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Games Based Learning

Digital Games for Learning

Conclusions and recommendations from the IMAGINE project

Author:

Roger Blamire
European Schoolnet
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www.imaginegames.eu

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Introduction

This paper arises from work in 2009 and 2010 in the IMAGINE project, funded by the European Commission under the Lifelong Learning Programme.. It outlines conclusions related to the use of digital games for learning, as they affect education policy-makers and decision-makers in school, vocational and adult education, presents the underlying evidence behind them and makes a series of recommendations arising from the conclusions and evidence.

In the IMAGINE project (described in Annex 1) a round table and a series of sector-specific workshops took place bringing together key stakeholders to share and discuss the state of the art in games for learning (also called Games-Based Learning – GBL) and to formulate recommendations for future actions. The collated conclusions and recommendations were further presented and discussed at a meeting of European Schoolnet's Policy and Innovation Committee in September 2010 and finally presented at the EMINENT conference in Copenhagen in November 2010.

The IMAGINE project partners would like to thank all who contributed to these recommendations.

Context

There are good foundations for the case for mainstreaming games in the learning process in Europe:

- **Political**. A European Parliament resolution[1] states that computer games inside and outside of the schools are valuable and should be supported
- **Educational**. Games in learning can develop mathematical and linguistic skills and knowledge and can support the development of key competences, including digital competence, creativity and innovation, citizenship, and lifelong learning. They can also develop 'soft' skills including strategic thinking, planning, negotiating skills, group decision-making as well as eye-hand coordination. There is a growing body of evidence to support the use of games for learning, showing how they are interactive, engaging and immersive, thus increasing motivation and engagement in learning. They tend to be most effective when educational content is embedded and they are used with certain curricula and pedagogies.
- **Economic**. Use of computer games develops digital literacy, an essential facet of future economic development The games industry is overtaking more traditional media in terms of value to national economies. The EU needs more people who know how to use IT technologies. For example the "Digital Agenda for Europe: What Would It Do For Me?" informs us that 30 % people in EU have never used the Internet (especially older people, people socially and economically deprived and people with disabilities).
- **Technological**. The quality and features of the most recent computer games reach ever higher levels of sophistication and performance. Broadband speeds, portable devices, storage space, graphics cards and computer processing power continue to improve while prices fall. As an entertainment medium, computer games are extremely popular from an early age. Coming soon are Massively Multiplayer Online and Alternate Reality Games. The influential Horizon report 2010 K-12 Edition identified four emerging technologies set to play a key role in learning in the coming years: cloud computing, collaborative environments, mobile devices and game-based learning. The report underlined the proven value and extensive use of digital games in military and industrial training.

Despite such compelling reasons for large-scale adoption of games in learning, formal learning is still a few years away from embracing games as mainstream practice. Significant barriers prevent their integration within curricula, including: relevance; accuracy and appropriateness of content; difficulty of adaptation; negative stakeholder perception of learning achieved; lack of time; other resources available to teachers; suitability for adults; child safety; costs of technology and gender issues.

The IMAGINE project (Increasing Mainstreaming of Games In Learning Policies) examined these issues from the perspective of experts in school, vocational and adult education, through a series of activities and workshops, leading to a series of conclusions and recommendations.

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[1] European Parliament. (2009) Report on the protection of consumers, in particular minors, in respect of the use of video games. http://www.europarl.europa.eu.

Conclusions and recommendations

This section provides <u>eleven conclusions</u> from work in IMAGINE and, more generally, games in learning, most of which apply to the three sectors represented in IMAGINE in turn (vocational, adult, schools), followed by <u>fifteen recommendations</u> based on those conclusions. Where conclusions and recommendations apply to one sector in particular, this is stated. The conclusions and recommendations are broadly grouped under the following headings: policy-making; research; game development; teachers and learners), but there are of course overlaps.

POLICY -MAKING

1. It's not clear what is meant by games for learning.

Much learning is playful, and always has been, particularly in the early years. We recall times playing with water and sand when we were young and resources like the play house designed to stimulate imaginative play. There are however, differing understandings of the terms and scope of 'computer', 'digital' or 'video' games in learning and this has hindered the uptake of digital games in learning. There are also issues of perception related to computer games, for example associations in the minds of many people with violence, addiction and sexuality.

A suggestion from participants at the IMAGINE schools Round Table was to lay the emphasis on the term *learning activities* (e.g. related to 'pinch points' in the system where there are known problems not solved by current approaches, e.g. developing '21st century competences', addressing issues like low-attaining boys' low interest in learning, transition between institutions, or difficult concepts like algebra) and to play down the games element, in view of resistance to GBL. People being motivated to solve questions raised in Global Conflict about Palestine or Latin America is surely of greater significance than the fact it is a computer game; as a Danish participant in one workshop said: "It's not because it's fun, it's because it's empowering." It's a matter of framing the game, he argued, maybe differently for girls and boys (girls were said to be more willing to accept a game if the context and purpose are serious).

Some say the term 'game' should not be used, but activity, simulation, virtual world, exercise, should be used instead in order to underline the serious, education, intention behind their use in formal learning settings. The oxymoron 'serious games' has been coined to indicate a difference between such games and those used in learning, and 'games-based learning' (GBL) is widely used but it is often considered to encompass too many types of games, including the following:

- Video games
- Computer games
- Educational Games
- Virtual Reality
- Edutainment
- Immersive Learning
- Simulations
- Synthetic Learning Environments
- Game-Based "X" (i.e. Game-Based History, Game-Based English etc.).

There have been several attempts to categorise games used for learning. The table below[2] shows the range of types of games and could serve as a useful taxonomy if accepted by all stakeholders.

