

Proceedings of the 4th European Conference on Games Based Learning

The Danish School of Education
Aarhus University
Copenhagen
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21-22 October 2010

Edited by
Professor Bente Meyer
Aarhus University
Copenhagen

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Preface

These proceedings represent the work of researchers participating in the 4th European Conference on Games-Based Learning, which is being hosted this year by The Danish School of Education, Aarhus University, Copenhagen, Denmark. The Conference Chair is Birgitte Holm Sørensen and the Programme Chair is Bente Meyer, both from the University of Aarhus, Denmark.

The University of Aarhus has been pleased to have the opportunity of working alongside Thomas Connolly and Mark Stansfield from the University of the West of Scotland. As founders of this conference, they continue to bring new and innovative research to the event.

The conference will be opened with a keynote from Dr Suzanne de Castell, Simon Fraser University, with a talk entitled *Reversing the Order of Play: Gender and Games Research as Educational Intervention*. The second day will be opened with a presentation from Dr Thorkild Hanghøj, University of Aarhus, Denmark on the subject of *Gaming, Schooling and Knowing*.

The Conference is a valuable platform for individuals to present their research findings, display their work in progress and discuss conceptual advances in many different branches of games-based learning. It also offers the opportunity for individuals to come together to share knowledge with peers interested in the same area of study.

ECGBL has evolved and developed over the past four years, and the range of papers will ensure an interesting two days.

With an initial submission of 99 abstracts, after the double blind, peer review process there are 51 research papers, 9 PhD research papers and 4 work-in-progress papers published in these Conference Proceedings. These papers represent research from Australia, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Iran, Ireland, Italy, Malaysia, Mexico, Romania, Russia, Rwanda, Singapore, South Africa, Spain, Sweden, Taiwan, The Netherlands, UK and the USA.

We hope that you have an enjoyable conference.

Bente Meyer
Programme Chair
October 2010

Biographies of Conference Chairs, Programme Chairs and Keynote Speakers

Conference Director



Professor Thomas Connolly. The original instigator of this conference in 2007, Thomas Connolly is a Professor in the School of Computing at the University of the West of Scotland, 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 4th edition) and Database Solutions (in its 2nd 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.

Conference Chair

Professor PhD. Birgitte Holm Sørensen has been Research Programme Director of the Research Programme on Media and ICT in a Learning Perspective at the Danish University of Education since 2001. She was Director of the Department of Aesthetic and Media Education, at the Danish University of Education, 1995-97. Together with five other researchers from five universities she has created a virtual Master's programme, MIL, Master in ICT and Learning, which started in 2000. She has initiated and been in the development group of LAB, Language Across Borders, a research-based virtual language platform for foreign language learning in primary and secondary schools. She has been head of the research project "Children Growing up with Interactive Media - in a Future Perspective", supported by the Danish Research Councils as part of the research programme "Children's Living Conditions and Welfare", 1989-2002. Furthermore, she was head of the research project "Children and Computer Games", supported by Danish Ministry of Culture and Media Council for Children and Young People, 1999, and head of a development and research project "Multimedia Didactics and Learning" under the Nordic Council of Ministers, 1996-1999. From 1996-1997 she was a member of a working group on the Danish Board of Technology concerning information technology in primary and lower secondary schools. From 1994-95 she was chair of a commission under the Danish Ministry of Culture investigating research on



violence in the media, and from 1994-1996, head of a working group under the Nordic Council of Ministers on media education for teachers in the Nordic countries.

Programme Director



Dr Mark Stansfield. The founding programme chair for ECGBL, 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.

Programme Chair

Ass. Professor PhD. Bente Meyer is an Associate Professor at the Department of Curriculum Studies, School of Education, University of Aarhus and a member of the research programme Media, ICT and learning. Her research interests are second and foreign language education, intercultural and citizenship education as well as computer assisted language learning (CALL). She has edited several books on media, ICT and Learning, including Digital Media and Educational Design (Digitale Medier og Didaktisk Design, The Danish University of Education Press).



Keynote Speakers



Professor Suzanne de Castell is Professor of Curriculum and Instruction in the Faculty of Education at Simon Fraser University in Vancouver, British Columbia (Canada), where she teaches courses in qualitative research methods, and in literacy, new media, and educational technologies. Her doctorate is from Senate

House at the University of London, and she has published extensively on educational history, philosophy and theory, literacy and new media studies and technology, gender and digital game studies. Concentrating on learning and attention in play-based and non-formal learning environments, her current research involves multimodal analyses of educational interactions, and design-based theory, research and development. With Jen Jenson (York University), she co-edited *Worlds in Play: International Perspectives on Digital Games Research*, and co-developed an educational videogame on baroque music for the world-famous Toronto-based baroque orchestra, Tafelmusik. Currently she holds a visiting professorship in the Faculty of Education at York University.

Ass. Professor PhD. Thorkild Hanghøj is an Assistant Professor at The Danish School of Education, which is part of The University of Aarhus, Copenhagen. He has a MA in cultural studies and media studies, and has a PhD on the design and use of ICT-supported debate games within educational settings. Currently, he is studying the role of the teacher in facilitating computer games.



Mini Track Chairs



Dr Patrick Felíciaa is Lecturer and Researcher at Waterford Institute of Technology. He works within the in the Department of Computing, mathematics and Physics. He earned his PhD in computer science from University College Cork. In WIT his research and teaching focus on the use of creating innovative and engaging educational experiences by combining Gaming Technology and Educational Psychology. His research interests include Game-Based learning, Instructional Design and Technology-Enhanced Education.

Dr Thomas Duus Henriksen, PhD, EBA is a Business Psychologist and an Assistant Professor in the ICT and Learning programme at the Danish School of Education, Aarhus University. His research interests are the development, use and evaluation of game-based learning processes with adult, as well as with educational outcomes of the mechanics and didactic design of such learning games. He has published articles on game-based learning and social dynamics of such games in numerous anthologies and is an active learning game designer.





Dr Kristian Kiili works as a senior researcher at Tampere University of Technology. He got his M.Ed from the University of Turku in 2001 and his Ph.D. at Tampere University of Technology in 2006. The title of his doctoral thesis was "On Educational Game Design: The Building Blocks of Flow Experience". His research focuses on game based learning, exergaming, user experience and game design issues. Currently, kiili is creating educational game

design pattern library and design principles for exergames. Results received from his studies has been published in several scientific journals and conferences as well as applied in commercial e-learning products.

Dr Timo Lainema, PhD is the Development Director in the Institute for Executive Education in Turku School of Economics, Turku, Finland. His research interests are learning through simulation gaming, flow in games, knowledge sharing in virtual working contexts, and decision making under time pressure. He has published articles on gaming topics in Computers and Education, Simulation & Gaming, the International Journal of Advanced Technology for Learning on Games-Based Learning, the Journal of Information Technology Education, and the Journal of Interactive Learning Research. He is also a member of the editorial boards of Simulation & Gaming, and Computers and Education.



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Minoo Alemi is a PhD candidate of Applied Linguistics at Allameh Tabataba'i University and a faculty member of Languages and Linguistics Department at Sharif University of Technology. She has published about ten textbooks in General English and ESP, a large number of papers in international journals, and given presentations on TEFL at many international conferences.

Ruphina Anyaegbu, is a Nigerian and a PhD student in Nanjing Normal University. Her current research focuses on the integration of Education computer games named mingoville in teaching and learning English as a second language in both Chinese and Nigerian primary schools.

Alexander Arsentiev. In 2005 he entered a faculty of Electronics and Computer Devices of Volgograd State Technical University (VolgSTU). In June 2009 he received BS degree in the field of Computer Science. Since 2009 he is a MSc student of CAD department of VolgSTU. Research interests

are virtual landscapes, computer graphics, mobile games development and digital game-based learning.

Wolmet Barendregt is a postdoc researcher in the Department of Applied IT at Gothenburg University. She earned her PhD titled 'Evaluating fun and usability in computer games' in Industrial Design from Eindhoven University of Technology. Her current research and teaching focus on the use and evaluation of educational computer games.

Matthew Bates is a PhD research student of the Interactive Systems Research Group at Nottingham Trent University. He is currently working with local library services and secondary schools to investigate prototyping methods to facilitate children creating their own serious-games.

Mary Bendixen-Noe is an associate professor in the College of Education and Human Ecology. Her research interests lie in the area of developmentally appropriate practice for students of all ages. The emphasis of play in classroom learning is her current focus.

Luca Bisognin is the R&D Manager at Symetrix, a French e-learning company specialized in providing software solutions to support learning processes. Since 2003, Symetrix has gained its leadership in French e-learning industry with CourseLiner, a collaborative e-learning project management and authoring environment. Since 2007, He has promoted and managed new orientations for Symetrix: learning games, mobile learning, communities of practice and augmented reality. He is in charge of the Learning Games Factory project, funded by the CEC.

Rosa Maria Bottino is a senior researcher of the Italian National Research Council (CNR) and she is currently the Director of CNR Institute for Educational Technology (ITD-CNR). Her research interests are in the field of educational research and the role of information and communication technologies for improving teaching and learning processes. She is the author of more than 100 scientific publications both in national and international journals, books and conference proceedings.

Viviane Cantaluppi is a PhD student at the University of Zurich (Switzerland), working and researching in the area of game based learning at the Educational Engineering Lab, Department of Informatics. Her research is focused on game based learning applied within education. She is also a consultant of adapting eLearning solutions in educational institutions.

Thibault Carron is an associate professor of computer science at the University of Savoie. 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 and with learning games (Projects : Learning Adventure, Learning Games Factory, Serious Lab for Innovation, Pegase).

Nathalie Charlier is a lecturer in the Teacher training programme in health science education at the Katholieke Universiteit Leuven, Belgium. She obtained a BSc and MSc in Pharmaceutical Sciences in 1999 and her PhD in Medical Sciences in 2003. Her current research interests are (i) game-based learning in health science education and (ii) health promotion and education in low-income countries.

Yam San Chee is an Associate Professor in the Learning Sciences & Technologies Academic Group and the Learning Sciences Lab at the National Institute of Education, Nanyang Technological University, Singapore. His research focuses on new literacies and new media in education, with a special emphasis on game-based learning.

Thomas Duus Henriksen is a Business Psychologist and an Assistant Professor in the ICT and Learning programme at the Danish School of Education, Aarhus University. His research interests are the development, use and evaluation of game-based learning processes with adult, and with the educational outcomes of the mechanics and didactic design of such learning games

Simon Egenfeldt-Nielsen (PhD, Psychologist) is CEO of Serious Games interactive. He did a PhD on the educational use of computer games and after that worked as an assistant professor at IT-University of Copenhagen for 5 years on games and learning projects. In his company he has participated in three EU research projects within the area

Keri Facer is Professor of Education at Manchester Metropolitan University where she leads the CREATE research group specialising in digital cultures, emerging technologies and educational change. From 2007-2009 Keri led the strategic futures programme for education 'Beyond Current Horizons' for the UK government. From 2002-2008 Keri was Research Director at Futurelab.

Manuela Feist graduated in 2008 with a degree in Applied Computer Science from the University of Applied Sciences (HTW) Berlin, Germany. In 2010, she was awarded a Master of Science in Interactive Media from the University of Limerick, Ireland. She currently works in the research group "Information and Communication Applications" at HTW Berlin. Her particular interest is in developing e-learning and museum information systems.

Patrick Felicia is a Lecturer and Researcher at Waterford Institute of Technology. He works within the Department of Computing, Mathematics and Physics. He earned his PhD in computer science from University College Cork. In WIT his research and teaching focus on the use of creating innovative and engaging educational experiences by combining Gaming Technology and Educational Psychology. His research interests include Game-Based learning, Instructional Design and Technology-Enhanced Education.

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Thomas Hainey is a researcher in the School of Computing at the University of the West of Scotland specialising in games-based learning and particularly evaluation of games-based learning. He has a number of journal and conference publications in this area.

Fiona Hancock is a PhD Student at the University of the West of Scotland, Paisley. Having recently started my PhD after achieving a 2:1 Honours degree in Psychology, She has an interest in video games and the psychology that can be involved. Already with a published paper on The Implementation of Team Based Assessment In Serious Games, She wishes to take her research further and develop a foundation in the realm of video game research

Thorkild Hanghøj is an Assistant Professor at The Danish School of Education, which is part of The University of Aarhus, Copenhagen. He has a MA in cultural studies and media studies, and has a PhD on the design and use of ICT-supported debate games within educational settings. Currently, he is studying the role of the teacher in facilitating computer games.

Mikala Hansbøl, PhD -Postdoc in educational cultures and serious games on a global market place, research programme Media and ICT in a Learning Perspective, Danish School of Education, Aarhus University. Research interest is development of research methodologies for studying relationships between ICTs and education. Her work is Science and Technology Studies (STS) and Actor-Network Theory (ANT) inspired.

Hanno Hildmann has been at ECGBL for the last 3 years with various topics and is happy to be back again with this years contribution, titled 'Empirical evidence, Experiential & initiative games, Mobile device based education, Pervasive technologies”

Chientu Huang is a digital content specialist working in Taiwan Computer Association. He is a master in Msc Education, Technology and Society, University of Bristol. His research interests are Game based learning, collaborative learning enhanced by technology. He has published articles about e-learning in IEEE Computer Society Press and Lecture Notes On Artificial Intelligence (LNAI)(Sci & EI).

Ling-yi Huang, is a PhD student at the department of Journalism, National Chengchi University in Taipei, Taiwan. Her research interests include digital narratives, environmental design, entertainment-education and higher order thinking skills. She is working on her PhD thesis about designing serious games to enhance political efficacy and critical thinking disposition.

