

# **The European Conference on Games Based Learning**

Glynhill Hotel, Paisley  
Scotland, UK  
25-26 October 2007

Edited by

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Trinity College Dublin, Ireland

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# ECGBL 2007

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## Preface

This year is the inaugural European Conference on Games-Based Learning, which is being hosted by the University of Paisley in Scotland. The Conference Chair is Thomas Connolly and the Programme Chair is Mark Stansfield – both from the University of Paisley.

The conference will be opened with a keynote from Bob Stone, University of Birmingham, UK on the topic of "*Serious Games: A human centred approach to delivering meaningful tool for learning*". Later in the day Kurt Squire, University of Wisconsin-Madison, USA will address the subject "*The design of video game-based learning system*" and Constance Steinkuehler, University of Wisconsin-Madison, USA will talk about "*Virtual worlds, learning and the new cosmopolitan*". On the Friday TPLD, leaders in team-based games-based learning, will present their view on current and future games-based learning.

The main purpose of the Conference is for individuals to present their research findings, work in progress and conceptual advances in many different branches of games-based learning as well as to come together to share knowledge with peers interested in the same area of study.

A key aim of the conference is about sharing ideas and meeting the people who hold them. The range of papers will ensure an interesting two days.

With an initial submission of 52 abstracts, after the double blind, peer review processes there are 34 papers published in these Conference Proceedings. These papers represent research from Australia, Austria, Canada, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Nigeria, Norway, Scotland, Spain, UK and the USA.

I hope that you have an enjoyable conference.

Mark Stansfield, Programme Chair  
[mark.stansfield@paisley.ac.uk](mailto:mark.stansfield@paisley.ac.uk)

Thomas Connolly, Conference Chair  
[thomas.connolly@paisley.ac.uk](mailto:thomas.connolly@paisley.ac.uk)

## Conference Executive:

Dr Liz Boyle, University of Paisley, UK  
Professor Thomas M Connolly, University of Paisley, UK  
Dr David Edgar, Glasgow Caledonian University, UK (still to confirm)  
Dr Sara de Freitas, Birkbeck College, University of London, UK  
Kevin Grant, Glasgow Caledonian University, UK  
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Professor Feng Li, University of Newcastle Upon Tyne, UK  
Dr Hamish MacLeod, University of Edinburgh, UK  
Dr Mark Stansfield, University of Paisley, UK  
John Sutherland, University of Abertay, UK

## *Conference Committee:*

The conference programme committee consists of key people in the games based learning community, both from the UK and overseas. The following people have confirmed their participation:

Daniel Burgos ( Open University of The Netherlands, Heerlen, The Netherlands); Liz Boyle (University of Paisley, UK); Erik Champion ( University of Queensland, Ipswich, Australia); Maiga Chang (National Science and Technology programme for e-Learning, Taiwan); Thomas Connelly (University of Paisley, UK); Sara de Freitas (Birkbeck College, University of London, UK); David Edgar (Glasgow Caledonian University, UK); Bekim Fetaji (South East European University, Macedonia); Lisa Galarneau (University of Waikato, New Zealand); Kevin Grant (Glasgow Caledonian University, UK); Jeff Haywood (University of Edinburgh, UK); Kristian Kiili (Tampere University of Technology, Pori, Finland); Timo Lainema (University of Turku, Finland); Feng Li (University of Newcastle upon Tyne, UK); Hamish MacLeod (University of Edinburgh, UK); Alice Mitchell (Anglia Ruskin University, Cambridge, UK); David Nicol (University of Strathclyde, UK); Kris Popat (Ultralab, Anglia Ruskin, University, UK); Jim Piggot (TPLD Ltd, Dundee, UK); Elias Pimenidis, (University of East London, UK); Daniela Romano (University of Sheffield, UK); David Rush (University of Winchester, UK); Mark Stansfield (University of Paisley, UK); John Sutherland (University of Abertay, UK); [Richard Tunstall](#) (University of Glamorgan, UK); Nicola Whitton (Manchester Metropolitan University, UK).

## Biographies of Conference Chairs, Programme Chair and Keynote Speaker

### Conference Chair



**Professor Thomas Connolly** is a Professor in the School of Computing at the University of Paisley, having managed the Department of Computing and Information Systems for several years. Thomas worked for over 15 years in industry as a Manager and Technical Director in international software houses before entering academia. His specialisms are games-based learning, online learning and database systems. He has developed three fully online MSc programmes and developed and leads the undergraduate BSc

Computer Games Technology programme. He is co-author of the highly successful academic textbooks Database Systems (now in its 4<sup>th</sup> edition) and Database Solutions (in its 2<sup>nd</sup> edition). He is a reviewer for several international journals and has been on the committee for various international conferences. He is a member of CPHC (Council of Professors and Heads of Computing) and member of the Higher Education Academy.

### Programme Chairs

**Dr Mark Stansfield** is a Senior Lecturer in the School of Computing at the University of Paisley. He has a PhD in Information Systems and has written and co-written more than 70 refereed papers in areas relating to e-Learning, games-based e-Learning, information systems and e-Business. Journals in which papers have been published include the European Journal of Information Systems, Systems Practice and Action Research, the Journal of Further and Higher Education, the Journal of Electronic Commerce Research, the Journal of IT Education, and Computers and Education. Mark also serves on the editorial boards of several international journals that include the International Journal of Information Management, Journal of Information Systems Education, ALT-J and the Journal of IT Education. Mark was appointed Member of the International Association of Science and Technology for Development (IASTED) Technical Committee on Education for the term 2005-2008 and is a Registered Practitioner of the Higher Education Academy in the UK. He has presented papers at international conferences for over 15 years and has won Best Paper Awards at a number of conferences that include the UK Systems Society Conference in 1993 and the Informing Science and IT Education Conferences in 2003 and 2006.



### Keynote Speakers



**Kurt Squire** is an assistant professor at the University of Wisconsin-Madison in the Educational Communications and Technology division of Curriculum and Instruction. He is a former Montessori and primary school teacher and, before coming to Wisconsin, was Research Manager of the Games-to-Teach Project at MIT and Co-Director of the Education Arcade. Squire earned his doctorate in Instructional Systems Technology from Indiana University; his dissertation research examined students' learning through a game-based learning program he designed around *Civilization III*. Squire co-founded Joystick101.org with Jon Goodwin and currently writes a monthly column with Henry Jenkins for

Computer Games magazine. In addition to writing over 30 scholarly articles and book chapters and he has given dozens of talks and invited addresses in North America,

Europe, and Asia. Squire's current research interests center on the impact of contemporary gaming practices on learning, schooling and society. Along with several other University Wisconsin-Madison faculty, he runs the Games and Professional Practice Simulations (GAPPS) initiative located at the Academic Advanced Distributed Learning Co-Lab.

**Dr Constance Steinkuehler** is an Assistant Professor in the Educational Communication & Technology program in the Curriculum & Instruction department at the University of Wisconsin-Madison. Her research is on cognition, learning and literacy in massively multiplayer online games (MMOs). Current interests include “pop cosmopolitanism” in online worlds and the intellectual practices that underwrite such a disposition, including informal scientific reasoning, collaborative problem solving, media literacy (as production, not just consumption), computational literacy, and the social learning mechanisms that support the development of such expertise (e.g., reciprocal apprenticeship, collective intelligence).



**Professor Bob Stone** holds a Chair in Interactive Multimedia Systems at the University of Birmingham, UK, where he is the Director of the Human Interface Technologies Team. He also currently holds the position of Royal Academy of Engineering Visiting Professor in Integrated Systems Design at the University of Plymouth. In 1996, he became an Academician of the Russian International Higher Education Academy of Sciences (Moscow). Bob's ergonomics career has taken him from human factors research in defence and offshore

applications, through a period of developing telepresence interfaces as part of the UK's National Advanced Robotics Research Initiative in the 1980s, to the world's first industrial Virtual Reality development programme in the 1990s. He is currently involved in researching the human factors aspects of interactive 3D and serious gaming, with regular contributions to projects in the fields of defence, surgery/healthcare and cultural heritage. Bob is also the Research Director of the UK's Defence Technology Centre for Human Factors Integration.

