only be saved if students collaborate with each other and with ARG characters to bring people from different parts of Europe together by learning more about each others' histories, traditions and daily lives of the people. Through building the foundations and the tower step-by-step, the aim is for students to gain an understanding of other languages and cultures. The tower was designed as an ever growing wiki where students could add their own building blocks, which could be narrative, videos, quests, blogs, emails, as well as text. As part of the gameplay, students have to send information about languages and cultures to a futuristic world where both have vanished to save the earth from the same fate. Communication in different languages from the future is sent by a secret rebel society, which arrives to the players through email and through a special game portal. Members of the secret society ask players to solve a series of quests to help the world of the future remember what culture and languages are. If players find the right answer then they can add blocks to their virtual *Tower of Babel*.

In order to find answers to some quests, students need to conduct research and were encouraged to use search engines and other resources. Some of the quests required a correct answer – using multiple choice whilst other quests involved more open-end questions that required students to upload text, sound and image files that are representative of themselves and their cultures. Most of the quests involved students searching for the information and working collaboratively with other students who were speakers of different languages – for example, Bulgarian learners of English would have to identify Spanish learners of English or French learners of Spanish in order to find out information relating to a particular quest. As well as student–student interaction, the ARG was also designed to enable students and teachers with opportunities to interact, i.e. teacher–student, teacher–teacher interaction. The initial multilingual pilot of the ARG was designed to support English, French, Spanish, German Dutch and Bulgarian languages.

Within the ARG, it was the ARG project team members who took on the primary role of puppetmasters in controlling the gameplay, although this was seen as a short term for the pilot measure since this role would be taken over by teachers themselves. Initially the role of the teachers was to monitor their own students and provide feedback to the puppetmasters who were able to monitor how the community as a whole was coping with the quests and providing hints and tips as considered appropriate through a variety of communication channels. The teachers help assess student work and decide if 'building block' points were to be awarded, as well as providing guidance to their students. It was intended that after the pilot had been completed, teachers and students would be able to generate their own quests using themes that might have been discussed in the classroom and fitted their own educational programmes and objectives.

In order to adequately prepare the teachers for using an ARG for language learning, online teacher training activities were developed in which they were able to familiarise themselves with the interface and user environment in using the different communication media such as forums, messages, emails in interacting with other teachers and the ARG project team members.

3.2. The development of the ARG platform

In relation to the development of the actual ARG, the project team was faced with two main options of either developing the ARG platform 'from scratch' or using an existing platform that could be adapted to meet the project requirements. In order to be able to develop a reliable and workable prototype of the ARG and pilot it with teachers and students from across Europe, the project team decided that given time and financial constraints that affect the development of many educational technology-based projects and platforms, to adapt an existing platform.

Many open-source Virtual Learning Environments (VLEs), for example, Moodle, Sakai, Claroline, provide features for facilitating and supporting online learning (Dougiamas & Taylor, 2003; Yueh & Hsu, 2008), including: document sharing, assignment uploading, online assessment, online gradebooks, forums for synchronous discussion, and chatrooms/online classroom for synchronous web-based text-based discussions. In addition, many VLEs support the development of plug-ins and extensions that allow features such as video conferencing and wikis to be added by developers or third parties. As a result of an evaluation of several VLE platforms, the ARG project team decided to adopt Moodle due to its extensibility as a result of being based on PHP and MySQL. Areas that were identified as requiring further development and expansion to meet the requirements of the ARG were:

- The development of a 'game look and feel' theme in Moodle due to existing themes not conveying the ARG environment that the project team required. The game look and feel theme was developed for the *Tower of Babel* through the development of a theme based on XHTML and CSS that is shown in Fig. 2.
- Since an aim of the ARG project was to provide a learning environment that the students could feel was their own rather than just being controlled by teachers and one that sought to encourage participation and interaction, students were provided with an opportunity to reflect on their own work, as well as compare their solutions and answers with that of others completing the quests. Thus, an empathy score system was used in which students could vote by rating the level of collaboration of other students and how helpful they found their postings to be. This sought to encourage students to collaborate more in undertaking the quests, as well as providing an informal means of assessing how well students were doing. The other scoring system was provided by teachers who awarded building blocks to students based on how well they were judged to have completed a quest. Thus, students were being assessed by teachers, as well as through informal peer assessment which was aimed at increasing the sense of ownership of the ARG, as well as motivate students to collaborate and participate with others. The empathy and scoring of students is shown in Fig. 3.
- In order to enable the students to view their progress through the game, the project team created a Flash animation to show their score as a percentage the amount of the tower they had constructed, as shown in Fig. 4.
- Moodle was also extended to automatically release parts of the storyline through forum and blog postings. This meant that parts of the game could be set up in advance and automatically released at specific points in time without requiring manual intervention.