Jantina Huizenga is a PhD student at the Research Institute of Child Development and Education of the University of Amsterdam (UvA). Her research subject is game-based learning in (mostly) secondary education, with a special interest in mobile gaming

Pieter Joubert completed his Bachelors Information Technology at the University of Pretoria before working in industry as a test and programmer for an Electronics Warfare company for two years. He returned to academia and completed his Masters in Philosophy with a Specialisation in Informatics. He is currently pursuing a PHB in Information Technology while teaching and researching at the University of Pretoria. His research fields include Virtual Worlds, Serious Games and Web 2.0.

Alexander Kataev. In 2002 he entered a faculty of Electronics and Computer Devices of Volgograd State Technical University (VolgSTU). In December 2007 he received Professional degree in the field of Computer Science. Since 2007 is a PhD student of CAD department of VolgSTU. Research interests are algorithms and data structures, computer graphics, computer games development, digital game-based learning and educational games development.

Harri Ketamo, PhD, is a Director of Education at Satakunta University of Applied Sciences. His research focuses on conceptual learning, complex adaptive systems, user modeling and game AI's. Before coming to Satakunta University of Applied Sciences, Harri was co-founder and director of GameMiner Ltd., a game development company focused on game AI's and Data Mining.

Kristian Kiili is a senior researcher at Tampere University of Technology. His research focuses on game based learning, exergaming, and game design issues. Results received from his studies has been published in several scientific publications as well as applied in commercial e-learning products.

Kieron Kirkland's is a learning researcher for Futurelab includes leading the Greater Expectations project, which is exploring how digital technology can support young people to engage with their rights and entitlements, and researching the uses of computer games for learning. He has also published work on overcoming barriers to educational innovation.

Kevin Koidl is currently a PhD research student in the Knowledge and Data Engineering Group (KDEG) in Trinity College Dublin. Kevin has been strongly involved in the development of the European Commission funded project ELEKTRA and the ongoing 80Days project. His main research interests are adaptive DEGs and Web Personalisation.

Antti Koivisto received his M.Sc degree in software engineering. Currently he is a PhD student and a researcher at the Tampere University of Technology in Pori, Finland. His research interests are social media and multimedia.

Anke Königschulte holds German Dipl.-Inform. in Computer Science and soon finishes with her MSc. in the International Master Program Digital Media at the University of Applied Sciences Bremerhaven. She is particularly interested in the areas of Game-Based Learning and Human-Computer-Interaction and is working with different museums to enhance the visitor experiences by the use of interactive digital media.

Ratnakar Kotnana is a Lecturer in the Department of Computer Science, Faculty of Applied Sciences, National University of Rwanda, Rwanda. His current area of research is Artificial Intelligence in web browsers. His interests are Web Application Development and Digital Game Based Learning.

Erik Kristiansen is a researcher at the department of Performance Design at Roskilde University, Denmark. He received his Ph.D. in performance studies at the same university, 2009. His main interests include the design of games, particularly of pervasive games and design games.

Dennis Maciuszek holds a German Dipl.-Inform. and a Swedish Lic. in Computer Science (minor: Psychology), as well as an M.A. degree in Media. He was previously employed as a researcher at Linköpings universitet, Sweden. Now he is a PhD student at the University of Rostock, Germany, working in the area of Game-based Learning.

Rikke Magnussen is an Assistant Professor at the Department of Curriculum Research at DPU in Copenhagen. Her research concerns the representational inquiry methods in game-based science learning spaces. Rikke Magnussen has been an active part in establishing the learning game research group at DPU and holds a M.Sc.in molecular biology and science

communication and has worked as a science TV producer before doing game studies.

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The Impact of Word Games on Expanding Learner's Vocabulary Knowledge

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Abstract: One of the most difficult aspects of learning a foreign language, particularly in an EFL context, is the retention of vocabulary. Vocabulary learning plays a major role in English language learner's success. The standard method of presenting up to 20 or more new vocabulary words that students are expected to learn at a given time is not an effective way to help the learners develop vocabulary (Gresten and Baker, 2000). To this end, most ESL/EFL specialists often justify the use of games with reference to the motivation that they can provide for the students. Scholars suggest that many techniques, and word game is one of them. The impact of word game as a reinforcing device on improving student's vocabulary knowledge is a topic which needs to be investigated. This study attempted to investigate the role of using word games in expanding the learner's vocabulary. In so doing, an experiment using five word games, named Twenty Questions, Charades, Definition Game's, Passwords, and Crossword Puzzles respectively was conducted. The participants were selected randomly from a male/ female group of third- grade junior high school students studying at a private school. First, a standardized test was administered to 100 students out of which 60 almost homogeneous students were selected and randomly divided into two groups: experimental and control. Both groups were taught words using traditional methods, however, the experimental group received word games as a treatment at the end of each session. Finally, a vocabulary test was administered to both groups to determine the differences between them. The score obtained from the groups were compared through independent t-test. The calculated t exceeded the t-critical value, confirming the positive effect of word games on expanding learners' vocabulary.

Keywords: Word games, cross word puzzles, definition games, charades, passwords

Attacking Immune Attack™? An Evaluation by Teacher Students

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Abstract: A crucial factor in the adoption of educational games in schools is the attitude of teachers towards these games. In this paper, we describe the

results of an evaluation of the educational game Immune Attack™ by a group of teacher education students in the course Learning and Information Technology at Gothenburg University, Sweden. Immune Attack™ is meant to be a supplemental teaching tool for middle school and high school biology, introducing molecular and cellular biology in detail. The player assumes the role of a pilot remote-controlling a nanobot, called Explorer. With the help of advisors, the player must learn about the different cells and environments in the human body in order to determine how to train the immune system. Visual and audio clues in the game provide the information needed to accomplish this goal. The game has received a lot of positive media attention and has been developed by a team of researchers and developers from institutions such as the Federation of American Scientists (FAS), Escape Hatch Entertainment, Brown University, and the University of Southern California under a grant of the National Science Foundation. According to the designers of the game, preliminary test data has pointed out that students are learning and are gaining confidence with molecular and cellular biology by playing this game. Although many educational games do not succeed in being as motivational as other commercial games, or being convincingly effective as teaching tools, this game promises to be a candidate to convince future teachers to use educational games in their classroom. We thus considered Immune Attack™ an ideal game to be evaluated by the future teachers in our university program. Surprisingly, the results of the evaluation by teacher students discussed in this paper show that none of the teacher students would want to use the game in its current form for their teaching. Despite the general openness towards the use of computers in the classroom and Game Based Learning, these students also have a critical analytical attitude when evaluating the use of ICT in classroom settings. The paper first describes how the evaluation was performed and in what context. Then the arguments of the teacher students for why they would not use the present version of Immune Attack™ in their teaching are presented. These arguments are related to aspects like usability, integration of the learning content in the game, appeal, and motivation for the educational topic. The paper also presents some of the positive comments made about the game, such as the background music and graphic representation of the human body. Finally, the paper discusses the representativeness of this study for teachers' views on a game like Immune Attack™ and presents recommendations for improvement of educational games in order to convince prospective teachers of the usefulness of such a game.

Keywords: Educational games, evaluation, teachers, learning, motivation

Bringing Play Back to the Classroom: How Teachers Implement Board and Card Games Based on Academic Learning Standards

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Abstract: Research on implementing board games in elementary classrooms was conducted. The purpose of the study was to investigate how teachers' utilized play based methods in teaching academic learning standards. Teachers had funds to purchase, adapt and/or develop games to teach learning standards. Guidelines were developed to help guide their selections, including that games should be used at least once a week. Teachers identified the academic standard being addressed and kept weekly journals addressing a) teacher's reactions to the games, b) students' responses to the games; c) teacher's perception of how the game either did or did not help students' meet the academic standard(s). Journals were collected at the end of the year. That information and an exit interview with each teacher provided data for the researcher to analyze using content analysis and what Lincoln and Guba (1985) have termed "ethnographic analytic strategies" that are appropriate with qualitative data. Findings include: 1) teachers being able to discuss play practices with other teachers (the monthly meetings) aided them in thinking about different ways to implement using play in their classrooms; 2) students were more enthusiastic about learning and were learning the material in a 'deeper' manner; 3) students learned more social skills in working with other students. Teachers mentioned that while the social skills learned made sense, they did not anticipate the difference it seemed to make in their classroom management and in the classroom climate. Overall, all teachers planned to continue to use games to teach academic standards in the future.

Keywords: Play, academic standards, developmentally appropriate practice, teaching strategies

Learning Games Factory: Construction of Learning Games Using a Component-Based Approach

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Abstract: The complexity of Learning Games development is currently increasing significantly. The requirements for these learning environments imply building several components aiming at supporting particular activities

(games of "snakes and ladders" type, puzzles, animated MCQs). Furthermore, new up-to-date functionalities are often wanted: collaborative aspects, observation features for awareness purpose, and links to tangible user interfaces. In light of this observation, we need a new approach for the construction of Learning Games, in order to reduce the associated time and costs. We propose to reuse the various existing components for a particular purpose, to adapt, to configure and to integrate them in order to obtain a new game. We call our approach Learning Games Factory (LGF) as in a factory where one assembles parts to obtain manufactured objects. In this approach, we need powerful research tools to find out the suitable components meeting particular requirements. In this paper, we show how to ease the exchange of data between data providers and service providers through the Open Archives Initiative's Protocol for Metadata Harvesting (OAI-PMH). We first give the description of a general game-based platform called "Learning Adventure". We then explain how to tag components with meta-data, according to usual standards in the education field. The retrieval of such components according to specific needs is subsequently described through an architecture using OAI-PMH. We illustrate the different steps of this approach through a broad example in the "Learning Adventure" (LA) Platform. This example is taken from the LGF project, in which the different partners have already developed their own components (compliant with the LGF standards). The interesting idea is the integration of these different components into the LA platform, allowing their sequencing and their data exchange in order to obtain effortlessly a new learning game.

Keywords: Learning game, interoperability, LG Factory, component approach

Can Digital Mind Games be Used to Investigate Children's Reasoning Abilities?

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Abstract: This paper focuses on the use of digital mind games (also called puzzles or brainteasers) to investigate and assess students' logical and reasoning abilities. It draws on LOGIVALI, a research project whose main objective was that of verifying whether digital mind games can be employed with the aim of understanding and evaluating primary school children's reasoning abilities. Within the project, supported by the Italian Ministry of Education, the LOGIVALI TEST, a norm-referenced test, was designed and produced. In order to perform the validation and standardization of this test, a large-scale in-field experiment, involving more than 50 teachers and 500 primary school students (4th and 5th grades) was carried out. Students, during

school hours and under teachers' control, were asked to play individually with five mind games that had been carefully selected among mainstream free and Open Source software products. The choice of the games was made on the basis of some key criteria among which: ease of use (interface and design features); suitability to the target population and to the envisaged educational setting (e.g. level of difficulty - time required); disciplinary competences–independence (e.g. not requiring specific mathematics or language competencies); type of feedback offered during the gaming sessions. Following the playing sessions, students were tested by means of a detailed, custom made, evaluation test aimed at shedding light on the children's actual possession of the reasoning abilities required to solve the games at hand. At the core of the paper the LOGIVAL TEST is described and account is given of the specific abilities investigated in the test and of the methodology adopted to carry out the test validation and standardization. The major results of the project are also proposed, which, basically, account for the suitability of mind games to assess specific relevant reasoning abilities as far as the target population (pupils' age level 8-10) is concerned.

Keywords: Games-based learning, mind games, reasoning skills, evaluation, primary education, technology enhanced learning

Games Based Learning as a Vehicle to Teach new Content: A Case Study

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Abstract: In this study we have set up an experimental design to assess the effectiveness of a board game for learning new content (first aid). A traditional lecture method was used as control condition. The game was designed according to the curricular objectives of the Flemish secondary school curriculum. The sample consisted of 120 students (13-14 years old), who were assigned to two conditions, a gaming application and a traditional lecture method. Similarities between both conditions included the time frame (1 hour), the content (basic first aid) and interaction/feedback availability. The traditional lecture was given by two teachers (in two classrooms) using an identical powerpoint presentation and demonstrations. In the game condition, students were randomly divided into groups of four players. Three teachers were present to assist students with playing the game and performing demonstrations. The effects of the learning environments (game versus traditional lecture) on students' achievement were examined through a test of first aid knowledge. All 120 participants were subjected to a pre-test and a

post-test using a paper-and-pencil test. Two months after the intervention, the participants took a retention test and filled out a questionnaire assessing the participant's enjoyment, interest and motivation. An analysis of pre and post knowledge tests showed that both conditions produced significant increases in knowledge. The lecture was significantly more effective in increasing knowledge, as compared to the game condition. A significant decrease in scores was found for both conditions two months after the learning experience. Participants indicated that they liked the game condition more than their fellow participants in the traditional lecture condition. These results suggest that traditional lectures are more effective in increasing student knowledge, while educational games are more effective for student enjoyment. From this case study we recommend alteration or combination of these teaching methods to make learning both effective and enjoyable.

