Best Practices & Recommendations
GBL4ESL Project
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### Document Information

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Chapter 1: Introduction

This document outlines the experiences of the project partners, and the educators involved in the GBL4ESL project. It also provides recommendations related to the use of game based learning (GBL), and future actions in the GBL area.

The GBL4ESL project partners would like to thank all those who contributed towards making this project a success.

GBL4ESL Project

The main objective of the GBL4ESL project was to enhance educators’ digital competences and equip them with game-based learning tools and methodologies. The GBL4ESL TOOLKIT developed through this project (www.TOOLKIT-gbl.com) is a platform that can be used by educators to search for lesson plans and share game ideas to teach specific subjects such as Mathematics and English.

This project targeted students who were at risk of being early school leavers (ESL). The European Union set the target to reduce ESL to 10% across member states by 2020. Malta had a high rate of ESLs in 2013 (20.9%), and the Government aimed to reduce this rate over the years. Given that ESLs are typically disengaged from the traditional curriculum and teaching methods, this project sought to secure their interest by putting the student at the centre of the learning experience through GBL.

Key project outputs:

**TOOLKIT**: Educators can find meaningful games that have been tried and tested with students, as well as projects explaining how these games can be used in education and with which student cohort they work best.

**Guidebook**: The consortium has created a practical guide for educators. The guidebook contains examples of games and lesson plans that can be used to teach English and Mathematics.

Both the TOOLKIT and guidebook were widely disseminated amongst the GBL4ESL network and beyond.

**Recommendations & best practices** document to influence policy makers’ perceptions and future actions, and encourage educators to support GBL, create new initiatives, and try it out in class.
The GBL4ESL consortium consisted of five partners from Malta, Austria and Sweden. Below is a brief description of each one.

**Malta Information Technology Agency (MITA)**

MITA is the central driver and implementer of the Government of Malta, including IT programmes and initiatives, enhancing the public service delivery. It also provides the infrastructure needed to execute the ICT services to Government and to the Maltese citizens. MITA is also responsible to propagate further use of ICT in society and economy at large through promoting and delivering programmes to enhance ICT education and the use of ICT as a learning tool. MITA implements projects that bridge the digital divide, promote the use of technology in all aspects of society, and encourage professional development and lifelong learning.

**Donau-Universität Krems, Austria (DUK)**

The DUK provides continuing education with courses specifically designed to meet the needs of working professionals. The Centre for Applied Game Studies is part of the Department for Arts and Cultural Studies at the DUK. It was founded in 2006 and continues to be a pioneer in Europe in Game Based Learning (GBL). Staff and students from the Centre investigate the growing cultural importance and phenomena of digital games, focusing on education. The master's degree programmes focus on the benefit of the educational and interactive aspects of GBL. The Centre for Applied Game Studies plays a leading role in several National/International research projects related to GBL and gamification approaches related to the educational sector as well as extracurricular activities.

**University of Malta (UoM)**

The UoM is the only University in Malta. Around 10,000 students pursue their studies here, including c.a. 750 foreign/exchange students from nearly 80 different countries. Students follow full/part-time degrees/diploma courses, many of them run on the modular or credit system. The UoM has been involved as coordinator and partner in numerous EU-funded projects under various programmes totalling 86 projects in FP5/6/7, 8 projects in H2020, and 24 Projects in the last 2 years, and other international and regional programmes and initiatives. The UoM team is represented by the Department of Intelligent Computer Systems (ICS) within the Faculty of ICT covering aspects of serious game design and development, game-based teacher and student learning and game evaluation in Malta.
Nyströmska School, Sweden

Nyströmska Secondary School is a public school located in Söderköping, Sweden, that employs 87 educators with a student cohort reaching approximately 900. A third of the cohort has between 15 to 20 years of age, whilst the remaining two-thirds are over 20 years old. The school’s location is on a small rural campus approximately 180 km south of Stockholm. The school hosts many groups of students who have not yet completed the national criteria to begin Upper Secondary School but who will eventually join their peers at a later stage. These classes offer the potential early school leavers with the opportunity to eventually join the adult classes in areas related either to ICT, Tourism or hotel management.

St Margaret’s College, Malta

St. Margaret’s College is a network of seven primary and three secondary state schools, totalling 2,000 students and 370 staff members. The College Principal acts as the coordinator of this network and is supported administratively by a College Support Officer, a College Secretary and a College Precinct Officer. The schools are managed by a Head of School for each school supported by their Senior Management Team and their staff. The College also has a number of support staff with extensive professional qualifications and experience in counselling, teaching, career advising, youth work, social work and guidance teaching. These highly-trained professionals offer a wide array of support services to students and parents.

Multiplier Events and Short-Term Training

Over the duration of the project the consortium organised seven multiplier events, thus raising awareness on GBL. During the events educators and academics shared significant experiences that show the impact GBL has on students and their studies.

These events were attended by educators (both those involved in the project and those external to the project) as well as the general public. During the first events, the audience got acquainted with the project concepts and the game-based learning methodology. These events were an opportunity to bring together educators, GBL experts, and academics.

Two short-term training courses, one in Malta and one in Austria, were organised for educators from the partner countries. During this training, the educators were involved in hands-on sessions and provided their feedback to improve the accessibility and content on the TOOLKIT. They also had the opportunity to learn about GBL from their peers. Educators created GBL scenarios and uploaded them on the TOOLKIT, for other educators to use.