Fig. 2. The Tower of Babel theme within the ARG.

4. The evaluation of the Tower of Babel ARG

As highlighted previously, the issue of evaluation was an important one for the ARG project team due to the fact that there is a lack of empirical studies analysing the usage of such applications as well as general models of evaluation (Connolly, Stansfield, & Hainey, 2007). A detailed evaluation was conducted with both language teachers and students across Europe. Before the main pilot was evaluated in 2009, two mini-plots were run at the end of 2008 in Bulgaria and early 2009 in Spain. The purpose of the mini-plots was to identify any problems and issues that could be addressed prior to the main pilot study. The course for language teachers was divided into two parts, namely 'Getting to know you', which focused on teachers getting to know each other and contributing to forum discussions, and 'Teacher info sessions'. The teacher training course focused on two types of task, namely ARG-specific and foreign language teaching specific tasks. Most of the tasks had objectives relating to the development of language skills, as well as skills relating to Web 2.0 such as contributing to a forum discussion. During the mini-plots, a number of issues were identified, namely:

- It was considered that the game was too long in the first mini-plot at 15 days and as a result it was reduced to 8 days in the second mini-plot.

	Denitsa Petkova	Paisley	United Kingdom	13 days 5 hours		
	Maria Mietla	Wawrzeńczyce/Kraków	Poland	13 days 5 hours		
	Nikolay Kalev	Sofia	Bulgaria	13 days 7 hours		
	Troqn Malinov	чеканчево	Bulgaria	13 days 7 hours		
	Victor Todorov	Sofia	Bulgaria	13 days 8 hours		
	valentina brzuhalaki	Izola	Slovenia	13 days 9 hours		
	Laby Cullen	gorna malina	Bulgaria	13 days 12 hours		
	Kris Mattheeuws	Paisley	United Kingdom	13 days 15 hours		

Fig. 3. Empathy and scoring of the students.

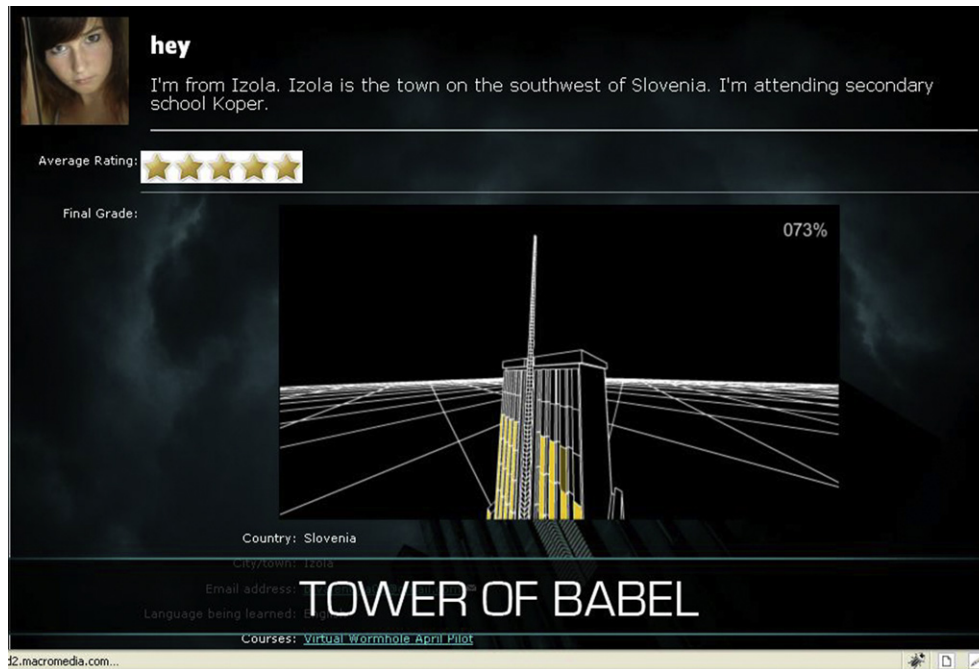


Fig. 4. Tower of Babel construction shown as an animation.

