

Not just for children: game-based learning for older adults

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Abstract:

The paper discusses the issue of how to use games effectively with older learners. It approaches the problem from a theoretical and a practical perspective, introducing the rationale and the methodology adopted in the Game-Based Learning for Older Adults (gambaloo) project, which aims to create a thematic network and to share good practice in the field. This paper first introduces and discusses the aims of the project and presents a rationale for the use of game-based learning with adults. The four themes of the project are then highlighted and explored. First, issues of motivation related to adults and games, the assumptions that are commonly made, and the differences between the motivations of adults and children will be discussed. Second, potential use of games for health, wellbeing and rehabilitation is discussed and research into the effectiveness of games in this field is presented. Third, the use of business games, a more established model of learning with adults, is considered, and lessons learned discussed. Finally, the potential of brain training games, for engaging and stimulating older adults, and research in the area will be presented. As a conclusion the advantages and disadvantages of the use games for learning with older adults are discussed and a future agenda for further research in this area is proposed, in the hope that the project outputs could be of help to educators working with older people, educational developers, course designers and industry.

Keywords/Key Phrases: game-based learning; lifelong learning; adult education; teacher education; games for change

1. Introduction

Game-based learning (GBL) can be an effective way in which to motivate students and engage them in active learning experiences. Game-based learning involves using games, both digital and traditional, to support and enhance teaching, learning or assessment. It provides a pedagogic approach that supports active and experiential learning, and has the potential to engage and motivate students. However, much of the research and practice in this field presupposes that learners are children, teenagers or young adults, while in reality the number of older adults in tertiary education and engaging in informal lifelong learning is growing significantly. The potential of games to support adult learning is less well researched, although some excellent practice exists in higher and further education, adult education and informal learning. With an aging population worldwide, the potential of games for use by adult learners, and in particular for older adults, is one that has been underexplored and one that will become of increasing interest in years to come. This issue is one that is addressed by the Game-Based Learning for Older Adults (gambaloo) project.

Game-Based Learning for Older Adults (gambaloo) is a two year learning partnership, funded under the EU Lifelong Learning Programme, which started in July 2011. The project aims to gain insights into how to use games effectively with older learners, in formal, non-formal and informal settings, including undergraduate and postgraduate programmes in higher education and in adult learning institutions. The target population are primarily older learners aged 50 years and above, but also younger learners (aged 25 years and over) where lessons can be learned and applied more universally.

This project has two main objectives: first, to bring together researchers, teachers and learners interested in the use of game-based learning with older adults; and second, to create an international network to share good practice and develop future collaborative research in the field. The project will achieve these aims by building a pan-european network of expertise, based around the three core

partners in Belgium, Germany and the UK, and a collaborating institute in Italy, all with expertise in different facets of the field. Four areas are of particular interest: motivation and older adults; games for health and wellbeing; business games; and brain training games.

Through this collaboration, the project will:

- build the capacity of learners and educators across Europe, and further afield, to explore the potential of games for learning with older adults through face-to-face workshops and conferences;
- develop a set of focused briefing paper covering relevant aspects of GBL with older learners;
- develop a collaborative blog and online resource that enable partners to share and comment on resources as well as to relate to other blogs in the field, and that allows non-participants in the project to access and benefit from the materials produced.

The project is intended to be student-focused and each partner has recruited a local group of learners who will input into the project through its duration. These learners contribute to local planning, workshop design, and the project blog. They are also invited to attend local workshops, asked to contribute to all outputs, participate in the evaluation activities, and attend the final conference. The project also intends to form links, through the project blog, with other bloggers who are older learners and online networks that support such learners.

2. Background

Recent research has started to shed light on the attitudes of older adults towards computers and gaming. In the framework of a regional program for the 'third age', a course was held by one of the authors in the field of digital literacy. One hundred and twelve older adults (aged from 55 to 86 years, half men and half women) were involved in a six months course. They were initiated to the use of computers and in particular to the basics of Computer Mediated Communication (CMC), internet search, the use of the Microsoft Office suite including drawing and painting tools, and some basic gaming activities were also proposed, entailing the use of very simple puzzle games (such as mine craft, sudoku, mastermind, etc.). The study population, despite some initial dropouts (5 people) followed the whole course and at the end received, from the local authority, a computer to be used at home for personal use. The digital activities of the group (reduced up to 87 owing to further dropouts) were monitored for one year after the course conclusion by the teachers both at a distance and in presence (where needed) (Gatto, 2005). After this period, they were considered to be 'autonomous' in the use of the computer, and their attitudes, abilities and preferences were investigated by means of questionnaires. What emerged was that the majority of the group (79%) had acquired very good familiarity with the available tools (both hardware and software) so that the 60% of them used the computer every day, 25% made at least weekly use of it, while the remaining 15% only used it once a month. The preferred digital activities, autonomously chosen and carried out by the group, were ranked. The four most popular activities were:

- Internet search
- Interpersonal communication
- Gaming
- Free writing

As regards the gaming activities, the puzzle games originally presented during the course were the most popular, and only the 2% of the group, besides playing the above games, were motivated and able to download other types of games from the net (or play new internet-based games). The more skilled persons in the group also involved a consistent part of the group in playing Facebook-based games such as Word Puzzle or Farmville. This helped maintaining the links among 'pairs', participants to the course.

This experience allowed the researchers to conclude that gaming is a well-thought-of activity for older adults. Regarding genres of the games that better suit their needs, it was noticed that there was a remarkable attention to non-violent games, and to those without pressing time constraints; word and card games and those non-time pressure games.

Another relevant aspect was the scarce interest in looking for and finding new games to be played; in fact, the participants appeared to need specific guidance for the choice of the games to be adopted.

Maybe this aspect is related to the fact that the group of older adults involved in the reported experience was composed of people that were previously digitally illiterate, so the conclusions drawn could be different if a population of older adults starting from a different background and having previous experience with computers and digital games was used.

Nevertheless, the gambalooa project also builds on these findings and acknowledges that: a) gaming is one of the digital activities that better suits the needs and preferences of the older adult population, b) the greater part of this target population needs guidance and assistance to choose well suited games and also needs accurate initial training and monitoring of the gaming activities to be carried out. Based on this, the gambalooa project not only aims at making the gaming activity pleasant, rewarding and stimulating but – as specific learning targets – also aims to increase older adults' mental and physical wellness.

3. Gambalooa project themes

The aim of the project is to explore and share good practice in four thematic areas, which reflect the expertise and research interests of each of the partners, and have implications for the area of games and older adult learners. In this section a brief overview is provided of each of the themes – motivation, games for health, games for business, and brain training games – highlighting the issues relevant to older learners.

3.1 Older adults and motivation

Computer games can offer interactive, inclusive and collaborative learning experiences for all learners, but for older people attitudes to games and learning, confidence with technology, preferred interaction modes, and accessibility limitations, may be different from younger learners. Older learners have not grown up with technology and may be less confident in its use, and their experience of (school- and work-related) may be more traditional learning, which has not included game-based learning in a manner that would lead this group to expect significant learning outcomes from this learning/teaching method.

There is also an issue of the age structure of teachers, as they also have to accept and get used to game-based learning or game-based teaching. It is also a big step for teachers to use games, because it implies a certain loss of control over the learning process, which teachers usually do not give up easily. Older teachers might not be that acquainted with these methodologies and younger teachers who might be more open, may be even more reluctant to give up control when working with groups of older learners.

Systems of adult Education and the training of adult educators differ significantly within and between EU countries. However, lifelong learning and the better integration (by better motivation) of older learners, due to the demographic shift and the changing requirements of the knowledge society, apply to all EU countries. Several studies show that an effect of game-based learning is a higher learning motivation, but this assumption is one that cannot simply be taken for granted. Whitton (2007) argues that games may be motivational for some learners but, conversely, they may demotivate others. In a survey of undergraduate computing students, 98% of whom played games in their leisure time, only two-thirds said that they would find games for learning to be motivational. A key finding of this research was that adult learners are typically open to a range of ways of learning – games included – as long as they perceive them to be an effective way in which to learn. If they are convinced of the learning benefits of games then they will engage with them, but for many the use of games simply to motivate will be ineffective.

Seminal work on games and motivation with children (Malone & Lepper, 1987) has suggested that there are four elements of games that are motivating: challenge, curiosity, fantasy and control. Other, more recent work on adult motivation to engage with games, in this case alternate reality games, (Whitton, 2009) determined six factors that influence players' motivation to engage with games. These are:

- Completion - collecting objects, completing levels;
- Narrative - following a storyline, journeying with characters, discovering what happens next;
- Creation - building things, developing ideas, creating artifacts;
- Competition - achieving things better or faster than other players;
- Community - talking with others, collaboration;
- Puzzle-solving - problem solving, lateral thinking.

Each of these elements were motivational for different players to different degrees, so for example some found the narrative of the game being evaluated compelling while others focused on collecting things or solving puzzles, and some players were more interested in the online community than actually completing the game. The lesson from this research is that adults play games for many reasons and, in order to create a game that appeals to as many people as possible, it is important to balance these six elements so that different players can engage in the game in different ways.