For more information please visit www.mita.gov.mt/gbl
Chapter 2: What is Game Based Learning?

The philosopher Bernard Suits (1978) has described the act of playing a game as a ‘voluntary attempt to overcome unnecessary obstacles’ (Suits 1978, p 41). As such, games require players to voluntarily accept the rules that define the permitted means of achieving the goal, adopting what he describes as a ‘lusory attitude’ (Suits 1978, p 35). More recently, education consultant Marc Prensky (2001) and game designers Salen and Zimmerman (2004) have taken a dimensional approach in defining games and identified a number of core elements; rules, goals (and objectives), outcomes (and feedback), conflict (competition/challenge/opposition), voluntariness, interaction and representation (or storyline).

With the inception of and rapid development in digital technologies, a number of these game features appear more vigorous in digital gaming platforms. These qualities include the ability to:

i. Offer instant and interactive feedback;

ii. Store and manipulate information in a multitude of forms (text, images, audio, 3D content, etc.);

iii. Automate complex processes;

iv. Enable and enhance both intra- and inter-game communication (Salen and Zimmerman 2004).

This has fuelled the interest of educators in starting to use digital games for learning purposes (de Freitas and Griffith 2007, Miller and Robertson 2010, Panoutsopoulos and Sampson 2012, Squire 2003), due to their close approximation to ideal learning contexts (Gee 2005). In fact, according to Norman (1993), optimal learning takes place in contexts which offer intensive interaction and feedback, have goals and procedures, are motivating, challenging and engaging, provide appropriate tools and avoid distractions. Moreover, motivational researchers Malone and Lepper (1987), argue that intrinsically enjoyable learning situations include elements of challenge, curiosity, control and/or fantasy. By allowing players to practice and enjoy play within but on the limits of their zone of proximal development, games cultivate a sense of motivation by presenting challenges matched to the abilities of the player (Malone 1980). Incentive systems in the form of badges, power-ups and other reward-like methods further sustain such motivation by encouraging players to improve their performance (Kinzer et al 2012). As such, far beyond their obvious success as entertainment media, digital games have increasingly gained attention as a facilitator of learning processes in education. This has led to the successful deployment of serious games, commercial off-the-shelf (COTS), online, massive multi-player games and other types and genres of games in the classroom context (de Freitas 2006, Squire 2003, Steinkuehler 2004, Whitton 2009).
The broad use of games with pre-defined teaching and learning outcomes, described as game-based learning (Shaffer et al. 2005, Tang et al. 2009), has seen games acting as hosts ‘into which curricular content can be embedded’ (Begg et al. 2005, p 1), where learning ‘matches up very well with emerging cognitive science research on how people think and learn’ (Squire 2005, p 7). In good games, which are ‘designed to getting themselves learned’ (Gee 2007, p 4), games scholar James Paul Gee (2007) ascertains an inbuilt ‘theory of human learning’ (Gee 2007, p 4), based on principles of learning which gamers master through gameplay. As such, apart from offering an environment for repetition and recall, games can be principally of benefit in developing and applying ‘high-level transferable skills – such as analysis, critical evaluation, autonomy, and team working’ (Whitton 2009, p 45). Annetta (2010) argues that ‘games can bring about a lifelike experience to problem based learning that cannot be replicated in the traditional classroom’ (Annetta 2010, p 110). Such digital learning environments are able to foster deeper learning processes by integrating knowledge content and learning skills through a technology-mediated setting.

In this sense, instead of presenting content-based phenomena as canonical facts for the sole purpose of memorisation and recall, games have the potential to present academic and curricular content as a contextual background for problem solving scenarios (Gee 2007, Shaffer 2006). This is mainly accomplished through the active and constructivist learning environments present in good game designs (Klopfer et al. 2009), where players learn about authentic contexts through situated cognition (Squire 2005), exercise problem-solving skills (Kiili 2005) and collaborate in shared accomplishments (Whitton 2009). In fact, games move from a strictly content-based approach to a more context-based methodology, crucial for the development of higher order social competencies (Thomas and Brown, 2011). The in-game feedback resulting from gameplay (Salen and Zimmerman 2004), fuels an experiential learning cycle (Kolb 1984), in which players’ experience, observe, reflect and test concepts in novel situations (de Freitas 2006). For instance, a complex problem-solving entertainment game like Civilization, fosters higher order skills, such as critical and creative thinking, through effective and adaptive gameplay (Squire 2004).

The potential benefits of game-based learning strategies in the classroom have been extensively explored and reported in the literature (Annetta 2008, Bers 2010), as well as their possible limitations (Linderoth 2010, Wagner 2008). This has been achieved, both on a theoretical (Bogost 2007, Salen and Zimmerman, 2004) and pedagogical level (Prensky 2012, Gee 2009). In this sense, the use of games in a teaching and learning context, underpinned by solid pedagogical principles, has been promoted as a suitable means of facing the ever-growing challenges posed by the digital age in education (Pivec 2012, Salen 2011). The prospect of games for learning purposes is increasingly acknowledged within the educational community. A meta-analysis conducted by Vogel and colleagues (2006), shows that computer games and other game-like activities involving simulations, contribute to higher cognitive gains and improved attitudes towards learning than other conventional instructional approaches (Vogel et al. 2006). However, any game-based learning methodology necessitates of complementary
teaching, learning and assessment strategies (de Freitas 2006, Squire and Jenkins 2003), which form part of a wider learning package (Whitton 2009). This helps students to ‘mobilize information [in order] to solve game-related problems’ (Squire and Jenkins 2003, p 14). Potentially, this leads to a further sense of empowerment, agency and engagement from the students.
Chapter 3: Research Study