Keywords: Game-based learning, health education, secondary education, curriculum-based game-design

Game-Based Learning as Performance: The Case of Legends of Alkhimia

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Abstract: The evaluation of learning outcomes associated with game-based learning is fraught with conflict and confusion. Many serious game developers uncritically use content mastery as the yardstick of learner progress and achievement. Other developers train simple skills in a drill-and-practice fashion in the belief that games are best used to motivate student interest in subject domains that students find boring or tedious to learn. This paper has two parts. The first part is theoretical, and the second part consists of an illustrative case. In the first part, I examine computer and video games as a unique digital medium that supports *first-person* immersive learning. I interrogate what kind of epistemology is entailed when learning takes place in the first-person. Drawing upon the philosophy of pragmatism, I argue that a powerful and appropriate way to assess game-based learning outcomes using such games is through the construct of *performance*. This construct is grounded in the literature related to performance theory and performance studies. A performative stance, I argue, is productive for viewing learning through the theoretical lens of *being* and *becoming* because game play involves *being* a person on a developmental trajectory of *becoming*. Locating learning within a socio-cultural context, I show how the construction of identity has a vital role to play in a performance-oriented theory of learning. In the second part of the paper, I reify the theoretical ideas above via the educational game "Legends of Alkhimia" (LoA). This game has been

developed at our research centre. It will be used in two classrooms, in separate schools, in mid-2010. LoA is a multiplayer game that supports up to four concurrent users. The game is designed to support authentic learning of chemistry by 14-year-olds at the lower secondary school level. The underlying pedagogy is one of learning as inquiry, in the spirit of Dewey. Dialogism and the enaction of identity are key elements of the curriculum's learning design. In the LoA game, students have to solve the mystery of recent strange happenings in the once sleepy town of Alkhimia. In tackling this challenge, students engage in *doing* chemistry to create effective weapons that can repel marauding monsters that appear out of nowhere, and they work to fulfil missions for the good of various inhabitants of the town. They slowly become acquainted with the legends of Alkhimia and learn that not all is as it appears. By engaging in the learning program, the goal is that students will develop a practical sense with and of chemistry as a professional domain of practice. In so doing, they appropriate the *habitus* of professional practice and develop the values and dispositions of critical reflexivity and epistemological vigilance. In short, they learn to *become* chemists.

Keywords: Performance, identity, values, becoming, inquiry

Didactic Design for Business Games

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Abstract: This paper presents the didactic design of two deployments of the EIS Simulation, which is a learning game for teaching change management. Two models, the 1-2-1 and the TiA, are used as framework for analysing how didactic activities are used for supporting, focussing and facilitating the learning process, as well as how different didactic models are used for generating different results. The first model, the 1-2-1-model is used for addressing what didactic activities succeed and precede the game, as well as how these activities facilitate a particular mode of participating and understanding, both the learning game, and the process of game-based learning. The second model, the TiA-model, is used for addressing how different didactic activities are embedded in the period spent playing the game and in particular how different reflective processes are used to facilitate a more reflective mode of participation, which is in contrast to the idea of trying to create a game-flow. By studying the two deployments of the EIS, two very different images of game-based learning processes emerge. The EURO deployment followed the 1-2-1 framework, where the learning process starts in a theoretical room, moves on to the practical experience, for then to return

to the theoretical approach to the game subject, the game-based learning process can be seen as an attempt to facilitate an explorative process. The IKEA deployment followed the TiA model, resulting in a much more blended approach, which explicitly sought to facilitate reflective processes by disturbing the participants while playing the game, creating a more reflective and theoretically reflective approach to creating game-based learning processes. Together, the two models provide different images on how to blend inductive and deductive learning processes together with a learning game in order to facilitate particular learning processes with its participants.

Keywords: Learning game, didactic design, learning process, blended learning, change management, EIS

The Challenges to Diffusion of Educational Computer Games

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Abstract: This paper explores evidence from prior research already conducted in the field of game-based learning supplemented by experiences from developers. The aim is to address why educational computer games are not yet more integrated in formal education. The analysis is structured by drawing on the well-established model by Rogers called Diffusion of Innovations. Based on the theory three examples of game-based learning products are presented to examine how game-based learning products fit the diffusion of innovation theory. The games analyzed are: Dimension M, Global Conflicts and Making History, which are all award-winning titles that have been in the market place for several years. The conclusion is that many game titles ignore the basics behind the theory diffusion of innovation, and that research provides ample evidence for the challenges game-based learning faces. The lacking of game-based learning makes it hard to make real headway towards general acceptance and everyday use in the educational system. Not because game-based learning doesn't work, but rather because it is perceived, designed and positioned in a way that hinder broad adaption.

Keywords: Business, diffusion, innovation, industry, educational, computer games

Grey Gamers: A Research Agenda for the Future

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Abstract: As the population ages across the world, societies are increasingly being challenged to find ways to enable older adults to play active economic

and social roles later in life and to keep learning for employment or social cohesion purposes. At the same time, the demographic of games players is changing from a profile that was traditionally dominated by young men, to one that is more diverse with growing numbers of female and older players. These changes suggest that it is now time to extend the focus of research on games and learning beyond its current emphasis on younger people and formal education and training, into the areas of lifelong and informal learning. At the present time, computer games that are explicitly designed for older people tend to be dominated by concerns around cognitive function. Such concerns lead to the design of games that are structured around behaviourist models of learning, with an emphasis on repetition and practice. This approach, however, may well over-simplify the capacities, interests and aspirations of older adults both in respect of their attitudes towards learning and in their attitudes towards gaming. In order to move beyond this stereotypical view of older people, learning and gaming, this paper discusses the results of a small pilot study of five interviews with people aged over fifty. These interviews demonstrate that there is a greater diversity of need and aspiration among this group and that there is evidence of a real potential for game-based learning. The paper concludes by calling for a research agenda that recognises the diversity of older adults, challenges assumptions and stereotypes and supports an interdisciplinary approach to investigating the potential of games for lifelong learning.

Keywords: Grey gamers, ageing, informal learning, constructivist games

Journey to the Galapagos Islands– A Game-Based Learning Application for Children, on the Subject of Charles Darwin and his Evolution Theory

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Abstract: The computer has become a widely used tool in people's everyday lives as a result of recent developments in the field of information and communication technology (ICT). Various computer programmes have been designed to facilitate human activities. In order to support conventional learning by means of new technologies, user-centred design (UCD) was applied in the development of an interactive edutainment game about the British natural scientist Charles Darwin and his theory of evolution, aimed at primary school children from the ages of 8 to 12. The particular application, "Journey to the Galapagos Islands", is designed to increase the pleasure of learning by integrating educational and entertaining elements in a seamless manner; enabling children to explore the educational content as active participants in a systematic way, due to the concept of guided discovery

learning applied to the prototype. This paper describes in detail the results of the four different steps of the iterative user-centred design process. The screen-based prototype was developed with the software Adobe Flash and the programming language ActionScript 3. It provides a graphical user interface (GUI) with which children interact by means of a computer mouse to solve several educational problems. Finally, this paper documents the evaluation of the prototype with representatives of the defined target age-group in Ireland, drawing important conclusions for further work. These conclusions have been instrumental in the development of a content-specific version to be used as part of a multimedia-based mobile museum within a cooperative project between the University of Applied Sciences (HTW) Berlin and the Jewish Museum Berlin (JMB).

Keywords: Game-based learning, user-centred design, edutainment, multimedia-based application

Assessing Players' Motivations and Learning Strategies Based on their Personality

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Abstract: The objective of this chapter is to provide guidelines for the design of adaptive educational video games, by identifying significant motivational and learning strategies for players. By evaluating the emotions sought by particular subjects, the author provides guidelines to assist game designers in the production of video games that both teach and entertain. The results, based on personality traits, acknowledge both dramatic and didactic aspects of video games, with an emphasis on emotions and motivation. It is based on players' personality traits in the light of the Big-Five personality model.

Keywords: Personality profiling video games learning

A Refined Evaluation Framework for Games-Based Learning

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Abstract: Games-based Learning (GBL) has a dearth of empirical evidence supporting the approach. One of the primary reasons for this is the lack of evaluation frameworks to generate sufficient ideas to guide and focus games-based learning evaluations. This paper will present a refined evaluation framework based on two extensive literature reviews. One review performed to identify evaluation frameworks and empirical evaluation evidence in 2008 and another in 2009 to identify research on learning value and methods of

measuring resultant outcomes and impacts of computer games. This paper will provide a brief description of existing evaluation frameworks and will then discuss specific refined categories of a previously developed evaluation framework to specifically evaluate games-based learning in terms of learner/instructor perceptions, learner/instructor preferences and learner/instructor motivations. The paper will provide a list of guidelines for evaluating games-based learning and will provide detailed measurements in terms of perceptions, preferences and motivations. Finally we will conclude with a discussion of future research directions with regards to further refinement and verification of the evaluation framework.

Keywords: Evaluation, empirical evidence, evaluation frameworks, perceptions, preferences, motivations

The Differences in Motivations of Online Game Players and Offline Game Players: A Combined Analysis of two Studies at Higher Education Level

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Abstract: Computer games have become a highly popular form of entertainment and have had a large impact on how University students spend their leisure time. Due to their highly motivating properties computer games have come to the attention of educationalists who wish to exploit these highly desirable properties for educational purposes. Several studies have been performed looking at motivations for playing computer games in a general context and in a Higher Education (HE) context. These studies did not focus on the differences in motivations between online and offline game players. Equally the studies did not look at the differences in motivations of people who prefer single-player games and people who prefer multi-player games. If games-based learning is to become a recognised teaching approach then such motivations for playing computer games must be better understood. This paper presents the combined analysis of two studies at HE level, performed over a two year period from 2007 to 2009. The paper focuses, in particular, on differences of motivations in relation to single-player/multi-player preference and online/offline game participation. The study produces a set of important motivations to be taken into consideration for each player preference type (single-player or multi-player) and each player participation type (online or offline) based on a large piece of empirical research.

Keywords: Motivations, empirical evidence, single-player, multiplayer, online, offline, participation

Teacher Roles and Positionings in Relation to Educational Games

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Abstract: So far, educational game research has tended to neglect the crucial role of the teacher in actually choosing, preparing for, teaching with, and evaluating the use of educational games. In this paper, we argue that in order to understand how teachers facilitate educational games, it is necessary both to consider how different game modalities enable different teacher roles and also how teachers position themselves in relation to games. We first present a theoretically and empirically based framework for understanding how teachers facilitate games by shifting through the roles as instructor, playmaker, guide, and explorer. Next, we analyse and discuss whether the model can be extended to describe a group of 19 secondary teachers' approaches to the educational computer game series *Global Conflicts* (GC). The empirical analysis is based upon positioning theory and multimodal theory and falls in two parts. In the first part, we analyse how the teachers enacted the GC games in different classroom settings. As our findings show, the available modalities of the game design made the teachers assume relatively passive roles during the actual game activities. Next, we analyse a series of pre-game interviews with teachers and analyse how the teachers positioned themselves in relation to the GC games – both in relation to their general pedagogical beliefs and in relation to more specific assumptions about how to teach with the GC games. This part of the analysis suggests that teachers' familiarity with computer games and ICTs was quite significant influential in relation to how detailed teachers could project and predict different pedagogical approaches to teaching with the GC games.

Keywords: game-based teaching, teacher roles, positioning theory, game modalities

How to Study Something That Does not (yet) Exist: Making Design Interventions With Learning Games

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Abstract: During recent years, there has been an increasing interest in the educational use of learning games – both among game designers, researchers and educators. At the same time, the processes of studying how educational computer games are being enacted in educational settings face several methodological challenges. As an example, it may be quite difficult to locate and/or follow how teachers teach with particular games on a regular

basis. Consequently, many studies of educational games tend to be based upon interventions, where researchers introduce particular game designs to be taught within an educational context. In this way, educational game researchers take an active part in framing the overall aims, meanings, and outcomes of game-based learning environments. In this paper, we wish to explore different approaches to educational design interventions, and what methodological consequences different design interventions may have. More specifically, we will analyse three studies of learning games carried out within the same research project. The first example involves a series of design interventions with the Global Conflicts games, which was introduced to and taught by a group of Danish secondary teachers. This study was inspired by design-based research, and tried to explore how the game design could be further developed in order to let students write articles based upon their game experience. The second and third examples concerns ethnographically inspired studies of how the game platform Mingoville was used by a group of respectively Finnish and Portuguese teachers and students. Our analysis suggest that there was a significant difference between the way that the teachers tried to fulfill the researchers' agendas and/or accomplish their own goals. The point here is that both design-based research and ethnographic approaches involve interventions, however with different consequences, practices, and meanings involved. The aim of the paper, then, is to discuss different methodological aspects to be considered when conducting educational design interventions.

Keywords: Learning games, game research methodologies, ethnography, design-based research

A Preliminary Analysis of 5 Separate Multi-National Comparative Studies on the use and the Availability of Mobile Devices in the Educational Sector

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Abstract: This paper reports on the first series of results from an (ongoing) investigation into the use and availability of mobile devices in general and mobile phones, particularly in the educational sector. Amongst the research questions driving the investigation are the evaluation of the overall availability of suitable mobile devices as well as the willingness of the student population to accept mobile device based education. The spread of mobile technologies throughout the student population is investigated in a comparative manner

with results focusing on the professional, educational and leisure use of mobile phones and other mobile devices. In addition the pervasiveness of mobile technologies is illustrated by comparing the use of a variety of mobile devices as well as the comparative acceptance of different functionalities of those devices. The presented study is undertaken with multiple research ideas in mind, including (but not limited to) the design of mobile device based augmented virtual game scenarios for experiential exercises and initiative games, the delivery of lectures and examinations in a virtual environment as well as the acceptance of mobile gaming devices in general. Future investigations will furthermore focus on the domain of mobile device based gaming, aiming to explore the preferences of the subjects for game types and scenarios as well as for interface and functionality. The first batch of results reported upon in this paper is but a preliminary analysis of 5 of the separate studies undertaken by the authors. Of those, 3 were conducted at 3 universities in the USA, Scotland and Germany and 2 more were conducted through social networks (using a major social network website as well as the professional and social network of the authors). Current and ongoing efforts are aiming to extend the spread of the targeted universities to include Belgium (K.U. Leuven), UAE (Khalifa University) and England (University of Liverpool). In addition, negotiations with universities in France, Italy and Brazil are taking shape. Interested researchers are invited to contact the lead author for collaboration and to further extend the spread.