- From the two mini-plots, it was identified that there were too many quests, which were subsequently reduced for the main pilot.
- From the two mini-plots, it was identified that some quests were not fully integrated with the storyline, which was subsequently rectified for the main pilot.

4.1. Methodology

According to Maguire, Elton, Osman, and Nicolle (2006) the general experimental designs of studies evaluating games-based learning are experimental as opposed to quasi-experimental and are often based on pre-test/post-test approach. In the specific case of the ARG study, its distributed nature meant that it would not have been feasible to have set up multiple control groups. Since the ARG study was primarily concerned with areas such as student motivation, engagement, technical issues and attitudes, the experimental design used for the study was pre-test → ARG intervention → post-test.

4.2. Procedure

Each student was sent a pre-test questionnaire (see Appendix I) which was designed to collect demographic and learner type data, details of foreign languages learnt, skills that students believe can be obtained from computer games, important reasons and motivations for playing computer games. The students were given the opportunity to play the *Tower of Babel* ARG in the classroom and at home for a period of 10 days. After this period a post-test questionnaire (see Appendix II) was sent to students in order to learn their views about the game, how much time they had devoted to playing the game, their motivations for playing the game, as well as technical aspects and skills relating to the game. Additional questions were asked about realism, confusion and complexity in using the game. The majority of the questions posed in both the pre-test and post-test questionnaire were of a fixed response nature. Due to the age groups involved and lack of previous experience in completing questionnaires it was decided to try and keep the questionnaire as focused and as straight forward for the students to complete as possible to avoid any confusion and the students feeling overwhelmed by the nature of open questions. The pre-test and post-test questionnaires were created and implemented through SurveyMonkey and the results analysed using SPSS version 15.

4.3. Results

The main pilot of the ARG took place with students in April 2009, with 328 students from 28 schools across 17 European countries. In terms of the number of students completing the questionnaires, 105 students completed the pre-test, 92 students completed the post-test and 45 students completed both the pre-test and post-test questionnaires. In reference to the pre-test questionnaire, the demographics of the students were 34.3% male and 65.7% female, with a mean age of 14.22 years (Standard Deviation (SD) = 0.85) with a range of 12–15. Students spent an average of 4.58 h (SD = 5.47) a week playing computer games. The foreign languages being studied by students were: English (89.5%), German (24%), French (11.4%), Russian (7.6%), Spanish (7.6%), Italian and Bulgarian (6.6%).

Table 2
Reasons for playing computer games.

Reasons	Rank	Mean	SD
Challenge	1st	3.74	1.08
Cooperate	2nd	3.64	1.24
Fantasy	3rd	3.60	1.30
Curiosity	4th	3.51	1.30
Pleasure	4th	3.51	1.20
Compete	5th	3.48	1.10
Feel Good	6th	3.38	1.17
Prevented Boredom	7th	3.38	1.28
Relax	8th	3.27	1.47
Escape Stresses of Life	9th	3.24	1.31
Leisure	10th	3.23	1.38
Release tension	11th	3.12	1.37
Control	12th	3.11	1.50
Avoid Other Activities	13th	2.85	1.43
Recognition	14th	2.85	1.38
Emotional Stimulation	15th	2.79	1.38

From the pre-test questionnaire, the students believed that computers games would provide them with the following skills: Creativity (63.8%), collaboration/teamwork (51.4%), problem-solving (49%), reflection (37.1%), critical thinking, analysing/classifying, leading/motivating (35.2%), and management skills (28.5%). The majority of the students (66.7%) preferred cooperative learning – learning by working with other students. Due to the collaborative nature of the ARG game, this particular learning preference was expected. Table 2 shows the mean rating for each reason for playing computer games along with the order of importance for its rating and Table 3 shows the mean rating for the importance of aspects in a game with the order of importance of its rating.