Quantitative Research Results

Following the iterative design approach, the TOOLKIT was gradually improved in course of the project GBL4ESL. The quality assurance process mostly relied on qualitative feedback. To be able to meet the demands of a multidimensional approach, a survey including quantitative questions was created and sent out to all teachers which were involved in the project. The quantitative research was carried out to understand how teachers rate the TOOLKIT in terms of usefulness for introducing GBL in class as well as tackling the problem of ESL. Additional questions referred to the usability of the platform. The qualitative research put the spotlight on the potential benefits of GBL in terms of reducing the risk of early school leaving.

In total 32 teachers from the partner countries filled out the survey, 68% of these had already used the TOOLKIT in class. Below are the most salient results from the questionnaire:

The overwhelming majority (39%) sees the TOOLKIT as a very useful tool for introducing GBL into the class, while another 29% see it as a useful tool.
Exhibit II: Usefulness of the TOOLKIT for addressing ESL

21% see the TOOLKIT as very useful and 32% as useful.

Exhibit III: Usability of the TOOLKIT

The usability of the TOOLKIT in its current form is rated as good. The overall satisfaction is at a medium to high level which means that there is still room for minor improvements.
Exhibit IV: Rating of the TOOLKIT

The TOOLKIT got mainly good ratings (50%) and almost 29% see it as an excellent platform.

Qualitative Feedback

Educators were asked to share their opinion and perspective on the TOOLKIT. The following is some of the feedback received from Maltese, Austrian and Swedish educators.

Teachers stated that the TOOLKIT is easy to use, attractive and well structured. The initial impression was positive, and it is an excellent companion for educators aiming to implement game-based learning in their methodology. It provides an ever-growing database of games and project ideas which can be easily searched by academic subject and age group. The TOOLKIT also helps educators build on their ideas and take their projects to new levels, thanks to its feedback features.

Information is readily available on the games:

- How it may be used;
- Feedback given by previous teachers after using the game;
- Target age;
- Target Subject;
- Game type;
- Platform;
- Price (where applicable).
An online search can be performed to find games according to the above criteria. It can be used both in a computer lab setting and a class setting, using the interactive whiteboard and an internet connection.

Teachers can upload as many games as they want to the TOOLKIT and create a community of users where they can share projects and ideas. They can also give ongoing positive or negative feedback about their experience in using the uploaded games.

Some educators however expressed confusion regarding the goal of the TOOLKIT in terms of providing game entries and projects versus providing downloadable games. Negative aspects include the number of fields needed in order to submit a game analysis or a project, the lack of a saving feature when submitting a project as well as the lack of a short summary for each game entry or project. Suggestions for improvement include easing up the process of submitting projects and providing downloadable games for educational use.

The layout of the Guidebook is very good, it makes it easy to locate games by subject and is also very easy to refer to, thanks to a uniform and detailed document structure for each game entry. Since the Guidebook is available as a softcopy on the TOOLKIT, it is also proving relatively easy to disseminate. The guidebook can be a great help to teachers that are not so confident in using the online TOOLKIT. It offers a number of lesson plans, each with details on a particular game of how it can be used and integrated in the classroom.

The TOOLKIT includes:

- Scope of the game;
- Game overview;
- Link to the game;
- Teaching strategy;
- Game debriefing;
- Price (where applicable).

The games are grouped according to subjects and their strands. This makes it easier for the teacher to find a particular game according to the topic s/he needs to tackle.

Teachers see games as powerful educational tools for fostering motivation, and for making standard lessons more interesting and fun for students. Potential obstacles hindering the success of using games in class include missing or slow internet connections, outdated hardware, time constraints and low acceptance rates of GBL. Some educators believe that GBL still has a long way to go in terms of a broad and accepted implementation of digital games in classrooms all over Europe but are hopeful that they can break through the struggles encountered.
Reflection

Following the research conducted by the consortium it is clear that educators require a pragmatic overview and support in implementing a GBL approach to teaching. In fact, 76.5% of the educators who responded to the online survey, feel the need of professional support in implementing game-based learning in their own context. The survey respondents need support in assessing game-based learning (53.8%) and in determining the practical and technical constraints of a game-based approach (30.8%). Seventy-two percent (72%) of educators who took part in the survey are aware and follow online professional game-based learning support networks, in the form of websites, blogs, open and closed groups.

On the TOOLKIT one can find the relevant steps to help the educator in getting started with implementing a game-based approach to teaching and learning. It builds upon the different guidelines and recommendations present in the relevant literature, based on the experience and expertise of GBL researchers.

Recommendations to further enhance the TOOLKIT & Guidebook

The following suggestions for improvement of the TOOLKIT and guidebook have emerged from the small-scale research study conducted with educators.