## **Biographies of contributing authors (in alphabetical order)**

**Neil Anderson** is deputy head of the school of education at James Cook University, Australia. His research has centred on equity and information communications technologies. Professor Anderson has excellent publication record in international and national journals and has an upcoming book 'Equity and ICT in Education' through Peter Lang, New York. He has presented recent keynotes for EDU-COM 2006 in Nong Kai , EIDOS research congress 2006 in Brisbane and at the opening of the Global Management Institute at the University of Shanghai. Professor Anderson is an invited speaker at the APEC Digital Economy Forum in June, 2007. Professor Anderson's work has been influential in recent government policy and has received national press in the Melbourne Age, Sydney Morning Herald and Business Review Weekly in 2006.

**Daniel Aranda** has a PHD in Media Studies with a study about the television program called Big Brother in Spain. This work applies the methodological tools of the Cultural Studies for investigating the television consumption and its reception. The purpose of the research is to investigate the communicative contexts and processes of resignification of two groups of audiences confronted by the meaning/sense (social and cultural) of the second edition of Big Brother: on the one hand the fans of the program who meet in internet and, of the other one, an association of viewers. I'm interested in cultural studies, digital consumption and media education. I am a lecturer of the Universitat Oberta de Catalunya (UOC) in charge of the theoretical and sociological area of the media studies.

**Matthew Bates** Recent MSc graduate from Nottingham Trent University with a Distinction in Multimedia Engineering. Currently studying for a PhD in immersive educational environments and teaching multimedia studies to level one students at the University.

**Tobias Bevc** PhD 2004 in Augsburg/Germany in Political Theory Since 2004 lecturer at the Lehrstuhl für Politische Wissenschaft at Technische Universität München. Focusing since 2005 on the Construction of Society and Politics in Video Games. Further focus of research: Political Theorie and History of Ideas, Visual Politics/Film and Politics

**Peter Blanchfield** and Colin Higgins are the PhD supervisors for Naim. Dr. Blanchfield is currently the Director of the Informatics Institute of Information Technology, which is part of the School of Computer Science and IT, The University of Nottingham while Dr. Higgins is Head of the Learning Technology Research Group at the same School. Both are very keen on using various application not only in the educational sectors but also for other sectors.

**Liz Boyle** is a lecturer in educational psychology, language and thinking, research methods and developmental psychology. She has considerable experience of student learning, including learning styles, motivation, assessment, problem solving and dyslexia in HE. She also has considerable experience of using e-Learning for collaborative and discussion-based tasks and higher-order tasks such as problem-solving, synthesis, analysis and evaluation.

**David Brown** is Professor in Interactive Systems for Social Inclusion, and Director of the Interactive Systems Research Group at Nottingham Trent University. He is currently the European Coordinator for the Grundtvig sponsored Game On Project, using games based learning approaches for the education of prisoners and those at risk of offending.

**Ellen Brox** is a researcher with background in ICT. The main research focus the last years has been ICT in education and e-learning, and the last couple of years she has been the coordinator of a Socrates/Minerva project where one task has been to develop an educational computer role-playing game for Finnish language learning.

**Thibault Carron** is an associate professor of computer science at University of Savoie, France . He is a member of the Syscom laboratory. He obtained his PhD in computer science at the "Ecole Nationale Supérieure des Mines de Saint-Etienne" in 2001. His current research interests deal with the study of collaborative activity observation.

**Naim Che Pee** is a 1st Year PhD student at the School of Computer Science and Information Technology, University of Nottingham. His main interest is the usage of computer games in the educational system.

**Patrick Felicia** is PhD student in University College of Cork. He is also lecturing Game Design in Waterford Institute of Technology. His areas of interest include eLearning, Instructional Design and Game Design. He currently investigates ways to improve the educational effectiveness of serious games and in particular how to adapt game design techniques to users' personalities.

**Marco Greco** received his degree in Management Engineering in 2006 and since November 2006 he is attending his Ph.D. in Management Engineering at the University of Rome "Tor Vergata". His current research field concerns negotiation and games-based learning.

**Pedro González-Calero** is Associate Professor of Computer Science at the Complutense University of Madrid, Spain, where he is the founder and director of the Group for Artificial Intelligence Applications, and director of the Master of Videogame Development since its creation in 2004. He has developed his career in the University of Madrid where he obtained a BS on Physics in 1990 and a PhD in Computer Science in 1997 while assuming teaching duties in the Faculty of Informatics since its creation in 1991. His research has focused on the confluence of software engineering and artificial intelligence and he is author of over 70 reviewed journal and conference proceedings articles on knowledge-based software engineering, software reuse and case-based reasoning, with applications to serious games.

**Thomas Hainey** is in his second year of his doctoral studies in the application of games-based learning to teach software engineering concepts, particularly requirements collection and analysis at tertiary education level. The research expands on research performed for his MSc thesis which focused on using games-based learning to teach database design.

**Ashley Healy** is a PhD Student at the University of Paisley and her research is based around Informal Learning Environments, particularly games-based communities, communities of practice/learning and FLOSS communities. She has completed an MSc Thesis on Games-based Learning and has considerable market experience in this field.

**Hanno Hildmann** studied Artificial Intelligence at the University of Amsterdam. He has done research and/or taught at the University of Bologna, the University of Amsterdam, DFKI Saarbruecken, the University of Liverpool and the University of Paisley where he is currently doing his PhD on "Co-Evolution of hierarchical strategies for resource bounded

environments (i.e. real-time strategy games)". His interests include Game Theory, Logic and Multi-Agent-Systems.

**Jonathan Hill** is a Senior Lecturer Operations Management. MSc BSc C Eng Senior Lecturer in Operations Management for the past 10 years, following 25 years of management experience, much of which was in Senior Management positions with multi-national companies, including working in businesses across Europe and in USA, also on assignments in Australia and Brazil

**Yu Ping Hsu** received a master degree in Communication and Multimedia. Now, she is a instructor in Taiwan, and her research focuses on Multimedia design and e-learning. Hsu, Yu-Ping, "Gender Rhetorical Characteristics of Computer-Mediated Communication in Taiwan".

**Jantina Huizenga** is a PhD-student at the Graduate School of Teaching and Learning at the University of Amsterdam. Her research subject is gaming in secondary education. Jantina has a BSc and MSc in Education and Child Studies from the University of Leiden (2006). Her research interest is ICT in Educational Sciences.

**Temisan Ige** is a lecturer in science education at the University of Ibadan, Nigeria. She teaches courses in Curriculum and science methods. She is a researcher on challenges in curriculum development and implementation for graduate and postgraduate teacher training. Her interests include achieving quality assurance in CPD for teachers, emphasising reflective thinking and the use of technology in instruction.

**Guillermo Jimenez-Diaz** is Teaching Assistant in Computer Science at Dept. of Software Engineering and Artificial Intelligence at the Complutense University of Madrid, Spain. He is member of the Group for Artificial Intelligence Applications ([gaia.fdi.ucm.es](http://gaia.fdi.ucm.es)), and he actively collaborates in the Master of Videogame Development since its creation in 2004. His PhD relates to learning object-oriented programming in virtual environments.

**Elisabeth Katzlinger-Felhofer** Scientist at the department of Data Processing in Social Sciences, Economics and Business, Johannes Kepler University Linz, Austria. Study of business administration and pedagogy.

**Kristian Kiili** is the senior researcher in Tampere University of Technology, Information Technology at Pori, Finland. He got his Dr. Philosophy at Tampere University of Technology in 2006. The title of his doctoral thesis was " On educational game design: building blocks of flow experience ". His research interests include game-based learning, user experience and usability.

**Diane Jass Ketelhut** is an Assistant Professor of Science Education at Temple University. Her current NSF-funded projects include River City, a scientific inquiry-based multi-user virtual environment, and "Science in the City," a standards-based scientific inquiry project. She was a secondary science teacher for 12 years, and received her doctorate from Harvard University.

**Michael Kickmeier-Rust** holds a master degree in psychology and is also an experienced software developer. He is presently working for the EC-funded project ELEKTRA, which attempts to advance psycho-pedagogical approaches to game-based learning and adaptive educational technology in virtual learning environments. Michael's work focuses on cognitive modeling, ontological approaches, and adaptive technology. Michael is a

member of various organizations, for example the ACM, and he is the vice-chair of the Austrian Aviation Psychology Association.