Keywords: Survey, mobile devices based education, pervasive technologies, usage and functionality of mobile phones

A Virtual World in Which to Learn To Speak English: A Case Study Using ESL Students Learning to Speak English in an English School in Secondlife

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Abstract: Nowadays, it has become accepted that technology is a fact of life. In particular, the development of information technology has provided new opportunities for people to engage in education. Such learning is not limited to classrooms, or even real life. The invention of computers and the Internet has created the possibility of learning inside a virtual world. SecondLife (SL), as one of the products which has resulted from the combination of education and information technology, has caused researchers to examine the possibilities of studying in a virtual environment. This study aims to investigate how English as a second language (ESL) students learn to speak English in a language school in SL. It also seeks to explore the affordances of this kind of 3D virtual world and examine ways in which students practise

speaking English in a simulated environment. This study will be conducted using research questions examining how students practise speaking English in a language school called ESL in SL, with the aim of finding out what attracted these students to the school and how SL supports and inhibits ESL speakers' learning processes. This study will show that an English school can, and does, exist in a 3D virtual environment. The attraction of such a school appears to be that students wish to have an opportunity to practise speaking English in real life with native English speakers, which is difficult to do outside of SL. Although there are at least two issues with learning English in SL (technical problems and distractions), participants in this study still found that it could help them to improve their English.

Keywords: SL, virtual environment; learning English; CALL; experiential learning

Mining Educational Game Data: Uncovering Complex Mechanisms Behind Learning

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Abstract: Data Mining refers to methods to find patterns, dependencies or other meaningful information from large data sets. Common methods for data mining are based on regression analysis, Bayesian models, clustering algorithms and neural networks. Data Mining has been successfully applied in science, business and logistics for years. However, educational Data Mining is relatively young discipline focusing on understanding students' use of interactive learning environments. According to original ideas of Data Mining, there are no hypotheses set in advance: the data will reveal the answers. The study focuses on the process of conceptual change (N=818) while trying to reveal playing behavior that facilitates it and learning transfer. In the paper we briefly describe the conceptual change approach, data mining methods and our research framework for transfer. Finally, the results of the study are presented and discussed. The main result is a finding that difficulties in understanding different numbering systems are mediated by fraction numbers with odd numbered nominators. These results show the strengths of Educational Data Mining: we could point out difficulties and their backgrounds, which would not have been found without mining approach.

Keywords: Data mining, education, games, user modeling

Eye-Tracking in Educational Game Design

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Abstract: Educational game research tends to rely too often on behavioral activity rather than cognitive activity. How learning happens is methodologically very challenging to point out and thus it is usually avoided. In this paper we tackle the game based learning process with eye-tracking method. In particular, the study focuses on exploring the meaning of cognitive feedback in game based learning process. Based on perceptual data we evaluate the effectiveness of cognitive feedback and identify game elements that may hinder the learning process. The results indicated that players' perception patterns varies a lot and some players even miss relevant information during playing. It seems that what sooner the player notices the cognitive feedback and grasps its meaning that better (effectively) they can play the game. The signaling method should be used strongly enough to highlight all the necessary elements. On the other hand, extraneous elements should be eliminated from the game world in order to avoid incidental processing in crucial moments. The results also showed that eye-tracking can provide important information from game based learning process and game designs. However, we have to be careful when interpreting the eye movement data, because we cannot be sure if the player understands everything that he or she is paying attention to. Thus, eye-tracking should be complemented with offline methods. In this study retrospective interview was used as a complementary method and it turned out to be very useful and increased the validity of the results.

Keywords: Eye-tracking, game, game design, learning, reflection, cognitive feedback

Play-School: Linking Culture and Curriculum Through Games-Based Learning in Schools

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Abstract: Game-based learning is proliferating in formal school classrooms, yet to date there is relatively little evidence to demonstrate its effects on teachers' pedagogies. This paper provides analysis from two studies of computer games use in authentic classroom settings. In particular, it focuses on the ways in which practising classroom teachers discuss and describe games-based learning in relation to their *curricular intentions* and their less formal *cultural assumptions* about the relevance of gaming to young people

outside of school. Data is from two empirical studies of games-based teaching and learning in school classrooms in the UK. The first project, “Teaching with Games,” explored how teachers might develop practical pedagogies to facilitate games-based learning using commercially-developed games in authentic classroom contexts. The second project, “Computer Games, Schools and Young People,” took the form of a quantitative and qualitative study of existing games-based learning practices in schools in England, Scotland, and Northern Ireland. The study demonstrated that while teachers are concerned to meet some emerging professional and curricular goals, they also base their games-based pedagogies on a set of popular cultural assumptions. This presentation provides analysis of classroom observations and interviews with the participating classroom teachers and derives a series of discussions about their emerging curricular and cultural understandings of games-based learning, and how these understandings translate into pedagogic practice.

Keywords: Curriculum, pedagogy, classrooms, cultural assumptions

Dynamically Adjusting Digital Educational Games Towards Learning Objectives

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Abstract: Personalization techniques offer the possibility to tailor each learner’s experience of a Digital Educational Game (DEG) to their specific needs. Such personalizations can adapt the challenge and difficulty of the DEG to the learner’s cognitive ability, motivation and gaming abilities. In particular, complex story based DEGs have introduced micro adaptive approaches, in which the adaptivity is applied in specific learning situations that do not usually affect the overall story line of the game. For adaptivity to be applied across an entire story based DEG, macro level adaptivity, such as learning situation sequencing, needs to be addressed. Such adaptivity can provide the means to dynamically adjust a DEG towards learning objectives based on the learner’s evolving needs, whilst monitoring and adapting to the learners motivation. For this the applied adaptations need to consider a holistic view by encompassing different dimensions within DEGs, such as learning, game play and narrative. This can be achieved by allowing the underlying storyline of a game to dynamically grow based on micro adaptive decisions made in specific learning situations with the goal to ensure an exciting and meaningful gaming experience for the learner. Finally any approach to adaptivity in DEG needs to assist reusability and general

applicability in order to allow low cost and timely development. This paper introduces an approach to producing adaptive story based DEGs that incorporate best practice in reusable personalization techniques in e-Learning with adaptive storytelling for games. For this the concepts of micro and macro adaptivity are introduced as a means of addressing the challenges associated with applying personalization in story based DEGs. Furthermore the usage, implementation and evaluation of such dynamic personalizations is detailed. Finally the challenges of dynamic adjustment of DEGs towards learning objectives is illustrated based on two full-featured demonstrators that have been produced as part of the European Commission funded research project 80Days.

Keywords: Digital educational games (DEG), non-invasive adaptivity, adaptive storytelling, micro and macro adaptivity

Experiences of Learning Through Exergame Design

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Abstract: The development of motion-based controllers has facilitated the new coming of exergame genre that involves physical activity as a means of interacting with the game. The playing of exergames seem to motivate students a lot and they would like to play exergames in their free time as well as in schools. In this paper, the results of an exergame design study is reported, in which junior high school students designed their own multiplayer exergames by utilizing our exergame platform. In the learning through game design approach students produce the knowledge and design decisions associated with the end product, a game design document. The game design approach was implemented as a competition into which the students could voluntary participate during their free time. The exergame design competition motivated only a small group of students ($n = 35$) and finally only fourteen game design documents were returned. The results showed that most of the students' game concepts were too ambitious to be implemented, because they could not perceive the constraints that our exergame platform sets. Furthermore, the students had problems to express their game concepts clearly and they would have needed more support during the design phase. The results clearly indicate that without adequate support and resources the quality of students' designs varies a lot and they do not benefit from the activity as much as they could.

Keywords: Exergame, game design, flow, learning, mobile phone

Integrating an Educational Game in a Museum Exhibition – Challenges and Limitations

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Abstract: In contrast to developing educational games e.g. for schools, the development of games for museums has to meet even more limitations and specific requirements. These limitations concern the character of the game, its content, its location in the exhibition, its design and interface. In our paper, we present and discuss our experiences and drawbacks in developing an educational computer-based game for the German Maritime Museum in Bremerhaven, a game dealing with the Hanseatic League and the old Hanseatic cog. This game was developed by Digital Media master students of the University of Applied Sciences Bremerhaven in close cooperation with the responsible museum expert. Demanding a certain amount of the visitors' time and attention, a game risks competing with the exhibition rather than being part of it. Due to this context, the game design has to consider specific requirements and restrictions, concerning not only the game content that has to be (of course) true and serious but also the limited time available for playing, the flow and number of people as well as restrictions on size, sound and its location in the exhibition. Furthermore, a terminal game - in contrast to an exhibition guide - needs to be flexible enough to provide additional value for visitors at different phases of their museum visit: It needs both to engage visitors in applying knowledge acquired in the exhibition as well as to stimulate them exploring the environment more carefully after playing. Trying to master these challenges the game in this project was created in several development cycles, where game prototypes were reviewed by museum experts, tested by school children and optimized according to the evaluation results.

Keywords: Museum game, educational game, game-based learning

Using Audio in Location-Based Educational Games

**Erik Kristiansen
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Abstract: In connection with the new geological museum at Møns Klint in Denmark, an education centre was established. This teaches school classes about the special nature in the area, particularly the famous chalk cliffs on the eastern coast of the island, where the museum is located. Together with the "Danish Forest and Nature Agency," and the education centre of the museum, we designed a game to teach children aged 13 and up, the special nature found on the cliff. As the education centre already offers guided tours,

the problem was to design a game that would take the children and adults out on their own or in small groups, using familiar technology like the mobile phone, but in a new way. It was also considered important that the technology should “stay in the background”—that is, require a minimum of hands-on interaction and if possible, not use a screen at all. This would free the players to concentrate on the nature of the site and on the game. To meet these requirements a location-based game called “Klintespillet” was designed. As almost all location-based games use the players' mobile device to show a map on the screen, the challenge was to design an audio-only or audio-mostly location-based game. Audio is used widespread in games, but few games rely on audio as a primary means of communication. Using audio in location-based games is even more interesting, as game audio can be enjoyed without disturbing the visual experience of the place. Game audio may provide the player with an audio experience, that mix various kinds of audio with the soundscape of the location in a number of ways. On the other hand designing a game without using visuals and with a minimum of keyboard interaction is a challenge. This was explored in the location-based game called “Klintespillet,” based on a site-specific narrative built on the folklore and special features of the site. This resulted in a prototype that was evaluated using qualitative methods. Evaluation showed that an audio-only location-based game may not be desirable, but that an audio-mostly location-based game may create an immersive game space, which is an interesting platform for location-based learning.

Keywords: Location-based computer game, audio game

Component-Based Development of Educational Games: The Case of the User Interface

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Abstract: The paper assumes a software engineering view on game-based learning. It outlines our approach of a component-based educational game framework, presents its implementation, and discusses its usage and utility via three experiments. By proposing a component-based framework, i.e. a reusable software architecture skeleton with a growing library of components that can be plugged together and exchanged, we seek to increase reuse in the development of digital educational games. The paper presents our Plug 'n Train framework and its implementation in Java and XML. Inspired by Clancey's (1984) architecture of Intelligent Tutoring Systems (ITSs), Plug 'n Train expects an eLearning system to consist, at least rudimentarily, of four semantic components: User Interface, User, Expert, and Process Steering. A new eLearning system is constructed by plugging these together. We show

how this works in our implementation by reporting on a proof-of-concept implementation of the four-component architecture – a simple, yet functional ITS on organic chemistry. The prospect of composing a new eLearning system by exchanging only a subset of components and reusing the rest is particularly interesting for game-based learning. Our hypothesis is that a traditional eLearning application can be transformed into an educational game by exchanging very few modules. In particular, we assumed that we could turn our proof-of-concept ITS into a game by replacing only the user interface. Experiment 1 re-created the Java-based user interface in the game-like virtual world *OpenSim* and plugged it into the existing architecture. Experiment 2 tried the same with a *Tetris*-inspired user interface designed in *Flash*. Both experiments prove the utility of exchangeable modules. Problematic issues are discussed and improvements suggested. For more complex game genres, new architectures have to be composed. Replacing the user interface of a puzzle game is not enough. We are currently applying Plug 'n Train to computer role-playing games (RPGs). Experiment 3 realised an *OpenSim*-based user interface for a sample educational RPG quest. It contains only little non-user-interface code, concentrated in one in-game object, which can be outsourced to the three further framework components.

Keywords: Game-based learning, software architecture, component-based development, framework, intelligent tutoring system, virtual world

Designing Intervention in Educational Game Research: Developing Methodological Approaches for Design-Based Participatory Research

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Abstract: The international focus on the learning potential of games in recent years has led to a boost in both academic research interest and the development of game formats. Numerous educational computer games are available for today's teachers, but the implementation of games in everyday teaching is often problematic. In this paper, we argue that the focus on designing and implementing game-based learning environments in educational settings implies a need to rethink methodological questions on how to apply and study educational designs. We review the methodological approaches of design-based research and action research and discuss some of the implications of applying these methods to game research. Both methods involve combining empirical educational research with the theory-driven design of learning environments. However, whereas action research aims at changing attitudes or behavior by involving participants in the different phases of designing environments for change, design-based research has a

strong focus on theory-based design and implementation of technologies and artifacts as part of the learning environment. In this paper, we present data from a study involving the design and implementation of game technology in educational settings: the game *Global Conflict: Latin America*, which is a role-playing game, set in a 3D environment. In the game, students play a freelance journalist who has to investigate particular issues or conflicts in the Latin American region. The game is designed to teach different subjects that involve social studies, such as geography, Danish, and history in secondary and upper secondary schools. In the first case, we conducted a study of how it is possible to integrate the game *Global Conflict: Latin America* in a local school practice. The involvement of game developers, researchers, students, and teachers in the different phases of the game-based educational scenario is discussed. The teacher involvement in the various design phases and student approaches and practices observed within the classes playing the games are compared as well as possibilities for the future integration of design. The case is discussed in relation to the methodological approaches of action research and design-based research. With the aim of developing approaches to modulate and integrate new game designs into school education, we suggest a design-based research approach inspired by action research with a focus on inviting teachers and players into the various phases of development of designs, intervention, redesigns, and analysis of design interventions.

