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of the

6th European Conference on Games Based Learning

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University College Cork
And Waterford Institute
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Ireland

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Edited by
Dr Patrick Felicia
Waterford Institute
of Technology
Ireland

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Preface

These proceedings represent the work of researchers participating in the 6th European Conference on Games-Based Learning, which is being organised and hosted this year by University College Cork and the Waterford Institute of Technology. The Co-Conference Chairs are Professor Grace Neville and Dr. Sabin Tabirca, both from University College Cork, Ireland. The Programme Chair is Dr. Patrick Felicia from Waterford Institute of Technology, Ireland.

The conference will be opened with a keynote from Dr. Simon Egenfeldt-Nielsen from Serious Games Interactive. The topic of Simon's presentation is "The potential of tablets to game-based learning." The Keynote address on the second day is by Stephen Hagarty from Big Fish Games, Cork, Ireland.

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 areas and specialties within Games-Based Learning. It also offers the opportunity for like minded individuals to meet, discuss and share knowledge. ECGBL continues to evolve and develop, and the wide range of papers and topics will ensure an interesting two-day conference. In addition to the main streams of the conference, there are mini tracks focusing on the areas of Multi-User Virtual Environments, Content and Assessment Integration, User Profiling and Barriers and Opportunities for the introduction of GBL in Educational Settings

With an initial submission of 159 abstracts, after the double blind peer review process, there are 68 research papers, 4 PhD research papers and 11 work-in-progress papers published in these Conference Proceedings. These papers represent research from Australia, Austria, Belgium, Brazil, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Malaysia, Norway, Philippines, Russia, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, The Netherlands, UK and the USA.

We hope that you have an enjoyable conference.

Dr Patrick Felicia
Programme Chair
October 2012

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The 2012 conference programme committee consists of key people in the games based learning community, both from the UK and overseas. The following people have confirmed their participation:

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Biographies

Conference Director

Professor Thomas M 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

Dr Patrick Felicia PhD, is a lecturer, course leader and researcher at Waterford Institute of Technology, where he teaches and supervises postgrad uate students. He obtained his MSc in Multimedia Technology in 2003 and PhD in Computer Science in 2009 from University College Cork, Ireland. His research interests and expertise are mainly in Game-Based Learning, Multimedia, Educational Psychology and Instructional Design. He has served on program committees for international Game-Based Learning and Technology-Enhanced Learning conferences. He is editor-in-chief of the International Journal of Game-Based Learning (IJGBL), and is also editor of the Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches, published by IGI.

Programme Co-Chairs

Professor Grace Neville is a native of Cork city. After graduating from UCC with a double first class honours degree in French and Irish, Grace won the French Government scholarship to l'Université de Caen. She later taught at l'Université de Lille and l'Université de Metz. Professor Neville was awarded her doctorate from l'Université de Lille. Grace has been involved in Teaching and Learning initiatives since the early 1980s, from the UCC Teaching Development Unit to more recent initiatives inspired by the Teaching and Learning Scholarship at Harvard and the Carnegie Foundation for the Advancement of Teaching and was one of the first recipients of the President's Awards for Excellence in Teaching. Grace has particular responsibility for Ionad Bairre, the Centre for the Support of Teaching and Learning in UCC and is a member of the teaching/organizing team of the Certificate, Diploma and Masters in Teaching and Learning, as well as the university-wide postgraduate module in Teaching and Learning.

Dr Sabin Tabirca is a senior lecturer in Department of Computer Science of University College Cork working in the Multimedia group. His main research interest is on Mobile and Parallel Computing for Scientific Problems. He has published more than 150 articles in the areas of mobile multimedia, parallel computation, number theory and combinatorial optimization

Keynote Speakers

Dr Simon Egenfeldt-Nielsen (PhD, Psychologist) is CEO of Serious Games interactive. He gained a PhD on the educational use of computer games and thereafter worked as an assistant professor at IT-University of Copenhagen for 5 years on games and learning projects. He founded Serious Games Interactive in 2006. Today it has offices in three countries and around 20 employees. The company is currently among the leading in the field. He has studied, researched and worked with computer games for more than 10 years. Over the years he has been involved in developing

more than 50 games for different clients. He has also been involved in developing the award-winning series Global Conflicts, Playing History and Trunky. He has served on the Digital Game Research Association Board for 3 years, co-founded Game-research.com and authored four books on video games. He regularly gives talks around the world.

Stephen Hegarty has brought a positive influence and made a tangible difference in all the companies he has worked with to date. He has actively led company growth through people and technology. Stephen has a passion for team led solutions, and with his teams, he has delivered product and services that have enhanced multiple industry sectors. Stephen currently oversees Big Fish Games in Cork as Director Of European Business. Prior to Big Fish Games Stephen was the COO & Head of Operations in Southwestern, Cork, Ireland.. Stephen completed his MBA with Henley Business School this year.

Mini Track Chairs

Francesco Bellotti holds the post of Assistant Professor and currently teaches Object Oriented Programming and Databases and Software for Embedded Systems at the University of Genoa. His main research interests are in the field of technology enhanced learning, serious gaming, artificial intelligence and Human-Computer Interaction. He has been the responsible of the design and implementation WPs of several European and Italian industrial research projects. He authored more than 120 papers in international journals, books and conferences.

Dr Stefan Göbel holds a PhD in computer science from TUD and has long -term experience in Graphic Information Systems, Interactive Digital Storytelling, Edutainment applications and Serious Games. After five years work as researcher at Fraunhofer Institute for Computer Graphics, from 2002 to 2008 he was heading the Digital Storytelling group at the Computer Graphics Center in Darmstadt. In late 2008 he moved to TUD and is heading the prospering Serious Gaming group at theMultimedia Communica-

tions Lab. Dr. Göbel is author of numerous papers and member of different program committees such as ACM Multimedia, ICME, Edutainment, Foundations on Digital Games, Serious Games Conference and serves as jury member of the Serious Games Award.

Dr 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. Thomas delivers a module on Serious Games covering content integration, assessment integration, evaluation, design principles and story and narrative at honours level.

Dr Pauline Rooney works as an elearning developer, researcher and tutor with the Dublin Institute of Technology (DIT). She obtained her MSc (Ed) in Computer Based Learning (with distinction) from Queens University Belfast and completed her Doctorate of Education (EdD) with the University of Sheffield: her thesis investigated what happens when a multidisciplinary in-house approach is taken to the design, development and implementation of serious games in higher education. Prior to joining DIT, she worked as an instructional designer in the private elearning sector, collaborating with the Royal College of Surgeons and Harvard University. Current research interests include serious games and virtual worlds, qualitative research methodologies, interdisciplinary practice in higher education and student attitudes towards pedagogical innovation.

Viktor Wendel received his degree in Computer Science from the Julius-Maximilians-University of Würzburg in 2009. Since November 2009, he is working as a research assistant at the Multimedia-Communications-Lab at the Technical University of Darmstadt. Research topics are Game Mastering in Multiplayer Serious Games, and Collaborative Learning. Further, he is an editor for ACM SIGMM Records.

Biographies of Presenting Authors

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Anna-Sofia Alklind Taylor is currently doing her PhD in serious games at the University of Skövde, Sweden. Apart from an enthusiastic interest in gaming, she has a background in cognitive science and human-computer interaction. Her current research is focused on system support for instructors in game-based training.

Anissa All works as a junior researcher (since July 2011)at IBBT-MICT (Ghent University). She mainly is involved in projects concerning game-based learning, such as concept development of a road safety game and has been involved in a study conducted for IPTS concerning Digital Games for Empowerment and Inclusion. Further, Anissa is involved in Living lab research.

Yasemin Allsop has been working as ICT Coordinator in various inner city schools in London for over eight years, currently based at Wilbury Primary School, London. MA ICT in Education from IOE, University of London and will start PhD in September at Goldsmiths College, University of London. Yasemin Interests are developing transferrable skills through technology, media literacy and game based learning.

Suen de Andrade e Silva is finishing her research master's studies in Media and Performance at Utrecht University. Her main research interest is on new media, digital culture, and video game culture. She is particularly concerned with the use of Social Networking Sites and the play of Social Network Games.

Dr. Sylvester Arnab is a senior researcher at the Serious Games Institute, UK with an interest in immersive environments and the application of technologies to address health, learning and socio-cultural issues. He is currently involved in the EU-funded Games and Learning Alliance and the PRE:PARe game development project.

Kristine Ask is currently in the last year of her phd project Kristine Ask is investigating expert players and culture in World of Warcraft. Her background is in Science and Technology Studies with a focus on user productions, knowledge management, everyday life and play.

Kiavash Bahreini joined Center for Learning Sciences and Technologies (CELSTEC) in July 2011. He is a PhD candidate at Learning Media Department. His research topic is 'Learner support in serious games: enhancing online soft-skills training for lifelong learning'. He took his Master of Science in the field of Computer Science and Engineering in Turkey (T.R.N.C.).

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Peter Blanchfield associate professor, School of Computer Science and member of management group of LSRI. Previously head of Computer Science, Nottingham University Malaysia Campus involved in lifelong learning. Long and varied publication record but recently concentrated on development of computer games in various educational contexts, especially work on development of games and game development approaches to teaching software engineering and coding curriculum.

Andrej Jerman Blazic currently works in Laboratory for Open Systems and Networks at Jožef Stefan Institute as a researcher in the field of e-learning and organizational learning. His current research is focused mainly on applications of information and communication technology in education with focus on Web-based learning, Game-based learning, and standardization of e-learning and organizational learning.

Jeroen Bourgonjon is an FWO-research fellow whose main research interest is video games as a form of and in education. He focuses on the research of the meanings (rhetorical) and effects (statistically) of video games in education. He has published before in journals as Computers & Education, Digital Creativity and CLCWeb.

Liz Boyle is a lecturer in psychology and teaches modules on psychology and education, developmental psychology, psychological theory and psychology of language. Her research interests are in learning, motivation and communication and more recently she has looked at the relevance of these to computer games, working on the GALA NOE project and the CHERMUG project.

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Thomas Bröker Researcher, chair of building physics, Bauhaus-Universität Weimar. Helped develop and implement *eLearning Bauphysik*, further education programme and masters course in field of building physics. Architectural background and worked/lectured on conjunction of architecture and civil engineering. Researches development of learning scenarios to mediate complex scientific and planning coherences in civil engineering;ways to unitize their implementation.

Cyril Brom PhD degree in Computer Science from Faculty of Mathematics and Physics of Charles University in Prague. Currently employed as assistant professor there, and also head of Artificial Minds for Intelligent Systems research group. Research deals with serious games, artificial intelligence, 3D virtual reality, and computational ethology. Collaborated with Vit Sisler on several educational projects, including Europe 2045.

Professor Carsten Busch earned his PhD at the TU-Berlin. He taught at a variety of Universities including the European Business School Oestrich-Winkel and the Academy of National Economy and Public Administration (Moscow). He currently teaches in Media Informatics at the HTW-Berlin

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Dr Darryl Charles joined the University of Ulster in 2001 where his research expertise falls in the areas of computational intelligence and serious games. He has made research contributions both nationally and internationally including a recent book based on biologically inspired AI and games and more than 70 peer-reviewed publications over the past 15 years.

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Stéphane Chaudron worked for several Educational Projects for last ten years. Has been in charge of coordination of a large Research Thematic Network dedicated to Science Teachers Education in Europe at Université catholique de Louvain. More recently, after working for the Distance Learning Programme at Imperial College, London, she coordinated several projects within European Schoolnet.

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Ioannis Leftheris is an undergraduate student in the Informatics department at the Aristotle University of Thessaloniki. His intention is to go on and do postgraduate course in Information and Communication Technologies in Education at the same University. His ultimate ambition is to work

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Leonardo Brandão Marques is a Psychologist with a master degree in theory and behavioral research. Leonardo has Researched on computerized teaching and educational games. Today is linked to a doctorate in National Institute of Science and Technology Studies of Behavior, Cognition and Education funded by the National Institute for the Development of Science and Technology of Brazil (CNPq).

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Maria Priovolou graduated from the Department of Mathematics and holds a post-graduate degree in the Didactics of Mathematics. She is a math teacher in Psychiko College, Athens. She is approaching mathematics through their historic origins and actual day-to-day problem solving with the use of new technologies.

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Christian Reuter studied Computer Science at TU Darmstadt and finished his Master Thesis about the "Development and Realization of Methods and Concepts for Multiplayer Adventures" in 2011 before he then joined the Multimedia Communication Lab. His research focus includes the StoryTec-Platform, especially its extension for multiplayer serious games.

Margarida Romero has a European Ph.D in Psychology by CNRS (France) and UAB (Extraordinary Ph.D. Award in Psychology). She is a Associate Director of E-learning in ESADE and associate professor in UAB and UOC. She was awarded with the first price of the Artificial Intelligence French Association in 2006. Her research aims to advance the understanding of the time factor in online learning.

Dr Pauline Rooney works as an elearning developer, researcher and tutor with the Dublin Institute of Technology. She is involved in a range of educational research projects and teaches on postgraduate programmes, specialising in elearning. Research specialisms include serious games and virtual worlds, qualitative research, interdisciplinary practice and student attitudes towards pedagogical innovation.

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Making the Implicit Explicit: Game-Based Training Practices From an Instructor Perspective

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Abstract: A game-based learning environment is more than just a digital artefact. Factors such as where the game is played, how the learning experience is designed, the level of social interaction and so on, need to be considered when designing a game for learning or training. For instance, during gaming, the learners might physically leave the virtual environment to continue the gameplay in the physical environment. If the instructor wants to keep track of, for example, learning progress or game states, the gaming system needs to support these activities both in-game and outside the game, via different logging tools, e.g. video and voice recording. Military organisations have a long history of using games and simulations for training. This means that they have had the opportunity to develop and refine training practices that are both cost-effective and valuable for learning. However, these practices are largely based on instructors' own experiences rather than scientific studies. This study aims to describe game-based training practices in order to (1) extricate good practices that may be transferred as inspirational examples for others, and (2) identify areas for improvement. Empirical material was collected using observations and interviews and then analysed and categorised. Interpretations made from the analysis were later validated through a questionnaire survey with military personnel directly or indirectly involved in simulator- or game-based training. The analysis shows that a game-based training cycle consists mainly of four phases: preparation, introductory lecture, gameplay and debriefing. Although the systems used are advanced in that they log user activity and support quick changes to the scenario during gameplay, running a training session is highly demanding for the instructors. Offline tools (e.g. pen and paper) are commonly used when there is a lack of system support in a specific situation. The paper concludes with a list of system support features for different aspects of game-based training.

Keywords: best practices, game-based training, instructor-in-the-loop, instructional support, puckstering, serious games

Co-Designing Interactive Content: Developing a Traffic Safety Game Concept for Adolescents

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Abstract: Co-design is a user-centered design method which has gained popularity in innovation research where it is used for opportunity detection for new applications or technology based systems and to better tune their development to the user's requirements and preferences. It has only rarely been used as a tool for content creation however. This study explores the added value of co-design in addition to other innovation research methods in the process of developing interactive content. Co-design sessions took place as part of the development of a concept for a digital location-based educational game dealing with traffic safety. Before, a state of the art literature survey, a focus group with traffic safety experts and collaboration with a professional game designer had resulted in a number of preliminary game concepts. In total, 72 adolescents between 15 and 18 years participated in five co-design sessions lead by a researcher and a professional game designer. The sessions provided input regarding the locations in the city where adolescents would like to play mini-games, the mobile phone technologies they would use, the topics that interest them and the game mechanics they would find enjoyable. In the final design document, several ideas coming from the co-design sessions have been picked up and integrated. Thus our study indicates that co-design can be a source of additional ideas on top of other innovation research methods such as SotA and expert consultation and thus lead to more effective interactive content creation.

Keywords: game-based learning, co-design, traffic safety, content creation, adolescents

Exploring the Educational Value of Children's Game Authoring Practises: A Primary School Case Study

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Abstract: In today's technologically advancing world, computer games have become an important part of children's lives. Educators started to see the power of this new medium and explore ways to use computer games to support learning within schools. There are many references in research literature about computer based games having a varied impact on learning, however not many studies have looked into educational value of students designing their own games. Where learning through games seems to be the most important focus point, learning about games is not seen as being as valuable. Whilst educators endeavour to achieve goals in maths, science and literacy using games and other technology, the potential of gaining transferable skills that will support students to perform better in other areas of learning has been overlooked. In this study the educational value of children authoring games was explored and the skills students developed during the game design process investigated. A mixed method approach was adopted, where a qualitative research method was used together with a quantitative method to explore the educational value of children's game authoring activities. Individual interviews, observations, children's written game designs and finally completed games were used to understand the context around students' game design activities. A survey was used to collect background data about the participants' gaming experiences. The result of this study shows that the children had opportunities to develop some invaluable skills which are transferable to any area of learning such as; communication, critical thinking, advanced technology skills and working collaboratively. The game design process itself represented the aspects of creativity where children used their ideas and imagination to make games. However this study did not aim to reflect on the impact of transferable skills on actual learning.