It is being suggested that the following features on the TOOLKIT have to be improved:

i. Saving a draft of an incomplete item. This would enable educators to break their entry into smaller chunks while ensuring that they input all the details required.

ii. Automated tasks especially if some information has already been used before. Repetitive tasks tend to become tedious, ideally such tasks are avoided or better still pre-set by the TOOLKIT itself.

iii. An automatic save every few seconds or minutes should be performed to secure inputted data.

iv. The TOOLKIT and guidebook could have a similar look-and-feel as this would help users to easily navigate through them.
Chapter 4: Game Based Learning Insights

One of the main aims of the Erasmus+ GBL4ESL project was for teachers, in partner schools, to make the utmost of the TOOLKIT and the Guidebook and become ‘agents of change’ within their schools by practising and sharing the GBL pedagogical expertise aimed at maximising the engagement in learning of the potential early school leavers.

In the following section, some of the educators who embarked in the project through their schools share their experiences:

"Computing and ICT

I am a Computer Studies and ICT teacher and in my teaching I use computer-based games. I have used GBL mainly for consolidation of knowledge normally at the end of the lesson. It helps me to find out if the students have understood or not the concepts explained during the lesson. Also, it gives me the opportunity to monitor each student individually and makes space for student creativity. In Computer Studies and ICT, we work mainly on project-based work which allows the students to be creative, innovative and reach their own individual level of attainment. Each student can achieve their own potential while working at their own pace.

Eleanor Mifsud"

"Mathematics

In mathematics, we have used GBL to introduce topics, consolidate an objective/s, revise a single learning outcome or a whole topic and explore mathematical facts during lessons. Digital quiz games were used to gauge students’ knowledge in a fun, competitive way without the pressure of an examination setting. GBL was also used as a math-fun activity during breaks where students played digital games in a computer lab. This was done to enhance the motivation and interest of the students towards mathematics.

Rose Grixti & Victoria Brincat"
Personal, Social and Career Development (PSCD)

In PSCD, I made extensive use of game-based learning in the pedagogy. Games, particularly board games have always been popular in my teaching strategy. I always believed that learning should be fun, interesting, exciting and hands on. Additionally, I found out that game-based learning increases the participation and engagement of the learners. I used different board games to help students learn skills such as reflective thinking, planning, problem solving, decision making, logical thinking, emotional intelligence, cooperation, competition, how to deal with mistakes, and communication. For example, I used Chess, one of the world’s most popular strategy games, to promote thinking skills. The game helped the students to focus and concentrate. Throughout the game the students were stimulated to plan and have a long-term vision. It has also improved the students’ logical thinking. Another popular game which the students really enjoyed was Mancala. Throughout this game the students developed their observation skills, analytical thinking, and problem-solving skills.

Marion Evelyn Cassar

Maths & Computing

During the project implementation, we realised that the promise of pleasantly-frustrating problem-solving presented in a gamification approach is intriguing for all students, irrespective of their academic achievement or their motivation towards learning. We tried out a GBL approach with a variety of students, starting from Maths Club and Computing high-achieving students, to students with initiatives in the school’s Students’ Council along with the Core Curriculum program students, where we integrated gamification approaches even in assessing the learning obtained in the low-track programs aimed at these potential early school leavers. Learning through games was also enjoyed by students in the gaming club; a mid-day break club that attracted students of different abilities. A recreational approach to GBL with a curricular element was also used through the monthly Maths competitions, where students in the Maths Club designed puzzles to present to their fellow school-mates and then declared a monthly winner.

Marlene Galea & Dorienne Grech
Student Achievement

We tried to take things a step further with our Gaming Club and Students’ Council of our school, St Margaret College Secondary School, Verdala by involving these students in game design. Our students co-produced the game Open a Window for Peace. Our main aims were to create a Quiz-game that promotes peace and encourage students to interact with the exhibits in our school’s Annual Exhibition. Hence, we had the opportunity to involve our students in a discussion on the elements of good game design.

The Students’ Council hence animated their peers’ visits to the school exhibition through this game. Our students also wanted to show that games and video games can be used to promote peace instead of war. Hence through this activity they also introduced their peers to educational video games like Global Conflicts Palestine and Global Conflicts: Child Soldiers. Participation in this exercise introduced element of holistic lifelong education and explored values and cross-curricular themes that students do not have much opportunity to explore in lesson-time.

Marlene Galea & Dorienne Grech

Student interest in games

At Nystromska School, we felt that choosing to use games in the classroom opened a world of new resources for teachers. We used both digital and non-digital games. Examples include, Reigns, Pokemon Go, geocaching, Taboo, Scrabble, Kahoot!, D-vide, and a number of other games which can be found on the TOOLKIT. Something that we found useful was to practice the game before presenting it to the students. We always evaluated the outcome directly with students after every session. It was important for us to know how the students perceive every game and we wanted to know what they learned after every game session. This gave us sufficient feedback to either keep the game or adapt it.

Jose Molina Avella
Gradual Inclusion of Games in the Curriculum

The impact of digital games on cognitive, motivational, behavioural, social and affective outcomes has been examined in various studies around the world. Digital games have increasingly gained attention as facilitators of motivation and learning processes. While the core aim of most studies is to analyse motivational processes, potential knowledge gains have likewise been assessed. The potential benefits of digital game-based learning (GBL) applications and strategies have been explored thoroughly (Annetta, 2007, 2010; Bers, 2010), as have their limitations (Wagner, 2009; Linderoth, 2010). There are various ongoing initiatives promoting educational gaming as a suitable tool to face the challenges of the digital age (Salen, 2011; Pivec, 2012).

