

This briefing paper is aimed at policy makers, senior managers and practitioners who are interested in an overview of game-based learning and how it may be used to support effective learning and teaching practice. The paper provides an overview of game-based learning, including the background, policy perspective and benefits and challenges. In addition, the paper provides a section outlining the work that is currently being funded by JISC in support of this area of activity. The aim of the report is to inform readers about game-based learning and to assist those interested in finding out more about the area.

Background

Game-based learning (GBL) refers to different kinds of software applications that use games for learning or educational purposes. Also termed 'serious games', these games applications can include fully immersive environments (or 'metaverses'), such as Second Life where 3D graphics capabilities are providing opportunities for learners to take on virtual presence in virtual worlds. Equally, simpler games such as quiz games akin to e-assessment tools as embedded in higher and further education (HE and FE) VLEs are being used, and web-based or Flash animations are gaining popularity with tutors and learners, particularly for improving English and Maths or language learning skills. The use of leisure games in learning is also notable and games such as Brain Trainer promote a blurring between formal and informal learning, which may have benefits for supporting learning in HE and FE contexts.

Policy perspective

The increasing importance of GBL has been highlighted recently by Lord Sainsbury, when he acknowledged the importance of 'serious games' to the productivity and advancement of policy in the UK (Department of Trade and Industry, 2006). This puts the games industry in general, and 'serious games' in particular, in an important position for innovation within the public sector. With an export value worth £488 million in 2003, Lord Sainsbury highlighted the broadening games market, the introduction of third-generation games consoles, user-generated content and social interactions as particularly noteworthy recent developments.

This wide range of different games applications is taking education by storm. But key questions remain:

- Will the use of GBL provision change the infrastructural requirements of tertiary education, and if so how?
- What provision is needed to meet the required needs of learners?
- Who are currently using game-based software, alongside popular web-based services including podcasting, blogging, file sharing and the production of collaboratively authored content in their everyday life?

There are many questions as yet unanswered in research terms and largely untested in terms of practice. Work needs to be undertaken therefore to fill in some of these gaps. The Government is showing some commitment to this through the facilitation of collaborative working between the Department of Trade and Industry (DTI), Department for Education and Skills (DfES) and UK Research Councils.

Serious games services and applications have a role to play in relation to their potential to provide greater opportunities for personalising learning experiences (DfES, 2005; HEFCE, 2005). In common with other e-learning tools and services, serious games may offer more choice for learners. Furthermore, serious games are becoming part of a landscape that not only provides unique ways of differentiating learning but also provides potential for supporting social interactions between learners and tutors. While game-based software tools and environments may offer the learner an enriched learning experience in informal learning contexts, the integration of effective GBL approaches into formal learning contexts provides interesting challenges as well as benefits for developers, educationalists and tutors.

Using game-based learning

Game-based learning, if used effectively and in a coherent and relevant way, can support both the option of more choice for how the learner can learn (experientially), as well as offering the potential for personalising the learning experience. In addition it offers a way of integrating a range of different learning tools (e.g. social software) into a more coherent view of learning from the learner's perspective. But this does rely upon two factors:

- Readiness of the learner or learner group to adapt to a new learning tool
- Correct level of institutional support (e.g. technical support, continuing professional development, allocation of staff time and resources, curriculum development)

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While those institutions already using GBL are satisfied that learning in this way is effective, outstanding issues concerning the level of support needed from the institution do present considerable challenges. However, if the learner group is interested in learning in this way, and if the support structure at the institutional level is sufficient, then the potential of GBL to engage and motivate learners is significant.

What are the benefits of game-based learning?

The benefits of effective use of GBL are considerable, but as studies have shown use is often most effective with particular learners who enjoy learning with games (de Freitas, 2006; de Freitas et al., 2006) and therefore its most effective use may need to be differentiated accordingly to learners' specific requirements (e.g. according to learning level, competencies and skills).