Keywords: digital literacy, game literacy, game based learning, transferrable skills, case study

Click, Share and Learn! Social Network Games as Serious Play

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Abstract: This paper investigates how the merging of social interaction and gameplay can enhance learning practices. By drawing on the theory of situated learning (Lave and Wenger, 1991), and by using social network games as case studies, I reflect on the potential of multi-player collaborative play to promote learning. I argue that the simple game mechanics and the collaboration-based gameplay of social network games transform them into a unique space for promoting not only the simulation of real-world experiences and the active engagement with problem solving, but also the building of a social environment that is highly beneficial for learning. To develop this argument, I look firstly at the main approaches adopted in studies of games and learning, summarising the forms of individual learning that are usually related to videogame play. Then, I explain how social network games have shifted the emphasis from individual to social learning, and why the theory of situated learning can be fruitful in analysing serious social play. As the final step, I use the Facebook games EcoCity and Trash Tycoon to discuss social network games from the perspective of situated learning, offering a new understanding of the role of social interaction and collaboration in serious play. Although this investigation is primarily theoretical, the analysis of those games shows that, by playing them, individuals can effectively learn about sustainable development and environmental issues.

Keywords: social network games, situated learning, Facebook games, sustainable development, environmental issues, video games

FILTWAM - a Framework for Online Game-Based Communication Skills Training - Using Webcams and Microphones for Enhancing Learner Support

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Abstract: This paper provides an overarching framework embracing conceptual and technical frameworks for improving the online communication skills of lifelong learners. This overarching framework is called FILTWAM (Framework for Improving Learning Through Webcams And Microphones). We propose a novel web-based communication training approach, one which incorporates relevant and timely feedback based upon learner's facial expressions and verbalizations. This data is collected using webcams with their incorporated image and microphones with their sound waves, which can continuously and unobtrusively monitor and interpret learners' emotional behaviour into emotional states. The feedback generated from the webcams is expected to enhance learner's awareness of their own behaviour as well as to improve the alignment between their expressed behaviour and intended behaviour. Our approach emphasizes communication behaviour rather than communication content, as people mostly do not have problems with the "what" but with the 'how" in expressing their message. For our design of online game-based communication skills trainings, we use insights from face-to-face training, game-based learning, lifelong learning, and affective computing. These areas constitute starting points for moving ahead the not yet well-established area of using emotional states for improved learning. Our framework and research is situated within this latter area. A self-contained game-based training enhances flexibility and scalability, in contrast with face-to-face trainings. Furthermore, game-based training better serve the interests of lifelong learners who prefer to study at their own pace, place and time. In the future we may possibly integrate the generated feedback with EMERGO, which is a game-based toolkit for delivery of multimedia cases. Finally, we will report

on a small-scale proof of concept study that on the one hand exemplifies the practical application of our framework and on the other hand provides first evaluation results on that. This study will guide further development of software and training materials and inform future research. Moreover, it will validate the use of webcam data for a real-time and adequate interpretation of facial expressions into emotional states (like sadness, anger, disgust, fear, happiness, and surprise). For this purpose, participants' behaviour is also recorded on videos so that videos will be replayed, rated, annotated and evaluated by expert observers and contrasted with participants' own opinions.

Keywords: communication skills; affective computing; web-based training; lifelong learning; serious gaming

Exploring University Library Induction Within an Undergraduate Serious Games Design Module

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Abstract: Libraries form a vital part of the academic process in Higher Education (HE) institutions offering resources and services which are a key cornerstone of academic attainment. Research suggests that the mission of all HE libraries should be to showcase and promote their resources to students via simple and accessible induction resources. This paper is set against a background of development in library induction, with academics and librarians looking to review games-based learning approaches as methods of delivering induction activities to increase student engagement and familiarisation with library services. The paper documents the design and results of a 2010 undergraduate teaching module which investigated the suitability of student-created serious games as induction resources for use by librarians. The module allowed final year undergraduate students to meet regularly with university library staff (as a client) and serious games researchers (as design consultants) to create user sensitive products for use by new university students. The 36 students undertaking the module were divided into self-selecting development teams and guided through a

three phase user sensitive design process incorporating: 1) research and analysis of design requirements, 2) communication of ideas via storyboards and prototypes, and 3) modification of designs following a user-based assessment. Students presented both mobile and static products as potential approaches to library induction as part of their module assessment, including use of Quick Response (QR) barcodes to create an augmented 'treasure hunt' around a physical library space. The paper concludes with a review of the module and its output from both client and student perspectives.

Keywords: library, induction, serious games, design, QR (quick response)

Video Games and Civic Learning

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Abstract: Educational scholars such as Biesta and Lawy (2006) have suggested that "young people learn at least as much about democracy and citizenship from their participation in the range of different practices that make up their lives, as they learn from that which is officially prescribed and formally taught" (p. 14). From this perspective, video games – an important aspect of youth culture – have received a lot of attention for their civic potential (Steinkuehler & Williams, 2006). This paper presents a summary of academic scholarship studying the relation between games and citizenship from different perspectives. Firstly, game mechanisms are analyzed from the perspective of learning, focusing both on classic and media learning theories. Secondly, the civic learning opportunities and experiences that come forth from the social context of gaming are explored. In addition, this paper presents the outlines of a Dutch research project on game-based learning in which secondary school students perform a rhetorical analysis of video games in order to improve their critical reflection skills as an important component of citizenship.

Keywords: game-based learning, civic learning, citizenship, moral reasoning, critical thinking

Cognitive Task Analysis (CTA) in the Continuing/ Higher Education Methods Using Games (CHERMUG) Project

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Abstract: Research methods and statistics are core competences across various disciplines but pose significant challenges for many students. The CHERMUG project aims to develop a digital game to support students in acquiring methodological and statistical expertise. A key issue that has to be addressed in developing a game is to identify the desired learning outcomes for students. The current paper describes a cognitive task analysis (CTA) which was carried out in the CHERMUG project to identify the component cognitive skills, knowledge and competences that are required in developing a comprehensive and usable understanding of research methods and statistics. Structured interviews were carried out with research methods experts. The experts were provided with a briefing sheet which introduced them to the CHERMUG project and the aims of the CTA. In a subsequent interview, participants were asked to describe a prototypical research problem and for this problem identify and discuss the most prominent and relevant issues and difficulties they experienced with their students in working on this. They were asked to consider these for the four main steps in the research cycle: research question, data collection, data analysis, and discussion & conclusion. This approach to CTA focused on the experiences of experts teaching or supervising projects in research methods and statistics and provided valuable concrete suggestions and recommendations relevant to the design of the game.

Keywords: serious games, cognitive task analysis, game design, research methods, statistics, CHERMUG

Digital Games and the Hero's Journey in Change and Innovation Management Workshops

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Abstract: Joseph Campbell's Monomyth not only provides a well-proven pattern for successful storytelling, it may also help to guide teams and team leaders through the challenges of change and innovation processes. In project "HELD: Innovationsdramaturgie nach dem Heldenprinzip" researchers of the University of the Arts Berlin and the Berlin Gameslab, part of the University of Applied Sciences HTW-Berlin, team up to examine the applicability of the Hero's Journey to change management using an adaptation of Campbell's pattern called „Heldenprinzip®“. The project's goal is not to simply teach the stages of the Monomyth as mere facts but rather to enable the participants of training courses and interventions to actually experience its concepts using a portfolio of creative and aesthetic methods. While a pool of aesthetic methods - like drawing, performing or role-playing - is already being used, the Gameslab subproject qualitatively researches the potentials for enriching and complementing these methods with interactive digital media and games. This paper discusses three types of game based learning treatments to be used in training and intervention sessions in general and their pros and cons for our use-case. The first option for treatment is providing the participants with a game that follows the Hero's Journey and inducing them to reflect on the experience and its relation to the learning goal. An alternative strategy is to make participants go through a game sequence broaching issues that are relevant for a stage or the journey of change in general. Last but not least, digital equivalents of the non-digital aesthetic methods can be constructed by using digital games or digitally enhanced set-ups for playful interactions. All three treatments have their merits and pitfalls, which are discussed in relation to the identified game-based learning scenarios: self-study, blended game-based learning and face-to-face sessions. Furthermore, these scenarios are compared and specific techniques (e.g. knowledge transfer by storytelling) and boundary conditions, like varying levels in gaming experience among participants, are highlighted.

Keywords: blended game-based learning, physically interactive digital games, hero's journey, innovation and change management training

OpenGames: A Framework for Implementing 3D Collaborative Educational Games in OpenSim

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Abstract: The main goal of this paper is the presentation of the design and implementation of a game framework, for building 3D collaborative educational games. The final framework, which is called OpenGames, supports the creation of such games, in the virtual worlds of the open source platform, OpenSim. This paper presents the steps followed for the implementation of this framework, its technical aspects, as well as the first impressions and evaluation results after the conducting of a game based educational activity.

Keywords: 3D virtual game based learning, virtual learning environments, OpenSim, game framework, serious games

Rapid Development of Games Inspired Metacognitive Learning Experiences Using Moodle and Gamemaker

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Abstract: There are many ways that learning metaphors from games may be harnessed in the construction of motivating and effective game based learning (GBL) experiences. However, significant difficulties exist in the creation of GBL software for use within education and GBL related research. Two of the primary difficulties, which provide the focus for this paper, are cost (both time and monetary) and quality. There is often a requirement to build specific games experiences for a particular research

investigation that cannot be fulfilled through the use of existing COTS games. However, research budgets rarely offer adequate expenditure to facilitate the construction of bespoke games for learning experiences that compete favourably with commercial games. Additionally, within research teams the expertise and experience necessary for making games is often limited in comparison to an industry based team. This is further compounded by the need for experimental software to be completed before an academic term/semester starts. Failing this requirement often results in the experiment being delayed until the next academic semester or year. In this paper we discuss a short term project undertaken by a development team comprised of two academics and two commercial game developers. With only two weeks of design and development a game based learning solution is created and deployed over a five week period for a class of 2nd year university computing students. This work was intended both as a technological proof-of-concept and as an investigation into the students' reaction to the use of games to enhance their understanding of their learning experience. We report on our design and development experiences within a multidisciplinary team, and in particular discuss the use of Moodle and GameMaker as potentially powerful rapid development/prototyping toolsets. A summary and analysis is provided of the extensive student interaction statistics within the learning system and the associated game. This quantitative information is utilised to inform the discussion of additionally gathered qualitative student feedback regarding the system.

Keywords: games-enhanced learning, gamification, metacognition, rapid development

Not Just for Children: Game-Based Learning for Older Adults

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

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

Reflective, Reflexive Guided Appropriation: Facilitating Teacher Adoption of Game Based Learning in Classrooms

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Abstract: The use of games to advance learning in the classroom often appeals to teachers perplexed by students who disengage from conventional instructional processes. However, the research literature suggests that enthusiasm quickly wanes when obstacles are encountered and things do not work out as expected. Consequently, the take---up of game---based learning is inhibited, and the "scaling" of techno---pedagogical innovations into routine classroom practice stalls. Recognizing that teacher preparation is crucial for successful implementation of innovative game-based curriculum in the classroom, a process-centric "appropriation model of innovation uptake" was initially suggested as a conceptual tool with which to approach the said challenge. This model draws on ideas from Coburn (2003) on "rethinking scale" in the context of school reform, as well as those of Clark and Dede (2009). The suggested model shifts the focus of attention from a system perspective of "scaling" to a model where the teacher plays the central role. It foregrounds the construct of "shift" as being central to what is required for teachers to sustain and to spread the adoption of game---based learning pedagogy. The model positions depth and ownership as critical factors that influence the likelihood of achieving a stable shift in teaching practice, while recognizing the importance of system support for accommodating and rewarding innovative teaching practice. This appropriation model helped us to engage in a research project whose objective has been to level up teacher capacity for successfully enacting game---based learning in the classroom. This paper describes (a) the appropriation model and its evolution over the course of our research, and (b) challenges faced by teachers in enacting the game-based learning pedagogy. The paper reports findings from three separate implementations of the Statecraft X game-based learning curriculum. We worked with four schoolteachers in two government secondary schools in Singapore.

Over the course of our work, the initial appropriation model evolved to include a 'teacher-identity' component that is strongly influenced by teacher professional development. Thus, our model developed into a process model of teacher development through reflective, reflexive guided appropriation. In the paper, we cite instances of tensions faced by teachers that are related to (1) sense of professional responsibility, (2) entrenched teaching habits, (3) questioning of deeply seated epistemological beliefs and values, (4) misalignments with conventional modes of assessing student learning. These tensions illuminate the somewhat unpredictable pathway of learning and development that teachers need to traverse and make sense of. Our findings suggest that, to the extent the development process was seriously dislocating and triggered a process of introspective reflection, it was also the most deeply transformational. Teachers who did not experience perturbation to their understanding and a deep sense of disequilibrium showed the least growth in terms of professional development. In general, teachers have to deal with complex personal issues, in addition to managing social and institutional factors, as they navigate the process of changing their teaching practice.

Keywords: appropriation, professional development, reflective, reflexive, scaling

Effective Citizenship Education Through Mobile Game Based Learning: The Statecraft X Curriculum

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Abstract: Educating for effective citizenship remains a largely elusive goal in schools. All too often, schools only educate students about citizenship. This outcome does not translate into the dispositions and capacities for active citizenship widely sought in students' post-school years. To address traditional weaknesses of citizenship education in schools, we developed and researched the Statecraft X curriculum in classrooms. Unlike learning about content related to citizenship, students learn governance and its relation to citizenship by enacting governorship, that is, by performing

governance. Performance is enacted through role taking in immersive game play on a mobile device—an Apple iPhone—and through dialogic conversations in the classroom, where students reflect on the significations arising from game play. Teachers facilitate these conversations and help students to "play between worlds" by making pertinent connections between issues arising in the game world and in the real world. They encourage students to be reflexive in their learning, directing them to the actions that they took in playing the game and thinking through the ensuing consequences. In this paper, we report an implementation of the Statecraft X curriculum in a Social Studies class attended by 42 15-year-olds attending a government secondary school. At the conclusion of the three-week curricular program, students wrote an extended essay related to governance that served as the summative assessment. They were asked to identify key issues of personal concern and to suggest how the government should deal with the problems highlighted. The essays of the intervention class were compared with those of a control class comprising 40 students who were taught governance using traditional instruction. Essays were evaluated on the basis of four criteria: (1) multiple viewpoints, (2) solutions supported by evidence and argumentation, (3) disposition of active citizen, and (4) persuasiveness. The results indicate that students of the intervention class outperformed those of the control class on all four criteria. Our findings suggest that the Statecraft X curriculum has efficacy in achieving the desired curricular learning outcomes. We discuss some challenges that teachers needed to work through and to resolve in order to effectively appropriate the understandings, beliefs, and dispositions essential to enacting the curriculum successfully in the classroom.

Keywords: citizenship education, mobile game, performance, dialog, learning outcomes

Pre-Service Teachers' Views on Using Adventure Video Games for Language Learning

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Abstract: The use of games in education has become increasingly popular. However, having the idea that games are merely for entertainment and full of violent/indecent content, many parents and teachers in Taiwan often consider game playing to be useless and even harmful to students. Thus, games are not welcomed in various educational settings. If Taiwanese teachers hold a more positive attitude toward video games, it is more likely for them to incorporate game-based language learning (GBLL). To change teachers' stereotypical views toward the value of video games for language learning, it is essential to first allow teachers to explore the potentials of GBLL. In this study, we first introduced GBLL to 20 pre-service teachers in one computer-assisted language learning (CALL) course, and asked them to play a commercial video game Back to the Future for 12 weeks. The video game is based on the story of the famous movie Back to the Future. In the game, the player controls the leading character, Marty, to explore the 3D environments using either the keyboard, mouse or game controller to move around. The pre-service teachers were allowed to play the video game for one hour each week. After 12 weeks, all the teachers were asked to write a formal evaluation report discussing how they feel about using adventure video games in English learning. After carefully analyzing the reports written by these teachers, we found that these pre-service teachers showed very positive attitudes toward the video game and also identified several reasons why games could be an attractive and motivating tool for second language learning. As for language learning, teachers observed that video games can be very useful for vocabulary, listening, and reading development, and can even enhance students' logi-

cal thinking and reasoning abilities. They, however, pointed out that the game is limited in developing speaking and writing skills. Teachers also expressed their concerns over the following issues: 1) Game design and content for ESL learners, 2) the financial support needed for implementing GBLL, 3) the teaching and learning strategies required for implementing GBLL, and 4) the learning gains achieved through GBLL. The research findings of this study provide game researchers several possible research directions and also offer valuable suggestions for school teachers who intend to incorporate video games in second language teaching and learning.