During the project implementation, games have been used both as an introduction to a lesson and as a consolidation at the end of the topic. Games have also been used for fun and to stimulate creativity. Students are more engaged and teachers are better able to give individual attention to the students during game play. This methodology also fosters learning at one's own pace, which is particularly suited for classes with a range of abilities. Furthermore, it enhances peer collaboration as students help and support each other to succeed. Games have also been used to tackle specific objectives with low ability students as they allow students to achieve and build their self-confidence. Such games can help LSAs (Learning Support Assistants) to further practise and consolidate objectives covered in class.

The following table summarizes key empirical findings from studies that focused on the positive transfer effects that connect the virtual and real world. For answering the question if digital or analogue games should be integrated into the official curriculum, it is crucial to support and to enhance these effects on a broader scale.

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<tr>
<td>Durkin &amp; Barber (2002)</td>
<td>Self-concept</td>
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<tr>
<td>Ferguson &amp; Garca (2010)</td>
<td>Cooperation</td>
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<td>Gebel (2006)</td>
<td>Media competence</td>
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<tr>
<td>Gee (2007)</td>
<td>Problem solving skills</td>
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<tr>
<td>Gentile et al. (2009)</td>
<td>Prosocial behaviour</td>
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<tr>
<td>Green &amp; Bavelier (2007)</td>
<td>Spatial resolution</td>
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<tr>
<td>Hamari et al. (2014)</td>
<td>Motivation, Knowledge</td>
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<tr>
<td>Mhurchu et al. (2012)</td>
<td>Physical activity</td>
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<td>Rosser et al. (2010)</td>
<td>Motoric abilities</td>
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<td>Wernbacher et al. (2012)</td>
<td>Knowledge</td>
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<td>Wouters et al. (2013)</td>
<td>Motivation, User engagement</td>
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Table 1: Studies on the impact of digital games
Playing games leads to statistically provable effects on motivation, cognition and behaviour. Games offer a huge potential in terms of fostering motivation and interest while also enhancing motoric and social skills. In terms of subject related competences specific (learning) games would have to be designed. The TOOLKIT aims to start this process by providing teachers with filter questions based on the competence models for English and Maths.

Games for Assessment (Educators’ Feedback)

In order to understand the extent to which games can be used for education, two of the educators enrolled in the project used games for class assessment. Below is their feedback:

**Pharao Code** as a maths assessment task for core curriculum students (those at risk of becoming ESLs). The game was adapted for year 9 lower ability core curriculum students. The major aim of this task was to assess the students’ ability to reason out operations, to apply operations in the correct order and to be able to verbalise their mathematical thinking. These skills were all part of the task's assessment rubric.

The same idea of the assessment task explained above was tried out with all year 9 students during the Verdala Maths Trail: a full day of mathematical real-life activities organised at school by the maths department teachers where students are grouped in teams and move from one station to another to work out different tasks all related to their syllabus content. These students were faced with the game in its full version and had seen the game for the first time. This activity proved to be one of the most favourite tasks in which all the teams were positively engaged and did well.

**Educator’s reflection:** Using such a GBL approach in mathematical assessment had its positive effects at all levels of abilities, as it saw students better engaged in the tasks and doing their very best to apply their mathematical knowledge. The fact that the game gave students the opportunity to verbalise their mathematical thinking, rather than just write the answers, also gave the teacher the opportunity to analyse and assess their mathematical thinking, thus correcting any misconceptions that might be present – an excellent form of formative assessment.

Even though a GBL assessment approach is not possible in assessing all mathematical learning outcomes, the above positive experience is of encouragement to explore more games through which assessment of learning outcomes can take place.
Kahoot! quizzes were used as an exercise in assessment of, and for learning the topic ‘Input and Output Devices’ in Computing. The exercise was not only an effective means of measuring learning but also as students themselves noted, they were more motivated to try to excel, thanks to the continuous feedback and the competitive environment allowed by Kahoot!

Given the success of Kahoot! in the above scenario, other educators got involved and it was used with year 9 core curriculum students learning: home management, sciences, art, English and maths.

Due to time constraints, this exercise was carried out with a group of 22 students. In hindsight, it would have worked better if the group of students was smaller. However, most students involved were on task and engaged for the whole 40-minute span of the exercise.

Educator’s reflection: Kahoot! can be an effective means of assessment for students following the core curriculum programme, especially as it gives the teacher the opportunity to store results. Ideally, the exercise is carried out with groups of ten students maximum, and the number of questions should be limited to e.g. 20 given the engagement and concentration issues that are typically present. As educators, we feel that our experience this year has put us in a position to find value in GBL-based methods of assessment and to propose it to more of our colleagues from different teaching areas through subject meetings and our relevant committees in the coming scholastic year.
Chapter 5: Project Sustainability

The consortium wants to ensure that the project deliverables will still be available and widely disseminated amongst the target group after the end of the project lifetime. To this end, the consortium agreed that the TOOLKIT and the guidebook need to be kept updated regularly with the necessary information to keep them pertinent and relevant to educators. This will be done by means of an informal commitment by all project partners as a sign of goodwill for at least three years as of project closure.

The network of educators and academics built by the consortium over the years will be kept alive through various collaborations on a local and international level by sharing GBL experiences and good practices. The consortium is also working towards publishing a book on GBL as a practical approach to teaching.