**Timo Lainema**, PhD (Econ. & Bus. Adm.), works as Assistant Professor in Turku School of Economics. His present research interests lie in the areas of learning through simulation gaming, flow in games, and decision-making in complex domains under time-pressure.

**Daniel Livingstone** currently lectures a range of classes related to computer game development, and his research interests range from AI and Artificial Life for computer games to the use of game technology in education. His current work is focussed on the use of massively-multiplayer virtual worlds as learning platforms, and he was recently awarded a major grant from Eduserv to support this work.

**Colin Maxwell** has taught in Further and Higher Education for the past 9 years, specialising in Web and interactive technologies. Colin has a wide experience of interactive media development and has worked on digital media and visual arts projects with Channel 4, Adobe, the Scottish Qualifications Authority, Eyeline Media, Fife Constabulary and Ink Animations. His main areas of interest are games, simulations and virtual environments for learning.

**Mark McMahon** is a Senior Lecturer at Edith Cowan University in Perth, Western Australia, where he co-ordinates programs in Digital Media, and Game Design and Culture. He is an experienced multimedia developer and instructional designer, having been instrumental in the design of over 25 e-learning products of national significance.

**Idoia Olazar** is a graduate from the University of Deusto (Bilbao, Spain) in Pedagogy and also holds an MBA and a Master of HR from the Instituto de Empresa. She has a large experience as instructional designer and project manager. For the last two years she is the director of the elearning department, responsible of the creation of contents for business education.

**Elias Pimenidis** is a senior lecturer at the University of East London. His doctoral research focuses on project management of e-business and e0government projects. Other research interests include the evaluation of knowledge management systems (in particular their role in e-government) and the development and use of computer games for educational purposes.

**Colin Price** was trained as an experimental physicist and later as an electronic engineer. He has taught physics and electronics at both school and university level. He is currently Principal Lecturer at Worcester University where he is responsible for teaching games development and simulation. He also collaborates with Moscow State University in biophysics research.

**Jordi Sánchez-Navarro** biography: He has a PhD in Audiovisual Communication from the University Ramon Llull. Dissertation: "Authorship, aesthetic of the excess, and cultural recycling in the contemporary cinema" (2005). Communication Sciences degree; Universitat Autònoma de Barcelona (1996). At the Department of Information and Communication Sciences (UOC) he's responsible of the subjects Audiovisual Narrative, Theory and practice of editing, and Film studies and criticism. He is also academic director of the Masters in Edition. In the period 1998-2007 he was lecturer of the department of Audiovisual Communication of the University Ramon Llull, where he was academic co-director and teacher at the Masters in Cinema and TV Fiction (2006), within the official

program of Advanced Studies in Communication. Research lines: Aesthetic of the contemporary film and audiovisual; cybercultures and cinema; videogame culture; young subcultures and cinema; fans and new film practices.

**Maria Saridaki** PhD candidate and Research Associate at the Laboratory of New Technologies of the Faculty of Communication & Media Studies (National University of Athens). Her research interests lie on Digital Games as an educational and recreational tool for people with cognitive challenges. She obtained an MSc in Information Management (Strathclyde University) and a Bachelor in Media and Communication studies.

**Louise Sauvé**, Professor of Educational Technology at Télé-université, Director of the Center for expertise and research of lifelong learning (SAVIE) and Co-leader of the Simulation and Advanced Gaming Environments (SAGE) for Learning project. She is co-author of « Simulations and simulation games: educational tools in health » and of an online course entitled « Games, simulations and role-playing: a pedagogical exploration and analysis ».

**Catherine Schifter**, Ph.D. is an Associate Professor in Curriculum, Instruction and Technology in Education at Temple University, USA, a Carnegie Scholar (2000-2001). She was the Director of the Temple Online Learning Program from 1996 through 2000. Recent scholarship includes evaluation of staff development programs for infusing technology into classrooms in K-12 education.

**Nicola Whitton** is a Senior Lecturer in Learning and Teaching Technology at Manchester Metropolitan University. She has worked in a range of learning technology roles including educational design consultancy, multimedia development, research and teaching. Her research interests include online collaborative environments, multimedia interaction, and games-based learning.

# **Profitable Experiences from a Business Game**

**Mohammad Ali and Jonathan Hill**

**Buckinghamshire Chilterns University, UK**

**Abstract:** This paper evaluates the experiences of Business Management students on undergraduate and postgraduate courses, who participated in a business game midway through their course. The objectives in designing the game were to provide an opportunity for students to work together, to integrate what they have learnt about different business functions and to see how these are drawn together using Financial results, in the context of a dynamic competitive market. Whilst the objectives are to grow the business to acquire a profitable market share of this rapidly developing market, the winner of the game is not determined simply on the basis of profitability or market share. Teams are required to present a Board Report evaluating their performance and explaining how well they are positioned to exploit opportunities for the future. Thus performance is evaluated, not simply on the financial indicators, but rather on the discussion of strategies that led to the results. Questionnaires to 200 students, who had participated, revealed that they felt that they had run a successful business and been party to decisions, although they found decision-making difficult. They felt that they understood better the relationship between different business functions and had improved their decision-making and team-working skills. The survey revealed that students appreciated why numerate ability is important for business.

The level of participation by students was surprisingly good, providing that the teams are kept reasonably small. The research shows that the game generated much excitement amongst the teams, with a truly competitive spirit. Many also learnt that it is possible to succeed in business, providing that you learn from your mistakes. We believe that the business game, with the interaction between students and tutors, made this a valuable learning experience.

**Keywords:** Business game, numerate, decision making, team-working, evaluation

# **From Popular Culture to Traditional Culture: Learning Through Video Games**

**Neil Anderson**

**James Cook University, Cairns, Australia**

**Abstract:** Gee (2007) argues that video games can lead to deep intellectual engagement in a highly motivating context. Often the context for engagement with video games has been described as occurring within a 'popular culture'. This paper examines the benefits of a proposal for video game development in Australia to introduce learners to aspects of specific, traditional Aboriginal and Torres Strait Islander culture. This melding of popular and traditional culture mirrors the work of the University of Wisconsin, Games and Professional Practice Simulation group in relation to American First Nation culture. To contextualize the paper for international readers, some details of indigenous Australian cultures and the sites of the study are described. The literature review looks at what is known about the advantages and disadvantages of educational games and links this to the emerging use of games to foster knowledge of indigenous cultures.

**Keywords:** Video games traditional culture

# **Leisure Time and Personal Development Through Video Games: A Case Study Under Development in Barcelona**

**Daniel Aranda and Jordi Sánchez-Navarro**  
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**Abstract:** Video games, as with any other cultural resource, are basic tools in social and cultural learning, tools for socialising that provide players with instrumental and social competences and skills. The project has two complementary focuses for reflection and data collection providing mutual feedback designed to aid understanding of how video games work as educational tools in non-formal education. On the one hand, we want to consolidate the project's theoretical framework based, principally, on the study of the theory of play and video games, studies on cultural consumption and the contributions made by leisure education. As a second focus for attention and reflection, we have just completed a pilot project entitled ELLAD, (Espai de Lleure i Aprenentatge Digital - Digital Learning and Leisure Space), looking at the use of video games in non-formal educational contexts. In this paper, we summarise the factors that led to the creation of the video games classroom, the dynamics established and the initial conclusions reached, which will let us validate, defend or discard future implementations and/or methodologies in the production of the white paper.