From the post-test questionnaire, the mean amount of time students spent playing the game in class was 1.94 h a week (SD = 2.41) with a range of 0–10.33 h indicating that different time allowances for playing the game in class may have been a factor. Students played the game for a greater amount of time in their own time (3.66 h, SD = 3.82, range 0–17.5) possibly indicating that the game was more intrinsically enjoyable outside the classroom environment. The reliability of Internet access to the ARG was considered by the students to be generally good with 32 (35%) of students indicating that it was very good, 42 (46%) of students indicating that it was good and 11 (11.9%) indicating that it was medium.

78% of students indicated that the ARG met their expectations and 61% of students indicated that they did not find the game confusing. In addition, 78% of students indicated that the level of realism and the level of complexity of the ARG were appropriate. Students believed the skills they obtained and developed from using the ARG included problem-solving skills (49.4%), reflection skills (37.6%), analysing and classifying skills (45%), collaborative and teamwork skills (55%), leading and motivating skills (43%), critical thinking skills (31%), management skills (31%), and creativity skills (54%). The ranking of students' motivations for playing the ARG are shown in Table 4.

Negative comments about the ARG included: “It was more like a website and forum than a ‘game’ in 3D”, “The story of the game wasn’t much connected with the quizzes”, “I was expecting it to be more interesting and for more people to take part in the game facilities”. Other problems and issues identified by some students included: “There were some misunderstandings on my side as I skipped some instructions in order to save more time on playing the quest”; “I found some quests hard to understand – I mean the questions were unclear”; “I was confused when I couldn’t find where those diaries of the characters were and I didn’t know where to look for information on their personalities”.

Despite some negative comments towards the ARG, the attitudes of the students were generally very positive. 29% who completed the post-test questionnaire strongly agreed and 35% agreed that the ARG was a social activity, with only 5% strongly agreeing and 13% agreeing that playing the ARG was a waste of time. 13% strongly agreed and 38% agreed that the ARG helped them to develop new skills, 19% strongly agreed and 54% agreed that playing the ARG was an interesting activity, while 14% strongly agreed and 34% agreed that the game was a worthwhile activity. In addition, 18% strongly agreed and 41% agreed that playing the ARG was an enjoyable activity, 15% strongly agreed and 41% agreed that playing the ARG was a valuable activity, and finally 19% strongly agreed and 32% agreed that the ARG was an exciting activity.

In terms of comparing pre-test and post-test results, 45 students had completed both questionnaires. 105 students completed the pre-test and 92 students completed the post-test questionnaire. As a result, *within sample tests* can be performed for the 43 students as

Table 3
Importance of aspects of computer games.

Aspect	Rank	Mean	SD
Narrative	1st	4.08	0.99
Help and Support	2nd	3.97	1.03
Story	3rd	3.95	1.18
Solving Quests	4th	3.88	1.14
Realism	5th	3.84	1.09
Characters	6th	3.80	1.02
Collaboration	7th	3.70	1.31

Table 4
Students' reasons for playing the ARG.

Reasons	Rank	Mean	SD
Control	1st	3.71	1.28
Curiosity	2nd	3.61	1.19
Fantasy	3rd	3.45	1.18
Pleasure	4th	3.36	1.37
Leisure	5th	3.38	1.28
Cooperate	6th	3.36	1.30
Avoid Other Activities	7th	3.30	1.42
Emotional Stimulation	8th	3.30	1.21
Feel Good	9th	3.19	1.22
Release Tension	10th	3.13	1.28
Escape Stresses of Life	11th	3.13	1.32
Recognition	12th	3.10	1.32
Relax	13th	3.07	1.30
Challenge	14th	3.06	1.35
Compete	15th	2.92	1.35
Prevented Boredom	16th	2.89	1.31

one group and *between sample tests* can be performed on the remaining students as independent groups, that being the 60 students remaining in the pre-test group and the 47 remaining in the post-test group. In relation to motivations, the pre-test questionnaire asked students what motivations they considered to be important in games and the post-test questionnaire asked them what motivations they considered to be important in the *Tower of Babel* ARG, enabling an assessment as to whether important motivations have been incorporated into the ARG.