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[2] Serious Games in Education and Games-Based Experience for Learning (forthcoming), Vanessa Pittard presentation, Brussels, 29 September 2010. See also Williamson, B., 2008, Games and Learning Interim report: Survey of existing research and criticism, Bristol, Futurelab.
http://www.futurelab.org.uk/resources/documents/project_reports/Games_learning_review.pdf

Type	Basis for learning	Key games	Key texts
Active games	• Promotes physical activity • Early learning skills (hand-eye, motor-skills)	*Wii Sports* *Wii Fit*	-
Alternate reality games	• Embodied play experience • Authentic real-world experience • Social collaboration	*Savannah* *Uncle Roy All* *Around You*	IGDA (2006) White Paper on Alternate Reality Games[10]
Authoring games	• Understanding of games' structure, production, effects and audiences • Media literacy	*Mission Maker* *Adventure Author*	Burn, A and Durran, J (2007) Media Literacy in Schools
Creative games	• Creative production • Collaboration and sharing	*Spore* *LittleBigPlanet*	-
Epistemic games	• Professional practice • Workplace skills	*Pandora* *Digital Zoo* *Urban Science*	Shaffer, DW (200) How Computer Games Help Children Learn
Massively multiplayer online games	• Distributed thinking • Collaboration	*World of Warcraft* *Everquest*	Taylor, TL (2006) Playing Between Worlds
Military games	• Authentic professional training	*America's Army* *Full Spectrum* *Warrior*	Prensky, M (2002) Digital Game-Based Learning
Mobile games	• Authentic real-world contexts • 21st century skills	*Virus* *Newtoon*	Klopfer, E (2008) Augmented Learning
Persuasive games	• Critical skills • Critical reflection	*Oil God* *Activism*	Bogost, I (2007) Persuasive games
Role-playing games	• Understanding character and identity • Problem-solving	*Deus Ex* *Tomb Raider*	Gee, JP (2004) What Video Games have to Teach Us
Serious games	• Managing real-world problems • Manipulating real-world data sources	*Global Conflict: Palestine* *Operation: Climate Control* *Ceduceus* *Supercharged!*	Derryberry, A (2006) Serious Games
Simulations/ Microworlds	• Management of complex systems • Testing real-world ideas and scenarios • Constructing ideas	*SimCity* *The Sims* *Rollercoaster Tycoon*	Papert, S (1993) The Children's Machine
Strategy games	• Manipulating real-world scenarios • Conjecturing and trialling • Strategic thinking	*Civilization* *Europa Universalis* *Knights of Honor* *Age of Empires*	Egenfeldt-Nielsen, S (2005) Beyond Edutainment

Modes of learning aligned with specific game genres

Recommendation 1: Define the terms used in games for learning

A clear, agreed and well-publicised definition and classification of digital games for learning is needed, matched to learning objectives, together with evidence from research.

2. There are few enduring results from European Commission-funded games projects.

One of the core activities of the IMAGINE project was to identify European projects in the area of games for learning, particularly those receiving Commission funding. The research highlighted the difficulty to ascertain information from previous projects and the lack of available resulting resources. Maja Pivec found that, of the 82 projects identified, only 56 of these were found to have referenceable material[3]. Many of the projects identified did not produce sustainable results, and there was a lack of communication and result sharing between the projects. Project domains and results tend to disappear after the project (and funding) ends.

Pivec found that those projects that did achieve what they set out to accomplish were usually successful and well received by the target community. Exemplary examples of notable mention, chosen because of completeness of results, usefulness of output, and perceived sustainability, were:

- ***Discover** - www.discoverproject.net*
- ***Games in Schools** - games.eun.org*
- ***eMapps** – www.emapps.info*
- ***ElderGames** - www.eldergames.org*
- ***eCircus** - www.e-circus.org*

Apart from ElderGames, they are all aimed at schools. All were European-Commission funded with the exception of Games in Schools, which was funded by the Interactive Software Foundation of Europe.

However, some projects did not achieve their stated objective of producing a usable game; many only produced a prototype, and some only created the assets to be used in the un-developed game. Sustainability appeared to be a recurring issue. Many of the projects': outputs and resources were often only available while the project was being funded. As Pivec notes:

> "Although the majority of projects reviewed focus on resource as an output objective, many of these only create prototype games for use within the project. Only a select few go on to commercialise the resulting product, or to create a community that lives on after the project has ended."

The IMAGINE project has begun develop an enduring repository[4], together with a teachers' handbook[5]. and it is intended to replicate and develop it at European Schoolnet after the end of the project. The Engage Catalogue of Games for Learning 2009-2010 – A guide to games for the classroom[6] covers localization and cultural issues as well as information about quality and rating. The reviews contain case studies of how these games may be used in a classroom environment and

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[3] Pivec, M. and P., IMAGINE project, work package 2 Final Report, FH JOANNEUM University of Applied Sciences

http://www.imaginegames.eu/eng/content/download/666/3771/file/Imagine%20Report%20Final_1.0.pdfDetails of these and other projects can be found at http://www.imaginegames.eu/eng/Case-Studies

[4] http://www.imaginegames.eu/eng/Games-Directory

[5] Felicia, P., 2009. Digital games in schools: A handbook for teachers, European Schoolnet, EUN Partnership AISBL: Belgium. Available at: http://games.eun.org/upload/GIS_HANDBOOK_EN.PDF.

[6] Available online using the search tool at http://www.engagelearning.eu/teachers/?page_id=26

suggested implementation of the game. The experience of the reviewer is tabled and a walkthrough to reduce the learning curve is detailed. This is in line with Uliksak and Wright[7], who argued that if games are to become mainstream classroom tools teachers (who are often not gamers) need support to identify which games are available that meet their learning objectives, how they can best be integrated into lessons given the context, and how learning can be assessed (such metrics need to be shared by teachers and developers so that there is a common language to describe and use games).

The Austrian Federal Ministry of Economy, Family and Youth service unit BuPP (Bundesstelle für Positivprädikatisierung von Computer und Konsolenspielen; http://bupp.at/) provides a support to parents and other people in the form of a categorised on-line catalogue of information related to commercially available digital computer games. Part of their service includes information on positive aspects of computer gaming as well as information on PEGI rating.