**Keywords:** Video games, play, non-formal education, cultural consumption, cultural use, leisure, children and young people

# Carving Out a New Approach to Learning

**Matthew Bates, David Brown, Wayne Cranton and James Lewis  
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**Abstract:** Games-based learning or 'serious' games can form part of a wider educational strategy focusing on group orientated learning and problem solving. This paper evaluates a recent research project to investigate the approach of games-based learning and immersive environments for optimising the delivery of educational content. The project has involved the creation of suitable software representing a two dimensional approximation of the historical Chapter House building at Southwell Minster in Nottinghamshire. Collaborating with the Southwell Minster schools outreach programme, key areas of the Chapter House education strategy were identified to be given a digital makeover including the ability to interact with Bible stories and carve virtual stonework against the clock. Designed in Macromedia Flash, the software combines graphical representations of important figures in the Chapter House building with the benefit of interactivity allowing for children to browse, touch and connect with the historical structure at their leisure. Whilst building on the idea of 'bringing the Chapter House to life', the project aimed to utilise this digital world for the teaching of young children in the age group 8-10 years regarding history, religious education and basic computing skills including hand-eye coordination. Testing involving a class of thirty Year 4 pupils aged 8-9 years was held in a Nottinghamshire primary school with analysis based on usability, attention retention and an overall ability to educate. Qualitative testing was conducted using a system of group briefing, observation and finally group discussion with results demonstrating the powerful ability of the software to promote inter-peer collaboration and support amongst young children. Key problems revealed during testing are discussed including the high level of tutor support required to maintain a productive educational environment. Areas for further research are identified including optimal levels of initial scaffolding to ensure maximum educational effect.

**Keywords:** Historical, key-stage two, scaffolding, games-based learning, immersive environments

# Political Education via Video Games?

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**Abstract:** Political Education has to face the dilemma that the adolescents it wants to reach do not use the media political education normally employs, i.e., books, brochures and magazines. This is especially true for adolescents from the low-education strata of society who value education only – if at all – in an utilitarian way.

Given that this strata of society is very much inclined towards the new entertainment technology and (male) adolescents are especially inclined towards the „new“ medium of video games, it may be a good idea to utilize the enthusiasm of this group for the new media in order to spread the contents of political education.

The questions I will consider in my paper are:

- What kind of content must a video game have to be interesting for the target group?
- Are there gender specific differences concerning this content?
- Are there gender specific game genres which are to be employed?
- How does the game have to be designed? Should the game tend towards ludus (Game) or paidia (Play)?

My theses are: The medium of video games offers opportunities for reaching those strata of society for political education that have not been reached with traditional media.

A game programmed to transport goals of political education, e.g. the ability for critical judgement and self-efficacy, has to tend towards paidia.

**Keywords:** Political education, video games, game, play

# Can Serious Games Engage the Disengaged?

**David Brown, Nicholas Shopland, Steven Battersby, James Lewis and Lindsay Evett**  
**Nottingham Trent University, UK**

**Abstract:** The Interactive Systems Research Group (ISRG) at the Nottingham Trent University (NTU) were commissioned by the National Learning and Skills Council to design, implement and evaluate a serious game to address the development needs of young people at risk of social exclusion; characterised as having low self esteem, poor levels of confidence, aggressive tendencies, and lacking basic and employment related skills.

Given an exacting functional specification and a content specification that was developed in collaboration with subject expert tutors, a design based on a role play adventure was implemented. In taking a first person perspective the trainee could only escape an about to explode volcanic island by undertaking personal development tasks (self esteem, managing aggression, responding appropriately to stress) where each successfully completed task earned a vital crew member to aid their survival. The second part of the adventure found the survivors at New Island where their tasks were to train themselves in order to find sustainable employment in the island's fish Factory.

Testing was carried out in four major stages, each in four geographically distinct regions. The major goals that were identified in the design of the system were selected for evaluation. These were the ability of the system to engage (and sometime re-engage) learners and effectiveness. The first goal involved qualitative analysis by comparing actual levels of engagement against tutors' expectations and via observational studies; the second goal was more quantitatively focussed involving pre and post tests of subject related knowledge.

In most cases the levels of engagement of the target audience far exceeded expected levels, and in some startling occasions allowed previously excluded students to remain part of classroom activities. In all cases post test levels of learning either remained the same or improved upon pre test levels.

Finally the robustness of the experimental methodology is discussed, in the light of the needs of a follow up project to use serious games to engage offenders and those at risk of offending in learning basic skills, personal development and work sustainability. Potential limitations in using tutors' expectations as a baseline measure for students' customary levels of engagement are discussed. A more objective method is suggested, based on an earlier EPSRC study to determine the strategies that human tutors use in scaffolding the activities of people with severe learning disabilities in using virtual environments. A repeated measures study with an experimental and control group is also suggested for measuring effectiveness.

**Keywords:** Serious games, engagement, effectiveness, social inclusion

# **A Competence Jigsaw Puzzle – Making a Language Learning Game in a European Project With Diverse Competence and Diverging Standings**

**Ellen Brox, Gunn Evertsen and Audun Heggelund  
Norut, Tromsø, Norway**

**Abstract:** Based on the need for better learning material for the Finnish language in Norwegian and Swedish schools we decided to make a computer role-playing game. We received money from the Socrates Minerva program for this task. This was in 2004, and most of the educational role-playing games the participants had seen were simple games for social situations. Most did however have more or less experience with different types of entertainment games.

Making an educational computer game requires a real multi-disciplinary team with respect for each other's fields. Knowledge about computer game design is imperative. The game itself must have a storyline, and narrative competence is required. This story must suit both the curriculum and a target age group, and maybe most importantly it must be exiting and engaging. At the same time one must tread carefully regarding prejudice. Pedagogues are required, as are language experts to make sure that the game contents will enhance learning. The game also needs to look nice and have suitable sound effects. Artists are needed, as are good voices and maybe even musicians. One must also not forget the users; teachers and pupils are extremely useful in an iterative development process. An ICT team must find a suitable platform and technically put all parts together.

Language learning in schools is normally given in a certain order with one grammatical theme coming before another. Role-playing games are often non-linear, enabling the player to move around more or less freely, and thus maybe encountering the language in the "wrong" order. This was a real challenge in our project, as was the long distances between the participants. Other challenges were a common understanding of what we actually were going to make and the technology to be used. We underestimated the need for the pedagogues to collaborate closely with the design team from the beginning. Early simple prototypes to demonstrate platform possibilities would most likely have given a common understanding earlier.

The development ended up being a real teamwork across borders with partners who hardly knew each other before the project started. Basically we tried to gain consensus about most parts of the game. This resulted in a quite a few compromises, but also that all partners feel ownership of the end result.

This paper discusses some of the challenges we had and how we worked together to solve disputes. We also try to sum up what we have learnt. The authors represent design and development, and the lead author was the project co-ordinator.

**Keywords:** Language learning, educational game, multi-disciplinary

# Games as Learning Scenarios: Are you Serious?

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**Abstract:** As we were paying attention to the question “Can Games-Based Learning Enhance Learning?” we decided to develop a learning environment founded on a 3D graphical representation of a lesson. The emergence of online multiplayer games led us to apply the metaphor of exploring a virtual world, a dungeon, where each student collects knowledge related to a learning activity. In the dungeon, each room represents a place, sometimes a collaborative place, where students are supposed to acquire a particular concept. Learning objects may be present in each room and a correct answer to specific exercises gives a key to the students, allowing them to access other activities in other rooms.

In order to provide the users with awareness, this application uses data collected from traces resulting from the collaborative learning activity. The presented environment is instrumented to be observable by a multi-agent system.

In this paper, we describe the learning environment, the way the teacher creates a dungeon according to the general pedagogical goal of the session, the visual interfaces and the way of interacting for the students and for the teacher. The observation tools are then presented. Finally, we describe an experimentation that took place in this environment in our university and draw lessons concerning the new usages appearing when using such an environment.

**Keywords:** Virtual world, learning scenarios, activity traces, collaborative learning, new pedagogical usages

# Teaching Climate Change in Year 8!

**Naim Che Pee, Peter Blanchfield and Colin Higgins**  
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**Abstract:** Computer games are said to be prominent as a supporting medium in educating the new generation of students who have a high exposure to computer games in their daily life. This paper outlines the development of a computer game as part of the Year 8 Geography curriculum at a Nottingham school. The environmental impact of industry sectors on such things as global warming, air and river pollution is a major problem throughout the world. It is thus an important module in the current curriculum and in the particular study is being taught to Year 8 students. Methods of teaching currently used include books, videos, and the Internet search engines. The purpose of this research has been to introduce an added tool of a computer game and assess its effectiveness as a supplementary learning tool for teaching and learning purposes in global warming issues. An observation study using a prototype is being carried out amongst the secondary school students to study the performance of their spatial awareness and their cognitive skills. The study has also addressed issues regarding gender and teaching period time allocation in a typical classroom session. This current paper emphasizes key issues addressed in the design of the game.