In relation to motivations only 1 out of 16 showed a significant reduction, namely that of fantasy. A Wilcoxon matched pairs signed ranks test between the 45 pre- and post-test students only showed a significant difference with regards to fantasy ($Z = -2.842, p < 0.04$). The mean score for fantasy in the pre-test (3.71, $SD = 1.24$) was greater for fantasy in the post-test (3.14, $SD = 1.30$). The lower mean suggests that while fantasy is considered important in games in general, it can be an area potentially lacking in the ARG and in need of improvement. When the independent groups are compared, a Mann–Whitney U test indicated that the only motivation that had a significant difference was recognition ($Z = -2.146, p < 0.03$). The mean in the pre-test is significantly lower than the mean in the post-test indicating that the ARG provided students with more recognition than they initially expected from computer games in general. In terms of technical aspects of the ARG, the independent groups showed a significant difference in relation to story ($Z = -2.981, p < 0.003$) and characters ($Z = -2.946, p < 0.003$). The mean in the pre-test was significantly higher than the post-test indicating that the ARG story or characters did not meet the students' expectations and thus in need of improvement. In the group of 45 who completed both the pre- and post-tests a Wilcoxon matched pairs signed ranks test showed that there was no significant differences with regards to narrative, characters, help and support, solving quests and collaboration, however there was a significant reduction with regards to story and realism. This appeared to indicate that the ARG did not meet the students' expectations of these technical aspects in comparison to what they expect of computer games in general.

Despite these areas identified as potentially lacking and in need of improvement, the majority of students who completed the post-test questionnaire either "agree" or "strongly agreed" that they would be willing to play the ARG over a prolonged time period, and that they would play it as part of a foreign language course. In addition, the majority of students stated that they found the game engaging and it motivated them to learn and use foreign languages. Students played the ARG for a greater amount of time in their own time (3.66 h, $SD = 3.82$, range 0–17.5) indicating that the game may have been more intrinsically enjoyable or more suitable and accessible within the context of a home environment.

In relation to the training course with language teachers, a total of thirteen countries took part across Europe. Out of the 95 language teachers who took part in the pilot, 81% had previous experience in playing computer games. In relation to using computer games in teaching languages to students generally, the agreement of the teachers who took part in the study was shown by a pre-game questionnaire, which was completed by 42 teachers in which:

- 86% considered computer games add fun to the language lesson.
- 90% considered using computer games motivates students to learn better.
- 79% considered using computer games adds variety to the language lesson.

The post-game questionnaire was only completed by 19 language teachers, however, favourable feedback was received that included:

- 79% believed their students had really enjoyed the game.
- 89% believed the game was appropriate for motivating their students to learn a second language.
- 89% stated that they would use the game again in their language teaching.

In terms of less favourable experiences the project team noted that some teachers felt disappointed and frustrated when the ARG platform did not react as quickly as they expected it to, as well as the occasional technical problem. Some teachers (5%) considered that it might be too difficult to monitor students' actions throughout the game.

5. Discussion

Despite some negative comments, the ARG project team considers the pilot study to have been largely successful with feedback from both language teachers and students generally being supportive and favourable. During the time that the ARG ran students uploaded 826 files that included images, audio, video and presentations, and submitted 9135 quest answers. One of the main problems in undertaking the evaluation was the lower than anticipated response rate from the students who had completed both the pre-test and post-test questionnaire which was considerably lower than for students who had completed either the pre-test or post-test questionnaire. The specific reasons for this are not entirely clear, but with it not being mandatory for students to complete the questionnaire then students may not have understood the importance of completing the questionnaires. A criticism of the evaluation is that it could potentially be affected by an unrepresentative sample containing some bias in that students who liked the ARG may have been more likely to have completed the post-test questionnaire. However, the ARG project team are confident that there was sufficient data collected and analysis on different student groups appears to provide evidence in support of the potential of the ARG in motivating students into learning a second language and interacting with peers in different languages. The majority of students who used the ARG and completed the post-test questionnaire indicated that the ARG met their expectations and that they would be willing to play the ARG over a prolonged period of time as part of a foreign language course. The use of the ARG potentially provided a novel way of interacting with students from across Europe in learning another language, as well as using Web 2.0 and games-based learning components in order to enhance motivation in relation to interaction and participation.

A number of key lessons and issues were identified by the ARG project team as a result of the initial pilot study. It was found that some of the ARG story, characters and realism did not meet students' expectations. This could be because the students are used to playing more technologically sophisticated commercial computer games that can cost £millions to develop and provide depth of characters, story and realism that cannot be easily matched within an academic environment where resources can be more tightly constrained.