- **Motivation** is a key aspect of effective learning, but that motivation needs to be sustained through feedback responses, reflection and active involvement in order for designed learning to take place. Game-based learning offers a particular strength of motivating users and this is why many learning games have been developed for particular groups that have difficulties with sustaining motivation (e.g. Skillswise and a modified version of Neverwinter Nights are both designed to improve literacy and numeracy skills to Level 2)
- **Integrating a range of tools** together has been a key challenge for e-learning, as often tools that have potential uses for education are not always as easily integrated into institutional systems such as VLEs. Also, technical constraints (e.g. institutional firewalls and the graphics capability of available PCs) can often make ready access to new tools difficult. However, GBL does offer the potential to integrate different cognitive tools, such as discussion forums, bulletin boards and concept mapping software. In particular, the use of multiplayer online games promotes this 'tie-in' with other software tools. In some cases in the USA, games are being used as an interface to e-learning materials, resources and courses (e.g. Pulse!!!)



- One of the observations with GBL – and other new collaborative web-based tools – is that they allow for the spontaneous **formation of social networks**. The use of digitally supported learning social networks has not been a subject of extensive academic consideration, but there would be potential uses for learning in networked groups (for distance and online learning) in HE and FE, both in terms of accessing expertise and in providing extra support ensuring higher course retention and completion rates

Challenges for using game-based learning

While the demand for GBL is often provided by learner expectation based upon home use of games (de Freitas, 2006), the challenges of implementing GBL are significant. Learners are clearly expecting more engaging learning content as they are used to this at home. But to make GBL more effective in seminars, it may be more useful not to think of GBL per se, but rather to think of situations and contexts where it might be most effectively used.

- To date, GBL has been used in a wide range of disciplinary contexts (e.g. surgical training, medicine, legal education, science education). But it is fair to say that uptake of simulation and game-based approaches has tended to take deepest root in training and vocational areas. This is due to the experiential and problem-based learning approaches that have been prime pedagogic drivers – as well as due to the financial investment (and the requirement of high student numbers) needed to set up systems and adequate support. However, with the reduction in the associated costs, increasingly games are being used to support learning in schools and tertiary educational settings, particularly with an emphasis upon skills learning and science education
- It is fair to say that the large budgets needed in the past for effective use of GBL, and in particular simulations, are less of a driving force today with the emergence of easily accessible software applications. Development communities have also been allowed access to the source code, which in some cases has led to creative re-versioning of commercial software applications. While cost is still a consideration for institutions in terms of tutorial time, technical support and licensing costs, these costs are coming down significantly, and membership of online gaming communities is in general inexpensive. Pay-per-view style payment models also are becoming more widespread

JISC's work in the area

JISC has been actively engaging in these new developments. Part of the work in the area has been to fund two implementation projects in the Innovation strand of the e-Learning programme that focus upon wider uptake of game- and simulation-based technologies. JISC has also



Racing Academy: game interface

produced a report, *Learning in Immersive Worlds*, which provides a current detailed review of activities in GBL in HE and FE.

Projects funded by JISC

Racing Academy

The University of Bath is being funded by JISC to further develop and implement the use of Racing Academy. The game, developed by Lateral Visions with Futurelab, is a racing car physics simulation based upon advanced mathematical techniques. The main challenge to be addressed by the project centres upon testing whether such a game can adequately support a community of practice centred upon developing a deeper understanding of physics.

In the first phase of the project, Racing Academy will be integrated more fully into the science and engineering curriculum, through design workshops. The second phase of the project will focus upon the evaluation of the use of the game in practice. The evaluation is being undertaken at the University of Bath, Department of Mechanical Engineering, Barnfield Further Education College and Penwith Further Education College.

The main aims of the project are to ascertain whether Racing Academy can support communities of practice based around serious or educational discussion and debate of real physics principles. Although Futurelab and the main partners would like to use the game as a Massively Multiplayer Online Game (MMOG), currently the prototype has been tested in single player mode in classroom/computer room settings with limits imposed on

face-to-face communications, using message-board facilities to test and capture the level at which communities of practice are learning from, and sharing in, reflections upon learning.

SIMPLE (Simulated Professional Learning)

The Glasgow Graduate School of Law at the University of Strathclyde is being funded by JISC to further develop and implement its simulation-based approach to vocational training of legal practitioners and extend it to other curriculum areas. The Diploma in Legal Practice offered at the Glasgow Graduate School of Law (GGSL) is a vocationally oriented postgraduate course. The course aims to introduce learners who have completed their undergraduate studies in Law to the knowledge, skills, attitudes and values required to become advocates and solicitors in Scotland. Following the course, students then enter a two-year traineeship, on successful completion of which they are deemed 'fit and proper' to enter the legal profession.