Donau University managed to secure funding from the Austrian Federal Ministry of Families and Youth in order to make the necessary technical updates to the TOOLKIT in the coming years.
Chapter 6: Challenges & Recommendations

In this section a series of challenges to the implementation of GBL that have been encountered in the classroom have been identified, and recommendations are being provided respectively.

a) Resistance to changing ways and attitudes in the classroom by teachers, students, and parents.

Recommendation for teachers: time for educators to experiment and explore various games should be allocated during school hours. This would allow educators to build their gaming skills, improve their gaming knowledge and fully understand the impact and potential of using GBL. Educators should also allow time to discuss with each other, share knowledge and reflect on different teaching practices, including the GBL approach. It is also suggested that short (possibly online) courses are made available to teachers by the school. This would allow educators to broaden further their skill base on GBL and adapt their curriculum accordingly.

Recommendation for students: sometimes students might not be open towards the use of games in the classroom. It is the role of the educator to help them understand the benefits they get through playing. This shift in mentality is not easy, nonetheless it can be achieved if the educator clearly highlights the skill and benefits the student is gaining from gameplay.

Recommendation for parents: teachers should make parents aware on the scope of such an approach and how GBL can enhance a learner’s education rather than hinder it. Policy makers can also publish and disseminate information leaflets, as well as use social media platforms to disseminate information about the benefits of this approach; and how it is being implemented in class. Sessions for parents to learn about GBL and use games to learn first-hand could also be organised.

b) Availability of technology in the classroom

Recommendation: schools could be open to ‘Bring Your Own Device’ (BYOD) to school or set-up a media lab that is equipped with various devices to reflect game-based learning approaches. This setup could also include a flexible class layout, where learners are more free to sit in different formations, and move around as required by different games. A strong wi-fi connection is also required. Without this, the teacher will be limited in the choice of games that can be played. The support of the
school management as well as the relevant education authorities is essential for this recommendation to be implemented. It is also suggested that educators and other school members visit European media labs in European schools to garner exposure of ideas on various GBL set ups, and maintain a dynamic, innovative aspect to such a learning approach.

c) Social pressures because of social differences in the classroom - some students might have access to devices at home but some might not.

Recommendation: It is important for teachers to identify students who might face these difficulties before, in a way as to adapt the lessons around the different needs. It might be advisable that under the circumstances, teachers start using board games, card games or other non-digital games, to help put students at ease, and have them feeling at par with their peers. It would also be recommended that computer and digital games, especially those requiring a superior computational and logical thinking, and a higher level of reading skills are introduced gradually. Furthermore, it is suggested that where possible group or pair work is used for those students requiring more focused attention, to help increase confidence in their abilities.

d) Resistance due to curricular content which needs to be covered (syllabus and time constraints)

Recommendation: devise time management strategies that would allow teachers to cover the content proposed and apply different pedagogical approaches, such as GBL where and when it can be exploited with more benefit for the students’ learning. Such strategies could include the flipped classroom approach, where students are given the task of following content at home, and come to school to do the work (in this case the work could also be in the form of GBL). Another strategy would be to create a direct link between the subject being taught and the skills targeted in the game - for example Minecraft could be directly related to geometry concepts. Therefore, the syllabus would be covered through playing the game and then assessing the students’ knowledge emerging from the gameplay.
e) Resistance due to lack of knowledge, confuse the term GBL with games played for leisure and entertainment only.

Recommendation: raise awareness about GBL through various platforms including social media, videos, and seminars to explain how games can impart knowledge, skills and even values if properly interpreted.

To tackle resistance to the introduction and use of GBL at the school level, actions need to be adopted in a top-down approach. This strategy would entail that high-level policy makers, decision takers and other stakeholders such as school management, would openly embrace this methodology for learning, and show support to teachers and learners making use of it. In turn, this support would help teachers gain more confidence in using this methodology to teach and learn, whilst learners would be confident that this approach is not wasting time, but it is adding value to their knowledge. As this approach becomes more widespread and benefits start to become visible, parents and additional stakeholders will also become more aware of the benefits of using games for learning purposes. This, in terms of all the knowledge, skills and competences that can be gleaned from the environment, if used in the ideal ways.
Chapter 7: Best Practices for GBL Methodologies

The section below presents concise and clear GBL practices that are based upon the experiences and knowledge of the consortium garnered throughout the lifetime of the project.

i. The TOOLKIT developed through this project in itself is a best practice as can be deduced from the aforementioned teacher testimonials. It is an active database that helps educators to get started with lesson plan ideas and games.

ii. A kick-starter programme has been put together to accompany the TOOLKIT thus serving as a professional support to educators to embed GBL in their teaching approach as explained in Appendix I. Educators need to be confident that the game they will present is of benefit to the students.

iii. Games will empower learners because if they immerse themselves in the game they are playing, students can better understand the learning context, content and purpose of the learning deliverable. Students are enthusiastic to learn through practical experiences.

iv. For a better learning experience, games should be given a local flavour. An example could be by developing games in the mother tongue of the user (or be given the option). This reduces the language barrier and helps students better understand the game content.

v. Networking events should be organised to bring together educators, GBL experts, academics, and game designers and developers. Bringing on board teachers during the early stages of game development will allow the teacher to provide support in developing the pedagogical concepts around the gameplay and allow better use of the game in the classroom. Teachers involved in this stage will also feel a sense of ownership and therefore act as ambassadors for GBL.
Chapter 8: Conclusion

GBL is more than playing games. In summary, GBL includes playful activities, gamification, game-informed learning, meaningful play, and serious games. A game has to offer rules which may or may not be explicitly stated during gameplay, it has to pose a challenge that needs to be solved through a set of skills, and it has to offer an environment that is conducive to promoting shared accomplishments. All these features make up GBL. The potential for developing complex skills when playing games that are non-trivial is rather high; thus, contributing to the use of games for learning purposes to be increasingly acknowledged within the educational community.