Recommendation 2: Develop a central repository of quality resources

A European repository of good quality games should be created, categorised according to an agreed taxonomy, containing information on how to play the game, examples of use, reviews, how to use it and when a particular game could be used. Guidelines should contain concrete samples and it should be possible to download games. The repository should include those developed with Commission funding and also commercial games and examples of their use, for example Sony's EyePet or Nintendogs and how they have been used (in Scotland) to help young children learn about budgeting, dealing with numbers, and as a prompt for creative writing. The repository should be accessible to parents, the media, policy-makers (many of whom have game-playing children, as a workshop participant from Catalonia pointed out) so that they have access to awareness-raising good practices and quality products. The repository could link to those already existing[8] and build on their good features. Access by parents and young people without teacher mediation should also be envisaged. An activity to generate interest and uptake could be to announce a prize for the best educational game developed in Europe, perhaps along the lines of a challenge to design the production of STEM (science, technology, engineering, maths) video games by both developers and students in the US[9].

Separately but linked to this, a central repository could be created, of published documents and products related to games for learning resulting from EC-funded projects. Access to these could be made publicly available or upon request from interested parties. Resources have to be submitted in any case to the EC also in digital format as part of the project reporting process.

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[7] Ulicsak,

[8] e.g. edu365.cat, iprase.ln.it, spiskole.dk

[9] http://www.networkworld.com/news/2010/091610-white-house-unveils-stem-video.html

3. There are few relatively few European vocational-learning focused projects.

Only six of the 82 games for learning projects identified by IMAGINE were targeted at the vocational (industry) sector: "The majority of the projects reviewed targeted primary schools, both students and teachers. All sectors of the community had representation including the elderly, the disabled, at-risk people, and some projects were specifically aimed at women." [10]

Figure 1: EC-funded games for learning projects[11]

Targeted Audience

Primary/Secondary	Tertiary	Life-long Learning	Industry
eMapps	Aitmes	SIG-GLUE	Touareg
Discover	ELEKTRA	Goal Net	Game On
ARGuing	mGBL	L2C	ANSWER
cu@city.eu	UNIGAME	Playmancer	edutain@grid
eCircus	IPerg	ElderGames	GameTools
RENAISSANCE	80Days	G@L	mGain
ThinknDrinkn	GAMES	TA2	
Easy2	InterLoc	e-vita	
Consolarium	VirtualLife	ILGRECO	
Games in Schools	TARGET		
DANT/IPRASE	INSCAPE		
Kaleidoscope	Prosperity		
Eurogame	FUGA		
Teaching with Games	GaS		
Racing Academy	GameSpace		
Honoloko			
Europa Eureka			
Learning Game			
Radiation Games			
SITCOM			
TiM			

Of these six, two are worth highlighting: Learning Collaborate and Prosperity.

The *Learning to Collaborate (L2C)* Project aimed to provide knowledge tools for managers and decision makers in public and private companies and staff members within groups and organizations to overcome collaboration challenges and traps. The project created prototype simulations for and completed research trials with selected participants. The consortium reported the project as a success with participants being highly motivated to use the tools developed. Unfortunately, the link to join the L2C community is no longer available and the links to the prototype simulations provide only documentation and not the prototype games.

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[10] Pivec, op. cit.
[11] Pivec, op. cit.

The aim of the *Prosperity* project is the development of a computer decision making game in the form of and teaching materials which will allow the user to undertake business management training. Designed for use with a computer simulation, the games create a virtual environment allowing for decision-making and for identifying the player with the role played by them inside the game. It is envisaged that the players will feel the realism of the economical processes they have created. This supports the formation and the development of the key administrative and executive skills.

Recommendation 3: Focus vocational games on outcomes and involve end users

To increase the supply of games for use in the vocational training sector, end users should be part of the design process, i.e. participatory design, so that they are already introduced in detail to the game (so no introductory training is necessary). For industrial learning complex 3D interfaces should be avoided, because they can distract from the purpose of the training and waste time; the focus should be rather be on learning objectives (using 2D graphics and pictures to achieve them).

4. Education systems remain too rigid.

Participants in the adult education round table (e.g. Italy) warned that the formal educational system is still too rigid (indeed at all educational levels, including the lifelong learning sector), thus limiting learning practitioners to use innovative methods and content, including games, more frequently. The view was not universal: Spanish participants described the openness of their educational system which enables teachers at all levels to teach as they wish, as long as it conforms to curriculum goals. There is a need for a paradigm shift from banning games from schools, to embracing them as one of the important pillars for literacy. Teachers at the vocational education round table in Turkey said that if games were formally incorporated in the official curriculum their use would increase.

Recommendation 4: Gradually include digital games in textbooks, the curriculum and assessment.

To enable teachers to teach differently, in a less 'classical' way, game scenarios could be included directly in textbooks. Playing digital games would then gradually become part of the learning process. The strategy would therefore consist of bringing games into the textbook as part of the textbook.

Games should be linked with the curriculum to allow for playful learning, by, for example using them to teach simple concepts, and support problem based learning. Embedding in the curriculum, and assessment, will ensure that activities involving gaming will take place at scale.

The assessment of performance in GBL is a major issue, first because traditional methods of testing do not take account of gains made in GBL, and second because of the difficulty in assessing individual learning taking place in collaborative activities, especially if expected outcomes are not defined. Work is needed on new forms of assessment of educational outcomes and on designing games with predictable outcomes and some form of built in assessment and progress tracking.

Recommendation 5: Make games eligible for funding in education system modernisation programmes

There was a strong view expressed in IMAGINE workshops that ministries should focus spending and intervention more on systematic and long-term dissemination of best practices than on the development of new technologies, products and tools. The Games in Schools study recommended that games should be linked to moves to modernise education systems. In the US a three-pronged approach to modernisation is being piloted, comprising: research and evidence gathering; mapping games to the curriculum in a searchable database of tagged resources (e.g. enabling enquirers to ask ' I'm looking for a game to teach elementary algebra with low-achieving 12 year old boys'); and large-scale intervention and support.