In the sphere of educational games, an understanding of the complex nature of adult motivations is important if the field is to move beyond the simple assumption that learners will play games because they are motivating. The design challenge is to create games that are motivating in different ways to appeal to different types of people; the pedagogic challenge to create game-based experiences for adults that are effective for learning, and seen to be so by learners.

3.2 Games for health, wellbeing and rehabilitation

Physical activity participation in people over 65 can maintain and improve cardiovascular, musculoskeletal and psychosocial function (Aoyagi et al., 2010; Barbour et al., 2007; Chodzko-Zajko et al., 2009). Even light activity is associated with improved function and a reduction in mortality rates of 30% in those aged 70 years and over (Johannsen et al., 2008; Manini et al., 2006). In this section provide some examples regarding the use and effectiveness of games in physical exercise (i.e. promotion of healthy behavior), as well as in treatment therapy of older adults, are provided.

Falls and fall-related injuries continue to be a serious health concern for older adults. They are the leading cause of injury-related death for people over the age of 65 (Stevens et al., 2008). Games are becoming an increasingly popular technology for the training and assessment of balance in older adults. Recent studies have shown promising results for the use of platforms such as Nintendo Wii and Xbox 360 Kinect in fall prevention. A force plate and/or a depth sensor measure the performance of the participant and provide real-time visual feedback of postural control. Williams and colleagues (2010) performed a pilot study on healthy, independent community living adults over 70 years of age and found significant improvement in Berg Balance Scale performance following four weeks of Wii training. In addition to studies showing objective improvement in the physical statement of older adults, van Schaik and colleagues (2008) reported that older adults also preferred cycling with interactive gaming rather than traditional stationary cycling.

Besides the use of exergames in the promotion of healthy behavior, several studies using Nintendo Wii have illustrated the potential of active video games as a rehabilitation tool in older people. Compared to the traditional physical therapy treatment in a hospital setting, these platforms are becoming increasingly popular due to the low cost, independence and ease of use in the home. Furthermore, while traditional physical therapy can be monotonous for patients if they are required to do the same activities during every treatment, the game platforms provide a range of familiar sports and fitness activities such as tennis, boxing, bowling and Tai Chi that can be varied according to the patient's preferences (Bateni, 2011). A controlled study in adult stroke patients compared a two-week program of non-active leisure activities with two weeks of Nintendo Wii activities. Participants using Wii had a significant improvement in their upper limb motor function when compared to the recreational therapy group (Saposnik et al., 2010).

Bainbridge and colleagues (2011) assessed balance measures following a six-week program of Wii fitness exercises in six community-dwelling older adult participants. Four of the six participants demonstrated a clinically-relevant improvement in Berg Balance Scale measures following the Wii fitness program. The surprising success of Nintendo's Wii with the elderly in retirement homes inspired Benveniste and colleagues (2012) to design MINWii, a new serious video game in the treatment of Alzheimer and demented patients usable by untrained music therapy practitioners. Its goal is to improve patients' self-image (renarcissization) to reduce behavioral symptoms, which are an important cause of institutionalization. With MINWii, elderly gamers use Wiimotes to improvise or play predefined songs on a virtual keyboard.

3.3 Games for business

Business Games are a major part of the field of serious games, which benefits from the use of business games in professional contexts and from companies financing their use on different educational levels (mainly in order to improve the appeal of market economy), from secondary school to higher education as well as to vocational and further education. Thus they may be used by learners of all ages.

Educational games, like methods for learning and teaching in general, should be in accordance with their didactic purpose. If the game is only superficially related to the learning target the risk exists that the players learn to play the game but not the intended subject, which again can also be a motivational problem. This is particularly relevant as for cognitive learning goals the effectiveness of educational games is contested (e.g. Wilson et al., 2009). In general "the empirical research on the effectiveness of instructional games is fragmented ... research literature is also filled with ill defined terms, and plagued with methodological flaws." (Hays, 2005) Such didactic transparency, i.e. the recognition that a certain educational method is sufficiently effective, is particularly important for adults who will be more reluctant to engage in what they perceive to be inefficient time-wasting methods than younger learners usually do.

The extensive use of business games is not direct counter-evidence to this assumption. However business games, in the sense that they are games and not 'only' simulations, are also special in a certain regard, which can make them a suitable educational method. The educational success of a game depends on the sufficient correspondence between respective game dimensions and the learning targets, i.e. the playing process does not fall apart from the learning process. Such transferability of the gaming process in business games into practically relevant learning is at least partly easy to achieve. Business games can enjoy a certain amount of confidence regarding their didactic transparency as they usually build on the correspondence between the competitive or challenging dimensions of games and real-world competition faced in economic life. To compete (within rules) is as a deep-rooting anthropological trait of playing games. Accordingly a great variety of business games simulates features of competition of real markets or the challenges markets create within a company.