Another issue that was highlighted was the amount of time involved in marking quests by the puppetmasters or language teachers, which because they were not automatically scored some had to be carried out manually. This was a problem with 300 students participating in the ARG on a daily basis putting immense pressures on the markers to ensure that students received their scores in a timely manner in order for them to continue onto the next quest. Eight out of 47 quests required manual marking, which was deemed by the ARG project team and language teachers to be acceptable given that the purpose of the ARG was to *motivate* students into learning a second language and interacting with their peers in different languages, rather than focussing on specifically being used to teach a second language where more manual marking might be required.

In terms of future development of the ARG, the project team would like to implement mini-games in Java or Flash to further engage and motivate the students. This might be an area that can further help motivate the students in relation to the ARG's story, which results seemed to suggest did not meet the expectations of as many students as the project team would have liked. Many ARGs involve searching for clues across multiple websites. The *Tower of Babel* ARG took place within one Moodle platform. Moodle has a network module that allows a user in one Moodle installation to access resources in another Moodle installation. The feature supports single sign-on so that once the user has logged on to the first system, the user does not need to log on to the second system. As a future development, we would have a number of Moodle installations, each with a different look-and-feel (i.e. a different Moodle theme), to give the impression that the student is accessing different websites.

6. Conclusions

Overall the evidence collected from the pilot study appeared to indicate that the *Tower of Babel* ARG provided a potentially useful educational platform for motivating students to engage in activities relating to the learning of a second language. Both language teachers and students considered the ARG to have provided a stimulating and collaborative environment and provided opportunities for them to engage with their peers in different languages from across Europe in sharing knowledge and ideas using a range of Web 2.0 technologies that would not have normally been available to them within a traditional classroom environment. There were areas where the ARG can be improved and further developed such as in providing more of a 3D gameplay environment and gaming activities, as well as in further developing story lines, game characters and learning experiences. The ARG project has demonstrated that where they had previously been mainly used within marketing and promotional activities, the educational potential for ARGs is worth exploring in more detail. There are many other subjects and educational areas that might benefit from using ARGs such as environmental sustainability, politics and international relations where players can collaborate from across different countries and have to react to changing situations that may be the result of their ideas and actions. Clearly there are time and cost issues in developing and implementing ARGs within an educational environment, however, as this project has shown they can be developed at comparatively low cost by adapting existing open-source platforms. If we are to motivate and engage young learners of the future, then we must look beyond the constraints of the traditional classroom environment. Teenagers and young adults commonly interact with their friends across different countries using social software and Web 2.0 platforms. It is vital that educational professionals embrace the pedagogic value of such technology and adopt it within the classroom environment. A failure to achieve this may result in many students disengaging with the educational system and not reaching their full potential. The *Tower of Babel* ARG has demonstrated that combining collaborative learning, Web 2.0 applications, as well as gaming can considerably help in motivating and engaging students in learning a second language, which traditionally in some countries can be a very difficult task to achieve.

Acknowledgements

This work was supported by the EU Comenius Programme under contract 133909-2007-UK-COMENIUS-CMP.

Appendix I

Appendix I

Student Pre Alternate Reality Game (ARG) Questionnaire.

1. What is your email address?

2. Are you male or female?

Male

Female

3. What age are you?

4. What is the name of the class that you are using the game in?

5. On average, how many hours a week do you play computer games?

Less than 1

1 - 5

6 - 10

11 - 15

16 - 25

More

6. What foreign language are you learning?

French

German

English

Dutch

Spanish

Bulgarian

Other (please specify)

The goals in the game were clear.

The game managed to keep my concentration.

The game kept me sufficiently challenged.

The game provided appropriate feedback on success or progress towards completing game tasks.

6. Was the game what you expected?

- Yes
- No

If 'No' please explain why

7. Please provide a definition of an Alternate Reality Game:

8. In your own words, what was the game activity all about?

Playing the game made me feel good.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Playing the game stimulated me emotionally.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Playing the game allowed me to escape the stresses of life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Playing the game helped to stop me from being bored.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Playing the game helped me to release tension.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. Please rate what you thought of the aspects of the game:

	Very Good	Good	Neutral	Bad	Very Bad	Don't Know
The Story	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Narrative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Characters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Collaboration (with classmates and students in other schools)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Help and Support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Realism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solving Quests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. Please rate how strongly you agree with the following statements:

Playing the game was enjoyable.