RESEARCHING GAMES IN LEARNING

5. The evidence base of the effectiveness of games is growing.

There is limited scientific evidence that GBL works. Research from the UK indicates that:

- Games provide a platform for active learning, that is, they promote learning by doing rather than listening or reading, they can be customised to the learner, they provide immediate feedback, allow active discovery and develop new kinds of comprehension. There is also evidence of a higher level of retention of material[11]
- Students are often motivated and engaged in games in a way that they are not with formal educational practices.

In Scotland, school teachers reported[12] an increased focus on self-improvement and self-determination, increased engagement in writing and mathematics and more imaginative responses to learning tasks once they begin using gaming in the classroom. Research, also in the UK, by Futurelab[13] found that a lack of evidence had led to 'significant ambiguity' among teachers about appropriateness of computer games in the classroom.

Participants in one of the IMAGINE workshops agreed that research, covering both short, self-contained games and longer more complex games, could explore and test further views on what constitutes 'a good game' for education and training.

Recommendation 6: Evaluate GBL practices and research cognitive processes

There is a need to gather robust evidence to inform advice and guidance on integrating games into learning. Research should cover the impact of games on learning, which types of games work in which settings and why, the transferability of learning and wider benefits from games.. The research could examine what, if any, effect games have on learning, and how this compares to more traditional methods. Empirical measures could include cognitive testing, achievement of learning outcomes, transferability of knowledge and skills gained, and 'naturalisation' of skills learned.

A similar recommendation was made in the Byron Review[14:] "Research is needed to dissect the factors that benefit the child, including an analysis of the 'engaging' elements of play and contexts in which educational learning are boosted when they take place through technology".

The Games in Schools study recommended that the European territory be envisaged as an experimental laboratory. Education could be an incubator for new types of games and playful learning, giving developers an insight into what motivates learners and how game design might evolve.

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[12] To Derek Robertson, in Child's Play, Vision, 2010.

[13] Williamson, B., Computer Games, Schools and Young People, Futurelab, Bristol,2009. http://www.futurelab.org.uk/resources/documents/project_reports/becta/Games_and_Learning_educators_report.pdf

[14] The Byron Review, 2008. http://www.dcsf.gov.uk/byronreview/

DEVELOPING GAMES

6.   Educational resources are more valued when localised and in home languages.

This was a recurring view expressed at the IMAGINE workshops in the face of the fact that most commercial games are based on the American language and culture. It is especially important in schools that resources that children are exposed to should accord with national values, language and culture. Unless this issue is addressed games for learning will remain a minority interest in countries like Turkey.

There are some good games in languages other than English. Partly because they are in tune with learners in that country they are often well used on a large scale, for example Dictation with Pirates[15] in the Czech Republic.

A report[16] produced as part of the IMAGINE project examined cultural issues in games, stating that problems may arise because the European Union "has diverse audiences from different cultural backgrounds [who] perceive values, norms, artifacts, colors and symbols in different ways." Linguistic problems become a major obstacle to the success of conveying information to targeted audiences. Failure to appreciate the importance of culture and language issues in learning games in diverse communities can result in multiple adverse consequences, including difficulties with informed consent, miscommunication, inadequate understanding of content by students and dissatisfaction with the learning environments. Understanding the background, cultural values, and beliefs of target learners leads to good game design in culturally diverse communities.

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[15] http://www.imaginegames.eu/eng/Games-Directory/Dictation-with-pirates

[16] Demirbilek, M., Linguistic and Cultural Issues in EU Funded Game-Based Learning Projects, Suleyman Demirel University, Turkey.
http://www.imaginegames.eu/eng/content/download/696/4090/file/Linguistic%20_Cultural_Issues_EU_Funded_GBL_P.pdf

Recommendation 7:   Support the development of localised digital games

There should be mechanisms and funding streams to identify and localise good games, translating them into in languages other than English, possibly through government funding of games that show proven value, or with industry support (for example large computer companies have funded the translation of some products into languages other than English).

Game developers should understand the background, cultural values, and beliefs of target learners, applying it in game design. They should adopt values, norms, artifacts, colors and symbols to convey positive connotations to avoid negative interpretation of the games. Linguistic problems may occur if designers without sufficient cultural background or linguistic knowledge translate one language into another. If game designers do not notice these problems, confusion or even failure to convey the right information will occur. An accessible game should be adapted to the special characteristics of natural languages and the commonly accepted rules for their use, or of cultures in a given geographic region, to increase communication effectiveness, speed, accuracy, and retention.

Culturally diverse partnerships help develop culturally acceptable games. Multinational research and development projects help participants understand and appreciate different cultures and languages.

It is necessary to build the game on the knowledge and experience of teachers. The teacher should be able to explain ideas and the game can be then developed based on that knowledge and effective communication. At the same time, educational games should also focus on good game-play and especially be accepted and considered as fun to play from the student's point of view. Therefore an iterative game development approach where teacher and learners are repeatedly involved is important.

7. Practitioners, developers, industry and research have differing perspectives.

Researchers, educators and games developers work in isolation, each community using its own terms, language and values. Communication between them is infrequent and minds rarely meet. Many commercial games used for learning could be made easier to integrate with a few small modifications (e.g. making it possible to play part of the game in a short period of time, to save and return to a game). A major issue is that many commercial off the shelf games developers take the view that any 'educational' perception of their products will result in lower sales.

There is still a shortage of good quality games for learning, considerable gaps in curriculum coverage, and not all games are easily available. For school teachers at the IMAGINE workshop in Prague, the characteristics of a 'good game' included:

- A game that is easy to use and that pupils can use both at school and at home
- A game that children and teachers create themselves
- A game that also works online
- The content of the game can be freely released
- A game developed in one country can be used in another country – flexibility and openness
- Features that are appreciated by both teachers and learners (whose perceptions of a good game might differ).

One participant described her successful use of the Envi Game[17], developed from Emapps.com (see finding no. 2) to develop awareness of environmental issues with 10-12 year olds, taking the children outside school with GPS-enabled mobile devices. She argued that developers could exploit more fully the results of games like this and harness the greater sophistication and ease of use of new products as they become affordable.