Keywords: game-based language learning, adventure video games, ESL, pre-service teachers, perceptions

Mastering Technology for Greater Autonomy: Device Familiarisation for Older Users via Games

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Abstract: Technology is all around us, and many technologically enabled devices are not well used or understood. A case in point is that of kitchen appliances. The basic tool for familiarising oneself with these is via manuals, although in practice people also learn by watching others, by asking for advice from friends and relatives, and by trial and error. When people cannot learn in this way, the only resource is the (paper) manual, which is rarely motivating. Teaching and familiarisation techniques need a way to overcome this inadequacy and engage users' attention, whatever their knowledge, background, or abilities. Ideally they should entice and motivate users to learn the paradigms and operating procedures of any device. This paper describes an attempt to introduce game design elements into the familiarisation process; as well as gamification layers; and for the manuals themselves follow the example of games, whose stand alone manuals have become "re-mediated" into in-game tutorials and instruc-

tions. Integrating the manual with the use of the device, which is technologically feasible, could offer a way to motivate users to become more proficient with domestic appliances. Simply put, using the device, and having fun doing so, rather than experiencing frustration and uncertainty, could aid in achieving the goal of understanding and using the device and its functionality more fully. The task of device familiarisation, although mundane, is not trivial. The importance of being autonomous in the home, that is, being able to prepare food and to carry out basic domestic chores, does not relate only to satisficing bodily needs, but to social functioning and self-esteem, and this is especially important for older people. Moreover, this approach could be generalised to other technological devices, beyond kitchen appliances. Designing the interaction experience to be attractive and engaging, by using game properties, could offer a new worthwhile approach to this problematic situation, and be of interest to the field of games based learning.

Keywords: games, gamification, in-game learning, manuals; domestic appliances, device familiarisation

Collocated and Situated Learning Game Design

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Abstract: Learning Games are mainly based on scenarios involving artificial situations inspired by real situations. We propose, in this article, the use of ubiquitous computing in mixed reality to overcome the artificial situation of the problem, by recontextualization of problem knowledge and a communication centered solution. In the Mixed Reality paradigm, the use of mobile devices and tangible interfaces is an original solution for merging digital and physical worlds. In this context, mixed reality technologies are responsible for collaboration, and provide users with better feedback by redefining digital data as information and control support of the physical world. However, technologies introduction increase complexity of the design already complex. The challenge is to combine learning usefulness of

the pedagogical tool, motivational features from game principles, and advanced environment and technics from HCI to build a collocated and situated physical and numerical learning environment. Furthermore, in the Learning Game design, we can observe a lack of tools supporting the learning game design and development process as a whole. To solve this problem, we propose a design process based on the MDA (Model-Driven Architecture) approach, allowing us to explicate Collocated and Situated Learning Game Architecture and tools supporting LG production. These tools proposed are in charge of defining software behavior and appropriate user interfaces. We expect our proposal to help advance Learning Game design, and ultimately decrease LG production cost and increase their widespread use. This paper provide state-of-the-art of collocated and situated collaborative situations with some proven positive research outcomes, after which we present our approach of the design of Collocated and Situated Learning Games based on a process, a model and associated tools to support it completion. We illustrate our explanations with a concrete example of CSLG design.

Keywords: learning games, collaborative games, mixed reality, pervasive and ubiquitous computing, supporting user interface

Scripted Collaboration to Guide the Pedagogy and Architecture of Digital Learning Games

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Abstract: With the advancement of digital technology game playing emerged as an important learning generating experience and attracted significantly the interest of the educational community. However, current research strongly emphasizes the need for game-relevant pedagogical approaches that foster learners' essential knowledge construction and development of transferable skills. From another perspective, during the last twenty, or so, years technology-enhanced learning has witnessed the advent of the computer-supported collaborative learning (CSCL) domain. Col-

laborative learning refers to a variety of educational practices in which peer interactions are considered as the key factor in learning, while the term “computer-supported” refers to using technology tools to facilitate, support and guide interactions among both remotely located students (online interactions) and/or co-located students (face-to-face interactions). Relevant research stresses the fact that freely collaborating students usually fail to engage in productive learning interactions when left without teachers’ consistent support and scaffolding. As a remedy it has been proposed that teachers support learners by implementing specific didactic scenarios (collaboration scripts) which trigger and guide peer interaction. Collaboration scripts aim to engage students by providing explicit collective workflow description and guidance (for example, by assigning student roles) during the collaborative activity. This work suggests that scripted collaboration offers a promising pedagogical framework for efficient game design and game-based learning. To substantiate this claim the paper first reviews recent studies which integrate elements of scripting to guide learners in their game-based activity, analyzing the beneficial impact of scripted game play and also the conceptualization and reification of the scripting method in these specific cases. Furthermore, the paper introduces a framework for the integration of collaboration scripts in game-based learning, following a twofold perspective: (a) a pedagogical perspective, which principally analyzes the key implementation issues of the scripting method as a pedagogy that aims to enhance game-based learning outcomes, and (b) a game-design perspective, focusing on the specifications of necessary software components that support scripting within the general architecture of digital games. Overall, this work objective is to provide arguments and trigger considerations toward building a conceptual framework and software specification schema for the fruitful integration of collaboration scripting technique into game-based design and learning.

Keywords: scripted collaboration; scripted gameplay; game-based learning; learning game design; game architecture

Combining Game Based Learning with Content and Language Integrated Learning Approaches: A Research Proposal Utilizing QR Codes and Google Earth in a Geography-Based Game

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Abstract: The increasing use of computer games has motivated researchers to explore ways of integrating them in education. Game-Based Learning (GBL) provides learning approaches that better correspond with current students' requirements or habits and, as a consequence, engage students in the learning process. In this paper the GBL educational approach is combined with that of Content and Language Integrated Learning (CLIL) within the context of an educational geography computer game, utilizing QR Codes and Google Earth for teaching English Language to Greek Primary School students. This integration provides a motivational and cognitive basis for language learning, since it represents a meaningful, contextualized activity and on the other hand, gives students the chance to expand their cognitive skills and use more sophisticated language. CLIL is believed to help students improve specific language terminology, enhance students' intercultural communicative competence and foster implicit and incidental learning by centering on meaning and communication. QR codes were selected, as their low creating and reading technical barrier makes them ideal educational tools for innovative educators. The purpose of this treasure hunt – like game is to observe and enhance the learning strategies that students use while learning a foreign language. The proposed game immerses 10 to 12-year-old students in problem solving challenges regarding the use of geography in realistic contexts. In attempting to solve these problems, students must engage in collaborative work by following hints, provided by QR codes images. These images are embedded as pinned signs on Google Earth. By reading and decrypting them, the students are led to web pages with information and context-aware learning material, neces-

sary for distinguishing the next “stop around the globe” with a QR code image. Additionally, the students are required to fill in work sheets, thus keeping a journal of their “journey” while producing text based descriptions of their thoughts, written in the foreign language. The aim of this paper is to present an innovative approach for enhancing teaching and learning outcomes, as it suggests how Content and Language Integrated Learning can be successfully enacted through a geography game-based learning environment.

Keywords: QR codes, Google Earth, CLIL, language learning, GBL

Supporting Cognitive Adaptability Through Game Design

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Abstract: Adaptability is a metacompetency critically important to the United States Department of Defense and is considered a key component of 21st Century skills by the U.S. Department of Labor and the U.S. Department of Education). Video games are seen as learning environments supporting the acquisition of 21st century skills. Can games, then, be used as components of an effective learning environment that support the development of adaptability? Initially this paper describes the metacompetency of adaptability. Next is how adaptability can be functionally and discretely measured by focusing on its most granular or micromomentary level which we describe as cognitive adaptability. Finally, the authors examine both the nature of cognitive adaptability, interventions that support its development, and how those interventions might be translated into game design features. Toward this end, the paper will also discuss how these features are exhibited in a popular commercially available video game and how it could be employed to test the hypothesis that a play frame of 12 consecutive hours, using a video game meeting the design criteria and example previously discussed, will increase cognitive adaptability in the players.

Keywords: adaptability, cognition, cognitive adaptability, games, serious games

Assessment Integration in Games-Based Learning: A Preliminary Review of the Literature

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Abstract: Games-based Learning (GBL) is developing a reputation with some educationalists as a useful supplementary approach for teaching and learning. Two important issues for GBL application developers and educationalists are how the learning is actually assessed within a GBL environment and how assessment is integrated into a GBL application. This paper presents the preliminary results of a systematic literature review on assessment integration in GBL and highlights the state of the literature in this area by outlining important papers to act as a guide for educationalists tackling this important issue. This paper defines assessment and discusses formative and summative assessment and embedded and external assessment, but is primarily interested in integrating assessment into games-based learning applications. A discussion of traditional assessment approaches and assessment approaches in GBL are presented. Finally the paper presents the preliminary findings of the literature review and proposes a model/framework for educationalists to incorporate assessment into a GBL application.

Keywords: games-based learning, assessment, assessment integration, assessment model, assessment framework

"The Hunt for Harald" - Learning Language and Culture Through Gaming

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Abstract: "The Hunt for Harald" is an online, interactive language and culture training system for Danish in the serious games category. It combines

speech recognition with a virtual world and elements of game play for learning purposes. It allows the learner to navigate the virtual world and talk to the local population, who respond if they understand what the learner is saying. The ultimate goal of the game is for the learner to locate Denmark's birth certificate, the Jelling Mound and talk to the King who erected it, Harald Bluetooth. The platform is developed in cooperation with Alelo Inc. (www.alelo.com) and modeled on their Tactical Language and Culture Training Systems (TLCTS) (Johnson, 2006), which have hitherto primarily been used to provide military and civilian personnel with language courses for Arabic and Afghani, although other sectors and languages are quickly joining. The aim of the platform is to teach Danish language and culture, especially pronunciation and conversation, to the 45.000 immigrants taking Danish lessons every year, with the explicit purpose of reducing the annual cost of approximately 150 million euro. The platform has been tested on roughly 250 students at three language centers around Denmark from October 1st 2011 through March 31st 2012. The aim of the current article is to describe the platform itself, the study which was conducted and final results of the evaluation. The results showed that not only could the platform take over up to 20% of the in-class hours, students and teachers also enjoyed working with it.

Keywords: simulation, serious games, speech recognition, immersive, language, culture

Using Social Media Technology as an Educational Tool

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Abstract: In an educational context, third level institutions utilise simulations to educate doctors and dentists but to date social gaming has not been widely applied as a learning aid for Business Graduates. Based on the premise of social network analysis, social business gaming will, through real world problem-solving, enhance the learners logical reasoning, numeric abilities and spatial thinking. Both the environment and problems are developed to adapt to suit any course from conducting research to proposing business solutions. This study was undertaken in order to cre-

ate and facilitate social business gaming, which allowed students to measure their performances of understanding as part of their ongoing learning assessment. The online business game required students to apply what they have learned to problem situations and to further develop their understanding of a topic/s. The problems posed required that the learners had to prove that they understood the material being taught and could apply what they had learned in an online environment. Additionally, the ongoing assessment component of the gaming network was used not just as an assessment for grades but also as a learning tool. The online environment used in this study adhered to an ongoing assessment process, which clearly outlined the criteria of the game allowing students to both collaborate and compete against their peers in a series of challenges. This study focused on a group of final year undergraduate students. The online game was utilised as part of the continual assessment process to evaluate group interaction and learning in an Information Systems (IS) security assignment.

Keywords: social media technology, social business gaming, online environment, student assessment and learning

Educational Video Games Evaluation: An Approach Based on the Educational Playability

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Abstract: Educational video games (EVG) provide a rich platform to improve Player Experience (PX), and constitute some of the main edutainment applications currently in the market. However, the evaluation of video games as educational tools is very difficult due to their dual nature (fun and education). PX (as an usability measure) is a very important aspect of the EVGs, and a good measure of the level of fun and education presented to players and determines, to some extent, the success of an EVG. Educational Playability (playability in EVG) attributes have been proposed as a suitable and effective tool to analyze and measure the experience ob-

tained by a player during a game. Accordingly, the development of the EVGs involves the need to evaluate their playability, and measure the PX of the designed EVGs. In this paper we propose a new method for evaluating EVGs based on the use of the playability and its characterization, which measures the degree of success in developing the PX and the degree of success in integrating the learning model in video games. This evaluation method consists of three dimensions: the balanced structure between the contents of EVGs (fun and learning), educational playability facets and the learning process included in the game, which play an essential role in the development of PX in EVGs. Also, the proposed method uses several evaluation techniques (heuristics, cognitive walkthrough, tests) that have been defined to evaluate the proposed dimensions. These techniques cover general issues of playability in EVGs such as mechanics, challenge, fantasy, etc., and they ensure the success and quality of the learning process. In this method many types of evaluators (designers, educators, and players) are involved in the evaluation process, which will be useful for giving good results. Our objective of using this approach is to ensure a good playable-learnable video game, with a high degree of acceptance among end users.

Keywords: heuristics, player experience PX, playability, playability evaluation, educational video game EVG

Story-Telling and Narrative Methods With Localised Content to Preserve Knowledge

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Abstract: In today's globalized age, there exists the risk that individual cultures and customs could lose their importance and identity. This paper explores the notion that the traditional method of passing down knowledge from one generation to the next through story-telling could be enhanced in a more engaging ways using ubiquitous mobiles and computer technologies. This paper focuses on the importance of story-telling and narrative methods, which are also common in the Iban culture, and their relationship to a game-based intervention. Specifically, a pedagogic approach utilising a narrative-based method is employed. This method correlates the cultural content and game technology development based on the Cultural Technological Pedagogical Content Knowledge (Cu-TPACK) framework. The content knowledge component of the framework used for promoting cultural awareness would include key elements of cultures which are symbols, rituals, heroes, values and man's relationship with a god/deity, nature and people. The pedagogical knowledge component includes methods and strategies to promote and encourage understanding and respect of the culture. With the advancement of game technology, games can be initiated for learning cultural awareness. Game-based learning (GBL) implies self-learning abilities and allows transfer of learning from other cultures. The aim of integrating GBL and cultural elements is for knowledge preservation on culture.

Keywords: games, narratives, story-telling, culture

Exploring the Educational Perspectives of XBOX Kinect Based Video Games

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Abstract: This paper will argue about the educational use of the Xbox 360 Kinect technology as an innovative tool for learning and interaction among users. Kinect is a motion sensor, implemented by Microsoft for the Xbox 360 video game console. The device provides a natural user interface that allows users to interact without any intermediary device, such as a controller. The Kinect system identifies individual players through face and voice recognition. Video games should draw educators' attention as they provide them with new, more powerful ways for teaching in schools, communities, and workplaces—new ways to learn within the new information age. The Kinect sensor introduces two innovative characteristics: a) motion sensing which captures gestures and voice, and b) Xbox LiVE. The former has the potential to enhance Kinesthetic learning and the latter the potential to increase the online interaction and communication among users. This paper will categorize some of the available Xbox Kinect and Xbox Kinect LIVE games, considering their implication in education, so as to enhance teaching and support learning. For instance, DePriest & Barilovits (2011) outline two interesting learning opportunities via the Xbox LIVE with Kinect, the Video Kinect and Avatar Kinect. The important feature in these cases is that both can host synchronous or asynchronous conferences or classes and achieve high engagement, interaction and communication among users. This paper will focus on an instructive approach on the educational use of Kinect games, thus providing a categorization. Several commercial Kinect video games could be exploited by educators for teaching and practicing math, language or social skills. The drawback is that often teachers do not know how to evaluate a game in order to achieve creative and active learning. So, some of the most popular Kinect games will be analyzed and evaluated, regarding the opportunities they provide for implementing effective learning activities for enhancing the learning outcome.

Keywords: Xbox 360, Kinect, game based learning, categorization

eedu Elements: A School in a Game

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Abstract: This paper focuses on the theoretical and technical backgrounds on eedu elements game development project, which goal is to build Finnish elementary/primary school into a game that lasts six years. The fundamental background for eedu elements is, that globally we need school that can be exported anywhere and it is not bind into buildings. This is simply because 1) there is no possibilities for building school infrastructure with teachers for all developing countries. However there are good mobile data networks and high smartphone/tablet ratio. 2) in western countries, there are a lot of kids who are outlayers at school but would do well in different learning context, e.g. in games. 3) Games can give teacher more opportunities to support and coach the pupils than most content.

Keywords: learning, school, games, education mathematics

Using Immersive Virtual Environments to Assess Science Understanding: The Impact of Contextualization

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Abstract: High stakes tests are currently the standard for assessing whether students have learned the content. Yet, the validity of these as a primary, and in some cases sole, measure of students' learning has been called into question. Creating a science test that goes beyond testing isolated facts by assessing content and inquiry skills within a situated context is needed. This paper reports on the design and implementation of an immersive virtual environment-based science assessment, SAVE Science, for middle grade students of 12-14 years of age. In this study, we look at the impact of embedding test questions within a given context on student abil-

ity to show understanding. In a comparison between situated and non-situated multiple choice questions, students were more likely to answer questions correctly when they were contextualized. Further, we found that the format of the test was crucial for nearly half the students with 22% of the students only able to show their understanding in the contextualized, immersive virtual environment version. For these students, context is crucial and harmfully missing from the vast majority of tests. Providing students with both traditional multiple choice questions and ones such as those embedded in IVEs could permit a larger set of students to convey their science understanding. These promising results provide initial evidence that situating assessments in immersive virtual environments can play a role in improving standardized, high stakes assessments.