Keywords: Design-based research, action research, game-based education

Tools and Methods for Efficiently Designing Serious Games

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Abstract: Serious games are pedagogical multimedia products made to help learners develop specific competencies. Their use has proven to be promising in many domains, but is at present restricted by the time consuming and costly nature of the developing process. When developing Serious Games (SGs) for academic purposes, not only is there a budgetary challenge, but there is also the challenge of integrating enough educational value without sacrificing the fun characteristics. In this article, we detail the designing process of a SG and enumerate the various actors who have to collaborate: project manager, cognitive specialist, domain experts, storyboard writer, artistic director, pedagogical expert, programmers. To help them work together and communicate in an efficient way, we first propose a step by step engineering method that helps the actors collaborate in an efficient and structured way. Each member of the designing team is assigned a set of

tasks. Then, we propose authoring tools that can be used to carry out these tasks. They offer the possibility of simultaneously viewing various dimensions of the SG scenario: target knowledge, storyline, learning scenario, fun characteristics. When the authors connect to the platform, each of them is provided with a customized selection of dimensions presented with more or less detail. When interacting with one dimension, the other dimensions react and modify themselves automatically in a synchronized manner. In particular, we present a number of elearning tools, that have been adapted for SG design and that allow us to specify the target competencies that have to be learned and build the pedagogical learning scenario. The SG authors will also have access to sample SGs and resources to provide them with inspiration for using fun characteristics to captivate the learners and carry them through the learning process. In response to the need felt by many SG authors to store and share their experience, we present a number of tools to help the authors store, find and integrate reusable software components into their SGs.

Keywords: Serious games, education, engineering method, elearning, authoring tools

Serious Game Pedagogy as a Perspective on Children's Learning

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Abstract: This paper assesses early childhood learning through the use of board games. At Laurea, Finnish University of Applied Science's, students has developed board games which support children's development and learning. In this paper I introduce as a way of supporting learning a game called Konkkaronkka. It has been developed as a support tool for social and emotional learning. This board game has been implemented through joint co-operation involving Social Services students and Business Management students at Laurea University of Applied Sciences. The graphic designing of the game was completed in co-operation with students from Metropolia University of Applied Sciences and Aalto University. There has been a group of students in Social Services every year who are interested in developing games for children. The important starting point of these product innovations has been children's learning. The need for games arose from the wishes of teachers who work at day care groups that collaborate with our institution. The teachers at the day care group wished for material that would support their work in mapping out and in supporting children's learning and developing. The key elements of children's learning are playing, adult built learning environments and the activities which these environments can offer.

An important theoretical element to this presentation is Vygotsky's zone of proximal development. According to Vygotsky an essential part of learning is that it happens in the zone of proximal development. Learning is an internal awakening of consciousness an evolutionary process, which is only possible when children interact in their own environment and whilst working with their own peers. Once these processes are internalized, they become part of their development. An important element of this presentation is also learning in peer groups. A community can teach the acceptance of differences and give confidence to others. In children's groups it's typical that there are plenty of differences between members of the group, for example knowledge, skills and understanding. The aim of this presentation is to visualize what possibilities board games can offer in connection with children's learning. Additionally to give examples of the kind of research we have done in relation to finding out how games can be used to support children's learning.

Keywords Children's games, play, early childhood education, learning

Using Games Based Technology in Formal Assessment of Learning

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Abstract: While scoring is a routine part of most computer games, and games based learning continues to grow, the formal assessment of learning within a gaming context has been somewhat neglected. The opportunities afforded within games to control the environment have advantages for both learning and the assessment of learning in that context. Allowing a serious game to produce output which can then be used for the assessment of prior learning may overcome practical and validity issues where simulated. In 2008, the Scottish Qualifications Authority with the support of the European Social Fund, started developing Games Based assessments for the hurdle tests which form part of their pre-existing vocational qualifications. By embedding the assessment into a simulated work environment it was aimed to provide a more authentic and valid assessment than traditional pencil and paper. To ensure parity with existing assessments and the maintenance of standards, a report was produced at the end of the game with the responses given in the game used to complete the answers to questions. This report was identical to the outcome of a completed pencil and paper test. Initial trials based on a retailing environment suggested that this approach would be popular with vocational candidates and the teachers who assessed them. There were however a number of practical and organisational difficulties encountered which need to be overcome before we could mainstream this innovative assessment methodology. This paper examines whether Games

Based Assessment can provide a practical, cost effective and acceptable method of assessing candidates in vocational subjects, whether it can provide a more authentic assessment experience and as the impact that the change in mode has on the validity and reliability of the qualification. It also goes on to look at the natural progression of games based learning into games based assessment once the medium becomes more mainstream.

Keywords: Assessment, SQA, vocational education, outcome based learning, games based assessment, formal assessment, hurdle test, vocational assessment

Bat Cave: A Testing and Evaluation Platform for Digital Educational Games

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Abstract: Adaptive Digital Educational Games (DEGs) are based on complex processes and algorithms, which can be tested and evaluated in various fashions. Concerning evaluation, either the overall effects of the games (e.g. on learning efficacy) or the functionality of algorithms can be evaluated. For testing, it is desirable for game authors to try out the game they are working on early during development, in order to test the effects of changes to the games' structure or parameters of the adaptive algorithms. The European research project 80Days has developed a DEG for teaching geography that is based on several adaptive technologies. Among them are a Story Engine and a Learning Engine, with the former controlling the execution of the game, balancing aspects of narrative, gaming and learning (using data by the latter). Of the testing and evaluation possibilities described above, evaluations of the effects of the game have been carried out with an immersive game demonstrator at schools. However, for the other purposes outlined, a separate platform named "Bat Cave" is described in this paper. The approach of Bat Cave is to implement a game platform in a prototypical fashion, by creating simplified representations of situations found in the game. Details of the workings of the algorithms are visualized in several ways. Using Bat Cave, evaluation and testing of the methods and parameters is possible. In this context, Bat Cave is used as a testbed for this novel approach of creating adaptive DEGs. On the other hand, Bat Cave, due to its simplified structure, can be used by game creators to rapidly create early versions of the game, which can be tested extensively without having to play the actual game. Therefore, both the design of the game's structure and content (narrative, learning content) as well as the impact of parameters for the adaptive algorithms on the game can be tested early, allowing a game creation process based on early prototypes.

Keywords: Testbed, evaluation, rapid prototyping, adaptivity

Global and Large-Scale Pre-School Digital Games Based Learning Evaluation

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Abstract: Many game editors are proposing web applications with more than 200-300 Digital Games Based Learning (DGBL) for pre-school children. There added values are to propose advises in the choice of games by the way of a recommending system, a personalizing system, or just to propose a large variety of activities. They are going bigger and evolve when designer bought set of games to publisher. The strategic choice of publishers or the type of games is sometimes difficult because designer didn't have a global view of their corpus of games or on the uses the learners do. Our work consists in proposing to them a protocol to gather data and a dashboard tool to analyze them in order have this global view and make good decisions. A focus is made on indicators construction and metrics used. The observation methods used to collect data are heuristic analyses, structured observations of child-DGBL interactions, log tracks, survey and diaries (for parent, teacher and child opinions) and video. The DGBL analyzing tool is composed of three parts: a data capture interface, a study endpoint configuration interface (used to specify the wished level of quality) and a dashboard for analysis and decision-making. These protocol and tool are so usable to made formative or summative global and large-scale evaluation. "Global" means that evaluations take into account various criteria like usability, game play and immersion, pedagogical performance and context of use. "Large-scale" mean that they can be use on many users and on many games.

Keywords: Evaluation, game based learning, pre-school children, dashboard, indicators

Back two Spaces, and Roll Again: The use of Games-Based Activities to Quickly set Authentic Contexts

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Abstract: One of the inherent problems in the use of game-based activities in training and development contexts is the disconnection between the game itself, and the real world context the participants have come to learn about: the games tend to be a means to an end within the confines of the training.

Backgrounded by a long history of games and simulations in areas of education and training, recent work on the way that games can engage learners through the creation of authentic contexts led the author to explore the use of small, low cost games which could quickly create authentic contexts within training and development environments. Three case studies (a simple puzzle, a live activity, and a board game) are provided as exemplars of this approach, presenting a range of possible designs; and their value in overcoming a suggested *contextual gap* amongst participants is discussed. Ways to consider and quantify this *contextual gap* are provided, along with advice for those wishing to create their own games-based approaches.

Keywords: Higher-education, course-design, games-based, context, integration

TuxMath: Is it Possible for a Game to Enhance Multiplication Skills?

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Abstract This paper focuses on a digital games-based learning pilot in a primary school classroom, as part of a project assignment of the “ICT in Education” MSc program jointly run by the University of Athens, the University of Thessaly and the Technological Educational Institute of Piraeus, Greece. The aim of this pilot research was to investigate how a digital game (TuxMath) can be incorporated into the primary school instructional process in order to enhance multiplication skills. Research questions included issues such as whether continuous gameplay can help memorizing multiplication tables; which is the most effective way of integrating the game in the daily timetable; whether collaborative gaming can be more effective than individual gameplay; as well as under which conditions the game can be used by students with learning disabilities and influence their learning performance. The theory of Dutch Mathematician Hans Ter Heege underpins this research, suggesting that learning multiplication can be broken into three levels: multiplication by counting, structural multiplication through scaffolding strategies and formal multiplication in which basic operations are gradually automated and memorized. The pilot whose results are reported falls within the third level of this approach. 41 students participated in the pilot, split into teams of three by applying norms of collaborative learning. Children suffering from learning disabilities have been observed in isolation, whereas all students have participated for three weeks playing the game for two or three times per week. TuxMath, the drill-and-practice game used for this pilot, has been ported to Greek by N. Nikoloudakis, whose contribution is

acknowledged, as part of his MSc Thesis. Through instructor-controlled game parameters, gameplay has been restricted to multiplication of the numbers from one to ten. In order to ensure correctness and completeness of the research results, participating students have been presented with a pre-game and a post-game exam. As pilot findings have shown, the game cannot be used throughout learning multiplication as it does not support acquisition of the foundational concepts and strategies (levels one and two of the ter Heege learning model). On the contrary, it can be used as a tool to complement teaching since it provides feedback, and it does help students in memorizing multiplication operations and results. Most importantly, the game has proven to entertain students and help them come together under a common cause. Children that have gained a prior understanding of multiplication can greatly benefit from the game as opposed to children that appear to have learning disabilities. The latter can still benefit using the game as a complement to additional educational activities, including individualized instruction as well as support at home. The interest of this communication lies in reporting practical findings and lessons learnt from an actual in-class pilot. The particular case of learning primary school multiplication skills lacks the apparent complexity of more demanding learning subjects but exactly because of that serves, combined with an established learning model, to reveal subtle limitations of the one-game-fits-all approach, thus laying the grounds for a more informed selection of different games for different stages of the learning process.

Keywords Digital games-based learning, drill-and-practice games, TuxMath, multiplication skills, primary school

Designing and Investigating Game Tasks for Supporting Collaborative Learning

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Abstract: This study is part of the larger Game Bridge project, which investigates the potential and challenges of designing and implementing 3D-learning games for Computer Supported Collaborative Learning (CSCL) (Koschmann 1996; Hämäläinen, Oksanen & Häkkinen 2008). In this study, we concentrated on designing a collaborative 3D-learning game for vocational education and developing methodological tools for understanding the effects of elements of the game to the players' psychophysiological reactions and collaborative learning. In the design of the game, we attempt to combine pedagogical scripts, general strategies of the game design and the opportunities of the game as an interactive form of media, with each other.

The designed game “Gamebridge” is a multiplayer game which aims at task solving in the area of human sustainability. Four core tasks require effort and commitment from several players for successful completion, and they have been designed to promote collaborative activities. The game lasts approximately two to three hours depending on the group. For the empirical part of the study, we used multiple data collection methods. In our previous studies, we had focused mainly on analyzing the type of discussions that the groups have engaged in during play. However, this type of analysis only is not enough to give a full picture of the collaboration process because the players were also able to communicate in other ways, such as non-verbally. Since the analysis of the discussion is vague and a poor representation of nonverbal collaboration, we have found that new methods are needed to capture all of the collaboration processes. In addition to our previous methods, we collected the players’ cardiac activity (e.g. heart rate and heart rate variability) during the game. Cardiac activity is measured with an electrocardiograph (ECG) by electrodes placed on the skin. It has been established that tasks requiring cognitive effort elicits emotional arousal accompanied by heart rate (HR) acceleration. From a preliminary analysis of the research data, it seems that playing the game causes changes in the players’ cardiac activity. In this presentation, we will focus on the usability of measuring players’ cardiac activity in the research of collaborative learning in games.

Keywords: Computer-supported collaborative learning, game design, game task, multiplayer puzzles, psychophysiological methods

Joining Playability and CSCL to Improve the Learning Experience

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Abstract: Implicit learning is accepted as one of the most effective learning strategies for children (and also adults). If we apply this strategy to “electronic learning”, in our case, educational video games, we find that the video game we propose to children must be a “real” video game in order to engage them into this “special” learning process. But, how can we know if an educational videogame is a real game? We can measure the quality of a video game by means of measuring its playability. We define *playability* as the set of properties to describe the player’s experience with a particular game system, where the main goal is fun/entertainment to the player in a satisfactory and credible way, playing alone or with other players. In this paper we have specially focused on group learning by means of video games. And, in particular, we are interested on collaborative learning. CSCL (Computer-

Supported Collaborative Learning) is a well known discipline that allow student to learn in groups by means of a process of sharing ideas, discussions and knowledge building jointly. For these reason, it is sufficiently proven that CSCL improve several skill of students, such as respect or tolerance, for example. Starting from these key aspects, we have proposed a new acronym to identify collaborative process by means of educational video game, which have named VGSCSL (Video Game-Supported Collaborative Learning). Because better collaboration produced better knowledge acquisition, we have also designed a set of measurements based on SNA (Social Network Analysis) to assess collaboration taking place during the collaborative learning via video games. In this paper we analyze how playability and VGSCSL are related. Thus, we show how to improve playability contributes to improve the collaborative process and how a good collaborative process provides better playability. As result, if both playability and collaborative process are well defined and produce good measurements, it provokes better learning processes.