There was also a divergence of views at the roundtable among education practitioners as to whether it makes sense to concentrate on short, simple games as being the only feasible route to integration in curricula, schemes of work and classrooms or whether a more liberal philosophy encompassing the possibilities of more complex (longer, more expensive) game constructs should be promoted.

A Summer School for Students and Young Designers was organised in Tampere, Finland, from 30th of August to 3rd of September 2010, at the DEMOLA Centre of Innovation, as part of the activities for students and industry within the EC funded ENGAGE project (http://www.engagelearning.eu/). The Engage Summer school tackled issues related to game design as well as how to embed curricular topics in the game design and was carried out in a collaboration of academia (FH JOANNEUM, Austria, TAMK, Finland) and received strong support and involvement of game-developers industry (3MRT, imaginary, Fablusy, Games Factory Online, Alelo).

At the IMAGINE workshops, it was frustrating to hear of games for education designed without involving educators, and to hear the developers complaining that teachers 'struggled with the game'. On the other hand it was heartening to listen to an experience in Estonia where a history game about World War 2 started from the history curriculum for schools, and included elements that made it successful in classrooms, e.g. the game can be completed in one lesson, fostered co-operation and is built to open standards enabling teachers to create and modify games. An Italian

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[17] http://www.envigame.cz/

participant also spoke in favour of 'little games targeting a specific ability'[18] that last for one lesson, and backed up her views with research findings that showed higher assessment scores among those playing the games. Teachers in vocational schools at the Turkish round table proposed that expert opinion should be taken in developing the content of educational games. The quality and attractiveness of many games targeted at schools is often markedly lower than the games young people are familiar with outside school. They are unlikely to find a simple computer-based matching game as compelling as some teachers might imagine.

Recommendation 8: Increase opportunities to bring together researchers, games developers, industry, education experts and learners.

There should be more opportunities for bringing together research, practice and games development, to share perceptions and work towards common goals, increasing cooperation between the games industry and education around ambitious projects. There is a case for a cross-domain Thematic Network type action to help bring this about.

A neglected aspect in games for learning is the actual learning design, rather than the technical or operational features. If the pedagogical design could be enhanced, sales and uptake would surely increase. It is important to define the expected outcomes from a game, for example concrete information acquired, skills learnt or why children are motivated to play the game. The skills need to be defined more concretely and the result of this definition should be transferred into the learning context. Games for children should not be overly text-based.

There are opportunities to develop games to cover poorly taught or -resourced curriculum areas. In Slovakia, for example, Investland simulates a market-based economy and helps young people learn about entrepreneurship even if their teachers may not be expert in the subject.

As suggested in Recommendation 2, a design challenge competition for the best game developed for supporting learning could provide an impetus for developers and students, give credibility to games for learning, and help attract interest in careers in the digital games industry.

Recommendation 9: Ensure that games are available for further development.

The strategy would be to foster licensing of the games under open standards (e.g. Creative Commons or similar) and build on the developers' and innovative users' communities. An Open Source 'laboratory' could be created such as that made available by Europeana for cultural resources[19.]

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[18] See www.iprase.tn.it

[19] http://version1.europeana.eu/web/guest/news/-/blogs/148578;jsessionid=95F79491081CE353134CDAFC45B7D02E

TEACHERS

8. Games are at the early adopter stage in education.

Games-Based Learning is still at the early adopter stage, although this varies between countries - Scotland, Denmark and Catalonia are probably in the lead for GBL in schools. According to some participants at the lifelong learning Round Table, most teachers use only existing textbooks and are not motivated to go beyond them. At the vocational schools round table in Turkey, participants suggested that head teachers had no knowledge or experience of educational games, although, when asked, they were positive about their potential, provided schools were adequately equipped, teachers were digitally competent and class sizes optimal..

The Games in Schools Study[20] compared approaches to digital games in European education systems and found that there were four major reasons cited by educators for using games: as a support for pupils in difficulty; to modernise the system; to develop advanced skills; and to prepare future citizens in an increasingly 'virtual' society.

An example of a game used to support learners in difficulty is a set of commercially available training games[21] for sufferers from Attention Deficit and Hyperactivity Disorder. They can control ADHD symptoms by playing mind controlled attention training computer games that improve attention and train self-discipline. The games system uses a helmet lined with electrodes, to monitor brain activity, which is connected to a computer. The helmet picks up brain rhythms associated with concentration and this sends messages to what is effectively a computer games console, so the player can control the game with their mind. In one game the children have to get a deep-sea diver to descend to the seabed and retrieve treasure. To get him to dive, they had to focus their attention – he stopped moving if their mind wandered. Despite proven effectiveness (and to some extent its cost), this game is not yet in general use.

Designing, producing and marketing games, rather than 'consuming' them, can be an enriching classroom activity to develop skills and prepare future citizens contributing to the knowledge economy. By following the process from inception to production, learners develop a range of skills as well as problem-solving, working in teams, entrepreneurship, etc. Again, this is not yet widespread practice. A useful starting-point is the book Game-*based learning: Discover the pleasure of learning*[22], especially y Chapter 4: Designing and implementing a game in an educational context.

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[20] Wastiau P., Kearney C. & Van den Berghe W. (2009): How are digital games used in schools. Main results of the study. http://games.eun.org. AT, DK, FR, IT, LT, ES, NL, UK

- Final report: *How are digital games used in schools?*
- Synthesis report: *How are digital games used in schools?*
- Handbook: *Digital Games in Schools: A handbook for teachers*

[21] http://www.gamesforlife.co.uk/educators

[22]: Pivec M., Moretti M. (Eds.), (2008) Game-based Learning: Discover the pleasure of Learning. Pabst Vrlg. (ISBN 978-3-89967-521-4), also available in pdf format from http://www.engagelearning.eu/community/?p=50.