Keywords: virtual environment, scientific inquiry, assessment, situated

Towards Creative Pedagogy: Empowering Students to Develop Games

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Abstract: Due to social, economic, and technological changes in our society creativity is nowadays seen as basic survival and success factor. Thus, innovation, creativity and production of media should be emphasized also in the school of the future. However, current schooling system tends to produce consumers of media instead of creative problem solvers, critical thinkers, and producers of media. At this point also educators and policy makers should be creative and introduce innovative learning solutions and practices that support the development of creativity and 21 century skills. This paper replies to this call by considering learning by developing games as one of future learning strategies. Learning by developing games is not totally new idea, but the research has only begun to explore the possibilities that this pedagogical strategy provides. In this article we introduce a new game authoring environment MAGOS that is developed according to the framework of creative pedagogy. The framework of creative pedagogy

comprises of three interrelated elements of creative teaching, teaching for creativity, and creative learning. From these three elements we derived eight design principles that guided the development of MAGOS environment. MAGOS supports creative teaching practices by providing different tools for planning and for teacher participation. Teaching for creativity is supported by offering an imaginative and innovative learning environment and tools with which a teacher can support students' creative and constructive processes. MAGOS include multiple elements that promote students' collaborative game development that is supposed to enhance co-creation of knowledge. MAGOS requires a joint effort for game development and enables building on each others' ideas through sharing and remixing other students' existing work. MAGOS also provides a tool that helps students to generate novel ideas for their joint game development.

Keywords: creative pedagogy, game design, game-authoring, learning by doing, game development, pedagogical

Measuring User Experience in Tablet Based Educational Game

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Abstract: In this paper we summarize first findings from eedu Elements user experience studies. eedu Elements is a game that brings the whole Finnish maths curriculum (primary school) available for players all over the world and it is optimized for tablets and smart phones. The game is based on teachable agent approach, which means that in the game students can teach skills to their game characters. Research focused on evaluating the implementation of the game and exploring player's attitudes about the game. The participants were Finnish (N = 43) and Ireland (N = 22) primary school students. Group interviews, eye-tracking and observation methods were used to evaluate the eedu Elements game. In general, the game was experienced as good or excellent learning game in all the studied age

groups. The results showed that it took less than two minutes to learn how to play the game, but still the players were expecting to learn the gameplay even faster. It seems that users demands are nowadays so high that learning curve should be very steep. Thus the easy of use can be regarded as one of the crucial aspects influencing on diffusion of new game based solutions. Furthermore, the eye-tracking results indicated that players' perception patterns varied a lot and some players even missed relevant information during playing. The results showed that eye-tracking can provide important information from the quality of the game design and this information can be used to improve game's user interface and gameplay. 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 such like retrospective interviews.

Keywords: game, learning, usability test, eye-tracking, user experience

Towards Social Serious Games

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Abstract: Serious Games for Learning provide a pedagogically thoroughly designed game play experience. Still players need to pause the game when they are stuck with a misunderstood game quest and seek for help in less structured sources like online bulletin boards or in a talk with other players. The knowledge exchange about approaches to game quests, the game play personalization and interactivity can be enhanced by adding Social (Game) functionality to Serious Games. User-generated content is then provided to other players in game and solutions can be discussed and assessed (Peer Education concepts). The proposed middleware GENIUS provides game developers with the methods to use Peer Education concepts for Knowledge Sharing in Serious Games.

Keywords: Serious Games, social games, knowledge exchange, online social networks, peer education

Information and Communication Technology in Greek Primary Schools: A Pilot Application

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Abstract: The rapid development of Information and Communication Technologies has introduced new opportunities in the learning process, as they allow the use of the new digital tools for the representation of knowledge and the active participation of the learner. The need for the implementation of educational programming environments that could enhance the self-acting, the collaboration and the active participation between the students, as well as their creativity and imagination, exists within the educational community. The presented research project, was held on the notion that KODU software could be used in order to help pupils to familiarize with basic principles of programming. The specific programming environment is a teaching tool addressed to pupils that come in touch with a language of visual aspect oriented programming for the first time. Its significance in the learning procedure is evaluated in real class conditions as a group of 25, from the sixth grade, pupils were introduced to the KODU software and asked to create a digital game as part of their participation in an official innovating Environmental Educational Program entitled: "Environmental Routes". The main objective of the pilot research project is to introduce the students to the basic principles of object-oriented programming, and to assess the satisfaction and interest generated through the creation of a specific technological product.

Keywords: MS KODU, visual programming, educational programming environments

Design and Evaluation of a 3D Collaborative Game to Support Game Based Learning

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Abstract: The purpose of this paper is to present a detailed and comprehensive design and evaluation of a 3D collaborative game using the OpenSim virtual world platform. The aim of the game is to develop the collaboration skills of the students, give them a new perspective of knowledge acquisition, combine fun with learning and give teachers a new and innovating educational tool for the learning process. The evaluation results are very promising, as far as the students are concern for two reasons: a) because they believe that the virtual game activity improves the effectiveness of the knowledge acquisition and b) they recommend the addition of such activities in educational programs.

Keywords: 3D game based learning, digital game based learning, serious games, simulated environments, OpenSim

Challenges to Develop an Interactive 3D Virtual World for Psychological Experiments

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Abstract: This article is a case study which discusses the implementation of a 3D virtual environment that will enable psychology students to conduct

experimental investigation for the testing and analysis of models and theories relating to operant conditioning. Teaching and learning in psychology focuses on how people think, feel, and behave. Students must learn to use scientific methods to collect data from participants, and then analyse the data to testify related models and theories learned in the classroom. Experiments may be performed to study at different levels: individuals, groups, organizations, and communities. In the real world there are limited opportunities and various challenges for undergraduate students to be involved in experimental investigations. 1) There are difficulties recruiting participants. This often results in the use of convenience samples consisting of undergraduate students. The problem will compounded in campuses with a low student population and a limited variety of participants resulting in small sample sizes or skewed samples which can makes statistical analysis meaningless. Alternatively a lecturers may provide a dummy data sets for analysis. In this situation students do not practice appropriate experiment design nor learn to administer surveys for data collection. 2) There are difficulties conducting longitudinal studies relating to reinforcement or induced behavioural changes due to time limitations. This is essential for some theories and models such as developmental psychology which may require longitudinal studies over many years. 3) It is risky to allow undergraduate students to conduct experimental investigation on human subjects. These issues may be addressed through the use of a virtual environment which will allow students to explore a range of psychological phenomena without the need for close supervision required when dealing with human subjects. A range of simulation software is currently available to simulate learning behaviour and experimental design, but none is suitable for scalable psychological studies. It is proposed that a single-user virtual environment or multi-user virtual world can be created for this purpose using intelligent agents and 3D avatars with physical, physiological, and emotional responses. This would allow students to interact with avatars, participate in the virtual world to conduct experimental investigation, and collect and analyse data. A prototype virtual environment currently under development for the teaching of experimental design and learning theory in psychology is discussed. When conducting investigations, students will provide rewards/punishments to induce changes to an avatars' behaviour. For example, an avatar that is rewarded for engaging in a behaviour will have a higher probability of displaying that behaviour in the future (operant conditioning). If an avatar is punished it will be more likely to decrease that behaviour. This virtual environment

will enhance student's learning experience in research design and analysis, and provide the ability to perform research that would be difficult or impossible to conduct in undergraduate psychology subjects run over a single semester. Future research proposes the addition of physiological and emotional responses, incorporating more complex learning algorithms, and extending the virtual environment into a multi-user virtual world.

Keywords: intelligent agents, virtual world, learning, reinforcement, research design

Educational Games for Self Learning in Introductory Programming Courses - a Straightforward Design Approach with Progression Mechanisms

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Abstract: During the relatively short history of Computer science and programming education, the pass rate has been low in most introductory programming courses at the university level. Students taking courses have had severe problems in the understanding of how to construct algorithms and also with the use and implementation of basic programming techniques. There are identified bottlenecks in theoretical concepts, but there have also been problems with the solving of assignments and more practical parts of programming courses. Educational games aimed at teaching programming have frequently been discussed in academic research during the last years. There have also been a few attempts at developing educational games with the objective of teaching basic programming concepts but most of them are in our opinion either too complicated with the target audience being experienced gamers, or that they are oversimplified to suit younger students. Although games designed specifically for learning have proven to be most efficient, an objection has been that they are too expensive. What features are really needed to engage students in a programming game? Do we need to make games that resemble the gaming

industry's high end games at a cost of 20 to 30 million Euros per title in order to motivate students in university courses? The aim of this paper is to describe and discuss the development and evaluation of an Educational game prototype for programming courses at university level. A qualitative approach with semi-structured interviews has been used in the evaluation of the prototype. This study evaluates an approach using different progression mechanisms to attempt to motivate the players along with a straightforward narrative that situates the learning of various programming concepts. Players get various programming missions on different levels to solve in different Swedish cities. After a completed mission players get virtual money for their work with code solutions in the Python programming language. After completing some basic programming jobs in Sweden the player will get access to higher levels where more advanced programming techniques are required for solving programming missions outside of Sweden. A game prototype has been developed in the Flash development environment using the *ActionScript* programming language. Findings show that the game could help students to improve their programming skills and our recommendation is that educational games should be used for self learning in introductory programming courses. Straightforward progression mechanisms seem to increase the players' motivation but if the unlocking mechanisms in the game could appear more randomly and non-linear it would make the playing more exciting. The described prototype is, because of database dependency, not that easy to distribute in programming courses. An improvement would be to adapt the game for use in the *Moodle EduGame module* and have the gaming as a voluntary extra activity amongst others in programming courses given in the Moodle virtual learning environment. However, different students have different learning styles and educational games are not a solution that will solve all problems in programming courses. There are also students that do not even like the idea of replacing the traditional learning material with game playing, but as a complementary tool for self learning we find the described approach promising. We also claim that this kind of game can be developed without the 10 million euro budgets that often are the base today for development of commercial computer games.

Keywords: educational games, game-based learning, programming, eLearning, edutainment, python, programming games

Standardised Training Simulations: A Case Study of the Water Industry in Australia

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Abstract: This article is a case study which discusses how a realistic game-based simulation training platform may tackle the challenges raised by the requirements for a national competencies certification framework and the requirements of a new generation of trained water operators. The proposed platform aims to 1) enhance training experience with learn by doing and scenario- based learning experience, 2) increase training capacity for the water industry, 3) provide cost effective methods to deliver training in remote areas, and 4) attract young people to join the water industry workforce. The National Water Commission of Australia is currently developing a national competencies framework for certification of water treatment operators. This framework aims to ensure that the water operator role is carried out by qualified staff. In response to the introduction of this new competencies framework, there will be an increase in demand for skills training in the water industry to ensure that employees at water treatment facilities possess the required certifications. Currently, the water industry is facing several challenges to meet the future training demands required by the new competencies framework. The lack of standardised training manuals and assessment criteria make it very difficult to ensure that training is consistent between different water treatment facilities. Australia is an immense country with sparse distribution of population centres and large distances between towns, which create an insurmountable problem for delivery of training. In particular, for rural areas, there is a substantial lack of trainers available to deliver training. Travel expenses and loss of work days for travelling makes training a very expense exercise. Also, the water industry is facing an ageing workforce with an average age over 45. There are less than 5% of trained water operators under 25 years of age. With the ever increasing technological advancements being introduced into the water industry, a new generation of water operator who are technology savvy are required. In response to these problems, a realistic game-

based simulation training platform is being developed for water operator training. The pilot training module focuses on the collection of water samples. This particular task was chosen as it is a statutory requirement for the industry to perform water testing at regular intervals and it is a critical factor in the quality assurance process. It is also important as thousands of dollars can be wasted on each contaminated water sample. During the development of this training application, several technical challenges were encountered. The challenges include rendering of realistic water, simulating physics for small objects, and using two handed controls for object manipulation. Future development of this training platform will also be discussed.

Keywords: skill training, serious game, action learning, experience learning

Towards the Constructive Incorporation of Serious Games Within Object Oriented Programming

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Abstract: Object oriented programming (OOP) is a complex domain in the education field and requires proper technological underpinning for the facilitation of the process. However, the vast variety of available programming environments makes the selection of the most efficient technology that will cover students' needs and will lead to the teachers' desired learning outcomes a significant challenge. These technologies, such as Educational Programming Environments and Programming Microworlds, are often applied on OOP courses in order to underpin the process and help students develop internal incentives, thus foster the feeling of challenge, curiosity, active control and imagination. However, students of the 21st century are growing up in a fully digital world and therefore learn and react accordingly. Alongside the growth of the Internet, high speed access and virtual communities have contributed to a new trend development called online gaming. Therefore, computer games can be considered an appropriate means to deliver knowledge to students of most courses and increase their motivation to learn. A term that is often used when referring

to computer games incorporated in the learning experience is “serious games”, and they can involve one or multiple players. Serious games have a higher learning value when they are used in courses that consider critical thinking, group work and decision making as essential to be developed. Therefore, it is the paper’s initial intent to examine representative examples of commonly used technologies in OOP education and to derive their most prominent features that support students’ successful learning experience. To this end, we carry out a theoretical research of the literature regarding Educational Programming Environments and Programming Microworlds in OOP education, as well as serious games in OOP or in computer programming in general following a concept-centric methodological approach. These concepts consist of the most prominent functionalities supported by representative technologies in the three categories. This leads to the conclusion that even serious games can enable and foster the development of skills and personal characteristics through the underpinning of group collaboration towards the motivated fulfilment of given tasks within highly interactive environments that simulate worlds and situations.

Keywords: object oriented programming; educational programming environments; microworlds; serious games

Making Games and Environmental Design: Revealing Landscape Architecture

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Abstract: This paper features results of two pilot studies (courses) that are part of an ongoing investigation about making games to foster good contemporary learning, challenging traditional environmental design education to embrace games as a means to inspire better teaching and learning, and contributing to the general lack of investigation of video games in environmental design education. There is much written about the potential and value of video games in education. But little has emerged from academia to address the impact of video games on environmental design education, in landscape architecture or any other related design discipline.

This paper reveals design processes and products from an immersive, interdisciplinary, Landscape Architecture (LA) elective course on game design. The thesis here is that making games, through application of Constructionist theories in a studio-based setting, can provide a creative outlet where environmental design students can learn more and differently about a given or chosen discipline. Results suggest that designing and making games in the context of such an environmental design curriculum has great potential to stimulate traditional pedagogies and foster student learning, provide an enriched venue for students to learn about a unique discipline, and make teaching and learning more fun, meaningful, and memorable. Both pilots resulted in some excellent game-making and learning experiences, and unique video game prototypes. The evidence is encouraging that game design has educational value in environmental design disciplines and is a legitimate direction for further study.

Keywords: constructionism, environmental design, games, landscape architecture, learning, making

Behavioral Evaluation of Preference for Game-Based Learning Procedures

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Abstract: Recent research has studied game mediated learning and its motivational function. Educational games must maintain their educational function retaining clear definitions of the teaching objectives and instructional methods. This paper evaluated the impact of a game on a reading instructional procedure that has been successfully applied in Brazil. Two matching-to-sample teaching tasks were tested on 19 children in literacy ages. In the condition of standard teaching, only the matching-to-sample tasks were presented. In the game-based condition, the same matching-to-sample tasks were interspaced with game challenges. A behavioral choice procedure indicated the participant´s condition choice. After learning 15 words, the participants responded a computerized version of the Learning Motivational Scale of Basic Education, which identified the intrinsic and extrinsic motivational factors. Results show no motivation and reading

scores correlation and validate the choice procedure as reliable predictor of preference.

Keywords: game-based learning, preference assessment, motivation; literacy

Authoring and Re-Authoring Processes for Educational Adventure Games

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Abstract: Educational Adventure Games attempt to combine positive features of the adventure game genre such as captivating story lines, interesting puzzles and character interactions with educational content. While this approach is promising, analyses of the production processes of typical educational adventure games show that the required interaction between technicians and domain experts introduces delays and higher costs. In order to alleviate this problem, authoring tools unifying these actual processes and practices can be created. This paper describes the application of the Serious Game authoring tool StoryTec to educational adventure games and the insights gained during re-authoring of an existing commercial educational adventure game. The main contribution of this paper is the demonstration of the elaborated authoring concept by re-authoring an existing educational adventure game, showing the resulting increase in adaptability, extensibility, maintainability as well as the provided level of user support for the groups involved in the creation of such a game. This includes the mapping of previously less structured game content into the structures provided by StoryTec and the application of interaction templates to create the original gameplay found in the game. Thereby, this allows not only extensions to existing games, but to create new educational adventure games with similar designs at lower costs and higher impact at the same time. A focus-group evaluation of the authoring tool carried out with game designers and developers partly involved in the original development of the re-authored game shows the interest in and the feasibility of such an approach.