Keywords: Playability, computer – supported collaborative learning (CSCL), video game – supported collaborative learning (VGSCSL), game based learning (GBL)

Personalised Learning for Casual Games: The 'Language Trap' Online Language Learning Game

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Abstract: The features of video games that contribute to effective learning are drawing increasing attention in the world of technology enhanced learning. To date, game based learning has focussed on the learning benefits provided by the inherent motivation, rich visualizations, and low risk of failure, provided by contemporary educational games. Although these advantages create highly engaging and immersive learning environments, there remain additional techniques that can further aid the learning process. The integration of personalisation into educational games presents unique challenges, the most important being the preservation of the gaming experience. In consideration that a well designed educational game can seamlessly blend learning and gaming content, any adaptation of the learning content will ultimately affect the gaming experience. In effect all educational adaptations must be achieved in a manner that is non-invasive to the game play. In this paper we introduce the 'Language Trap' German language learning game that provides learners with an online casual gaming environment that also benefits from a personalised learning experience. We demonstrate how a game playable online in a browser, using simple controls,

and with low production costs, can effectively deliver this personalised learning experience. Through using the ALIGN (Adaptive Learning In Games through Non-invasion) system the game delivers adaptive dialogue difficulty, performance feedback, motivational support, and meta-cognitive hints, all within a highly interactive adventure role-playing game. The results of an authentic evaluation of the Language Trap game are presented, additionally we demonstrate how the ALIGN system can effectively adapt the learning experience within the game in manner that is non-invasive to the game play. A discussion on the benefits of adaptive educational games is presented, with particular reference to the benefits provided by the ALIGN system.

Keywords: Adaptive learning, personalisation, casual game, user modelling

Understanding the Game: An Examination of Ludoliteracy

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Abstract: In the widening field of Game Based learning, games are included and addressed in many different ways. In this paper, the authors explore the possibility of using games to strengthen students' *digital literacy* and more specifically their reflective understanding of video games, which we label *ludoliteracy* by adopting the term from José P. Zagal. For some years, *digital literacy* has been considered a pivotal competence due to the increasing digitization of information. It is simply not possible to become an actively participating citizen in society today without the skills and competencies required to navigate the digital information. Digital media are becoming ever more ubiquitous and intertwined, and games are a central component of this process. It is thus imperative that games are included in educational settings, and that we develop a framework for this inclusion. This leads to our primary research question: How can we define "ludoliteracy" and how can games be included in education in order to develop this literacy with students? As we are working within a new field at an early stage, neither theory nor practice is thoroughly consolidated. Our approach is therefore one of *convergence*, where we are fusing together available theory with our own empirical studies in order to build a more comprehensive framework for ensuring a sufficient understanding of video games. We draw on the last century of research from the field of *game studies*, and the knowledge gained in relation to the broader *digital literacy*. *Game studies* have provided us with important insights, and should be considered part of the foundation for any approach to game based learning, not least one that is concerned with *ludoliteracy*. Building upon these pillars of theory, we have carried out several empirical projects with

students at different levels in order to shed light on possible approaches towards *ludoliteracy*.

Keywords: Ludoliteracy, digital literacy, game studies

Playing With Fire: Kindling Learning Through Mobile Gaming

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Abstract: Mobile learning is increasingly commonplace at all levels of education as well as in the workplace. Its ubiquity, immediacy, flexibility and especially its strong motivational power are such that large-scale adoption is likely imminent, especially as smart phone technology becomes affordable. Another emerging trend is mobile gaming, a looming multimillion dollar industry following in the footsteps of the billion-dollar gaming industry. Furthermore, gaming industry giants such as UBISOFT predict that 'serious gaming' will be the fastest-growing segment of the industry over the next decade. In this article, we present a project which is innovative and unique in combining M-learning, M-gaming and Serious Gaming within the purvey of science and technology High School curricula implementing 3D, Augmented Reality (AR) technology.

Keywords: Mobile gaming, augmented reality, geomatics

Game-Based Fostering of Entrepreneurial Attitudes?

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Abstract: The paper discusses the adequacy of educational games for teaching entrepreneurial attitudes. Entrepreneurial attitudes in this respect are not restricted to business contexts only but also to the general aspect of initiating and implementing a 'project'. The paper will be based on a differentiation of entrepreneurial attitudes. Then it is shown that there is sufficient correspondence between the method, i.e. gaming, and the learning target, entrepreneurial attitudes. From theoretical perspective this assumed to be a possible condition to make it an effective teaching method. The correspondence is based on different interlinked issues. The paper discusses four such issues: a) competition as common motivational frame of game players and (at least business related) entrepreneurs; b) opportunity recognition as a specific form of experiencing one's entrepreneurial and game environment; as well as intrinsic motivation based on c) autonomy and d) competence as a specific motivational experiences both within gaming and

acting entrepreneurial. Overall the analysis will be reflected with the respective development of two corresponding games (as part of a project funded by the EC). The decision to develop two games is explained by the assumption that by this the learning targets, i.e. the complex set of entrepreneurial attitudes, can be matched better. A short overview on the rule sets will be given.

Keywords: Learning and instructional theory for game-based learning; entrepreneurship education; intrinsic motivation; opportunity recognition

Digital Games-Based Instructional Design for Students With Special Education Needs: Practical Findings and Lessons Learnt

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Abstract: Digital Game-based learning (DGBL), if used effectively and in a coherent way, can support both (a) more choices on experiential learning as well as (b) personalization of the learning experience according to learners' needs and abilities, which is essential in a special education setting. The educators' perceptions on the potential and the actual design of the instructional process function as self-fulfilling prophecies and are of cardinal importance to overall success. The EPINOISI project has been a year-long (end 2007 – end 2008) R&D effort investigating the place of especially designed serious games and online educational computer games in the educational experience of users with Mild Intellectual Disability (MID). Through teacher training on games-based learning for special education, the project has aimed at building practical evidence of the potential of DGBL interventions in special classes, as well as an informed strategy for games-based instructional design and DGBL application requirements. This communication focuses on the outcomes of the EPINOISI project with respect to design and implementation of DGBL interventions for MID students by special educators, discussing the potential and limitations of using games-based content to enhance the students' inclusion and motivation in the educational process. Approximately 200 special educators in some 160 special schools have realized DGBL interventions in the context of the EPINOISI project, involving more than 500 students with MID and other special needs, resulting in an overall mid- to large-scale pilot for digital games-based instructional design. During such interventions each educator documented in detail the designed and actual instructional experience as well as his/her views on future GBL interventions in special education classrooms, providing feedback to the EPINOISI R&D team regarding the implications and benefits of such an effort. As will be presented, educators have documented

in detail their initial plans and final observations on using digital games as a motivational tool for students with MID, providing important insight into this process, revealing successful practices as well as common mistakes and misconceptions. According to the reports gathered digital games are less threatening for students with MID than other learning tools and have the potential to effectively engage them promoting external and internal motivation. Other findings include the observed capability of digital games to provide feedback to learners and educators alike in order to help the former identify their current levels of achievement while the latter can intervene, scaffold and adjust learning opportunities as necessary in relation to objectives and outcomes. The practical value of this communication, therefore, lies in the grounding of the practical findings reported and lessons learnt on actual in-class experience, as well as on the highlighting of practices to take-up (or on the opposite to avoid) in an effort to move from digital games-based learning to digital games-based teaching.

Keywords Digital games-based learning (DGBL), special education, mild intellectual disability (MID), EPINOISI project, digital games-based teaching

Mobile Learning Games for Primary Education

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Abstract: What words (excluding hello)? often start every lesson at school. A teacher asks children to switch off their mobile phones. It is almost the same as to taking away a child's favorite toy. This means for children that something boring and incomprehensible would start now. This paper describes the state of the art in the field of mLearning, a new direction in the field of effective teaching, that could be used in primary education. Several approaches, methods and techniques used in modern mobile educational games are analysed with a view to making mobile educational games more entertaining and to incorporate 'subtle' learning in them. Existing research in the area of learning game development for mobile platforms and popular educational games are analyzed to determine, the main factors leading to the popularity and wide expansion of several major games.. The peculiarities of mobile devices and modern technologies are described, followed by a proposal for a set of techniques that take them into account in order to produce addictive and efficient learning games. The idea to using existing concepts in popular entertainment games and to build a game world around several well-known and admired characters is discussed. The concept of a game series "The Termite Planet" which includes games for teaching mathematics, language and geography in a primary school is presented.

Each game in the series has an entertaining part based on the existing popular non-educational games developed by authors. All the games in the series are built around a universal game engine for mobile platforms called “The Termite Engine”. The Architecture of the engine, the main technologies and development decisions are reported. The paper concludes with a discussion of the traits and benefits of using the proposed games for teaching in primary school, the perspectives of educational games development and the steps still to be taken to achieve the main aim of finding ways of developing learning games for mobile platforms that would be at least as attractive as pure entertainment games and would increase children’s motivation to study subjects at school.

Keywords: Mobile learning, games, primary education

Question-and-Answer Based Explorative eLearning Exercises

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Abstract: For many years interactive elements like case studies or business games have been an inherent part of university teaching. They are of highly practical relevance and convey the problem-solving competence of students, as well as a structured way of working. But in many cases, the problem definition is clear and all relevant information is given to the participants. This situation is not representative for day-to-day business: Many problems are not well-structured. Data are missing, the problem definition is incomplete etc. Then employees have to specify the problem accurately, search for relevant information, ask how the task is intended. Before these aspects are clarified, they are unable to use their knowledge to solve the problem with their learned methods. This “real life situation” has hardly ever been practiced at universities. In this paper we present a game-based learning solution that simulates the real life situation of incomplete problem definitions. The end result is clearly defined, but the restrictions or determinants are not given. There is an input field in the exercise definition where the end result can be filled in. But before doing this, students have to compute or search for the correct solution. Therefore, they have to structure the problem. They have to find the determinants they need to compute the result. Then, they can ask the system about the required values and get information and leading hints in response.

Keywords: eLearning exercises, explorative learning, question-and-answer game, online assessment

Leading Students to Solve Maths Problems Using Question-led Learning

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Abstract: Solving problems is the most essential part of mathematics and it is well known that it has been difficult for students all over the world. In this paper we describe a method for solving maths problems based on the Polya's four phase method. This approach leads the student step by step through the process of solving maths problems. In order to lead students to solve math problems, we focus on a technique called *question-led learning* that can be a form of learning. This style of learning helps students when attempting to respond, as best they can to questions they do not know the answers to. Question-led learning forces them to think about the information and choose the correct answer through reasoning, rather than just being told the correct answer. Thus learners are actively participating and using decision making skills. This approach has been so popular around the world and easily grabs people's time and attention making it an obvious vehicle for digital game based learning. Solving problems requires lots of repetitive practice and computers are very good at presenting a series of problems and keeping track, statistically, of how people answer them. We describe a database that stores information about *problems* and *steps* that solve them, *recommendations* for each problem, time limit to solve the problems, points per problem, and difficulty level. Additionally the database stores information about learners such as: *name, age, gender, score, number of solved problems, number of faults, time taken to solve a problem*. We also integrate the question-led learning method and the database in a game-based learning software, since both the method and database integrate interesting game features games. We expect the software to be distributed and share among students, teachers, schools and libraries as soon as the database stores enough problems. Teachers can use it in classrooms where learners will be able to collaborate in communities of practice –sharing ideas, cheats, hints and tips and encouraging progress to higher skill levels. This in turn can also be very useful for educational assessment and research.

Keywords: Maths problems, database, question-led learning, game-based learning

The Impact of Cautious Playing Behavior on Learning

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Abstract: In this paper, player characteristics in so-called “open games for learning” for adults are discussed. Open games are authentic and complex learning environments that provide multiple solution paths. In such environments, players solve problems according to their individual backgrounds, preferences, and strategies. Open games encourage experimentation and exploration. In order to experience certain events, players have to take risks and push the boundaries of the game environment. However, many players are used to act cautious and are anxious to take risks because traditional learning environments teach them to be careful and to not make rash decisions and mistakes. The focus in this paper therefore lies on cautiousness and how it affects the learning outcome in open games for learning. Open games that are specifically designed to be used as games for learning, offer many challenges. Cautious players approach a game differently than risk-taking players, which may lead to uneven learning outcomes that are not intended by the educational designer. Therefore, an understanding about how cautious players behave is required. This paper introduces an online game called “Hortus”, which was specifically designed to investigate player characteristics. Hortus is a strategy and simulation game about horticulture that teaches some fundamental principles of biology. The player’s actions are recorded in real-time and later analyzed off-line with respect to specific events and situations. A mixed method approach is applied. First, user actions are collected implicitly through the online game. The fact whether or not a player showed a cautious behavior is then derived based on well-defined metrics through statistical analysis of the recorded data. Second, qualitative methods such as think-aloud protocols are applied to reveal explicit user information. The experiments showed that “cautiousness” was not a stable player characteristic over the course of the game but it rather may be connected to certain game events. Furthermore, the data supported the concern that cautious players reach different learning content than risk-taking players. Several players did not achieve the designers’ intended learning goals.