Recommendation 10: Provide professional support for practitioners using games

Teachers need support to get to know and use games for learning. This could be provided either by companies or experienced educational organisations. Motivational strategies should be considered that could be applied to encourage teachers to embrace games and new teaching / learning methods, change the attitudinal environment amongst teachers (their general non-acceptance of games as a learning activity), and ensure ownership of resources (teachers want to use their own resources). Examples and case studies are needed.

9.   There is growing interest among teachers but considerable resistance too.

A study by Futurelab in the UK, Teaching with games[23] found a sharp polarization between teachers willing to consider using games (59%) and those would not use games (37%). At the round table in Turkey, teachers were concerned about the violent, addictive and negative image of computer games and the difficulty of classroom management. There are several reasons for resistance to using games for learning, e. g. it is difficult to integrate games into the curriculum, lack of infrastructure (insufficient availability of computers), negative attitudes from many sources (e.g. other teachers, local policy makers, parents), the length of the lesson and the length of the game.

Which obstacles do they face?
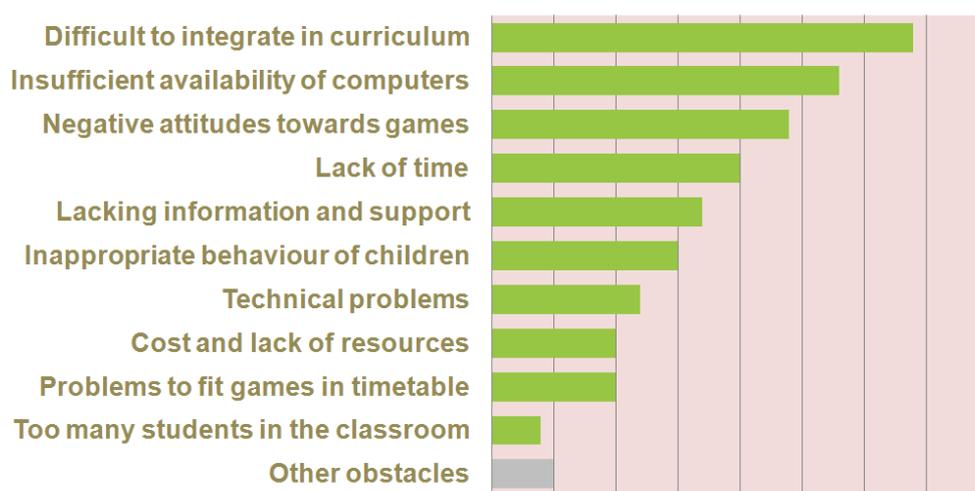
Nevertheless many teachers either use games or are positive about their potential, teachers at the Turkish round table for example ageing that games can improve creativity, participate in lessons actively and acquire vocational concepts easily. The Games in Schools Study[24] found that teachers using games in schools do not belong to any particular sub-set of teachers, i.e. there was no bias towards gender, age, number of years in the profession, familiarity with games, age of pupils or the subject they teach. They use educational games as well as commercial off the shelf (COTS) and leisure games. Most teachers in schools believe that the games might be useful for the students with difficulties and special needs.

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[23] http://www.futurelab.org.uk/projects/teaching-with-games/
[24] Op. cit.

Why are teachers interested in using games?
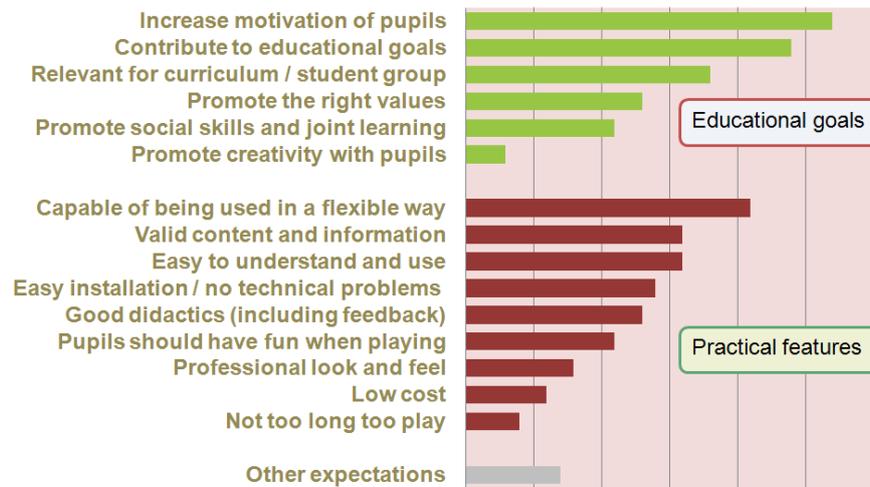
The Games in School study concluded that several elements are needed to counter resistance and promote the use of games in learning: a structured pedagogical framework; interaction with traditional pedagogy (a mixture of frontal teaching and other styles); collaborative experiences (teachers´ communities of practice, exchanging ideas, sharing the results etc.); and different approaches depending on the educational system (support to pupils in difficulty, involvement of educational authorities). At the round table in Turkey, teachers strongly felt that games used in education should be appropriate, not waste time or lead to disruption At another workshop exposure to game-based learning as part of teacher education (as in Belgium) was said to bear fruit.

Recommendation 11:	Use the experience of the teachers working in this area

Teachers are inspired by peers and this viral effect can be exploited to mainstream the use of games for learning. Testimony from a teacher such as this is surely contagious: "The children have responded in ways in which I could only have dreamed of. Not only in writing and literacy but in other areas – children are no longer reluctant writers but enthusiastic participants. Many have had barriers lifted and realised that they can do it!! But the other stuff I was not prepared for. We had improved attendance for the whole 4 weeks (almost 100% which is unheard of usually), improved behaviour, increased group-work skills (no squabbling in class and the children who 'hate' writing were so switched on they would come in the morning asking "Is it Myst writing today?". One child who is my weakest and perhaps most reluctant writer even asked if he could stay in over lunchtime to finish writing.[25]

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[25] reported by Tim Rylands http://www.timrylands.com/blog/2010/09/17/ict-for-education-conference-brighton/

A structured set of EC financed dissemination activities to promote GBL and the quality of learning games based on targeted national seminars was carried out in 12 EC countries in 2010[26]. The seminars offered theoretical and practical sessions, game reviews from educational point of view and best practice examples of usage of games for learning. During the workshops a high level of interest amongst teachers, especially in practical sessions, was observed. However, the need for resources, games and seminars in the country's language was expressed repeatedly in various countries, especially in the primary and secondary school sector, indicating, that certified courses should be adapted and offered in their own language, a view reflected at the vocational schools workshop in Turkey where participants argued that professional development is crucial to change vocational teachers' attitudes towards computer games.