Playing the game was a lonely activity.

Playing the game was a valuable activity.

Playing the game was exciting.

16. Did you experience any confusion while playing this game?

Yes

No

If yes (please explain why)

17. Did you believe the realism of the game to be adequate?

Yes

No

If no (please explain why)

18. Was the complexity of the game adequate?

Yes

No

If no (please explain why)

19. Would you like to experience more of this integration between Information and Communication Technologies (ICT) and language learning?

- Yes
- No

Please explain your answer

20. What skills do you think you got from the game?

- Problem Solving Leading/Motivating
- Reflection Critical Thinking
- Analyzing/Classifying Management
- Collaboration/Teamwork Creativity

Other (please specify)

21. Please list any new elements you would like to see in the next version of the game in terms of technology, storyline and game design.

Technology

Storyline

Game Design

References

- Ash, K. (2008). Alternate reality games: bridging imaginary and real worlds. *Digital Directions*, 2(2), 18.
- Balanskat, A. (2008). eMapps.com – Impact on policy and recommendations for policy makers. *Learning through games and mobile technology conference. eMapps.com final event*, 12 February 2008, Prague.
- Brackin, A. (2008). Tracking the emergent properties of the collaborative online story “Deus City” for testing the standard model of alternate reality games (Doctoral dissertation, The University of Texas at Dallas, 2008). *Dissertation Abstracts International*, 69, 3A.
- Brophy, P. (2008). Learning impact. *Learning through games and mobile technology conference. eMapps.com final event*, 12 February 2008, Prague.
- Connolly, T. M., Stansfield, M. H., & Hainey, T. (2007). An application of games-based learning within software engineering. *British Journal of Educational Technology*, 38(3), 416–428.
- Connolly, T. M., Stansfield, M. H., Hainey, T., Cousins, I., Josephson, J., Rodriguez Ortiz, C., et al. (2009). “Arguing for multilingual motivation in web 2.0: an evaluation of a large-scale European project”. 3rd *European conference on games-based learning (ECGBL)*. Graz, Austria.
- Crookall, D. (2007). Second language acquisition and simulation. *Simulation & Gaming*, 38(1), 6–8.
- Davies, R., Kriznova, R., & Weiss, D. (2006). eMapps.com: games and mobile technology in learning. In: *Proceedings of first European conference on technology enhanced learning, EC-TEL 2006*. Crete, Greece, October 1–4, 2006.
- Dougiamas, M., & Taylor, P. C. (2003). Moodle: using learning communities to create an open source course management system. *ED-MEDIA 2003 conference*. Honolulu, Hawaii.
- de Freitas, S. (2006). *Learning in immersive worlds*. Joint Information Systems Committee.
- García-Carbonell, A., Rising, B., Montero, B., & Watts, F. (2001). Simulation/gaming and the acquisition of communicative competence in another language. *Simulation & Gaming*, 32(4), 481–491.
- Gaudart, H. (1999). Games as teaching tools for teaching English to speakers of other languages. *Simulation & Gaming*, 30(3), 283–291.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.