**Keywords:** Computer games, computer-based learning, teaching, learning

# **A Survey of Students' Motivations for Playing Computer Games: A Comparative Analysis**

**Thomas Connolly, Liz Boyle and Thomas Hainey**  
**University of Paisley, Scotland**

**Abstract:** Games-based learning has captured the interest of educationalists, as it is perceived as an engaging form of supplementary learning to teach requirements collection and analysis in software engineering at tertiary education level. However there is a dearth of empirical evidence to support the validity of games-based learning in the literature (de Freitas, 2007; Connolly *et al*, 2007). This paper will present the results of a survey to identify motivations and attitudes associated with playing computer games compiled from the results of 556 higher education students at the University of Paisley. This study will perform a comparative analysis of two studies, one performed in 2005 and one performed in 2007 to identify consistency and alterations in relation to motivation, attitudes and demographics in a two-year period. The 2007 survey confirmed the findings of the 2005 survey showing that computer games play an important role in the lives of students (Connolly *et al*, 2006). 68.7% of the respondents play games, spending on average 7.72 hours per week playing. Male students spend more than twice as long as females playing games and are also more likely to play online games. The study will make a valuable contribution to empirical evidence in the field of games-based learning.

**Keywords:** Games-based learning; computer games; motivation; game genres

# Evaluating the Effect of Personality on the Design of Educational Games

**Patrick Felicia and Ian Pitt**  
**University College of Cork, Ireland**

**Abstract:** Video games represent ideal learning environments in which users can improve their skills and learn in a safe and controlled manner. They often implement well-known instructional strategies such as social learning, discovery learning or zone of proximal development. However, despite evidence of the impact of personalities on learning (e.g. Multiple-Intelligence, Emotional Intelligence, etc.), very few serious games adapt to players' learning styles. The authors explain how the Five-Star and the MBTI models, two widely accepted personality models, can be used to explain and analyse how students' emotions and personalities can impact on the learning process. They explain why and how video games can accommodate different learning styles and facilitate learning at both cognitive and emotional levels. They introduce the PLEASE (Personality, Learning Styles, Emotions, Systematic Approach, Evaluation). This model uses an emotional and user-centred approach to learning in video games. The model also addresses some of the issues encountered by serious game designers (e.g. choice of Instructional Design strategy, evaluation, etc.) but it essentially focuses on practical applications of user-centred learning approaches for educational games. The authors then describe an experimental study that they carried-out in two of Cork' s secondary schools aimed at assessing the PLEASE model. A video game, Math Quest, was developed to teach them Mathematics using a tutoring system that adapts to their personalities. The game was developed in Java 3D and consisted of a virtual maze in which students had to navigate and gain access to the next level. To find their way through the maze, students had to locate and open doors by solving a linear equation. 80 subjects took part in the study. Their personalities were described and analysed in the light of the IPIP (International Personality Item Pool). Data collected during this study are described, analysed and contrasted with current game design practices.

**Keywords:** Computer-base instruction, education, video games

# Game Based Learning Beyond Simulations

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**Abstract:** The amazing growth of the videogame industry in the last few years has opened new opportunities for the use of games in education. Not only the technology has evolved to a point where almost photorealistic 3D virtual worlds can be seen at home with retail equipment, but also the language of the videogames has evolved to become sophisticated enough to express mental processes, social relations and to represent rich and diverse ways of interacting with the elements of the virtual worlds. In spite of the growing complexity of the videogame language, most of its applications to education are merely simulations built with game technology. This approach limits the application of game-based learning to those domains where real world activities can be easily simulated.

The motivation for the work presented in this paper is to pursue more creative uses of videogames in education. When confronting with abstract domains, it is not always possible to find a correlation between each game mechanic and a *real world* counterpart of the taught subject. So we advocate for doing the *game experience* a more important part of the learning process instead of using the common simulation-centric approach. The solution that we propose is the use of *metaphors* where, given the domain to be taught, a virtual world is designed with elements, actions and processes that correspond, as much as possible, on a one to one basis to elements, actions and processes in the problem domain.

As a proof of concept, we are working in a system called JV<sup>2</sup>M to teach the inner workings of the Java Virtual Machine. The user is given a piece of Java code which has to be executed by interacting with a *metaphoric representation* of the Java Virtual Machine. In this paper we present two possible metaphors, one is based on adventure games and the other on multiplayer first person shooters.

**Keywords:** Metaphors, game play, teaching programming

# Improving Negotiation Skills Through an Online Business Game

**Marco Greco and Gianluca Murgia**  
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**Abstract:** Game-based Learning enables students to undertake tasks and situations which would otherwise be impossible or undesirable for cost, time, logistical and safety reasons. As a matter of fact, this training technique allows learners to earn skills which wouldn't be developed through a traditional didactic approach.

It is important to consider negotiation capabilities among the skills that may not be developed just by reading a book or by learning through a teacher. Only a small niche in the wide panorama of "Serious Games" focuses on negotiation and just a couple of them are designed in a software version. More importantly, the majority of them are "single-player" games, in which learners are able to choose only among a few predetermined choices. This paper will introduce Win Win Manager, an online multiplayer business game that focuses on negotiation.

Multiplayer technology allows a deeper learning, favours a greater commitment of the students and allows a continuous comparison between users boosting competition, fun and commitment through a more realistic approach. It will be demonstrated how Win Win Manager achieves its formative goal, providing quantitative evidence of an increase in the users' negotiation skills, and showing the outcome of a survey on perceived improvement in users. In Win Win Manager players negotiate online in randomly selected couples, using a private discussion board, on each of the ten scenarios provided by the game. Players obtain a score accordingly with the results of their negotiation. In the first edition of Win Win Manager we noticed that both linear and polynomial tendency curves of players' mean scores increased in a monotonic way as the difficulty of the scenarios increases. The second edition of Win Win Manager seems to comply with this trend. Even if such score is very useful for evaluating each player's performance, it often doesn't provide an adequate feedback for him. Thus, in the second edition of Win Win Manager, we introduced a feedback algorithm complementary to the score, which we will briefly introduce in this paper.

**Keywords:** Win Win Manager, negotiation, business game, games-based learning, feedback, anonymous negotiation

# **Does Games-Based Learning, Based on a Constructivist Pedagogy, Enhance the Learning Experience and Outcomes for the Student Compared to a Traditional Didactic Pedagogy?**

**Ashley Healy and Professor Thomas Connolly  
University of Paisley, Scotland**

**Abstract:** While computer games have been phenomenally successful within the leisure industry with their inherent ability to motivate, engage and inspire, their application for educational purposes has had limited success and there remains a number of key challenges that need to be addressed to fully understand and demonstrate the applicability and limitations of this approach. As research and media coverage increases, the potential benefits of games-based learning (GBL) are becoming more apparent. A prime potential benefit of GBL is that game play can sustain skill development such as: Personal and Social Development, Language and Literacy, Mathematical Development and Creative Development. Additional benefits include; youth appeal, flexibility, motivation, engagement, real-time feedback, asynchronous learning, immersive and fun, and adaptable to individual learning needs.

This paper reports on an experiment that compares GBL with a more traditional form of teaching at primary school level. The experiment involves a post-testing approach to a traditional lesson and a GBL lesson with school children aged between 9-10 years of age. Each test group comprised of 15 children. The selected game for the experiment was 'Moving Toy Mechanisms', which facilitates the learning of Design and Technology for QCA Key Stage 2 Unit 5c – Moving Toys. The results support the stance that GBL can benefit the learning experience and aid academic achievements. It has also validated the view that formal teaching and learning styles are beneficial in some areas of the curriculum, thus reinforcing the importance of a hybrid set of methods to improve the learning experience and academic achievements of learners.