Recommendation 12: Establish accredited courses for teachers

Providing training for teachers is necessary and gives them support and resources to introduce GBL into their environment. GBL training also develops more general ICT skills. The multiplication effect might come into force: teachers who pass the course and gain concrete knowledge will disseminate their knowledge and experience to other teachers and colleagues. There is no need for teachers to learn about every aspect of the game (especially the concrete technical knowledge). They have to learn only what is really needed to know and necessary to run the game and they have to be convinced that the game is beneficial for the students/pupils.

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[26] http://www.engagelearning.eu/teachers/?page_id=30

LEARNERS

10. Adult Learner competence: the digital divide is real, creating digital literacy problems.

The informal learning sector is of increasing importance, e.g. learning for personal growth and for more active participation in society, but some 30 percent of Europeans have never used the internet, a high proportion of whom are disadvantaged adults.

A case study from Slovenia presented at the IMAGINE adult learning Round Table showed that many adults are still afraid of technology. Some who have particularly low self-esteem don't even allow their children to teach them basic skills. Use of digital games is still very much beyond where they are, and elementary digital literacy skills need to be acquired before introducing innovative ICT supported learning methods, such as digital games. The Slovenian institute for adult education used to offer extensive literacy programmes, teaching adults basic skills to work with computers. The programmes were successful, but they stopped due to lack of finances.

The main focus of the study "*Gaming for reading: A feasibility study on the use of video games to engage adults with low literacy in reading for pleasure*", published in June 2010 by The Reading Agency[27], was how the scale of engagement achieved by the £1 billion (€1.15 billion) gaming industry can be brought to bear on this country's adult literacy skills. They were looking at the potential for games, ranging from those created for educational purposes to commercial games accessed online, on games consoles or on handheld devices, to engage adults in an enjoyment of reading and to support their skills acquisition at the same time. They are also exploring how the successful Six Book Challenge scheme for emergent adult readers, launched in 2008, might be enriched with a gaming or digital dimension.

> ### Recommendation 13: Maintain funding for digital competence programmes and resources
>
> In a context of cuts in public spending, many programmes targeted at the disadvantaged are under threat. In the private sector, there are issues of high risk for companies, high costs. It is thus difficult to assure enough funding. To achieve evolution of teaching practices, more money is needed to would allow teachers to be more creative and develop resources useful for further work.

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[27] http://www.readingagency.org.uk/new-thinking/gaming_for_reading_report.pdf

11. People of all ages and both sexes are enthusiastic game players outside formal learning settings.

Games are integral to most young – and, increasingly, older – people's lives. Educational games are the third most played type of game played by parents and children under 15 years old (just behind fitness and racing / sports games[28]). The ICT in primary schools study, STEPS[29], found that the experience with technology of young children aged five to seven is much more developed and sophisticated than the technology they encounter in school.

Online games like Footee[30] show how informal learning outside school can take place – and how popular it can be (Footee has over 100,000 registered players). Building on the popularity of football, Footee is a set of activities related to the curriculum which, when completed, earn points which can be used to 'buy' famous footballers to create virtual teams. Parents receive updates on their children's choice of games and their performance, together with suggestions for other activities.

The main reason teachers give for using games in lessons is to harness this enjoyment and engagement to support learning, though, as some participants at workshops noted, it is an expensive way to motivate children.

Recommendation 14: Link home and school learning through games

Exploit the installed base of equipment at home, the engagement of families and the motivation and skills of children to develop a systemic approach to learning outside school in informal settings. The focus should be on tackling 'pinch points' in the system (where in-school provision is ineffective), progressing through games-based activities towards assessed outcomes related to curriculum objectives. The phrase 'in the curriculum, but out of class' could sum up such an approach, in which progress towards defined and assessed outcomes through gaming takes place outside school but is considered an extension of, and equal to, learning inside school in more formal settings. This is taking place in the US and has potential in Europe, especially in countries where there is a common core curriculum. The prospect of doubling learning hours is a compelling argument in favour of this initiative.

As games for learning develops in schools, parents need to be kept informed and their fears allayed. Paper-based, short and snappy promotional materials should accompany online information provided for parents (proposed by Ulicsak and Cranmer[31]). The suggested repository (Recommendation 2) should be open to and easily understandable by parents and the media.

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[28] Ulicsak and Cranmer, Gaming in Families, Futurelab, Bristol, 2010
[29] http://steps.eun.org
[30] www.footee.com, a free online game with an optional added-value subscription service.
[31] Ulicsak and Cranmer, Gaming in Families, Futurelab, Bristol, 2010

Like some teachers, many parents are concerned about over-exposure to computer games, both at home and at school. At home, their concerns include relate to time spent playing, negative impact on social abilities and on family time and unsuitable content and contacts in some games. Parents tend to play more frequently with sons than daughters. Danger may exist in the terms of suitability of the games for children and the PEGI system of rating[32] is useful in showing clearly which games are suitable for children and which not.