Keywords: authoring tool, digital educational game, adventure game

Game-Based Language Learning for Pre-School Children: A Design Perspective

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Abstract: During the last decade there has been a growing focus on pre-school learning within education, especially with regard to the learning of basic literacies such as reading and writing. In addition to this many nation states increasingly focus on the basic literacy competences of the information society, ICT and English. This has, as suggested by for instance Scanlon and Buckingham (2004) boosted opportunities for the sale of educational material and hardware to children for home learning, but also for learning material that links content directly to the curriculum, to school work and to assessment. This paper will focus on the design of learning material for pre-school teaching and learning through the example of a game-based platform for learning English called Mingoville.com. Mingoville has been studied in connection with the project Serious Games on a Global Market Place (2007-11), where a number of games were followed into classroom environments across nations. Currently, the developers of Mingoville are working on a platform version that targets preschool learners and works on tablets as well as pcs and smartboards. The paper will discuss the implications of redesigning the platform for pre-school teaching and learning and how this affects game-based language teaching and learning with Mingoville.

Keywords: language learning, game-based learning, design for preschool learning

Learning Game 2.0: Support for Game Modding as a Learning Activity

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Abstract: When we talk about video game, we observe that people who modified it are those who best know its content. Thus we can consider game modifications as a way of knowledge appropriation. In this paper, we apply this model to learning games, positioning the research project in a Web 2.0 approach. If the content of a game can be learned by playing it, it can be more deeply understood by making this game evolving. The Web 2.0 is not defined by its technologies, but by the way of using it. However technologies 2.0 are developed to catalyse this participative way of use. Similarly with video games, specific tools and support are required. If they are simple enough to use, learning by game modding can be accessible to anybody without programming skills. In addition, game modding is a collaborative activity. Modders must be able to share their creations and to discuss their ideas. Thus, in our point of view, a game 2.0 environment is complete only if it allows users to play the game, to collaboratively modify it, and to share their creations. After an explanation of the game modding choice, we will present a model and a toolset for supporting such an educational activity.

Keywords: modding, game development kits, learning game 2.0, collaborative learning

An Inclusive Framework for Developing Video Games for Learning

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Abstract: Games are a type of vehicle with which society is changing at present-day. But how the games themselves will be changed by society, is an interesting question to ask for enhancing and initiating better design of games. As participation in gaming upsurges around the world and across a larger part of the population, it is obvious that games are not only an entertainment medium for children or young people anymore. Games can be used to accomplish different purposes for different groups of people in the society. Design and use of games for learning and/or educational purpose has been an important research field for several years. However, this research field is yet to deliver expected achievement and result, despite many efforts and resources put into it. Factors that are important to consider for designing a game that will motivate users to active involvement in playing a game for active learning, are crucial for the successfulness of the design of such a game. The design goal for educational games would be to produce games that motivate users and thereby achieve effective learning. This paper proposes a framework in which the parameters of what users want from a game are considered for the development of games for learning. The framework is based on the previous research and theory of Richard Rouse (2001), who defined different dimensions of game design in terms of learning. The proposed framework is important in order to investigate and assess the success of existing games used for learning. Also the framework can provide better understanding as a requirement engineering tool for game designers, who are to design games for learning and educational purposes in the future. The proposed framework was verified using a small quantitative analysis. It was found that, while some parameters of the framework indeed have significance for designing games for learning, there are additional factors that need to be discovered by further analysis and research to enhance the usability of the framework.

Keywords: games and learning, inclusive games design, inclusive framework for games design, educational computer games

The Serious Game Approach to Problem-Based Learning for the Dependent Learner

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Abstract: Cognitive sciences research has resulted in a greater understanding of learning thus causing a paradigm shift from fact-based learning to inquiry-based learning leading to a renewed embrace of Problem-Based Learning (PBL). In addition, the constructivist pedagogical approach to instructional design has also rekindled interest in Problem Based Learning. PBL is characterized by Problem stimulating learning; group work stimulating interaction and tutors facilitating it. There have been perceptions that PBL is meant for the independent learner (gifted) alone; it is unsuitable for young students in that the self-directed study component of PBL can be difficult for them. It could be argued that either Kiili's Problem-Based Gaming Model conception rests on these perceptions, thus the emphasis on reflective-thinking or the model is restricted to independent problem solving thus robbing children the chance of reaching their level of potential development through support from teachers and collaborating with more capable peers. Be it as it may, in contrast it has been revealed that the benefits of PBL represent valuable educational goals for all learners, not just for the gifted or independent problem solvers. Though reflection is an element of PBL, so is scaffolding. Scaffolding is based on the Vygotzkian Zone of Proximal Development (ZPD) concept which refers to the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers. Providing support for children (primary six) could be a daunting task, placing a high demand on the teacher's time considering the varied ZPDs. The aim of this work is to design a serious game framework with an effective scaffolding mechanism which can be fine-tuned to suit various ZPDs. This would be done to make teacher's support for Problem Based Learning less daunting in addition to engaging the children. This is

particularly important because the child stand to gain problem-solving skills and a positive attitude toward learning.

Keywords: serious game, fine-tuning system, problem-based learning, scaffolding, ZPD, peer-tutoring

Collaborative Serious Game as a Sociable Computer-Supported Collaborative Learning Environment

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Abstract: This study is part of a larger body of research that investigates the potential and challenges of designing and implementing 3D learning games for computer-supported collaborative learning (CSCL) in vocational education. In this study we focus on investigating a theoretically grounded 3D collaborative serious game, "Game Bridge", as a sociable CSCL environment. More specifically, we concentrate on learners' socio-emotional experiences with the game as a space for social interaction and collaborative activities. In practice, we investigate the level of perceived sociability and social presence in the collaborative serious game "Game Bridge" by using self-reported measuring tools. In addition, a comparison of the levels of perceived sociability between two different kinds of CSCL environments (synchronous multiplayer game and asynchronous virtual environment) is presented. The results of the study show that the game environment facilitated and supported socio-emotional processes, as well as the emergence of a confidential and stable atmosphere for group formation and functioning. This atmosphere further facilitates the emergence of social interactions and collaborative activities. In addition, the high level of behavioral involvement together with positively toned feelings towards teammates is a strong indication of the positive interdependence between group members; in other words, members had a reason to work together and this reason was positively toned. A comparison between the sociability of two different kinds of CSCL-environments revealed that the level of perceived sociability was largely higher in serious game setting than in the more tra-

ditional, asynchronous type of virtual environment. Thus, it seems that theoretically grounded 3D collaborative serious games can be interpreted as a very promising type of sociable CSCL environment.

Keywords: computer-supported collaborative learning, collaborative serious game, perceived sociability, social presence, serious game experiences

Integrating PBL Games Into a Graduate-Level Statistics Module

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Abstract: Much of the work in integrating problem based learning (PBL) into introductory statistics modules has concerned motivating the need, in an undergraduate cohort that lack the necessary experience of their subject area, for statistical techniques. University College Cork has recently introduced structured PhD programmes in which a module on statistics is available. Students on these programmes are mainly concerned with learning how to use statistics (e.g. developing good experimental designs, choosing an appropriate statistical procedure, interpreting statistical results in a scientific paper) rather than developing statistical theory. In a lecture-based approach the focus is on learning statistical concepts, not on the process of using statistics to solve problems and in particular statistical concepts are not integrated with discipline knowledge. A PBL approach enables students learn to identify areas where more knowledge is needed and these methods are suited to students who have the self-discipline to take active responsibility for their own learning. In this paper we explore the problems, solutions and effectiveness of introducing a PBL element into a graduate level module on statistics that has a mixture of traditional lecture, tutorial, laboratory and online elements. We introduce PBL through an online game, which allows the students to explore the consequences of different choices that would be open to a researcher (e.g. sampling techniques, experimental designs). We assess if PBL was conducive to cultivate students' learning ability, creativity and practical ability.

Keywords: problem-based learning, teaching statistics, statistical misconceptions

Let's go to the Movies! Learning Math Through Creativity and Role Playing

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Abstract: Math helps us in everyday life, intervenes in every scope of life, is used by everyone regardless of sex or age and defines every interaction we have, though not always evident. At school, Math is considered a course, usually repulsive to students due to the structured and strict thinking it requires. The teacher should use students' math experience as a starting point for organizing the educational process and not the typical math knowledge. After all, Math is not a summary of rules and techniques forced into the students by the teacher but a process of creating knowledge where students participate actively. Our project aimed at making a journey with the children through which they would apply math to everyday situations, such as going to the movies, solve actual everyday math problems and eventually love it by expressing themselves psychomotorly through role plays, while in the meantime gained knowledge in problem solving. We picked for our lesson plan a movie theater to combine entertainment and knowledge. We developed activities with a view to avoid limiting children in a strict classroom. Students split in groups and take up roles, i.e. the clerk, the usher, the audience, the salesman, the statistical services' employee. The activities involve figuring out mathematic strategies to solve actual problems such as purchasing film tickets and buying various beverages and snacks from the concession stands. Our goal was to motivate students to actually "do" math, not only attend the class. We envisioned students applying math outside the class making use of the knowledge they had gained in classroom. We tried to get students involved with every subject we tackled and eventually, make them solve problems and express themselves literally through the situations they had experienced. Students were asked to show team spirit, depict their imagination and enhance creativity and judgment with a view to develop actual problem solving while they gathered knowledge through role play.

Keywords: movie theatre, role playing, realistic mathematics

ScenLRPG, a Board Game for the Collaborative Design of Gbl Scenarios: Qualitative Analysis of an Experiment

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Abstract: This paper presents the results of an experiment with ScenLRPG, a tool intended to foster collaboration during the design phase of GBL scenarios. Based on a specific graphic formalism, ScenLRPG allows groups of designers to describe scenario elements so as to justify and negotiate their design choices. The version presented is comprised of a board game featuring cards and tokens. The aim of the experiment was to test hypotheses regarding three main issues: the method's propensity to favour designer collaboration, its ability to offer new ideas, and the pros and cons of a board game design tool versus a computer-based environment. The experiment was carried out with the help of fifty-six subjects at a GBL summer school, to test hypotheses, gather user needs and improve the tool. Qualitative analysis of the experiment has highlighted improvement areas with regard to the three issues targeted.

Keywords: collaborative design, role-playing games, learning scenarios, professional training

Measuring Enjoyment in Games Through Electroencephalogram (EEG) Signal Analysis

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Abstract: Awareness is growing that neuroscientific knowledge can offer a significant contribution to improve education. This paper reports the research work we are conducting in investigating the in-game player's enjoyment state through a simple commercial electroencephalogram. In particular, we focus on three consequential research questions: is it possible to statistically distinguish a flow from a boredom condition? Which wavelengths are significant for such a classification? Can different levels of boredom and flow be identified? This work gives initial positive answers. Results, even if limited because of the small size of the test, are promising and enable further research. New, more extensive experiments are needed to better interpret some results of the wave spectrum analysis, also exploiting a better characterization of the actual activities and conditions of the user during the tests. Support Vector Machine (SVM) classification achieved significant accuracy results in the 2-level analysis case, in particular with personalized training (81% average accuracy).

Keywords: user profiling, adaptivity, electroencephalogram (EEG), flow, support vector machine (SVM)

The use of Games-Based Learning at Primary Education Level Within the Curriculum for Excellence: A Combined Result of two Regional Teacher Surveys

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Abstract: Games-based learning (GBL) is perceived by some educationalists as a highly motivating form of supplementary learning and is now being used more widely at different levels of education to engage pupils. In Scotland a new approach to education called the Curriculum for Excellence (CfE) has been introduced in schools with a focus on the child at the centre of the learning process to achieve optimum engagement. GBL is one of the experiences and outcomes of the CfE that has gained increasing popularity; however, one of the main difficulties with the approach is that there is a dearth of empirical evidence supporting its validity. This paper presents the combined findings of two surveys carried out in Scotland, one carried out in the Renfrewshire Council area and another in the Glasgow City Council area. The surveys were intended to gauge the current implementation of GBL in primary schools and particularly focused on the use of games, game creation tools and teachers' opinions on the benefits and obstacles of GBL within the CfE. A comparison of the two surveys is performed to ascertain if there are any significant differences in teacher attitudes to GBL between these regions. Overall, the combined result shows that, in general, the implementation of this approach is still limited, despite positive attitudes of teachers towards this approach. The obstacles faced by teachers when using this approach is discussed and suggestions to overcome these are proposed. The findings will contribute to the generation of empirical evidence in the field of GBL by providing important insights into the benefits, motivations, attitudes and obstacles from the teachers' perspective.

Keywords: games-based learning, GBL, teacher survey, curriculum for excellence CfE, empirical evidence, primary education

What do we Learn From the 'Game of Catallaxy'?

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Abstract: Playing/gaming is considered a fundamental anthropological feature. This means for culture as an integration of individual action that this anthropological feature of many individuals is aggregated on the social level and that hence plays and games can be fundamental for culture. Thus the 'casino capitalism' of our society might be understood as the aggregation of the specific gaming aspects of risk and competition. This form of aggregation is, however, not clear for the individual actors. The 'spontaneous order' of the market, also called 'game of catallaxy', is hidden behind our backs. If it is really a game, what can we learn from it and how? Business games imply the conceptual leap from the individual business transaction to the systemic feedbacks of the market as a learning target. Such market simulations try to reveal this hidden process. In the end, economic reality, which is called a game, is easier to comprehend in an experiential way by certain games than by reality itself.

Keywords: casino capitalism, market society; business games, market simulation, game of catallaxy

Multiplayer Adventures for Collaborative Learning With Serious Games

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Abstract: The concept of Computer Supported Collaborative Learning (CSCL) has been researched for many years with CSCL being an interesting alternative to traditional collaborative learning scenarios, today. In recent years, a multitude of game-based learning applications and Serious Games

have been created for various fields of application, like learning, training, sports and health. However, only very few of these games support multiple players and can be used for collaborative learning as well as for training social skills like communication and teamwork. Especially in the adventure game genre which is traditionally used for learning games, there are hardly any concepts, and even less implementations of multiplayer modes. Since adventure games offer a way to present learning content in a structured and guided way, a combination of their properties with the advantage of multiplayer games seems promising. Therefore we present an approach for designing and authoring multiplayer adventures for collaborative learning. We derived requirements for puzzle design from literature covering single player adventures and multiplayer games in general. These requirements were used to describe different types of player separation as a basic concept for puzzle design. Furthermore, interfaces for explicit and implicit communication as an important factor for collaboration and the concept of adaptivity were discussed in this context. We implemented our concepts as extensions to the StoryTec authoring environment and the StoryPlay player. Thus, non-programmer authors are able to create multiplayer adventures using StoryTec. Based on this platform we then designed and implemented a prototypical multiplayer adventure. This game was evaluated in a user-centred study focusing on the collaborative gaming and puzzles elements. Another study focused on the usability of the authoring environment. Our studies have shown that players were able to play collaboratively in our multiplayer adventure, working together and solving puzzles as a team. The Players enjoyed the idea of playing collaboratively in a multiplayer adventure. We therefore believe that our approach may build the ground for further research in collaborative adventures.

Keywords: serious games, multiplayer games, adventure games, game-based learning, collaborative learning

Game Based Learning Time-On-Task and Learning Performance According to Students' Temporal Perspective

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Abstract: Learning needs a certain level of students' quantity and quality of time and attention. The use of games has been usually argued as a time-wasting activity competing against the students' academic time and attention for their learning activities. The combination of games and educational purposes has led to the emergence of Game Based Learning (GBL) methodologies, together with the use of Serious Games (SG) to support learning processes in computer-based environments. Serious Games have been considered as a learning methodology that attracts the students' attention and may allow focusing individuals on the learning activity through the SG game dynamic. Based on the hypothesis that an increase on the learning activities time-on-task could lead to the students' higher performance on GBL, this paper aims to analyze the relation between the students' time-on-task and their performance in the SG. We consider the learning performance in an individual and a collaborative GBL activity, concretely, in the SG named MetaVals. We expect the time-on-task to be related to higher performance, both individual and collaborative GBL. Moreover, we analyze the relation between the time-on-task and the students' performance, according to the students' Time Perspective (TP), which is defined as the way individuals and cultures divide their experience into different temporal categories: past, present and future (Zimbardo, Keough and Boyd, 1997). Previous research in face-to-face learning modality demonstrated that future oriented students show a higher academic performance while students with a present TP tend to engage more in games, as they prefer instant-reward activities. We conducted a case study using the Serious Game MetaVals (Romero, Usart and Todeschini, 2011; Usart, Romero and Almirall, 2011). Results of the experience showed no significant differences in game performances among individuals with different TP. However, the present-oriented students showed a higher time-on-task, both for individual and collaborative phases, than their future oriented and balanced counterparts. **Keywords**: game based learning, serious games, learning performance, time-on-task, time perspective, future perspective

Creating Serious Games at Third Level: Evaluating the Implications of an In-House Approach

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Abstract: Due to the inherently interdisciplinary nature of serious games their development necessitates the effective collaboration of team members spanning multiple disciplines and skill sets (Adams 2010). In their attempts to harness these skills, most higher education projects have formed teams through academic/commercial partnerships, whereby academics and commercial developers combine their respective expertises in subject matter/pedagogy and game design/development. However considering the expertise in most higher education institutions and the recent surge in serious games courses at third level, one might reasonably conclude that higher education holds huge potential for developing serious games in-house. Yet surprisingly, such ventures are relatively few. Thus, while cross-faculty higher education collaborations may hold potential for developing serious games, the implications of such an approach are largely unexplored to date. This paper aims to remediate this gap in the literature by presenting a phenomenological, naturalistic case study of an innovative project based in one higher education institution which involved multiple disciplines in the design and development of a serious game. Using a theoretical framework for game design comprising the elements of play, pedagogy and fidelity, this paper examines the impact of an interdisciplinary in-house approach on the design of this serious game, paying particular attention to the balancing of design elements and the impact of disciplinary perspectives in this regard. As such this study adds a new dimension to established difficulties involved in serious game design by illustrating the significant impact which interdisciplinary team work practices, and associated disciplinary perspectives, can have on the design process and product.