There is a wide range of realizations of such business games. They are implemented as board games, as computer-assisted and completely computer-based games for classroom instruction and as on-line applications for locally separated players. There are specific business games and mock companies, role plays (like conferences and auctions), stock exchange games, or simulations of the macro-economic system etc. These games reflect certain models of business processes and try to train respective action and perception schemes. Though the game scenarios are highly fictional and structurally restricted they try to partly resemble real social structures (Seeber, 2007).

3.4 Brain training games

Much has been written around the use of brain training games for the older adults (Nouchi et al, 2012). Such games are widely considered to be suitable tools to support exactly those cognitive functions and activities that need to be sustained in older adults such as memory, attention, preparedness, concentration and problem solving. The popularity of these games for the target age is grounded on the concept that the brain needs mental practice to stay active and alive and that mental exercise stimulates the brain, often providing long-lasting positive effects regarding thinking and reasoning skills, memory and processing speed.

Computer-based cognitive training has chiefly been found to improve performance on the training itself, rather than transferring to everyday application (Owen et al, 2010), with the only relevant exception being training of working memory (Klingberg, 2010), which actually is a very important mental function supporting reasoning and also fostering the ability to learn new concepts (Howard Jones et al, 2011).

In the direct field experience described earlier in this section, a wide number of such games have been adopted with older adults: from tetris-like games to word-puzzles, battleship, minefield, mastermind, simple calculations challenges, and memory trainers. Most of the games were very well accepted by the target population, with some differences linked to personal attitudes and preferences (some gamers being more likely to perform highly repetitive tasks and others more challenging actions). What clearly emerged was that under the umbrella of 'brain training games' there are a wide variety of games that are very different in nature; the definition of 'brain training games' appears to be

too much generalized. The games it encompasses are very different not only in interface choices and tasks to be solved but also as to the type of underpinning mechanics, pedagogical paradigms and learning goals to be achieved (e.g. they range from simple question-and-answer tasks to more complex strategy games where devising a suitable solution strategy is key to reach the solution).

This is more clear if, for instance, we refer to the revised taxonomy of Educational Objectives (Anderson & Krathwohl, 2001), represented in Figure 1 and actually comprising six different levels for the cognitive processes (Cognitive Processes Dimension) and four different types of Knowledge (Knowledge Dimension).

	The Cognitive Processes dimension					
The Knowledge dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual knowledge						
Conceptual knowledge						
Procedural Knowledge						
Metacognitive knowledge						

Figure 1: Educational objectives revised table taxonomy (adapted by Anderson & Krathwohl, 2001)

In an attempt to set in the above table(Fig 1) some of the so-called 'brain training' games used in the experiments, it was observed that a consistent number of such games fit in the first three columns (Remember, Understand, Apply) and mostly attain the domains of Factual and Conceptual Knowledge; other types of games (different from brain-training games) instead, cover, a wider range of cognitive processes and knowledge dimensions and thus are more appropriate for reaching higher-order cognitive objectives.

This means, as the field experience also demonstrated, that an accurate choice among 'brain training' games is needed and that it should be performed both by having in mind the specific objectives to be met (e.g. memory improvement, support to concentration, alertness, logical reasoning) and the specific needs/attitudes and background of each group or single subject within the target population of older adults. The gambalooa project goes in this direction once again following the idea that the role of educators and trainers is key to the reaching of the intended (learning or otherwise) objectives and that an accurate personalization (Al-Mubaid, 2008) of the educational paths is fundamental to make the most also of the potential of games with older adults.

4. Conclusions

This paper has described the aims of the gambalooa project, and explored in detail the four themes of the project. Over the course of the next year, a series of international workshops will continue, each focussed on sharing the expertise of the hosting partner, and drawing inter-disciplinary links between areas of research. The briefing papers, which will be written over the coming months will be shared with the community at large.

As well as the many benefits of using games for learning with older adults, the method also has its drawbacks. These include the potential difficulty with acceptance by older users, particularly in the context of learning; media portrayal of games as violent, hyper-sexualised and addictive does not help with this cause. Older adults may also be less familiar with digital games and require longer periods of learning, and in some cases interface devices, particularly those with small buttons or writing, may be difficult for anyone with a mobility or visual impairment (increasingly prevalent in older adults). The gambalooa project hopes to address these problems with game-based learning for this population, as well as highlight its benefits.

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