**Keywords:** Computer games, learning, games-based learning, primary school

# A Formal Approach to Represent, Implement and Assess Learning Targets in Computer Games

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**Abstract:** We introduce a formal language  $\mathcal{L}^*$  to represent learning targets for games. The language is constructed over Boolean statements (propositions) describing distinct facts of a game. Syntax and semantics are given and a connection to natural language (e.g. English) is made. Due to this connection, learning targets expressed in  $\mathcal{L}^*$  are both formally (and thus unambiguously) stated as well as intuitively understandable to a not technically inclined moderator or tutor. An algorithm to automatically evaluate complex high level learning targets is sketched and illustrated by a simple example. We argue that by considering this approach during for the implementation the resulting game can be enhanced with a control module that allows the assessment of dynamically adoptable learning targets, even during game play.

**Keywords:** Logic, learning targets, assessment, computer games

# Casual Games Provide Stress Relief for Female Gamer in Taiwan

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**Abstract:** Game market is growing rapidly in these years. Elder and female players are increasing and influential. Female gamers have more potential, so more and more games are designed with the female gamers in mind to explore bigger market. This study has been conducted in Taiwan between March and April 2007 among 1260 female adults aged 20 or above. Data are collected from 1200 surveys and 60 interviewees. The survey, comprising twenty primarily open-ended questions, is conducted from 1 to 23 of March 2007. Data of surveys are collected from 400 students, 400 working-women and 400 housewives. Both of qualitative and quantitative analyses are supplemented by this research. This research found that female gamers who play casual games feel better not only in the Western countries but also in Taiwan. The research also found that people play casual games for a short break from their works. Sometimes, when they feel anxious, they play casual games on their mobile phones for stress relief. In Taiwan, more female gamers play casual games because most casual games are non-violent games, and easy to play. Next, the playing time is more flexible for them. Therefore, the purpose of this research is to understand the gender differences of the gamers of casual games in Taiwan. Most scholars have already addressed how casual games affect female gamers in Western; however, Taiwanese female gamers may have a little difference from the Western situation. Moreover, the result of this research is that female gamers in Taiwan are the same as those of the Western. Examining the female gamers in Taiwan is important for defining the casual games, which may relieve stresses. In addition, this research would like to understand how casual games affect the life of female gamers, and how the stress of female gamers relieves from casual games. In the economic aspect, it also improves the casual game market because female gamers are emerging as a powerful market force.

**Keywords:** Casual games, gender differences, intercultural learning, game-based learning

# Learning History by Playing a Mobile City Game

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**Abstract:** Digital games seem to be excellent tools for facilitating and supporting situated learning. The unbinding of knowledge from a specific context fosters its transfer to new problems and new domains. Additionally, children's attitude towards computer games is the very attitude we would like all our learners to have. Therefore, it makes sense to try to merge the content of learning and the motivation of games.

The objectives of this paper are to generate insights into the practicalities and the effects of mobile game-based learning in secondary education on the development of pupils' engagement in learning (more specifically their motivation for the subject history), historical knowledge and collaborative skills. For this purpose we investigated a game called Frequency 1550. Frequency 1550 is a mobile city game in which pupils playfully acquire historical knowledge about the medieval city of Amsterdam. There have been two pilots concerning this game, one in 2005 and one in 2007. The first pilot was carried out with one class and evaluated on the usability of the game. For the second pilot the game has been redesigned, tested, implemented and evaluated. A quasi-experimental design is followed in which data have been gathered on the process of gaming and learning. Both quantitative and qualitative data have been gathered and analyzed. Twenty classes of some 25 pupils have participated in the pilot. Pupils from ten classes played the mobile history game while the other pupils were in the control condition and followed regular project-based lesson series. Learning effects, motivation and collaboration have been studied and analyzed in both quantitative and qualitative ways. The preliminary results show high motivated pupils playing, learning and working on the subject of medieval Amsterdam, even though there were problems with the technique and the assignments and pupils level did not always match.

**Keywords:** Game-based learning, learning effects

# Organising Learning Environments For Games Based Instruction: Practical Considerations.

**Temisan Ige**

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**Abstract:** There has been an increase in the awareness of the benefits of using games in education to amplify students learning opportunities and to involve them in strategic thinking. Issues bordering on how students learn from games, how games can be effectively used to engage learners and how teachers and learners respond to and interpret their experiences from game-based instruction have been the subject of numerous studies. The general consensus has been more in favour of the educational benefits of game use. Teachers could therefore take advantage of the strong attraction children have for games that cuts across age and culture. They could tap into the excitement, enthusiasm and active engagement students display in using games and harness these for instructional purposes. Game use will help to increase students' passion for learning as they are more receptive to digital resources typified by computers and the internet as opposed to traditional teaching methods.

It is therefore a legitimate concern to identify, create and organise learning environments that can effectively support game-based learning if learners are to achieve desired instructional goals.

Curriculum experts, schools and teachers should be involved in selecting and organising learning materials in a way that provides learners with the best possible conditions for learning by drawing on sound pedagogic theories, and research –based pedagogic frameworks.

This paper discusses the issues vital in identifying, creating and organising effective game-based learning environments for science classes which will support learners' reasoning and problem solving practices in desired ways. It examines how instructional content may be exposed in an environment that builds on the basic instincts of competition, interaction and imagination and employs the use of authentic and hands-on activities, metacognition, active engagement and collaborative learning.

It will also consider the implications of these issues in incorporating game use in schools in developing countries like Nigeria and in training teachers to provide them with the knowledge and skills to effectively integrate new technologies and e-learning in environments to support people learning with games.

**Keywords:** Learning environment, game-based instruction, collaboration, active engagement, metacognition, motivation

# Using Role-Play Virtual Environments to Learn Software Design

**Guillermo Jiménez-Díaz, Pedro. González-Calero and Mercedes Gómez-Albarrán**

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**Abstract:** Object-oriented software design is a kind of black-art that requires a combination of common sense, experience, good taste and the capability to look at a problem from different points of view. According to our experience, these abilities cannot be easily transferred to the students in a lecture.

Taking ideas from the way software is designed in industry, according to agile methodologies, we have tried a more active teaching approach using role-play. Students are faced with a design problem and provided with an initial sketchy design, i.e. a number of classes, and several use cases to be solved using those classes. Each student adopts the role of an object and each use case is executed through message passing between the objects represented by the students. This way, the students have the chance to, at their own pace, evaluate the consequences of a given design and test their ideas with the other actors in play.

The good results obtained during the empirical evaluation of this active learning approach have motivated us to transfer our teaching methodology to virtual environments. Using our previous experience developing game-based learning environments and taking ingredients from the interface and gameplay of first-person shooters and sport games, we have designed a role-play virtual environment (RPVE) that intends to maintain, and even reinforce, the benefits of role-play in the classroom.

We developed ViRPlay3D, a RPVE to understand object-oriented software behavior. It supported a single player, included a simple metaphor and did not allow the modification of CRC cards. Nowadays, we have completed the specifications of ViRPlay3D2, an extension of ViRPlay3D for, both, understanding and creating object-oriented designs. ViRPlay3D2 is a multiplayer environment where students mimic the classroom role-play sessions. The students are immersed in the environment using a first-person view that simulates the point of view of the objects that participate in the role-play. The students can modify the proposed design and the simulation is recorded for a further evaluation.

**Keywords:** Role-play, software design, object-oriented design, CRC cards, virtual environments, active learning

# Technology Enhanced Language Learning in Early Childhood - Experiences of an Advanced Training Curriculum for Kindergarten Teachers

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**Abstract:** This paper deals with a training curriculum for kindergarten teachers to introduce a learning game for a technology enhanced language learning in early childhood. The game helps children to become familiar with the German language as a mother tongue or as second language. The game “Schlaumäuse” was developed to enhance the children’s language learning through a game. Children from four to eight years old are the target group of this software. The different activities in the story of the game encourage the children’s phases of language learning like structure of syllables, phoneme, rhymes or phonological features. This paper reports about an advanced training curriculum for kindergarten teachers to launch the game in the kindergarten.

During their education and in their professional life kindergarten teachers have only little involvement with information technology. That’s why the new curriculum contains the topic ICT (not only for language learning). The potentials of new media are another highlight of the training. The advantage of the media in the “Schlaumäuse” game is that the silent scripts can be heard. On the other hand memorizing the spoken language is fostered by constant repetition of the words. In our training curriculum the kindergarten teachers get their hands on the game in a familiar situation and can learn to play the game in the way a child does.