- Green, C. S., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature*, 423, 534–537.
- Green, C. S., & Bavelier, D. (2007). Action-video-game experience alters the spatial resolution of vision. *Psychological Science*, 18(1), 88–94.
- Griffiths, M. (2004). Can videogames be good for your health? *Journal of Health Psychology*, 9(3), 340–343.
- Griffiths, M. (2005). Video games and health. *BMJ(British Medical Journal)*, 331(7509). <http://www.bmj.com/content/331/7509/122.full>.
- Halleck, G. B. (2007). Second language acquisition and simulation. *Simulation & Gaming*, 38(1), 31–34.
- Hays, R. T. (2005). *The effectiveness of instructional games: A literature review and discussion*. Technical Report 2005-004. Orlando, Florida: Naval Air Warfare Center Training Systems Division. <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA441935&Location=U2&doc=GetTRDoc.pdf>.
- Johnson, W. L. (2007). Serious use of a serious game for language learning. In R. Luckin, K. R. Koedinger, & J. Greer (Eds.), *Artificial intelligence in education* (pp. 67–74). Amsterdam: IOS Press.
- Johnson, W. L., & Wu, S. (April 2008). Assessing aptitude for learning with a serious game for foreign language and culture. In: *Proceedings of the ninth international conference on intelligent tutoring systems*. Montreal.
- Kim, J., Allen, J., & Lee, E. (2008). Alternate reality gaming. *Communications of the ACM*, 51(2), 36–42.
- Kim, J., Lee, E., Thomas, T., & Dombrowski, C. (2009). Storytelling in new media: the case of alternate reality games, 2001–2009. *First Monday*, 14(6).
- Leemkuil, H. (2005). *Is it all in the game? Learner support in an educational knowledge management simulation game*. Unpublished doctoral thesis. Enschede, The Netherlands: University of Twente.
- Maguire, M., Elton, E., Osman, Z., & Nicolle, C. (2006). Design of a virtual learning environment for students with special needs. *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*, 2(1), 119–153.
- Malone, T. W., & Lepper, M. R. (1987). Making learning fun: a taxonomy of intrinsic motivations for learning. In *Aptitude, learning and instruction. Conative and affective process analysis, Vol. 3* (pp. 223–253). Hillsdale, NJ: Lawrence Erlbaum.
- McGonigal, J. (2008). Why i love bees: a case study in collective intelligence gaming. In Katie Salen (Ed.), *Ecologies of play*.
- McLoughlin, C., & Lee, M. J. W. (2008). The three P's of pedagogy for the networked society: personalization, participation, and productivity. *International Journal of Teaching and Learning in Higher Education*, 20(1), 10–27.
- Moseley, A. (2008). An alternative reality for higher education? Lessons to be learned from online reality games. In: *ALT-C 2008*. Leeds, UK, 9–11th September 2008.
- O'Neil, H. F., Wainess, R., & Baker, E. L. (December 2005). Classification of learning outcomes: evidence from the computer games literature. *The Curriculum Journal*, 16(4).
- Prensky, M. (2001). *Digital game based learning*. New York: McGraw-Hill.
- Rankin, Y., Gold, R., & Gooch B. (2006) Gaming as a language learning tool. In: *Proceedings of the ACM SIGGRAPH educators program*, 2006.
- Rymaszewski, M., Au, W. J., Wallace, M., Winters, C., Ondrejka, C., & Batsone-Cunningham, B. (2007). *Second life: The official guide*. New Jersey: John Wiley & Sons.
- Shaffer, D. W., Squire, K. T., Halverson, R., & Gee, J. P. (2004). Video games and the future of learning. *Phi Delta Kappan*. <http://www.academiccolab.org/resources/gappspaper1.pdf>.
- Squire, K. (2002). Cultural framing of computer/video games. *Game Studies*, 2(1). <http://www.gamestudies.org/0102/squire>.
- Standen, P. J., & Brown, D. J. (2006). Virtual reality and its role in removing the barriers that turn cognitive impairments into intellectual disability. *Journal of Virtual Reality*, 10(3–4), 241–252.
- Standen, P. J., Rees, F., & Brown, D. J. (2009). Effect of playing computer games on decision making in people with intellectual disabilities. *Journal of Assistive Technologies*, 3(2), 4–12.
- Tsvetkova, N., Stoimenova, B., Tsvetanova, S., Connolly, T. M., Stansfield, M. H., Hainey, T., et al. (2009). Arguing For multilingual motivation in Web 2.0: the teacher training perspective. *3rd European conference on games-based learning (ECGBL)*. Graz, Austria.
- Whitton, N. (2009). Alternate reality games for orientation, socialisation and induction (ARGOSI): final report. Available at: <http://argosi.playthinklearn.net/final.pdf> Accessed 01.05.10.
- Whitton, N., Wilson, S., Jones, R., & Whitton, P. (2008). "Innovative induction with alternate reality games". In: *Proceedings of the second European conference on game-based learning*. Barcelona, 16–17 October 2008.
- Yueh, H.-P., & Hsu, S. (2008). Designing a learning management system to support instruction. *Communications of the ACM*, 58(4), 59–63.