The experience of the consortium and the educators involved in the GBL4ESL project is encouraging and positive. Educators have seen students learn in an interactive environment, engaged to solve problems whilst being provided with immediate feedback. GBL is a methodology that engages learners and helps them reach the desired learning outcomes by enhancing their skills. These skills go far beyond the traditional academic skills and include soft skills, like peer collaboration and creativity. GBL helps students visualise abstract concepts, which through a traditional approach is more difficult, especially for children who experience difficulties in learning.

Going forward, the consortium aims to help educators overcome the challenges found when using the GBL methodology. The formal educational system is still rigid, thus limiting the number and choice of games that can be used in a classroom setting. The consortium invites decision makers to be more open and embrace GBL as a tool for learning.

GBL in Malta is still in its early stages, thus follow-up studies need to be carried out to be in a position to understand the impact GBL has on students. However, looking at the educational systems in Austria and Sweden it is understandable that GBL is a workable phenomenon. Throughout the project meetings and the workshops, the main focus was on playing games, and ultimately having fun. Fun is also essential in mastering games and ultimately mastering key skills and competences. The teachers also noticed that the games that engaged them as individuals, were engaging for their students too; and this is an important consideration.

Ultimately the GBL4ESL project was not about simply presenting different games, but also about highlighting the importance of bringing back in the fun into learning for learning to be taken seriously and mastered at a higher level.
Appendix I – Getting Started Guide

The following table is aimed to serve as a guide for educators in getting started with implementing a game-based approach to teaching and learning. It builds upon the different guidelines and recommendations present in the relevant literature, based on the experience and expertise of GBL researchers.

<table>
<thead>
<tr>
<th>1. Choosing a game</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Collaboration and competition</td>
</tr>
<tr>
<td>ii. Modding and user-created levels</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Relevance and applicability of games</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Mapping of learning objectives to game activities</td>
</tr>
<tr>
<td>ii. Scaffolding</td>
</tr>
<tr>
<td>iii. A context in which to develop expertise</td>
</tr>
</tbody>
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<table>
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<tr>
<th>3. Practical Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Brief introduction</td>
</tr>
</tbody>
</table>
### ii. Debriefing activity

A crucial aspect of any game-based approach to teaching is exemplified in the learning package that surrounds the game itself. As such, post-game activities in the form of open discussions, reflections and other debriefing out-of-game world strategies should always be used to facilitate the transfer of knowledge from the game to the real world (Whitton 2010). An example of a wraparound task is the inclusion of talk-aloud walkthroughs, where players explain their actions whilst playing the game in front of their peers. The latter can then constructively criticise the players’ decisions, providing reasons and logical explanations throughout.

### 4. Recognising the strong points and limitations

| i. Producers rather than consumers of information | ‘Refinement of performance through replay and practice’ (Newman 2004, p 17) is essential in mastering games. As such, effective gameplay should encourage an active and critical role from the players’ end, where failure is part of the fun and at the same time fundamental to learning (Gee 2005). |
| ii. Higher order cognitive skills | The game should incite the players’ cognitive curiosity (Malone 1980) to drive the integration of existing and new information. This facilitates a cycle of expertise (Gee 2005), based on a higher order cognitive approach to learning (Bloom 1956). This should also be achieved through a multimodal interactive approach which accommodates for different learning styles and makes use of diverse modes of representation including words, sounds, moving and still images. As such, games should support and foster higher order skills; including application, analysis and evaluation in the planning, lateral thinking, micro-learning, hypothesis-testing and decision making processes that occur during gameplay. |
| iii. Formative inquiry-based learning approach | The players should have an explorative (Whitton 2010) and inductive role during gameplay. Parallel processing of different interacting variables is also to be encouraged (Greenfield 1984). |
| iv. Ways of progression | Instead of allowing multiple ways of progress (Gee 2007), games could present a linear and unique trajectory; both inside and between levels. This ‘single victory state’ approach (Newman 2004, p 24), does not allow different learning and playing styles while seriously limiting personalised and differentiated learning (Gee 2007). |
| v. Feedback from games | Immediate performance feedback should be formative and forward-looking and given at all levels. Multiple level goals could possibly take the form of points and speeded responses (Malone 1980). Try-again-type of feedback should be avoided as it does not feedforward the necessary information to the player, required for successful progression through the game. Useful information and feedback on the players’ actions can be presented both ‘on-demand’, for example in the form of mini-tutorials which can be brought into gameplay, and also ‘just-in-time’, by for example hovering over the characters or tools (Gee 2007). |
5. Practical and technical considerations

| i. Organisational and practical aspect | Logistical evaluations in terms of organisation and implementation; including time-management, time-table scheduling and availability of equipment should be thoroughly conducted prior any game-based learning activity/task. |