The next step of the training is to analyze the game according to the different phases of the language learning that are encouraged by the different parts of it. Consequently the game can be applied to assist children in their specific development of their language learning.

The experience with our training program shows that the kindergarten teachers need assistance in introducing the game in their children group. The training is a place where they exchange their points of view about the game and ICT in the kindergarten.

**Keywords:** Game-based-learning, life-long-learning, language-learning, collaborative learning, information technology education, early childhood learning

# Not Breaking the Narrative: Individualized Competence Assessment in Educational Games

**Michael Kickmeier-Rust, Dietrich Albert, Cord Hockemeyer and Thomas Augustin**  
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**Abstract:** Most existing educational games cannot compete with their non-educational counterparts in terms of visual and narrative quality, gameplay, or adaptability. Amongst the most advanced approaches is ELEKTRA, a European project targeting on producing a 3D adventure game teaching physics. The project developed a scientifically sound framework for intelligent and adaptive tutoring, enabling the game to adapt learning/gaming activities to individual learning progress and pedagogical strategies. A crucial aspect, and a weak spot of present educational games, is the individualized assessment of knowledge. Existing approaches frequently rely on typical quiz-like methods, failing to adapt to individual learners and, most likely, they break the game's narrative, what in turn weakens the "natural" advantages of educational games by compromising immersion and motivation to play and learn. In ELEKTRA, assessment occurs in integrated and individualized game situations within which learners have to accomplish adapted and tailored physics-related tasks, for example to hit a light sensor with a narrow beam of light, created with different optical devices, in order to open a door. ELEKTRA's methodology allows providing individualized game situations on the basis of the same pool of game assets. For example, a high performer will be provided with fewer but more complex situations than an underachiever. The set of possible actions and action sequences is modeled in terms of problem spaces. Problem solution states are determined and linked with a skill structure established by prerequisite relations between skills. An ontology holds both information, enabling a "learning engine" to reason about the learner's skills and increase or decrease their probabilities, approaching the true skill state. On this basis, the skills and therefore the learning progress can be assessed without compromising the learner's immersion with the game and, furthermore, subsequent learning and assessment situations can be adapted to the learners' needs.

**Keywords:** Adventure game, micro-adaptivity, competence assessment, non-invasive interventions

# Reflective Thinking in Games: Triggers and Constraints

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**Abstract:** State of art of educational game research has not managed to provide a theoretical framework that can be applied directly to educational game design. For that reason this paper reports some results of an ongoing design study that aims to develop a framework for problem-based gaming. The paper aspires to explain the framework with practical exemplars and focuses on exploring ways to enhance reflection in games. Furthermore, the aim is to also reveal elements that may disturb learning. These aspects are studied through three completely different games which are aimed at preschoolers, primary school pupils and university students (N = 94). The evaluation results indicate that the greatest challenge of educational game design is to implement the kinds of game elements that trigger reflection. The players that could evaluate their performance according to provided feedback, tended to be reflectors and double-loop learners who were more willing to develop several playing strategies while seeking the optimal one. Several triggers of reflection were found, from which the most important ones are conflicts, competition, visualization of performance, communication with other players and challenging comments of game characters. The results also pointed out that some of players could not perceive the meaning of implemented reflection tools. Therefore, the reflection tools should be developed using player-centred design methods. Furthermore, game elements that guide the reflection process should be implemented, particularly for the needs of those players whose metacognitive skills are low. The most important constraints of reflection that study results revealed were a gaming tempo that was too fast, complexity of the game and lack of challenge. These factors may disturb the reflection process and may even lead to misconceptions. Overall, the results of this study supported the structure of the problem-based gaming model and provided some concrete ways for supporting reflection in educational games.

**Keywords:** Educational game, game-based learning, problem-based gaming, reflection, game design

# How Decision-Making Styles Affect the Gaming-as-Learning Experience

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**Abstract:** According to several sources and disciplines different individuals prefer different styles of learning. People are different also by their decision-making styles. On one hand, people with a maximizer decision-making profile hesitate to make decisions without perfect information. On the other hand, people with a more satisficer decision-making profile are ready to make decisions as soon as they feel that they have gathered a satisfactory amount of information on the basis of their decision. Maximizers may more easily regret their decisions while satisficers are less worrying. In this paper we will study whether there are differences in how students with maximizer and satisficer profiles differ as decision-makers and learners in a gaming environment. The gaming environment applied was a business simulation game and the case students were mainly second and third year business school students. Our results show that students with different decision-making profiles do not differ much from each other in how they immerse in a gaming activity, how they feel about it, and how they appreciate the experience. This has some implications on the use of educational games for students. In the end of the paper we will briefly discuss these implications.

**Keywords:** Gaming as learning, decision-making styles, maximizer, satisficer, business simulation gaming

# Learning Support in Multi-User Virtual Environments

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**Abstract:** Multi-User Virtual Environments (MUVE) are seeing increasing use as educational platforms, despite having a number of deficiencies for educational support – both in terms of support for student learning as well as for learning management. In comparison with web-based Virtual Learning Environments (e.g. Moodle, Blackboard or WebCT) we see that MUVES have a number of advantages and some distinct weaknesses. We outline the open source Sloodle project – a project which is addressing some of these weaknesses by integrating the web-based and 3D virtual learning environments – providing additional learning support to activities undertaken within 3D virtual spaces. Sloodle is currently being developed using the open source VLE 'Moodle' and 'Second Life' a popular MUVE. This paper details some of the existing functionality, covering tools for supporting student reflection; aids for enriching the emotive content of communications within the virtual space as well as tools for assessment and co-ordination and planning. We additionally detail how these features may be used to support the achievement of educational objectives when undertaking teaching and learning in 3D virtual environments.

**Keywords:** Multi-user virtual environments, MUVE, virtual learning environments, VLE, second life

# **Team Play – Using Computer Games to Engage Learners in Teamworking**

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**Abstract:** Recent government reports and independent studies have indicated that video games can be used in the classroom to support learning of employability skills such as communication, problem solving and teamwork.

This document details the findings of a study using a prototype game designed to engage learners in the teamworking aspect of employability skills.

Constructed as part of the Focus on Learning 2: Steps to Employment initiative and supported by the Scottish Funding Council, the game was developed in a common web technology (Adobe Flash) to leverage Flash's low system requirements and accommodate the diverse range of platforms and delivery mechanisms available in classrooms.

In this small scale study the system shows promise in helping meet the challenge of engaging learners in the employability skill of teamworking.

**Keywords:** Teamworking, employability, Flash, game, core skill

# **A Document Oriented Model for the Design of Serious Games**

**Mark McMahon**

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**Abstract:** This paper proposes a instructional design model to inform the development of serious games. The model has key features in that it promotes a theoretically inclusive approach to learning, a focus on game elements such as goals, challenge, and flow, and an emphasis on documentation to provide the rigour necessary to be used as part of a broader project management model. The model is informed by several stages that increase in detail and complexity as the design evolves, leading to fully functional production documentation and accommodating development stages. Each design stage contains a series of iterative co-dependent elements. It is proposed that the model can form a base for prescribing and managing activities within an industry context but also as a means to teach the instructional design process for serious games within a higher education setting.

**Keywords:** Serious Games, Instructional Design Models

# The Use of Online Games in Business Education: The IE Business School Experience

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**Abstract:** This paper describes the experience of Instituto de Empresa Business School (IE) using games, simulations and interactive cases for supporting both online and face-to-face learning processes.

Instituto de Empresa Business School is a Spanish private institution of graduate business education, founded 1973. IE has some 35,000 alumni in 85 countries, produces over 1600 master graduates per year and has a main urban campus in Madrid and offices in ten countries.

The elearning department was created in 2000 and was responsible for the support to on-line classes and for the preparation of interactive learning materials.

The paper will show some examples of success in the use of simulations and games in business education. Multimedia content was originally developed for online education but has proved to be also useful in teaching regular face-to-face courses and for executive education. One hundred and sixty five modules (for all business areas) have been developed already internally in the elearning department. These modules can include interactive cases, simulations and games. The teaching strategy can vary as the professors can use these modules as additional visual aids for regular class discussion, as an exercise for the preparation of in-class discussion, or for direct in-class discussion, both for face-to-face or for on-line teaching.