The project uses a blended learning solution evolving a traditional lecture- and tutorial-based course with academic examinations into a highly interactive and practice-based set of activities supported by online collaborative assessments. The main focus of the Diploma is the fictional west coast Scottish provincial town of Ardcalloch. The virtual town of Ardcalloch includes businesses (including virtual law firms), institutions and citizens. The town – accessed via the University intranet – allows learners to take up the role of legal practitioners operating in Ardcalloch, supported by databases of legal documents and templates, forums for discussion with tutors, email communications with other firms and supervisors, and activity and personal logs. In addition



to these resources, learners can also access video course lectures, multimedia, online drafting tools, notes, documents and assignments through this means.

Tutor-practitioners in seminars, as well as through online support and communications, support the learners throughout the simulated transactions.

Conclusion

Serious – or educational – games are opening up new potential for learning in formal situations and in innovative ways. The emergence of GBL is offering the learning and teaching communities new opportunities to reach and motivate hard-to-engage learner groups, support differentiated and personalised learning, address vocational and training-based course materials and provide new tools for teaching basic and key skills, science and maths education.

The policy perspective over the last few years has increasingly become more supportive of learning with games and a series of high-profile studies (e.g. de Freitas, 2006; Sandford et al., 2006) have demonstrated a wide range of case studies of effective GBL practice.

While the benefits of learning with games have been demonstrated in the recent studies, the challenges for providing a sufficient level of institutional support, both technical and pedagogic, are not insignificant, and the emphasis upon 'early adopters' leading the way reflects that of other areas of e-learning. However, as the recent JISC projects are demonstrating, game-based and simulation-based learning approaches can bring learning alive in ways that can inspire and motivate interest for the subject beyond the end of formal learning and therefore offer new opportunities for tutors and learners alike.

Clearly, GBL has been effective in these situations and offers a wide diversity of approaches and tools for tutors to make use of in their practice. But GBL also offers the learner a chance to become more central in their own learning through generating their own content, learning collaboratively in teams and becoming more engaged in the processes of learning.

Further information and resources

Reports

de Freitas, S. (2006) Learning in immersive worlds. A review of game-based learning. The report is available at: www.jisc.ac.uk/whatwedo/programmes/elearning_innovation/eli_outcomes

de Freitas, S., Savill-Smith, C. and Attewell, J. (2006) Educational games and simulations: Case Studies from Adult Learning Practice. London: Learning and Skills Research Centre. The report is available at: www.lsneducation.org.uk/research/centres/RCFTechEnhanceLearn/computergames

Department for Education and Skills (2005) Harnessing technology: Transforming learning and children's services. London.

Department of Trade and Industry (2006) Speech by Lord Sainsbury of Turville, Minister for Science and Innovation (DTI) given at the London Computer Games Summit at BAFTA on 4 October 2006. www.dti.gov.uk/about/dti-ministerial-team/page34429.html

Higher Education Funding Council for England (HEFCE) (2005) HEFCE strategy for e-learning. Bristol: HEFCE.

Sandford, R., Ulicsak, M., Facer, K. and Rudd, T. (2006) Teaching with Games: Using commercial off-the-shelf computer games in formal education. Bristol: Futurelab. www.futurelab.org.uk/download/pdfs/research/TWG_report.pdf

Projects

Racing Academy project page
<http://staff.bath.ac.uk/pssrj/RacingAcademy/index.htm>

SIMPLE project page
<http://technologies.law.strath.ac.uk/tle2>

Websites

Brain Trainer
www.brain-trainer.com

Game learning is the website developed by Jake Hapgood to support teachers using game-based learning in their practice
www.gamelearning.net

Neverwinter Nights
<http://nwn.bioware.com>

Pulse!!!
www.sp.tamucc.edu/pulse/

Second Life
<http://secondlife.com>

Skillswise
www.bbc.co.uk/skillswise