Keywords: Player characteristics, open games, learning, cautiousness, risk-taking

Feedback in Educational Computer Games

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Abstract: Providing students with accurate, intelligent, and motivating feedback is a critical aspect of all learning environments. It is also assumed to be a vital component of the learning process in computer games. In fact, playing a game has been described as a cycle of judgments, actions, and feedback. Several aspects of feedback that may influence the learning process of games have been suggested including: timing of the feedback, content of the feedback, control, and delivery of the feedback. Research on the functions and effects of feedback in games is, however, sparse and still fewer studies try to connect general research on feedback and assessment to feedback in games. This article explores the use of feedback in an educational game “Men and Animals” that was developed as part of a research project. The game builds on ethical dilemmas with no right answers. Two feedback systems were built into the game: *Consequence-based feedback* occurs when the system reacts to the user’s responses or actions by changing the system path. The system thus adapts to the choices of the players. Consequences occur as a reaction on players’ choices and are registered as number of people getting ill or cured, as levels of the “happiness scale” and as comments from virtual inhabitants to the appropriateness of the choice made. To get help in making a good decision, players can get help from a system of *Information feedback* which is easily retrieved as part of the game play. In addition, *peer feedback* was built into the game-play by having students play in pairs. After having played, students discussed the dilemmas in the classroom where more information was retrieved. The game builds on authentic ethical dilemmas with no obvious right answers. In all 120 students aged 16-17 played the game. A majority of the students were shown to benefit from the game which gave rise to a range of arguments for and against the use of animals. Playing the game led these students to discuss and thus initiated peer feedback regulating the learning process. Information feedback was, however, seldom used by the players. A minor group of students – experienced male game players - did not at all use the opportunity of discussion or of retrieving information. They played the game to get the most points and to win. The result indicates the need either to embed the feedback, reflection and guidance as an integral part of the play or/and to integrate teachers in the game play.

Keywords: Feedback, educational, computer-games

EDoS: An Authoring Environment for Serious Games Design Based on Three Models

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Abstract: Serious games (SGs), the confluence of eLearning and videogames, have been developing very fast these past years. Indeed, SGs combine aspects of tutoring, teaching, training, communication and information, with entertainment elements derived from videogames, in order to capture people's attention for purposes that go beyond pure entertainment. However, the creation of a SG for educational purposes and professional training is a very time-consuming and expensive process. The challenge is to combine learning objectives and fun characteristics with an acceptable budget and time. For these reasons, we propose an interactive authoring environment, called EDoS (Environment for the Design of Serious Games), designed to assist SG authoring team. The EDoS is based on three models: (1) a formal domain-specific model of pedagogical objectives (competencies, knowledge, and behaviours) at which a SG aims; (2) IMS-LD-SG, an extension of the IMS-LD specification made specifically for SGs and (3) a task model formalized with CTT (Concurrent Task Trees) used to formalize Human-Computer Interactions sequences for screens of the game. The first model is the base of any SG design. Once pedagogical objectives are specified, the SG scenario must be elaborated very precisely to achieve them. The second model IMS-LD-SG is used for this purpose. A SG scenario is structured into logical chains and organizations, at different levels (play, modules, acts, activities) with which the users (learners or staff such as teachers, tutors, etc.) must interact in order to achieve their learning or assistance objectives. During the whole scenario elaborating process, these elements must be clearly defined and linked with the pedagogical objectives of the first model and also with gaming activities. These gaming elements and fun characteristics (amusing interactions, actions of characters, attractive competition, adventure, etc.) are specified by the CTT task model. The process of designing a SG is long and complicated and EDoS is developed to help the authoring team accomplish it. Indeed, it allows designing a SG through several steps, from formalizing the pedagogical objectives to elaborating a multi-level scenario and modelling Human Computer Interactions (HCI) sequences, in a structural and formal way. Moreover, EDoS also allows reusing resources (web applications, mini-games or components) of different suppliers. The outcome of EDoS is a structured scenario which will be automatically executed by an engine in the next phase of our production chain model. The EDoS provides SG designers with a method to create SGs faster and more efficiently, in a well organized process.

Keywords: Serious games, scenario design, authoring environment, eLearning, pedagogical objective

You can Learn Your Parents are Immature: An Analysis of What Learning can Result From Family Video Gaming

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Abstract: Video games are hugely important in many young people's lives. They play as individuals, with friends and, in some homes, with parents and siblings. Yet, little is known about how games are played as families and, consequently, what sort of learning emerges from family gaming. A survey commissioned as part of the Gaming in Families project in 2009 showed that 36% of parents had played video games with 3-16 year olds within the previous six months. Moreover, the time spent playing is longer than the average school lesson: 45% of parents claimed each gaming session lasted between half an hour to an hour, and 23% said the session was over an hour. In this paper an analysis of the survey findings is presented. It looks at the importance of learning as a motivation for gaming; and how this relates to the preferred choice of games and platforms. It considers the role of age and gender highlighted by the research. For example, 42% of primary aged children said they had played educational games with older family members, compared to 22% of those attending secondary school. Furthermore, educational games are usually played with mothers. These findings are then elaborated by a discussion of in-depth interviews with ten families who described themselves as gaming families. The parents and children were explicitly asked how and why they play computer games as a family and what constitutes a good gaming session. The paper discusses where learning predominantly of social skills like turn-taking, losing gracefully and collaborating - occurs and how these aspects compare to the perception that game playing improves skills such as resource allocation, negotiating with friends and challenging adversaries, manipulating situations and environments, actively pursuing goals and recovering from failures.

Keywords: Families, commercial video games, learning

Siren: Towards Adaptive Serious Games for Teaching Conflict Resolution

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Abstract: This short paper describes the Siren project, an interdisciplinary European project aimed at creating an adaptive serious game for teaching conflict resolution, and solve the research issues associated with this. We outline the challenges faced in various disciplines, including cross-cultural psychology, player modelling and procedural content generation, and the technologies and methods we will build on in order to solve these issues. We also discuss the design of the game and the means for validating our success. Though the project is just about to start, we have secured sizable funding, and conducted a few pilot studies on key component technologies.

Keywords: Serious games, procedural content generation, player modelling, interactive narrative, cross-cultural studies, natural interaction

PhD Research

Teachers' Thoughts on the Integration of Computer Games in the ESL Classroom in Nigeria

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Abstract: This paper is part of an ongoing PHD project on the integration of an educational computer game called Mingoville in teaching and learning English as a second language in two private primary schools in Nigeria. The paper reports a qualitative study of teachers' thoughts on the integration of the Mingoville game carried out to discover teachers' reactions to the use of educational computer games as a learning tool in the English language curriculum in Nigeria. The paper identifies factors that might hinder the acceptance of education computer games in learning English as a second language in Nigeria primary schools. It also recommends strategies to solve the challenges presented by the teachers. English language has occupied a premier position in Nigeria for many years, so English has enjoyed an unchallenged position in Nigerian education. However, a World Bank report found that Nigerian graduates have low proficiency in English. They stated that the 22% unemployment rate in the metropolitan areas in Nigeria is a result of poor quality of the graduates, particularly in communication skills. According to them, these graduates exhibit "poor abilities in the oral and written expression in English language. Recognizing these problems, there is a need to think about the education methodology that will suit the young generation to master English skills. According to Prensky, (2001) contemporary learners think and learn differently because they have grown up exposed to digital gaming environments for both pleasure, learning, and games, elicit motivation and provide the experience of engagement. He argues for changing the present learning environment from the predominantly "tell test" framework currently employed by a majority of educational institutions to ones that harness the potential of digital game based learning. The question remains, though regarding, how Nigerian primary school teachers perceive and accept the integration of educational computer games in teaching English as a second language? Education computer game is a new phenomenon in teaching and learning English as a second language in Nigeria. Egenfeldt-Nelsen (2006), the role of the teacher is crucial in achieving the learning outcomes from game based classroom be it declarative or affective. Egenfeldt-Nelsen (2006), The integration of computer games depends on the attitudes of teachers, so it is necessary to understand teachers' thoughts, acceptance and understanding of this innovation in teaching and learning. The findings of this study will help the teachers to learn more about the best strategies to motivate the students to learn English and to understand their own changing role in a digital classroom. The teachers will

also be motivated as they see their students increased interest in learning English.

Keywords: Teachers' thoughts, Mingoville, ESL, educational computer game

Facilitating a Games Design Project with Children: A Comparison of Approaches

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Abstract: This research is investigating if secondary school children (ages 11-16) can work with their educators to create serious-games for use by their peers. Collaboration with a local library service has created a multidisciplinary approach to serious-games design using researchers and educators acting as facilitators meeting regularly with children as participants. Collaborators have worked to create a new serious-game to advertise libraries as educational and social resources via weekly design workshops. Previous work with the library service had demonstrated that the design ideas of children are heavily influenced by the violent commercial action games which they play at home. Participants of this library investigation presented interesting concepts for small internet games but failed to convert these ideas into working examples to present to their educators. This paper documents a revised investigation between collaborators and discusses revisions to research methods including data capture tools and design objectives for a potential serious-game. The ten week investigation has used a more active approach to facilitation where design decisions have been organised into weekly discussions recorded by facilitators. Subsequent synthesis and development of ideas into digital prototypes has been handled by facilitators using Adobe Flash software. Appraisal of these prototypes by participants has created an iterative design process yielding the approved final product lacking in past investigations. Data collection methods have been modified replacing paper worksheets with electronic discourses recorded via an online blog. Popular board games have been used as physical design tools allowing participants to construct and discuss simple game designs with their educators. These methods are compared to activities using LEGO in previous investigations. Participants have delivered a review of the design process as a presentation to their educators. A summary of this presentation and its benefits in encouraging participants to reflect on the learning process is also presented.

Keywords: Authoring tools and methods; cooperative/collaborative learning;

A Computer Game Environment to Encourage Collaborative Learning

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Abstract: Teaching a subject which involves a long process and inter-related problems can sometimes be difficult through conventional classroom activities. This is particularly difficult at the UK Key Stage 3 (13-14 years) where students are only beginning to understand the processes of reason. Often what the teacher would like to encourage is group discussion but for many reasons, young students may be reluctant to put forward ideas in a conventional classroom setting. An area where this becomes less of a problem is once they get involved in playing a game together. In addition to this certain subjects are difficult to teach because they involve complex interactions that are largely outside the general knowledge of young students. An example of this is the issue of human contributions to climate change. The subject is one of recent heated debate, much of which involves complex arguments on the relationship between the natural contribution to climate variation and those produced by human beings. In the work reported here a computer game has been developed which tries to incorporate the various processes involved in a realistic way. In principle this game can be used individually. However, it also provides the opportunity for generating group discussion and reasoning processes. The game which has been developed uses a non-player character which is controlled by the teacher. The game is played in a networked environment with a number of teams of two players each trying to provide solutions to a complex climate issue. The non player character is able to monitor the performance of the different teams and provide feedback that will be of a more realistic/less predictable nature. An empirical study and control based experiment have been done using this computer game to investigate the effectiveness of game-based learning towards tackling these issues. The initial study involved two groups of Key Stage 3 children in a Geography class. The study was undertaken in the normal teaching sequence. The children were divided into pairs during gameplay and each session lasted about one hour. The behaviour of the whole group and individual teams was monitored throughout the gameplay. Analysis of this shows that the game not only allowed the students to investigate the science but also to communicate with each other during the process. It is felt that by introducing an environment with which they were sufficiently familiar (playing a game together) the normal inhibitions to communication were removed. The control based experiment reinforced these findings.

Keywords: Collaboration and cooperation, discussion, complex problem solving, game-based learning

Social Problem Solving and the Video Game Player

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Abstract: Social Problem-solving: problem-solving as it occurs in the real world, with reference to the approach an individual takes in finding a solution that works well for them. Take this and add it to video games, and we find some interesting results. Video game research has had little focus on Social Problem-solving (SPS), with the exception of Funk (2001) which suggested those who preferred to play violent video games had poorer SPS skills. Phase one of this PhD study aims to explore SPS and video games on various levels (via an online questionnaire): gender, genre (Genre was explored via, and based on, the respondents favourite genre), the time spent playing video games on average per week and the average time spent on other leisure activities in a week. Initial results found significant effects for gender in terms of the impulsivity/carelessness and avoidance scales of the social problem-solving inventory, as well as for gender and whether the participant played video games or not, and the length of time spent playing them. Significant effects were also found for the time spent on leisure activities and social problem-solving scores and, in terms of genre, violent-orientated genre showed no significance in comparison to non-violent (however, the results demonstrate that those who do not have a preference for violent games or do not play video games have lower social problem-solving skill scores), but when comparing online and non-online games it can be seen that those with a preference for online games (as opposed to another genre, or those who do not play video games) had significantly lower scores on the social problem-solving inventory - less constructive SPS skills. These results suggest that genre may need further investigation in terms of violent games (to look at Funk's (2001) theory and results which are currently not supported by this study) and the potential relationship there may be between aggression levels and preference, as well as social problem-solving and motivations for game play. Phases two and three of this study will aim to explore these areas.

Keywords: Social problem-solving, video games, ability

Designing Mobile Gaming Narratives for Guided Discovery Learning in Interactive Environments

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Abstract: The research question of this paper is “How to build a narrative-centered interactive environment for mobile game learning”? It attempts to achieve two purposes: first, to provide suggestions for designing mobile games in interactive environments and second, to explore the possible learning outcomes from mobile gaming. The research method used is textual analysis of the case “Façade”, an interactive environmental adventure game. The findings suggest that the flow chart, the hidden story and the braided plot are the best suited narrative texts for adventure games to guide learners in narrative-centered environments. Moreover, the possible learning outcomes from mobile adventure games could be guided discovery learning. In conclusion, this study suggests that in mobile adventure game design, teachers should consider which location is an important node that every learner has to go through. In each node, teachers should provide some choices, including wrong ones. Teachers also need to consider different possible ending scenarios according to learners’ self-construction. Finally, teachers have to explain why different learners have different results. Further studies can also apply the theories mentioned above on stories of different genres to design different adventure games for various purposes.