The use of games and simulations at IE has been a largely successful experience, with high learner satisfaction which has been measured since the beginning. The team responsible of the creation of the materials and the authors (almost always IE professors), have daily access to the comments of the students. These results are very useful for continuous improvement.

The paper will finally analyse the initial problems that the school managers had to face in order to achieve the implementation of the new learning methodology and a new learning materials among the traditional faculty and how they are being solved.

**Keywords:** Business education, simulations, games, online learning, executive education

# Developing a Computer Game for University Library Induction

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**Abstract:** Computer based educational games have been developed since the 1970's. Every game though has specific objectives and aims at particular audiences. Educational games are no exception and each such development is a unique and often novel solution addressing specific academic or training needs. This paper discusses the development of a computer game aiming to introduce students to the use of facilities and services offered by the library of a university. The project presented here evolved along with the development of a brand new library at the University of East London and the need to promote the new facilities in an innovative and entertaining way that would turn a rather ineffective library tour, taken at the start of each semester, into an interesting and enjoyable experience. The game has been developed by a group of students on a computer games programme of study. The development team has been faced with many challenges, primarily the need to capture a real library environment and the ability to introduce the player to different facilities. Maintaining the educational focus and ensuring that the students / players are not consumed into the game environment ignoring the library environment is a further requirement. Stakeholder support is high and so are the expectations of delivering an innovative and effective product. At the time of writing the project team has completed an alpha version of the game. Future plans for the game include further developing the game to make it available online through the university's web site.

**Keywords:** Educational games, project management challenges, computer games development, library induction

# Using a Commercial Game engine to produce Physics Educational Materials

**Colin Price**

**University of Worcester, UK**

**Abstract:** This paper discusses our research into the use of a commercial game engine “Unreal Tournament 2004” (UT2004) to develop and deploy educational materials. Over the past year we have successfully produced educational materials for use in A-Level physics classes. Our goal was to evaluate the potential use of UT2004 in developing both qualitative and quantitative physics educational materials. Through the construction of a number of virtual physics experiments, we have probed the behaviour of the UT2004 physics engine, especially its fidelity and internal consistency. The fundamental question was to evaluate whether serious quantitative physics experiments could be constructed using UT2004 where pupils could perform experiments, log data and relate this to physics theory. This paper reports on our approach, our findings and evaluates the potential use of UT2004. We suggest that our approach may provide a useful resource for physics educators, important in this epoch of falling interest and recruitment onto A-Level and undergraduate physical science courses.

**Keywords:** Computer games, physics education, unreal tournament 2004

# **Digital Games as a Learning Tool for Children with Cognitive Disabilities: Literature Review and some Preliminary Methodological and Experimental Results**

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**Abstract:** Through the mutual efforts of devoted game researchers and educational practitioners, the value of digital games for learning is starting to augment in formal education, even though considerable opposition persists. Previous studies have shown that an interactive tool tends to educate users better than a pure textual source and it can be argued that in the educational field of perpetual learners such as students with mental retardation, game is a basic form of pedagogy. However, despite the theoretical connection of existing digital game design with accepted general pedagogy methodologies and practices, the important sector of Special Education has not yet been the objective of considerable research.

This paper outlines various theories of Special Educational Needs (SEN) pedagogy with a special interest in mental retardation, in order to demonstrate how educational and commercial games are able to embody the fundamental elements of SEN educational methodologies. More precisely, the paper examines how commercial and educational games support various SEN methodologies and theories regarding mental retardation pedagogy such as those described by Christakis (2002), Kalantzis (1985) and Soulis (2002).

The theoretical discussion of the paper is further substantiated by some preliminary experimental observations in order to highlight actual correlations between digital game play and learning outcomes. Based on the above theoretical correlations and early findings from pilot observations it can be postulated that serious games constitute an important medium of educational pedagogy for children with learning disabilities due to mental retardation.

**Keywords:** Games-based learning, special education, mental retardation, learning theory, pedagogy

# Designing Multiplayer Educational Games with Online Generic Shells

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**Abstract:** A research and development program initiated under the aegis of the Centre for research in lifelong learning (SAVIE) developed a series of generic educational game design shells to enable teachers, trainers and community services workers to create educational games that provide effective learning conditions and which are adapted to their learning at a distance needs. These environments were based on the frame game concept and on the essential attributes of games as compiled within the framework of the longitudinal *Simulations and Advanced Gaming Environments for Learning Project (SAGE)*. This paper will first present the problematic that underlies our developmental research. We will then define the concept of the generic game shell. Then we will illustrate how the structure of the game of Parcheesi has become a generic game shell. Finally we will present an example of an online game.

**Keywords:** Design, multiplayer, game, educational, online

# Teacher Acceptance of Game-Based Learning in K-12: The Case of River City

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**Abstract:** Integration of game-based learning (GBL) into kindergarten through high school classrooms is more of a challenge for some teachers than others. Essential to winning veteran teachers to the vision of how GBL enhances student learning today is demonstrating how innovative technology solutions support teaching and learning in ways not previously attainable. However, this “promise” of what innovative technologies can do for teaching and learning has been the “promise” since the introduction of film and radio into classrooms in the early twentieth century, and television in the last half of the twentieth century (Cuban, 1986). Since computers came into schools in the late 1970s, many teachers have been able to avoid embracing them by allowing computer classes to be the sole source for student interaction with computers. For many years, this was acceptable since students only learned computer languages and productivity software, not considered important for subject learning.

As computers and educational computing options have matured, no longer are teachers and schools limited to the two-dimensional educational programs available for the early computers. Twenty-first century computers, capable of accessing the Internet and harnessing multimedia software, are more the norm in classrooms, paving the way for more advanced opportunities through game-based learning. Again, teachers are being promised that these innovative technology solutions will support their teaching and student learning as nothing has previously. However, for some teachers, this seems like *déjà vu*. These teachers have seen in their career new approaches to teaching come and go quickly and they have learned to take a jaundiced view towards new ideas. In the past, just as they became knowledgeable and perhaps comfortable with the current ‘new’ approach, it was replaced with something quite different. This learning cycle with its concomitant need to reestablish a comfort-zone, makes teachers reluctant to engage with change. So for teachers, in particular, guiding them toward understanding the potential impact of GBL will be important. (Cuban, 1986). In this paper, we present a case study of River City (<http://muve.gse.harvard.edu/rivercityproject/>), a multi-user virtual environment (MUVE) curriculum project, to illustrate how an unfamiliar technological project is accepted by teachers. We highlight the impact of the format of the professional development and associated support systems on acceptance of this innovative curriculum project and offer comments from teachers as supporting documentation. We conclude by describing a model to promote teacher acceptance of technological curricula.

**Keywords:** MUVE, K-12, integration, teacher acceptance

# Designing Computer Games for Adult Learners

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**Abstract:** Advocates of game-based learning argue that computer games have the potential to transform university education, motivating and engaging a new generation of learners in a way that traditional education does not. However, much of the rationale for this is based on the assumption that games have potential because they are intrinsically motivating to most people. This paper considers the case for using computer game-based learning in Higher Education, focussing on its pedagogic rationale, and presents twelve guidelines to support the design and evaluation of educational games. The development of an online team building game is used as a case study to show how these guidelines can be applied.

The assumption that games will revolutionise education because they lead to increased motivation is challenged in this paper. However, it is argued that there is a huge potential for increased engagement in learning through games, but this is only when they are designed for learning and in themselves can be considered to be constructivist learning environments, embodying the principles of problem-based, experiential and collaborative learning.

A set of design guidelines for the design of educational games for students in Higher Education, based on existing literature and theories of constructivist learning as well as an analysis of popular online games, are presented and considered. The application of these criteria to the design and creation of a multiplayer adventure game for teaching team working skills is discussed.

In all, this paper presents a rationale for the use of certain types of educational computer game in Higher Education and provides a set of practical guidelines for the effective pedagogic and interface design of educational computer games that are suitable for adults.

**Keywords:** Design, guidelines, constructivism, game-based learning