Keywords: case study, game design, disciplinary perspectives, collaboration, partnership, higher education

Multimodal Interaction Experience for Users with Autism in a 3D Environment

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Abstract: This paper describes the multimodal 3D game-based learning environments, accessible to users with autism, which we designed, built, and tested. Our innovative interaction system proposes a combination of visual, voice, and textual modalities able to guide the user through the 3D environment and allowing her/him to access contents in a multimodal and personalised way. The design process had to consider the different modalities users could have used to access the contents, and this multimodal user interface had implications on accessibility. By taking care of the multimodality of the realised environment, and of the relational context, children and adults with autism can have the unique opportunity of bypassing some of the difficulties they encounter during their social life, such as visual contact, unwieldy movements, and face-to-face interactions. From this point of view, shared 3D virtual environments with multimodal interaction interfaces represent an important opportunity able to improve the social life of persons with autism. The entire structure of the work has been characterised by five main pillars and innovative aspects: multimodal strategies to explore the environment and to access contents; user model; user profiles; personalisation of the contents; experimentation/validation. The proposed user model (based on the ICF* specification, a customised, extended version of the WHO International Classification of Functioning, Disability and Health guidelines - ICF) allowed an extensible, detailed personalisation, as different attributes described users both from the static and the dynamic points of view. Users with different levels of autism were profiled using our model, and involved in the experiment, permitting us to validate the effectiveness of the global approach. The results of such experiment showed us that indeed users appreciated the system and were able to take advantage of all educational opportunities the system provided.

Keywords: 3D environment, user profile, multimodality, accessibility, interaction

A Pilot Implementation of an Immersive Online 3D Environment for Collaboration Among Computing Students in a Scottish University

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Abstract: It has been suggested in the literature that Massively Multiplayer Online Games (MMOGs) and other virtual worlds can offer an environment in which informal learning by participants can succeed through communication and collaboration (Steinkuehler, 2004; Shaffer et al., 2004; Childress & Braswell 2006; Gee 2007, 2008; Steinkuehler & Duncan, 2008; Harteveld & Bekebrede, 2010; Wehner et al., 2011). It has further been suggested that there would be value in investigating the extent to which the processes and principles underpinning this informal learning can be translated to a formal learning context (Connolly & Stansfield, 2006; Wubbels, 2007; Oliver & Carr, 2009; Cerone & Sowe, 2010). There is, however, a dearth of empirical evidence in this area (de Freitas, 2007; Connolly et al., 2007; Wouters et al., 2009). This paper reports a pilot of the use of an immersive online 3D environment, UNITE, within Scottish Higher Education. The aim of the pilot was to investigate the pedagogical value and technical feasibility of using the UNITE environment to enhance collaboration and communication among tertiary students of Computing. The UNITE virtual environment was constructed using Open Wonderland, an open source toolkit for creating 3D virtual worlds. Eight students in the final year of a Scottish four-year undergraduate honours degree participated. Qualitative data were obtained from participants by means of a focus group discussion. The findings of this pilot study suggest that participants: consider the technical stability of the platform to be of high importance; consider being represented by an avatar to be a positive experience; suggest that virtual worlds should be more widely used in formal education; found learning within a 3D virtual space to be of value both in developing collaboration and communication skills and in building confidence; and regard both voice and text communication functionality as being of high importance in a virtual space. **Keywords:** game-based learning, collaborative learning, virtual learning community, virtual worlds

Development of Computer Games for Training Programming Skills

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Abstract: The opportunity to use a game based approach for the teaching of software engineering, from the basics of programming through to more complex problems like operations research, has received much attention. The majority of games that have been used in such teaching focus on a two stage approach, one in which the code solution is developed and the second in which the artifact developed is used in a game. While this approach has some merit it is seen to be in danger of separating the "fun" element from the "learning" element of the process and thus reducing the engagement of the learners with what they have to learn. This paper offers a different approach which involves the seamless integration of the learning elements into the game itself. Certain constraints for such games are analyzed and the advantage of our approach is highlighted. Two examples of games are given which illustrate this approach in use. The technical background to these specific games which can be used as training for learned material or tests of that learned material are given. The core of this mechanism is the development of a database of leaned element lexemes which can be reused for other games. The positive outcome of this has been seen in testing with two groups of learners who found the games engaging.

Keywords: learning games, training games, combined gaming and training, game-based testing, programming skills

Debating Matters in Digital Game-Based Learning

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Abstract: This paper provides an insight into some of the most prominent matters of debate within the emerging field of Digital Game Based Learning (DGBL) and explores to what extent the discourse is reflected in the view of a group of educators who work with Digital game-based learning on a daily basis. Review of relevant literature indicates an ongoing controversy regarding digital game-based learning among experts in the field. Some of the contributors to the debate emphasize playing as a key motivating factor for learning, while others take a more sceptical stand to such assumptions. Some recommend liberal adaptation of commercial games to the learning context in contrast to others who are more concerned with games designed for learning, emphasizing education perspectives and the idea of edutainment. A final matter of disagreement highlighted by this paper revolves around notions of generational differences. Contributors to the debate differ in opinions about the adeptness of the young generation of today to the use and employment of technology for learning. I explore the manifestations of these issues in a bachelor program in Digital Game Development at a Norwegian college, which aims at training students to make digital games for educational purposes. The study is based on analysis of relevant documents as well as interviews with faculty members. The group includes faculty members with technological backgrounds, some of whom also are educated or trained as educators. The emerging field of digital game-based learning offers abundant opportunities to engage students in meaningful learning activities and the matters of debate that are introduced here may have profound effects of the developing field of expertise referred to as Digital Game Based Learning. The aim of the paper is to explore how to what extent some of the most prominent elements of the debate are experienced by faculty members who work with Digital Game Based Learning every day.

Keywords: scientific controversies in digital game based learning, playing and learning, entertainment games vs educational games, generational differences in digital literacy

Social Gaming – Just Click and Reward?

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Abstract: Recent years have shown the impressive rise of social gaming, i.e. digital games based on social network services like Facebook. Social games have created a totally new group of players because of their low system requirements, their tight integration into existing social network services and their support of casual game play. Although it has been shown that they can foster learning, they are considered “Click & Reward games”, i.e. they provide rewards for tasks which are solvable without any mental effort. Admitting that an automated click tool could play social games successfully, this paper uses selected examples from the social games FarmVille and Fliplife to demonstrate that there exist hard problems in these games that players themselves can choose to engage or not. Such problems require engineer-like problem-solving to achieve goals which are far beyond first easy rewards. Areas which are subject to optimization and management - demonstrated by the examples – are structured in terms of a project management triangle consisting of Goals, Budget, and Time. Thereafter we give examples for the optimization of processes in gameplay. This paper argues that social games, from a player’s point of view, already provide an environment for spotting and tackling demanding problems. For this reason they are not only entertainment, but offer an opportunity to develop skills for those classes of players which are attracted to social games. Furthermore, if game designers are able to extend game-attractiveness to curriculum-related content, then social games could become an excellent media to support and foster learning: accessibility combined with promising easy first rewards may capture the player’s impulse to ultimately solve more demanding problems.**Keywords**: social games, Facebook, game based learning, educational media, FarmVille, Fliplife

Social Game Fliplife: Digging for Talent – an analysis

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Abstract: In the context of the increasing spread of the internet, the importance of e-assessment has gained momentum in the last years. E-assessment contributes to the efficiency of recruitment processes through computer-supported pre-selection of candidates. The set of e-assessment tools also includes video games, which allow observation of candidates in informal contexts. This paper presents a case study of the social online game Fliplife and its theoretical role as a tool in the recruitment process. As we have no access to the internals of this game, we describe a theoretically feasible approach to compiling a list of job candidates. We also identify restrictions of this method and suggest solutions to the problems identified. We draw the conclusion that video games can be valuable tools in the area of recruitment.

Keywords: e-assessment, Fliplife, recruitment, third place, social gaming

A Platform Independent Model for Model Driven Serious Games Development

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Abstract: Game-based learning (GBL) combines pedagogy and interactive entertainment to create a virtual learning environment in an effort to motivate and regain the interest of a new generation of 'digital native' learners. However, this approach is impeded by the limited availability of suitable 'serious' games and high-level design tools to enable domain experts

to develop or customise serious games. Model Driven Engineering (MDE) goes some way to provide the techniques required to generate a wide variety of interoperable serious games software solutions whilst encapsulating and shielding the technicality of the full software development process. In this paper, we present our Game Technology Model (GTM) which models serious game software in a manner independent of any hardware or operating platform specifications for use in our Model Driven Serious Game Development Framework.

Keywords: game technology model, serious games engineering, model driven engineering, games based learning

deLearyous: Training Interpersonal Communication Skills Using Unconstrained Text Input

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Abstract: We describe project deLearyous, in which the goal is to develop a proof-of-concept of a serious game that will assist in the training of communication skills following the Interpersonal Circumplex (also known as Leary's Rose) –a framework for interpersonal communication. Users will interact with the application using unconstrained written natural language input and will engage in conversation with a 3D virtual agent. The application will thus alleviate the need for expensive communication coaching and will offer players a non-threatening environment in which to practice their communication skills. We outline the preliminary data collection procedure, as well as the workings of each of the modules that make up the application pipeline. We evaluate the modules' performance and offer our thoughts on what can be expected from the final "proof-of-concept" application. To get a firm grasp on the structure and dynamics of human-to-human conversations, we first gathered data from a series of "Wizard of Oz" experiments in which the virtual agent was replaced with a human

actor. All data was subsequently transcribed, analysed and annotated. This data functioned as the basis for all modules in the application pipeline: the NLP module, the scenario engine, the visualization module, and the audio module. The freeform, unconstrained text input from the player is first processed by a Natural Language Processing (NLP) module, which uses machine learning to automatically identify the position of the player on the Interpersonal Circumplex. The NLP module also identifies the topic of the player's input using a keyword-based approach. The output of the NLP module is sent to the scenario engine, which implements the virtual agent's conversation options as a finite state machine. Given the virtual agent's previous state and Circumplex position, it predicts the most likely follow-up state. The follow-up state is then realized by the visualization and audio modules. The visualization module takes care of displaying the 3D virtual agent's facial and torso animations, while the audio module looks up and plays the appropriate pre-recorded audio responses. In terms of performance, the NLP module appears to be a bottleneck, as finding the position of the player on the Interpersonal Circumplex is a very difficult problem to solve automatically. However, we show that human agreement on this task is also very low, indicating that there isn't always a single "correct" way to interpret Circumplex positions. We conclude by stating that applications like deLearyous show promise, but we also readily admit that technology still has a way to go before they can be used without human supervision.

Keywords: communication training, natural language, virtual agents, interpersonal communication

GameDNA: A Method to Structure Player Actions in Serious Games

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Abstract: In order to design successful, effective serious games it is of pivotal importance that psychological paradigms are integrated in such a manner that adequate mental processes in players are provoked, while

safeguarding engaging game play that is fun, i.e. possesses good flow. When playing a serious game, besides the rules and dynamics of the game, cognitive processes of making inferences and learning should occur. A player executes mental processes (thinking, contemplating, deciding), perceptual processes (reading, listening, noticing), and must also physically execute what he/she has decided to do. More so than in games purely aimed at entertainment, in the creative and development process of serious games, a player (learner) centric notation and visualization method to analyse and structure what the player is facing cognitively is needed. We propose GameDNA (Game Discourse Notation and Analysis), a flexible notation and visualization tool for serious games, which will enable different stakeholders to conceptualize, communicate about and develop such games more effectively. GameDNA serves as a "toolbox" to create interventions in games at specific events, and demonstrates what these interventions mentally mean for the player and his/her mental processes. It shows the flow of information, besides only focusing on underlying game mechanics and rules.

Keywords: game notation, visualization, player actions, serious games

Towards a Game-Chatbot: Extending the Interaction in Serious Games

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Abstract: Game environments tend to be highly responsive and demanding and thus provoke active learner involvement. Surprisingly, gaming and in the same line also serious gaming, still make little use of one of people's most common type of interactions i.e. natural language. Despite the presumed positive effect in e-learning of interactive online characters, the use of virtual characters or so-called Non Player Characters still seems in its infancy. In this work, therefore, we started to look at the use of relatively

simple chatbots for serious games. We describe the first step of our exploration i.e. to extend EMERGO, an existing serious game environment, with a chatbot to enhance the interaction with the student. EMERGO is a toolkit and methodology that enables to develop new cases with relative ease and limited time. We will introduce EMERGO and give an overview of chatbot technology fitting our case. Next, we will explain the EMERGO case under development, and how it makes use of the chatbot selected and the technical architecture enabling the chatbot – EMERGO integration. We will conclude with a description of the evaluation planned.

Keywords: serious games; EMERGO; chatbots, natural language interactions, non player character

Learning by Playing: Can Serious Games be fun?

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Abstract: During the past two years we developed a physics game following a unique design principle. Many educational games currently available on the market solely focus on knowledge transfer following a behaviourist principle (Annetta, 2010). The learner is confronted with more or less demanding tasks which are solved using the trial and error method (Skinner, 1938). Learning success is directly assessed using a simple feedback system („right“, „wrong“). Furthermore the audio visual quality of interactive learning software often can’t keep up with video games today’s target group has become accustomed to. We decided to take a different path. Since fun of play is considered as one of the key elements of an elaborated game playing experience (Vorderer et al., 2004), we decided to design a fun filled and action packed learning game built around a serious topic: renewable energies. The content of the game is based on the physics curriculum while the graphical and audio visual quality of "Ludwig" was designed to stand a comparison with common triple a games. We crafted the

game using the powerful open source software Unity. This tool empowered us to create an immersive game environment which was inspired by the look and feel of World of Warcraft. A simple formula “learning goal = game goal“ defined the core game mechanics. Based on a constructivist paradigm "Ludwig" offers challenges in an interactive 3d world while learning takes place in an authentic context (McLellan, 1985). Players are allowed to explore the game world, to experiment in virtual laboratories and to solve problems freely while their actions directly lead to consequences and positive feedback by the game. The players actions leave a trace in the game world fostering individual experiences of self-efficacy (Bandura, 1977). Numerous feedback iterations with the target group consisting of students and teachers secured a satisfying level of quality regarding the learning content, the gameplay and the look & feel of "Ludwig". We decided to use an iterative design principle which empowers players to become game designers (Wagner, 2009). By applying qualitative and quantitative methods we gained insights in the applicability of variable quality assurance strategies. Students reflected on the playability of the game, on the usability of the interface and finally on motivational aspects (learning motivation, interest for physics). Teachers reflected on the potential benefits and problems of using "Ludwig" in class. The results of the formative (quality assurance workshops) as well as the summative evaluation (assessment of motivational, cognitive and learning processes) show that "Ludwig" can foster learning processes if game based learning is combined with established teaching methods and material.

Keywords: game based learning, serious games, intrinsic motivation, instructional design

Moving on: Use of Computer Games During Transitional Care for Young People with Long Term Medical Conditions

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Abstract: Young people with long-term medical conditions eventually have to 'transfer' from child to adult care. Transition involves careful planning and preparation for this event. Predictors for successful transition include increasing independence, active involvement in self-care and the ability to independently discuss care with the doctor. However, many young people and their families feel that they are not adequately prepared for transition. They can find it difficult to get information in an appropriate, age-related format. Therefore there is interest in how information can be presented in a youth-friendly way and how technology might support this. We have reviewed the literature for issues that are common to young people with long-term conditions and their needs as they move into adult care. The impact of computer games on healthcare education was also reviewed with findings extrapolated to scenarios where they might be of benefit during transition. Several computer games have been developed and evaluated in young people. Improvements in knowledge, self-efficacy, adherence to treatment and improved communication were reported. However the games were often disease specific meaning that their information cannot be generalised to other long term conditions. Some of the important skills required for transition include self-advocacy, teaching of age appropriate self-management, improved communication skills, understanding the importance of compliance to drug therapies and awareness of potential side effects as well as understanding of and being able to distinguish between similar conditions. Some of the inherent characteristics of games which could promote acquisition of these skills include goals, feed-

back, rewards, challenges and the ability to invoke curiosity and hence encourage involvement in the care process. We have made recommendations for design features that would allow the creation of games for transitional care which would reinforce appropriate skills and provide a format for delivering important health care information. Caveats are the acceptance of games by the young person, different ages and genders as well as by the clinical team. Therefore it will be very important to include these stakeholders when designing and developing health education games.