Keywords: Global positioning satellites, location-based services, mobile interactive environments, adventure games, guided discovery learning, interactive narrative

The use of Game Principles in the Design of Learning Role-Playing Game Scenarios

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Abstract: Learner motivation is a major preoccupation for a professional training sector that is showing increasing interest in the use of learning games. The lack of methodologies and design tools seems to be problematic for the eLearning companies and training departments placed in charge of learning game projects. In this context, we have focused in particular on the design of scenarios for Learning Role-Playing Games or LRPG because of their ability to suit to needs identified. This article presents the main

characteristics of our work. Our aim is to guide designers in the choices they make, in particular when it comes to the use of tailored game principles, to help them formalise and justify their choices in relation with the project specifications and to facilitate the implementation of the scenarios they design. With this in mind, our work takes a two-pronged approach: first, the analysis and modelling of a LRPG scenario design process based on the re-use of models and, second, the specification of a design-support environment (ScenLRPG) based on the model devised. The paper then focuses on a key stage of our work: the identification of game principles that may be used in a LRPG scenario. Six game principles have been identified from the study of literature on games and motivation. The article describes how these game principles are specialized to cater with our specific subject that is LRPG scenarios for professional training. Our categorisation of these principles and characteristics about how they can be implemented in a LRPG scenario are detailed. As an illustration, the game principles selected are used to describe an example of LRPG scenario. To conclude, the paper discusses the future outlook for the use of these elements in the design process and the support environment.

Keywords: Design support, game principles, role-playing game, learning scenarios, professional training

I Rather Play at Home: An Urban Sustainability Simulation Game in an Educational Context

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Abstract: ‘Serious games’ or ‘games for change’ are often designed with a particular agenda of in some sense transforming players’ views and behaviours about issues outside the game. Although games provide new models of learning, research has not yet established if and how games realise the potentials of transformative learning in an educational environment. Using the simulation game SCAPE (Sustainability, Community And Planning Education), an urban sustainability education tool, as a case study, this paper challenges the claim that the meaning of the game is represented in the games’ affordances and rules. SCAPE is designed to change the players’ perception of a given environment and illustrate how people’s lives and lifestyles are shaped and influenced by the sum of design and planning decisions. However, as gameplay is deeply connected and situated in cultural contexts and practices, research necessarily has to move beyond the study of gameplay. Thus, this paper argues for the need to consider games in a wider ecology of learning. Using Actor-Network Theory as an ontological starting point, I explore how students react to and interact

with a serious game in an educational context. Actor-Network Theory posits that entities acquire their characteristics through their relations with others. Agency is thus an effect of the network, which is made up of both human and non-human actors. This posits the game and the players in a wider ecology. Probing the controversies, disagreements, and difficulties among the actors involved illuminates the difficulties to separate gameplay from the wider and distributed assemblage of materials. Drawing from this ethnographic case study I argue that gameplay experience and subsequently the opportunity for transformative learning is modified and shaped by significant off-game factors. In fact, the gameplay experience cannot be seen separately from the assemblage of materials and relations. Consequently, the actors conflicting understandings result in unintended and unanticipated forms of gameplay and engagement.

Keywords: Transformative learning, serious games, actor-network theory

A Spiral Research Model for Game-Based Learning Studies: A Pragmatic Educational Research Design in Practice

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Abstract: Contemporary educational researchers often suffer from being tagged as either positivist or interpretivist—two opposite epistemological paradigms in social studies—and there is no exception for game-based learning (GBL) research carried out in educational contexts. An alternative methodology which embraces pragmatism, called a ‘Spiral Research Model’ is proposed. It incorporates a mixed-methods approach and multiple case studies in a practical way, in which the research question along with its changes over time, determines the choice of research methods. The temporal focus shift enabled the combination of three types of inquiries—exploratory, confirmative and explanatory in a single piece of research. The research began with a bottom-up analysis framework which provided the ground for the identification and classification of key issues and concepts. Two issues were identified and were used to direct the development of a questionnaire survey which was used to collect quantitative data. The questionnaire acted as a validating instrument for the qualitative findings drawn from the exploratory studies. The questionnaire findings were then deepened by follow-up semi-structured interviews; while the findings of the interviews were used to explain the rationale behind the views of the respondents in the questionnaire survey, with the support of document analysis. The explanation of the phenomena constructed the ‘justified true belief’, which is the perceived knowledge which supports the foundation of the

conclusions of this research. The paper explains how the combination worked, how qualitative and quantitative data were collected, analysed and synthesized to form the research thesis, and how issues of reliability and validity were approached.

Keywords: Spiral research model, game-based learning, educational research, mixed methods design

Learning Communication Skills by Making Cartoon Films

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Abstract: The UK Key Stage 1 and 2 Social and Emotional Aspects of Learning (SEAL) programme is designed, among other aspects, to enhance children's communication skills. The traditional approach to teaching communication skills is still important in school but new developments and the increasing availability of technology in the classroom, offer the potential for new ways to approach this teaching. A number of research institutions in the UK, for example the British Film Institute, are investigating how to use media such as films and television, in the classroom, in order to enhance children's learning. Making cartoon films is a potentially valuable teaching approach but the lack of a software tool to support this limits its viability. Existing software tools do reference the learning of communication skills as one of their features but they do not see this as a major learning objective. We believe that character animation in cartoon film can be a significant tool in the development of communication skills and it is also an imaginative and effective way of engaging children in the learning process, as a result of the significant impact of the utility of character animation. This paper describes a software tool, which has been developed to help children engage with the features of character animation, while learning vital communication skills. The structure of the tool is based on the SEAL guidelines, the initial process of the design being developed in conjunction with a SEAL teacher at a local primary school. The children involved in the development process were also observed using other computer games based learning tools. The original concept for the tool derives from the industrial 3D animated film production process. Using the tool, children experience the major steps in designing films and in this process each step is specially designed for them. In order to specifically suit the intention of children learning communication skills, the film type involves conversation and associated non-verbal communication skills only, such as facial expressions, hand and body gestures. The final product is a 3D dialogue film, which uses the children's recorded voices, expressions designed by them and their chosen body language. An initial study has been undertaken with a group of pupils from a primary school, who were introduced to a pilot version of the software. Based on their comments and observation

of their interaction, the software was redesigned and the initial stage of a more long-term evaluation was undertaken. The results revealed that the children greatly enjoyed this tool and that it maintains their focus throughout a lesson. The SEAL teacher also showed great enthusiasm for using the tool, due to the many positive reactions from the children, such as engagement, creativity, exploration, bravery and team- work. A longer-term study will be undertaken with different groups of students, in order to evaluate its effectiveness as a teaching tool.

Keywords: Learning by making cartoon films, communication skills, character animation, cartoon film, SEAL

Work in Progress

Alternatives and Passages: English Teaching, Learning, and Mingoville

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Abstract: While much research into serious games focus on following teaching and/or learning activities, and particularly the human and institutional actors involved in these, the central actors of game based learning research (i.e. the games) seldom get much attention (unless the focus is so-called “technological”). This brief positioning paper takes point of departure in an ongoing postdoc project following circulations and establishments of www.mingoville.com, which is a virtual universe with game based elements developed for beginning English teaching and learning. The paper presents a Science and Technology Studies (STS) and Actor-Network-Theory (ANT) inspired approach to researching emerging passages between beginning English teaching and learning and Mingoville.

Keywords: STS, ANT, virtual universe, Mingoville, beginning English teaching and learning, praxiography, relational, sociomaterial and processual research

Do we Know Where we Came From? A Historical Review of the Boarder Context of Digital Game Based Learning Research

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Abstract. This paper summarises the process of the growing academic maturity within the field of Digital Games research, detailing the last 30 years or so of Digital Game and Digital Game Based Learning research. The paper then furthermore attempts to categories the major trends within the field in terms of topics and researchers, methodology and results. This categorisation is intended to highlight the need for a structured framework or ontology within which Games research and Digital Game Based Learning Research in particular can occur.

Keywords: Digital games, game based learning, literature review, historical overview

Game Based Learning: A Beacon of Hope for Deaf and Dumb People in African Countries

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Abstract: The learning outcomes of Game Based Learning are germane to different types of situations and particular needs. It can be a very powerful tool to help people learn and gain knowledge. Statistics show that the mental acumen and cognitive capacity of children who use Game Based Learning is higher to those who did not as this pedagogical approach immerses the students into the academic environment while still accomplishing the fantasy factor. The main aim of this paper is to discuss the maximum possible techniques to enhance the outcome of implementing the Game Based Learning for the Deaf and Dumb illiterates. African countries register the highest number of disabled people owing to multifarious reasons like malnutrition, diseases, civil conflict and war, etc. The disabled are isolated and usually resort to cocooning themselves from the society and thus secluding themselves from the exploits of education. The Deaf and Dumb children are often at a greater disadvantage and have trouble in expressing their needs and ideas. The lack of knowledge of an effective and unified way of communication is a hindrance for them in achieving the social, academic or economic status on par with normal people. If the advantages of the Game Based Learning could be exploited in confronting the hindrances, the deaf and dumb people would be able to support themselves and be independent. Different series of Interactive games depending on the proven learning methods will be developed and deployed into the African Educational Society in general and the Deaf and Dumb in particular. The games differ from user group to user group depending upon the capacity of understanding and competing ability of each user group. The Deaf and Dumb games will be having a multimedia footage in sign language about all the information explaining everything. A Speech Recognition Technology could be incorporated into the system which would automatically render a sign language demonstration and thus helping the students both deaf and dumb to learn things quickly. Each game would have a series of levels that a student has to attain by learning from the game and answering the questions, culminating in mastering the level and attaining the required knowledge.

Keywords: Game based learning, sign language, *SignED*, interactive games, deaf and dumb, human computer interaction

Using Games to support students with special needs!

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Abstract: Videogames can be a powerful medium to support learning in different ways. Today dozens of studies that are proving the efficacy of digital game-based learning and how it can improve learning (e.g. Does game-based learning work? Results from three recent studies, Richard Blunt) has been done. There is a big difference between traditional learning and learning with videogames. While traditional learning's objective is "what you learn", learning with videogames encloses "HOW YOU LEARN" as well! This method of learning can provide the information in an amusing, realistic and interactive way. Students who often use educational games say: "You don't even know that you are learning"! . Many researches in recent years has been done on how that videogames can improve learning ("Don't Bother Me Mom -- I'm Learning!", Marc Prensky; "Serious Games: Games That Educate, Train, and Inform", Michael D. & Chen S; "What Video Games Have to Teach Us About Learning and Literacy", James Paul Gee). The question "How can we integrate videogames in our educational system?" is the main issue today. If we want to integrate a new educational tool, we have to take in account one of the important pillars of our educational system: "Everybody has to have access to education". It will be a great challenge to foresee access to educational videogames for all kind of students. We are sure that a regular student has no problems to access and use videogames. But what if a students with a disability wants to play video games? We can divide students with disabilities into 4 groups:

- Learning disability
- Visual disability
- Auditory disability
- Physical disability

For some categories, like visual or auditory disabilities, it is hard to find some solutions to have access to videogames because a videogame mainly consists of visuals and audio. In this paper we will take a closer look at some possibilities how students with disabilities also can benefit from educational games. We will discuss some concrete examples for every group of disability. Developing games for these specific students does not always mean that we have to create totally different games. Some of the special built-in features can also be useful for a regular student.

Keywords: Videogames, disabilities, special needs, learning

Presentation Only

A Literature Review of Claims on Learning and Motivation in Game-based Learning

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Abstract: The growing interest in game-based learning goes hand in hand with claims about the effects of game-based learning. For example, it is presumed that game-based learning increases motivation. But does game-based learning really work? And if it works, what are the successful elements? In this paper, literature on game-based learning is reviewed to gain a more thorough understanding of the potential learning effects and identify issues for further research. A systematic search in databases and some recent conference proceedings was followed by a critical examination of the studies found. After several selection stages 46 articles were included in this review. These articles are used to discuss the effectiveness of game-based learning regarding learning results, motivation for subject/learning task at hand and engagement in the game. The learning results are separated into 3 kinds of learning as distinguished in learning theories: learning factual knowledge, cognitive skills and meta-cognitive skills. In studies where game-based learning proves to be effective, attention will be paid to the question which elements in particular are accountable for this when the studies provide the information necessary.

Keywords: Game-based learning, claims, motivation, education

The Sims Paradigm; Enhancing Game-Based Learning and Developing Twenty First Century Skills.

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Abstract: The paper aims to describe the game culture from the ludological perspective and contemporary educational psychology view. The theoretical concept of game-based learning is discussed in light of the most effective ideas of methodological implementation of educational games. The main point of the article is to present the experimental education approach, which is constructivism. It focuses on motivational processes and innovation. The most essential typological factors concerning current trends in game-based education are briefly illustrated. Moreover, the paper discusses the subject of the twenty first century skills, as the most important cause for developing high technology games and simulations, which can create a context for more effective learning considering formal and informal education. In light of Clark

Aldrich's (2009) classification of games with purpose other than mere entertainment, the concept of multidimensional structure of Sims paradigm is concisely defined. That complex model concerns all relevant individuals who create, develop, teach, observe and experience games as creative, educational and meaningful tools which can enhance learning processes and reinforce communication and creativity. Sims paradigm accurately describes the way how one can classify, understand and implement games depending on a learning purpose and technology used. The article also refers to Wagner's (2008), Egenfeldt's (2007) and Šisler's and Brom's (2008) research on educational application of MMORpg games, which is an attempt to look at the Sims as multifunctional learning environments built on the game based experience. The paper argues that in order to establish an effective approach towards game-based learning and to facilitate its application into educational systems, the method of knowledge acquisition, particularly in a formal school setting, requires reconsideration. The positive impact of games on higher cognitive skills has been widely researched and scientific evidence is presented in the article. To introduce a theoretical framework and concept of the Sims, several successful examples will be examined: Global Conflict: Latin America, Europe 2045, Virtual Leader and The Prizm Game. By using them as patterns, the paper will present methods and most effective strategies of how they can be applied into formal and informal teaching and immersive learning in order to develop twenty first century skills and create an enjoyable educational environment.

Keywords: Game, game-based learning, constructivism, serious games, educational games, Sims, learning, flow