6. Assessment in GBL

| i. Constructive alignment | A constructive alignment between learning objectives, game activities and assessment (Biggs 1996) is an essential prerequisite to any game-based learning endeavour. The game should serve as a catalyst for learning that supports the teaching and assessment strategies designed to achieve the required learning outcomes (Biggs 2005). |
| ii. Assessment for learning | The game should provide information to the players which effectively directs their future actions inside and outside of the gameworld; thus allowing for the development of self-regulated learning skills and active engagement (Boud 2000, Nicol and Macfarlane-Dick 2006). Possible instances of assessment for learning tasks during a game-based learning activity, include the drawing up of a critical analysis report of one's own performance during the game and also the replication of game levels using real-life apparatus, for example in the Science laboratory. |
| iii. Embedded assessment | Games for learning purposes could possibly allow for an embedded assessment approach, which rooted deep inside the game mechanics, accurately but unobtrusively, measures the player's progress, with respect to predefined learning competencies (Shute and Ventura 2013). |

Table II: Getting Started with Game-based Learning
Appendix II – GBL Resource Catalogue

Amongst the overwhelming amount of games available on the market it is often hard to find those suited for an application in the classroom. A game analysis and also a closer look on the student’s favourite games can help to find relevant games for Game Based Learning (GBL) methods. The following Best Practice Games Catalogue serves as a guidance to show how useful games can be found in various genres and topics. The catalogue focuses on Math and English, but also provides examples for other subjects or interdisciplinary use. For all of the games listed GBL resources for teachers are provided. Those are well-proven and documented and can be easily integrated in the daily teaching practices.

<table>
<thead>
<tr>
<th>Title</th>
<th>Genre/ type of game</th>
<th>Topic/s</th>
<th>Competences/Skills</th>
<th>Subjects</th>
<th>Age</th>
<th>GBL Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal 2 (Valve Corporation)</td>
<td>Puzzle Platform game, Game Design Tool</td>
<td>Free will Technology</td>
<td>Logical thinking, problem solving, multidimensional thinking, creativity, tech Skills, teamwork and cooperation (in Multiplayer-Mode), Game Design</td>
<td>Physics, Math, Language Arts, Game Design</td>
<td>12+</td>
<td>+ Teach with portals: <a href="http://www.teachwithportals.com/">http://www.teachwithportals.com/</a></td>
</tr>
<tr>
<td>Classcraft (Classcraft Studios Inc.)</td>
<td>Gamification application for class, classroom management, Role Playing Game</td>
<td>Role Playing, Heroes, Learning, Improving</td>
<td>Self-reflection, teamwork, collaboration</td>
<td>all subjects</td>
<td>12+</td>
<td>+ Experience reports: <a href="https://www.classcraft.com/blog/">https://www.classcraft.com/blog/</a></td>
</tr>
<tr>
<td>Lure of the labyrinth (MIT, LG2G)</td>
<td>Point and Click Adventure, Math learning game</td>
<td>Math, basics in Algebra</td>
<td>Logical thinking, solving puzzles, problem solving, testing, English reading and understanding the content</td>
<td>Math Interdisciplinarity with English</td>
<td>9-13</td>
<td>+ Web platform of the game, case studies: <a href="https://labyrinth.thinkport.org/ww/educators.php">https://labyrinth.thinkport.org/ww/educators.php</a></td>
</tr>
<tr>
<td>Kerbal Space Program (Squad)</td>
<td>Space flight simulation</td>
<td>Engineering, space travel, aerospace, experimenting, astronomy</td>
<td>Problem solving, forward looking planning and thinking, creativity, English reading and understanding the content</td>
<td>Math, Physics</td>
<td>14+</td>
<td>+ KerbalEdu: <a href="http://kerbaledu.com/">http://kerbaledu.com/</a></td>
</tr>
<tr>
<td>Duolingo (Duolingo Inc.)</td>
<td>Language learning tool, Gamification application</td>
<td>Language</td>
<td>Improving Language skills (reading, listening, talking), endurance, self-assessment</td>
<td>English, German, French, Spanish and other Language Arts</td>
<td>11+</td>
<td>+ Duolingo for Schools: <a href="https://schools.duolingo.com/">https://schools.duolingo.com/</a></td>
</tr>
</tbody>
</table>

Table III: GBL Resources Catalogue
Existing Support Networks

i. **Institute of Play** (http://instituteofplay.org)

   The Institute of Play supports teachers in making learning more interesting and interactive for students. Current works include the design of schools, educator programs, curriculum design as well as dedicated GBL workshops.

ii. **Games Learning Society** (http://www.gameslearningsociety.org)

   The Games Learning Society (GLS) has a growing catalogue of learning games which promote engaged learning about biological systems, civic activism, self-regulating attention, empathy, programming, literacy, and many other domains. The annual GLS conference is one of the highlights in GBL research.

iii. **Mindshift – Games and Learning** (https://ww2.kqed.org/mindshift/)

   Mindshift offers stories from innovative teachers, provides teaching strategies as well as various blogs. A special section of the platform is dedicated to games and learning.

iv. **Quest To Learn** (http://www.q2l.org/)

   Quest to Learn is a public school for 6-12 year-old students with an innovative educational philosophy developed by educators and game theorists at the Institute of Play. The curriculum is based on GBL methods.

v. **The Glasslab** (https://www.glasslabgames.org/)

   The GlassLab creates educational games for the classroom. The focus is on serious games which balance the learning of content with engaging gameplay.
References