Keywords: adolescent, transitional care, computer games, long term conditions

Evaluation of Computer Games Developed by Primary School Children to Gauge Understanding of Programming Concepts

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Abstract: Under the Curriculum for Excellence (CfE) in Scotland, newer approaches such as games-based learning and games-based construction are being adopted to motivate and engage students. Construction of computer games is seen by some to be a highly motivational and practical approach at engaging children at Primary Education (PE) level in computer programming concepts. Games-based learning (GBL) and games-based construction both suffer from a dearth of empirical evidence supporting their validity as teaching and learning approaches. To address this issue, this paper will present the findings of observational research at PE level using Scratch as a tool to develop computer games using rudimentary programming concepts. A list of criteria will be compiled for reviewing the implementation of each participant to gauge the level of programming proficiency demonstrated. The study will review 29 games from Primary 4 to Primary 7 level and will present the overall results and results for each individual year. This study will contribute to the empirical evidence in games-based construction by providing the results of observational re-

search across different levels of PE and will provide pedagogical guidelines for assessing programming ability using a games-based construction approach.

Keywords: primary education, curriculum for excellence, programming, games-based construction, evaluation, scratch, review, pedagogy

Combining Game Designs for Creating Adaptive and Personalized Educational Games

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Abstract: In order to fully realise the benefits that game based learning can bring, it is necessary to provide the means of reducing the high cost associated with the production of educational games (EG) and to simplify their design process. These designs are increasingly complex as games nowadays exhibit a high degree of sophistication, not only in terms of graphical resources and advance interaction mechanism, but also with regard to their narratives and rules. In order to reduce this complexity, and to facilitate the production of designs which are easily managed and understood by the different roles involved in a EG design team, we propose describing those designs by combining more simple game designs. As the combination of the designs can be carried out at different levels it is possible to obtain game experiences which tightly integrate the original designs, as well as experiences in which the games definition remain relatively independent. This allows the designer to respond to established design trends in computer games such as the use of "missions", "mini-games" or "bonus stages". The combinations can be set up in a fixed way or specified together with a set of adaptation and personalization rules which determine the sub-design that should be active for a given learner profile and progress during the game. This allows increasing the possibility of designing a satisfactory game experience for a wider range of learners. In this paper we describe the proposed approach and introduce an adaptation and personalization model which considers five different types of adaptation rules: initializations, game adaptations, scenario adaptations, storyline adapta-

tions and rule adaptations. We also illustrate the proposal by describing the implementation of an adaptation module able to interpret adaptation rules specified in XML files and adapt some of the features of an EG. Game designers will also be provided with an authoring tool to aid in describing the player profiles and the rules that govern the adaptations.

Keywords: educational computer games, adaptive educational games, model driven development, game design

PHD Papers

The Value of Team-Based Mixed-Reality (TBMR) Games in Higher Education

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Abstract: This paper reports on a conducted study, measuring the perceptions of post-graduate students on the effectiveness of serious games in the classroom. Four games were used (Project Management Exercise, "Winning Margin" Business Simulation, Management of Change and Management of Product Design and Development) with scenarios ranging from product design to project management. The games might be classified as Team-Based Mixed-Reality (TBMR) games. The games were conducted over the period October 2010 to May 2011and the questionnaires conducted during June 2011. The results, from a sample size of 80 of largely international students, indicated a clear ranking of emotions experienced when participating in the games with "Exciting" outweighing "Apprehensive", "Bored" and Indifferent". The majority of students indicated that both "their team winning" and "showing their personal competence" were important to them. However 70% said that working in teams was valuable in itself implying that team-working was a strong element in the conclusion that the games were of value. For all four games, over 60% said that conflict was valuable and over 75% said participating improved their "working in teams" skills. The value of feedback was rated highly, as was improved motivation. Over 60% said that the participation in the games was more useful than lectures on the same topic.

Keywords: games, simulation, education, learning, assessment

Schools as Interactive Playgrounds: An Investigative Study of Hong Kong Primary Classroom Pedagogy

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Abstract: Academic researchers, game designers and educators are exploring game based learning (GBL) in order to facilitate diverse, playful, learning experiences in children. This shift from 'play and learning' to 'play as learning/learning as play', extends into my central concept of 'schools as interactive playgrounds'. Conventionally, the word 'playground' denotes a protected, enclosed space (indoors or outdoors) for children to indulge in various recreational activities. In contrast, I use the term 'playground' to signify a ground (foundation) created for play through play. Play is the highest level of child development (Froebel, 1887). A man is complete through play (Schiller, 1794). James Findley's (2008) elaborates "play as meta-intelligence: play not as a form of intelligence, but intelligence in all its forms". Games and play are mutually subordinate (Salen, Zimmerman; 2004). Researchers see a natural link between flow and games (Csikszentmihalyi, 1975b; Mitchell, 1990; Massimini et al., 1990; Sato, 1990 and Rathunde, 1990). Play as flow or optimal experience, is defined as a state wherein there is a harmonious synchronization and balance between an individual's high capabilities/energies and the high complexities of challenges faced by him/her while performing the task (Csikszentmihalyi, 1988). Flow is commonly associated with games, sports and learning (Csikszentmihalyi, 1988). My research focuses on the core concept 'schools as special (purified, simplified, progressive), social environments (Dewey, 1916) that act as a ground (foundation) for play (as meta-intelligence), through play (GBL). This paper outlines the theoretical rationale behind a doctoral research study currently in progress. My research focus in context to Hong Kong local primary education is: What forms of GBL can be manifested into the current classroom pedagogy to facilitate flow-like learning experiences in learners (ages 6-11), with their peers (co-learners) and instructors in school environments? What is the relationship between games; play; flow/experiences; motivation; enjoyment and learning? How can one effectively and efficiently measure flow in schools?

Keywords: education, play, flow, motivation, game based learning (GBL)

Intelligent Assessment and Learner Personalisation in Virtual 3D Immersive Environments

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Abstract: Science, Technology, Engineering and Maths (STEM) subjects are increasingly important in the 21st century as the world looks for new solutions to global problems. A major problem associated with engineering education is increasing its appeal as a subject discipline amongst prospective students. It is therefore essential that educational institutions attract the most capable students, nurture and provide them with the skills and depth of understanding needed to face the challenges of globalisation. If these aims are to be achieved future e-learning environments must accommodate the diverse learning styles, needs and skills of modern, digitally literate students. This paper introduces a next generation learning environment (+GLE) which combines and integrates the most effective elements of virtual and 3D learning technologies. However, unlike previous integrations, this learning environment will be designed specifically for engineering education. Two main contributions of intelligent assessment and learner personalisation are proposed which collectively work together as an Intelligent Tutoring System (ITS) to effectively assess the students' actions in the virtual 3D immersive environment. The learning is personalised by identifying the students weaknesses and strengths and adapting the +GLE appropriately based on the individual students' skills, knowledge and competences. The dynamic personalisation aims to accommodate the differing learning styles of the students. The outcome of the proposed research is a collection of interactive and adaptive STEM-based experiments, linked to real hardware, using 3D environments that reinforce theory through VLE's, aiming to meet the needs of students.

Keywords: collaborative learning technologies, educational games, adaptability and personalisation, technology enhanced learning, artificial intelligence

Interactive Narrator in Ludic Space: A Dynamic Story Plot Underneath the Framework of MMORPGs Storytelling System

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Abstract: For decades, the development of digital interactive storytelling in games has been of interest to many researchers. Some scholars have studied the expert system which dynamically creates plots for players, while other scholars investigate the story structure. However, the latter mostly focuses on the micro story level of storytelling structure (Begin-Middle-End). This paper describes the framework for a games writer in MMORPGs as a non-linear narrative, in which a gameplayer takes the role of a digital story writer in a magic cycle. It proposes an extended storytelling framework to a games writer. The framework is developed based on 3 prior theoretical notions: the Story structure, Dramatic structure (Freytag's Pyramid), and Hero's Journey model (Campbell). The story structure is founded by Aristotle in his Poetics (c. 335 BC), but is now considered the basis of digital narrative. Hero's Journey model is the basic of three structure story proposed by Cambel. Developing the framework, the study investigated forty Quests (quest stories) from players during gameplay in World of Warcraft, and employed the plot analysis to deconstruct game storylines. This framework is deeply focusing on the plot point of gamestory and develops further to the multi-plot point structure. To analyze the gameplay data in this study, the emotional experience and learning content are considered for the plot investigation. This study is sets out to examine the assumption that, when players play games in a semiotic domain of visual grammar, they simultaneously interpret meaning and produce the storyline per se. The result shows that (1) gameplayers create distinctive story plots which are shown by the story graphs in a freedom of Ludic space, (2) each quest has the different of story plot patterns; although, it has likewise a storyline pattern. To summarize, from the results, the paper proposes the multi-plot point framework which creates the concept of the

game story movement for applying in game-story design for learning purposes.

Keywords: interactive narrator, storytelling system, MMORPGs, dynamic story

Work in Progress Papers

Serious Game for Relationships and sex Education (RSE): Promoting Discourse on Pressure and Coercion in Adolescent Relationships

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Abstract. Pressure and coercion in adolescence relationship can lead to adverse psychological and physical health outcomes. Eliminating coercive sexual experiences for young people is one of the aims of delivering good quality Relationships and Sex Education (RSE). Engaging young people on sensitive subjects can however be challenging, and using interactive technology such as games may provide a more conducive platform for educators and young people within a classroom setting. This paper describes the on-going development and evaluation of a serious game (SG) to raise awareness on experiences of sexual coercion. This involves an iterative process that draws on stakeholder engagement and the theory and evidence base for what works, to support health improvement intervention planning. SG developers took the game concept plan and transformed it into an interactive game show, led by a teacher or facilitator to engage students in game play and discussion around the issue of sexual coercion. The final product known as PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships) is currently the subject of a cluster Randomised Controlled Trial (RCT) in local schools. Early data analysis shows that the learners are engaged with the game with potential contribution to psychological preparedness to deal with sexual coercion. This work represents the first attempt to use of Serious Gaming for RSE delivery.

Keywords: serious game; relationships & sex education; sexual coercion; intervention mapping; adolescents

Motivating Elderly People to Exercise Using a Social Collaborative Exergame with Adaptive Difficulty

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Abstract: The European population is ageing and physical decline of elderly people has become a significant issue. A lack of physical exercise results in decreased strength, flexibility, and the loss of bone mass. These are risk factors that cause elderly people to fall, which can result in injury and mortality. The risk of falling can be reduced by partaking in physical activities such as walking. Many elderly people don't exercise as they suffer from social isolation. This affects physical and mental health, causing illnesses such as depression and may result in low motivation to exercise. This paper proposes a solution to these issues: a social collaborative online walking game, the goals of which are to engage and motivate the elderly to exercise frequently and to increase their cardiovascular fitness and muscular strength. We have developed a prototype in HTML5, designed for ease of use for elderly people, which uses the Microsoft Kinect motion camera, the preferred controller selected by the user group. The principal advantage of this solution is it uses adaptive difficulty to provide dynamic balancing, allowing users with different skill levels to play together. User group tests suggested that static difficulty settings are not flexible enough to suit the group's range of skill levels. Each player has an individual difficulty level which is conducive to providing an enjoyable experience for all players. In particular, this facilitates intergenerational gameplay: elderly users can play with their children and grandchildren without comprising their individual enjoyment. Another advantage is that it promotes a gradual rate of improvement that reduces the risk of the user overexertion during exercise. The effects of the walking game are currently being evaluated with an elderly user group.

Keywords: Exergames, social collaborative games, adaptive difficulty, serious games, Microsoft Kinect

Class Room vs. In-Situ Simulation

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Abstract: Background: Simulation training is now widely used in medical education. Traditionally, simulation courses take place in simulation centers where considerable effort is done to mimic a real working environment. In-Situ simulation provides simulation in a real working environment, where highly realistic training conditions can be provided. This study looks especially into the question whether or not the simulation environment in in-situ simulations changes the student's perception of realism of the scenario and evaluates if perceived realism correlates to the students statement on how relevant the scenario was for achieving the learning objectives. Methods: This observational study compares two groups of healthcare professionals (n = 25) who participated at an one-day course on emergency medicine. For both groups, a medium-fidelity simulator and authentic medical equipment was used to simulate complex emergency medicine scenarios. For the study group, an In-Situ setting was chosen in a mobile intensive care unit (MICU), whereas the control group did the scenarios in a conference room. A participant response tool was used to measure student's perception of realism based on three dimensions of realism. 5-point Likert-scales (5=fully agree, 1= fully disagree) where used to measure immersion and relevance from students perspective. Results: There were significant differences in the level of perceived physical realism between the two groups, efforts done to increase the level of realism in In-Situ simulation were perceived by the students (4.48 vs 4.11, $P<0.05$). Simulation settings, however, did not influence the perception of both semantic and phenomenal realism significantly (4.33 vs. 4.44, 4.22 vs. 4.43 respectively). In general, those students with higher levels of perceived realism rated the scenarios as more relevant for their professional life, realism indices correlate well with relevance indices using the Pearson correlation ($P=0.008$). Conclusions: In-Situ Simulation alters the level of perceived physical realism, but not the level of perceived relevance in general. However, results of this study suggest that factors including scenario design help to reach high levels of perceived realism, especially in its phenomenal and semantic dimension. Perceived realism in general increases the relevance of the simulation scenario for the learner.

Keywords: realism, in-situ simulation, relevance perception.

Alternate Reality Game for University-Level Computer Science Education

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Abstract: Alternate reality games are a relatively new genre of games that use many different types of media to deliver an interactive narrative to the players. They consist of puzzles that can be very challenging and therefore they often call for collaboration among the players. In this work-in-progress paper, we describe our plan of using an alternate reality game in university-level computer science education. The primary target group of the game is university students from the field of computer science, but anyone is welcome to participate. The tasks and puzzles in the game involve computer science concepts, and therefore programming skills and basic knowledge of computer science are needed. Finding the initial clue, the trailhead, of an ARG is typically an achievement in itself. Similarly, our game is not part of any official curriculum, and we will use many trailheads in several media to promote the game. Also, the game organizer is not revealed to the players during the game. Since the game is not part of any official curriculum, participating is completely voluntary. Even though some of the skills needed in the game are very similar to the skills needed in completing similar course assignments, players will not receive study credits for solving the puzzles. They are just enticed to join the game to solve engaging challenges with other players. The game will have a wide range of puzzles from different fields of computer science, so that it would be difficult to solve all of them individually. Hence, the game calls for collaboration among the players. Getting students to join the game will be a challenge. Therefore, one of the research aims of this study is to investigate what motivates students to participate in ARGs when there is no reward in terms of study credits. We will also study the suitability of an ARG as a tool for computer science education and community building.

Keywords: ARG, alternate reality game, computer science, game-based learning, collaboration

Staying the Course – a Game to Facilitate Students' Transitions to Higher Education

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Abstract: The initial transition to higher education can be difficult for some students as they adapt to the institutional habitus (Thomas 2002) and for many students this can be one of the most significant and difficult learning transitions they will make (Yorke & Longden 2007). To help facilitate this complex transition the authors used the data from a regional student attrition study to inform the design of a board game and companion website. The purpose of the game was threefold: first, to set reasonable student expectations of institutional systems; second, to raise awareness of support services; and third to promote social integration. This paper outlines the literature that informed the game design and describes how the study data were incorporated into the design of the game board. The game was subsequently linked with discussion activities to prompt players to consider different perspectives and personal dilemmas as they played and this dual-media approach is discussed. The iterative process of how the game evolved during testing and initial evaluation is also described.

Keywords: student transitions, healthcare, student experience, attrition, game design

Fighting Physical and Mental Decline of Elderly With Adaptive Serious Games

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Abstract: The aging of the population is a serious challenge for the medical and social insurance systems in the 21st century. The continuously increasing average age leads to an increase of physical and cognitive frailty, which in turn, leads to substantial medical costs and costs for caring. Thus, frailty is increasingly recognized as a highly prevalent pre-disability state, which is amenable to interventions. Serious games appear being a promising approach to foster a holistic and motivational approach to fight frailty and related harms to life quality. At the same time, smart virtual systems may potentially reduce treatment costs. The virtual systems, however, need the capability of identifying individual states and traits (e.g., training progress or motivational states) and to adjust the gaming and training experiences accordingly. The short paper describes an idea of realizing such adaptation based on the concepts of Competence-based Knowledge Space Theory, which has already been applied in conventional educational successfully.