<table>
<tr><td>Recommendation 15: Ensure that games for educational use have PEGI ratings</td></tr>
<tr><td>To abide by the EC recommendations from the European Parliament session document (2009) on the protection of consumers, games developed for educational use, even if they are not commercialized and only utilized within a project, should not be exempt from the established PEGI ratings. PEGI1 guidelines suggest which age level a game is appropriate for and use a further eight categories to describe the content. Partners in EC-funded projects should be encouraged to implement these. This recommendation also appears in the 2008 Byron review in the United Kingdom.</td></tr>
</table>

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[32] http://www.pegi.info/en/index/

ANNEX:

1: The IMAGINE Project

The project

A two-year project funded by the European Commission under the Lifelong Learning Programme, the core aims and objectives were to:

- Draw together and valorise the results of previous Game Based Learning (GBL) initiatives and projects across the school, adult and vocational learning sectors.
- Use this evidence to influence policy makers' perceptions and actions to support a marked increase in piloting and mainstreaming of GBL.
- Have a significant impact on validating new learning paradigms and strategic thinking on curriculum reform.
- The major products of the project are:
    - A **State of the Art Report** on games-based outcomes, segmented by educational level
    - Identification and description of convincing **good practice case studies** spread across the three education levels covered and the establishment of a selection of these as 'reference sites' willing to be consulted by any interested party.
    - A **Directory** of proven software platforms, commercial and other games products etc which are available for wider use in GBL, terms and business models for their availability
    - A series of **recommendations** to policy makers also segmented by level of education
    - An **interactive web environment** underpinned by a database enabling the project to distribute regular news, reports and information to EU, regional and national policy makers transversally in every LLP participant country.
    - Reports from three separate **round-table workshops** involving policy makers and other expert stakeholders (including games industry representatives) to discuss and define major issues according to each of the 3 education sectors.
    - **A Final Conference** targeted to key policy makers from across Europe in November 2010.
    - A clear mechanism and responsibility for **sustaining the work** of the project after it is over.

The IMAGINE partners:

The desk research work and valorisation process is led by Maja Pivec, Professor of GBL and Learning with Multimedia at the University of Applied Sciences FH JOANNEUM in Graz, Austria and winner of the Herta Firnberg Award (Austria) in 2001. This work is supported by two other University research faculties from Slovenia and Turkey respectively with recent European level experience in GBL at school and adult level and also by European Schoolnet the association responsible for promoting innovative strategies for using ICT in schools in Europe.

The compilation of a Directory of Products and Services is being carried out by MDR Partners (see below) , supported by Cross Czech, an NGO both of which have recent experience of marketing and designing business models for new GBL products within an FP7 project: eMapps.com, and the other consortium partners.

Dissemination activities draw upon the unrivalled contacts network among policy makers of European Schoolnet and those of other, key transversal associations such as the European Adult Education Association (EAEA).

The process of formulating **policy recommendations** based on the systematic collection of evidence outlined above will be led by European Schoolnet in consultation with all other partners, taking care to reflect knowledge, evidence and concerns across the three levels of education involved. It will also host the **Final Conference** to discuss in depth, validate and promote these recommendations.

The web environment and dissemination channels for the project will be maintained by MDR Partners which has substantial and successful experience of maintaining 'one-stop-shop'/portal web dissemination channels and services for major European projects.

MDR s is also a very experienced co-ordinator and project manager of dissemination and exploitation projects under a variety of EC programmes. It is supported by Cross Czech in the quality assurance, monitoring and evaluation work of IMAGINE, drawing on its experience in this area at national and European level, in addition to its recent leadership of the eMapps.com GBL research project.

Workshops and events

Schools workshop
http://www.imaginegames.eu/eng/Events/IMAGINE-Workshops/School-Education

Vocational workshop
http://www.imaginegames.eu/eng/Events/IMAGINE-Workshops/Vocational-Education

Adult / Lifelong Learning Workshop
http://www.imaginegames.eu/eng/Events/IMAGINE-Workshops/Adult-LL-Learning/Adult-LL-Learning

Round Table at the 3rd European Conference on G
http://www.imaginegames.eu/eng/Events/EGBL-Conference-Roundtable

2: Glossary

Action Game: This genre focuses on speed, physical drama with high demands on the player's reflexes and coordination skills.

Adventure Game: This genre focuses on puzzle solving within a narrative framework relying on the player's ability to think logical.

Avatar: An avatar is an interactive representation of a human figure in a games-based or three-dimensional interactive graphical environment.

Commercial game: An overall term for computer games that are sold through traditional distribution channels, sometimes referred to as COTS – commercial off the shelf.

Educational games: Games for learning are often imaginary (e.g. fantasy) interactive and immersive environments in which role play, skills rehearsal and other learning (e.g. collaborative or problem-based) may take place individually or in teams.

Game engine: Each computer, video game or interactive application with synchronous graphics has a game engine. The game engine is the central software component, providing the underlying technologies. The engine greatly simplifies the task of games development, and often allows the game to be used on different platforms, e.g. different game consoles and PC operating systems.

Immersive world: Immersive world is a term used in this report to mean simulations, games and other interactive, often 3D virtual spaces, or crossover spaces (e.g. between virtual and real).

MMO or MMORPG: An abbreviation for massive multiplayer online game in which a large number of players interact with one another in a virtual world.

RPG: An abbreviation for role-playing games in which the participants assume the roles of fictional characters and collaboratively create or follow stories. Participants determine the actions of their characters based on their characterization, and the actions succeed or fail according to a formal system of rules and guidelines

RTS: An abbreviation for real-time strategy games that refer to a combination of action a strategy typically involving resource management and the waging of war.

Simulation: Games where realism is first priority. The player's ability to understand and remember complex principles and relations is paramount.

Strategy Game: Genre where the ability to make deal with dynamic priorities is key.

3. Going further

See also references in the body of this paper.

http://www.delicious.com/tag/hzk10+educational_games. A growing list of references and links developed in the writing of the Horizon Report 2010 K-12 Edition

http://gamesinschools.ning.com/: A community for those interested in games for learning

http://games.eun.org/: A blog managed by European Schoolnet on games in schools.

www.engagelearning.eu: ENGAGE is a major EC-funded dissemination project on games for learning.

GaLA - Games and Learning Alliance is the Network of Excellence on Serious Games funded by the European Union in FP7 – IST ICT, Technology Enhanced Learning with a budget of 5.65m Euros. **GaLA** started in October 2010 and lasts four years.