Keywords: frailty, mental and cognitive decline, social isolation, serious games, training programs

Designing Games for Well-Being; Exergames for Elderly People

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Abstract: The aging of population arouses several challenges for our society, especially for healthcare services. The elderly require increased health care for both mental and physical problems. Recent research exploring the use of digital games suggests a variety of positive effects on wellbeing of

elderly people. Contrary to popular belief, the elderly enjoy playing computer games. Thus, we should study and develop new solutions that support the wellbeing of elderly people. The aim of this pilot study was to explore the deployment of a mobile controlled game into assisted living environments. The study focuses on exploring how elderly people experience a game designed for rehabilitation and recreation purposes. In this pilot study, we designed exergame prototypes for elderly players. Games were designed to keep up or increase motor skills. Games were designed to be as simple as possible without any distracting graphical components or animations. Games run on a computer and are shown on screen or large television. Mobile phone is used to control these physically activating games. The created game prototypes were tested in two rehabilitation centers in Finland. The participants were over 70 years old people, who lived in assisted living conditions (N=34). After the playing sessions semi-structured interviews concentrating on themes related to personal information, technological awareness and playing experiences were conducted. Most of the participants found playing our games positive and would like to play these types of games also in future. Even though the sample size was considerably small the findings support the usefulness of the tested game concepts in activation, recreation and rehabilitation purposes among the elderly. We believe that cognitively and physically stimulating games could possibly help in part of the prevention process and reverse cognitive impairment in many elderly and also prevent impairment of motoric skills.

Keywords: mobile controlled game, elderly, exergame, cognitive game

A Design Strategy for Scaling up Implementations in Virtual Environments

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Abstract: According to Coburn (2003), "scaling up" educational innovations involve four interrelated dimensions: depth, sustainability, spread and shift in ownership. A technology innovation requires a design that can adapted in different contexts and robust enough to retain effectiveness in settings that lack its conditions for success (Clarke and Dede, 2009). Sustainability of innovations is the ability of the innovation to extend beyond the time that researchers are involved in classrooms by developing the capacity for sustaining the change (Penuel et al, 2011). According to Dede (2011), technology-based innovation designs should aid learning in classrooms, while also working to evolve in design and ensure that teachers can integrate without much difficulty. Researchers Clarke, Dede, Ketelhut, & Nelson (2006) identified the various factors that were critical to successful implementation and scalability of the River City project. Two of those conditions for success were related to teacher preparation. Clarke and Dede (2006) reviewed literature related to identifying the key contextual variables necessary for scaling up educational innovations. They compiled a list of various teacher level variables, among which teacher professional development related to innovation, teacher ownership, teacher comfort level and technology are critical. In this paper, we describe one of the approaches for scalability that attempts to address key teacher preparation variables: the design of a robust web-based portal called "SAVE Science Dashboard". This portal particularly addresses "Spread", referring to the infrastructure necessary for expansion of the innovation to more classrooms and schools, and "Shift", referring to the transfer of ownership and responsibility for implementation from designers to teachers and school community. The

dashboard's design and implementation is discussed in the context of a large scale project called "Situated Assessments Using Virtual Environments for Science Content and Inquiry: SAVE Science.

Keywords: immersive virtual environments, dashboard, scientific inquiry, technology implementation

Virtual Tutor Inside a Game: A Case Study From the MIRROR Project

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Abstract: The emergence of new technologies as a learning tool has significantly induced changes in teaching and offers a chance to constructivism theories (i.e. reflective learning) to be tested while placing the learners as active actors at the centre of their own knowledge building. In the main class of 'new technologies', specifically, serious games create real 'new learning experiences' in a safe virtual environment in which learners can have an active role, experiment new situations and learn from their errors. These are no longer perceived with frustration but as opportunities for personal enhancement. Seen from the Reflective learning angle, serious games have the potential to increase the ability of learners to reflect on and learn from their past experiences for at least three reasons: Even if a serious game represents a virtual experience, it is still a direct experience that engages people both psychologically and physiologically. Nevertheless, such virtual experience provides some distance from reality, and facilitates reflection-in-action and reflection-on-action. Serious games allow "Repeatability". They offer a simulated environment or a realistically recreated role play scenario that enables learners to try out a particular strategy or adopt a certain approach or behavior. If they fail or do not quite deliver the desired outcome, then they can try again with a modified approach. Serious games allow self-evaluation. Frequent, direct clear 'feedbacks' that most serious games provide, contribute to feed the learner's reflection on their direct/virtual, past/present experiences. This paper describes a game application designed for care homes and hospitals in the frame of the MIRROR project. The game aims to empower and engage em-

ployees to reflect on past work performances and personal learning experiences in order to learn in “real-time” and to creatively solve pressing problems. It depicts the 3D virtual hospital or care home environment developed with UNITY, where the user, playing a nurse/carer’s role, is challenged with some patients/residents’ ‘complex dialogue’. It introduces and portrays the central figure of a Virtual Tutor and details the gaming functions designed to provide the user with: Additional relevant information on demand; Frequent, rapid and clear feedback completed by deep final reports showing a clear link between acts and consequences; Specific help when repetitive errors or patterns are detected by the game system. Adequate tools to take a step back and collect one's own thoughts. The paper describes how the various gaming characteristics and supports offered by the Virtual Tutor create favorable conditions so as to allow learners to adopt a reflective attitude towards their own past/present acts and experiences, learning to take place and eventually to maximize the Zone of Proximal Development of the learner. Preliminary results of user experiences are reported and an outlook on further steps is given.

Keywords: reflective learning; serious game; virtual tutor; zone of proximal development; UNITY

User Models and Affective Metacognitive Scaffolding for Adaptive Games

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Abstract: As awareness of game-based learning increases, it is becoming more widespread and accepted as an effective learning methodology. The scale of adoption of this new learning methodology is putting an immense pressure on designers and developers to come up with solutions that cover very different requirements simultaneously. With users concretely at the center of learning design, game-based learning solutions need to take players’/learners’ differing aspects and characteristics into account and therefore need to become adaptive on several levels. Content should be

chosen and suggested to users according to their user profiles and performance. Additionally, tutoring services and support levels need to re-scale constantly to more appropriately support learners' needs as these develop. This paper presents exemplars of two interactive technologies: a serious game developed for care staff to train their ability to deal with 'difficult dialogues' with residents, and a dialogue simulation developed to improve intercultural awareness in multicultural dialogues. Moreover, this paper shows how user profiles can be conceived in order to steer adaptivity on both technological solutions. Finally, a metacognitive scaffolding service is outlined as one of the levels of adaptive support for both learning solutions. Some conclusions and outlook on further activities are given.

Keywords: user profile, serious games, metacognitive scaffolding, adaptive systems, technology-enhanced learning

Vocalnayno: Designing a Game-Based Intervention to Support Reading Development in Primary Schools

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Abstract: Encouraging children to read frequently and helping them to develop their reading skills as effectively as possible can be a challenge for some primary schools. Often, institutions have to rely on external teaching assistants and parent volunteers to provide pupils with additional one-on-one support in order help them to achieve an acceptable standard of reading. However, there are inefficiencies to this approach. For example, some volunteers lack the necessary instructional knowledge to deliver learning material effectively, while others may possess limited agency to assess pupil progress through the standard mechanisms. Consequently, this can delay the identification and communication of individual needs, which can be essential for tailoring such support. This research questions whether the use of a game-based intervention can integrate into the existing teaching culture at a primary school and aid teaching assistants to achieve a more significant impact on pupil reading development. In order to synthesize an appropriate design, an action-research inspired approach at a local school

has been adopted. This is very much a work-in-progress as several methodological challenges have already been encountered. In particular, addressing barriers to entry and including a wide variety of stakeholders in each stage of participatory design. However, the approach helps to maintain scope within relevant cultural boundaries while also addressing new weaknesses that emerge through the observation and discussion of current practices. A prototype based on an initial process of gathering requirements is presented using Multimedia Fusion Developer 2. The design incorporates a game-like exercise where a foam volcano character releases bubbles containing letters and words. Pupils must read these aloud in order to burst them open, which is recorded as a metric of reading ability. This example could be deployed as an assessment tool on a laptop or tablet device, providing assistants with an indicator of phonetic strengths and weaknesses.

Keywords: games, education, eLearning, reading, primary school, method

Abstracts Only

The use of Games to Foster Fluency

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Abstract: ESL/EFL specialists believe in the use of game based learning as an essential element in language learners' motivation. For them, games are fun and based on this definition game makes learning enjoyable so that students will be able to learn better and more and may even forget that are communicating (Celce-Murcia and MacIntosh, 1979). According to Norman, Levihn, and Hedenquist (1986) people often believe that putting their linguistic ability and knowledge into practice, instead of just learning language without practically using it will not lead them to promote their communication skills. Game based learning in this activity therefore seems to support this notion as well as many others. In this research, we attempted to find out what kind of communication strategies (CSs) intermediate level students use during an information-gap activity. This study focused on five particular CSs namely: 1- Paraphrase 2- Approximation 3- Hesitation 4- Words which are borrowed, invented, or anglicized and 5- Reduction Strategies. I also aimed to investigate the link between the use of CS and students' and teachers' beliefs. The study used a series of videoed and transcribed task observations based on 'Spot the Differences' information-gap activities. The views and beliefs of 6 teachers and 6 Pre-Sessional students all from University of Essex were also sampled using structured, in-depth interviews. The teacher interviews revealed that the more experienced teachers focused attention on fluency and helping student to 'keep going', while less experienced tutors focused attention on both fluency and vocabulary learning in communication tasks. The student interviews findings also indicated that students' beliefs are affected by tutor beliefs. Data from the videoed observations revealed that body language was an important element in communicating meaning.The observations also highlighted that there is a relation between the teachers' inner beliefs and the students' fluency level; in other words, students prefer to keep going even though they lack the knowledge when it is influenced by their teachers' idea of what a communication activity is performed for. The results also revealed what strategies these teachers encourage students to use in a communication activity to promote their fluency level. Interesting-

ly, using hesitation devices is suggested by some teachers to be taught as a good tool to improve communicative ability.

Keywords: game-based learning, communication strategies, fluency, communicative ability

Engineering Practices in Virtual Worlds

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Abstract: In contrast to other fields of higher education the discussion and research of new and improved didactic methods in engineering education has only started with the beginning of the 21st century. And while these other fields already start thinking about the demands of future education, the existing results of research in engineering education still have not even gained a broader acceptance. Engineering education is missing a perspective solution to the impact of life-long learning. It is also missing appropriate ways to implement the demand of distance learning that is associated to life-long learning. Todays learning management systems do offer only conventional ways of delivering content and a collaborative environment. While research in information technology already works on integrated, interdisciplinary data models for engineering projects, learning management systems still work on the basis of check-in and check-out documents. Multiplayer online games offer a persistent virtual world and immediate collaboration on simulated objects and contexts. Together with their sophisticated possibilities of specialization they show characteristics of interdisciplinary planning and projects. Steinkuehler and Duncan (2008) already presented ‚empirical evidence about the potential of games for fostering scientific habits of mind' in the massively multiplayer online game World of Warcraft. But specific examination for the aptitude of multiplayer online games for engineering education is still missing. Although there are technically oriented multiplayer online games, little is known about engineering practices within these games. Through a literature research we have gathered a profile of contemporary demands on engineering skills and practices, and the appropriate learning scenarios to train the corresponding skills. These results have been compared to a discourse analysis of data collected in the massively multiplayer online game EVE Online to identify engineer-

ing practices in this game. For more than 16 months data has been collected through a cognitive ethnography. The comparison of both results provides evidence that engineering skills are practiced and developed within the game. This knowledge delivers a possible way to develop similar but subject-specific virtual worlds that comply with the demands on distance education

Game-Based Assessment; Implementing an Android Application on Tablet Pcs for Peer-Evaluation

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Abstract: Mobile devices such as smartphones and tablet PCs are becoming increasingly popular, setting out opportunities in educational settings. This study investigates the use of an android application on a tablet PC as a suitable and valid tool for summative assessment by peer-students. Using a traditional exam as bench-mark, a game format was experimentally trialed to assess students' knowledge and skills at the end of a first aid course in a pre-service teacher training programme. The game format consisted of a board game and an android application enabling registration of answers given by the student as well as peer-evaluation. Ninety-seven master students were randomly assigned into two groups. Two assessments, a game-based assessment and a traditional test, consisting of a paper-and-pencil test in combination with a skills assessment, were applied on both groups in opposite order. In both formats students were placed in the role of judge over other students' efforts. Similarities between both assessment types included individual testing, type of assessor, content, type of questions and demonstrations, and the use of checklists for skills assessment. The assessment methods differed in assessment format and feedback availability. Both groups performed equally in the game-based assessment as well as in the traditional test, in spite of opposite order of the assessments. No significant difference was found between the mean scores on the game-based assessment and the traditional test. These data suggest

that an application on tablet PCs may provide an effective means of assessing students' competence at the end of a practical course.

Keywords: peer-evaluation, game-based learning, android, first aid

Learning Syntax Using Serious Games Gamification of Programming Languages

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Abstract: There has been considerable interest in the use of computer games for learning mainly due to their ubiquitous nature amongst learners and for their power of motivation. If the fun is deconstructed in any good game, it becomes clear and obvious that the in-built-in learning process makes it enjoyable. It was proven that games of any type may be used as motivational tools within education. The use and adoption of games as a part of a curriculum that uses the culture of learners and their critical engagement with pervasive media within the classroom is a natural progression in the use of new media in teaching. In the research area of Game-based Learning, serious games can be effective learning tools which can motivate learners to gain knowledge and obtain the desired learning outcome. Game-based Learning is today considered as a new vehicle for embedding new knowledge and/or skills that can then be immediately applied in the workplace. In the field of computer science, students or learners need to study computer programming where they are confronted with studying and practicing programming with a diverse set of programming languages and concepts. To achieve the basics of computer programming one of the central concepts that students need to learn is syntax – which is considered as a set of rules that define the combinations of symbols that are considered to be well formed in the programming language environment. Learning syntax is itself an educational content, which is ubiquitous to computer programming, but still can be presented as a general learning content. However, when making the de-construction of syntax into statements (simple statements, compound statements), we can found many

materials that can potentially be presented as a learning content. For the purpose of this article we have chosen the for-loop command as an example of how syntax concepts could be learn using a serious game. Young students and learners usually debate to understand the principles and physiology of using syntax statements such as the for-loop command. The aim of the paper is to describe a methodology to develop a serious game, that will help young students to better understand and use the for-loop command and the underlying philosophy of programming languages. Using narrative skills and storytelling processes, the for-loop functionality can be embedded into a game based learning process. Serious games are ideally suited to support Problem-based Learning by creating engaging experiences around a contextual problem where users must apply competences to solve the presented challenges. Studying syntax in a traditional way can be time consuming. A well designed learning game could accelerate the process of understanding and mastering this type of concepts by providing tailored exercises to learn syntax concepts. Using the for-loop as an example this paper presents the suggested concepts that can be applied when designing and creating games for this purpose.

Keywords: game-based learning, problem-based learning, serious game, programming languages, syntax,

Insights Into Student Learning Using Virtual Environments as Assessments; Datamining SAVE Science

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Abstract: A current push among researchers is to investigate the use of immersive virtual environments for assessment that is more authentic in reflecting scientific complexity. Our multi-university U.S.-based research team is focused on designing, developing, implementing, and evaluating such science assessments. Through our NSF-funded SAVE Science project, we have developed an immersive virtual environment, Scientopolis, to

assess middle school children's understanding of both science content and process. Scientopolis has four assessment modules, each focused on unique content and process skills (see Figures 1 and 2). Middle school participants take part in a problem-based narrative in each by exploring the environment, interacting with computer-based characters and objects in the virtual environment, collecting and analyzing possible clues, and using their understanding of the topic gained through in-class curricula and process to draw inferences about the problem. SAVE Science allows students to solve the problems situated in the virtual environment in multiple ways; many of these are equally correct while others uncover misconceptions held by the student. We hypothesize that this type of contextualized assessment will yield new insights into student understanding.

In this paper, we will discuss what we are learning about student understanding through their choices and actions in the game-based assessment worlds, including the ways in which we are analyzing those actions and what we think those actions are telling us about student learning. We hypothesize that student choices and actions while solving the inquiry-based problems in our modules can provide insights into student understanding of the content being assessed. However, this is complicated by the fact that we designed the problems to be open-ended, much like real scientific problems. The result of this is a large dataset reflecting the many and varied actions students can take while completing the game-based assessments. In 2010-11, the SAVE Science dataset recorded 59,374 interactions with 1052 objects embedded in the 3 modules implemented that year, among 562 participating students (from 8 classrooms). In addition, there were 16,281 measurements recorded to a virtual clipboard available to students in the environment. Clearly, the task of assessing student knowledge based on patterns of actions stored in our dataset is complicated by the size of the dataset, as well as by the fact that there are no single right and wrong pathways to solving the problems. Three data mining steps are being conducted: Principal components analysis (PCA), correlations, and clustering. Each will be described in the full paper with examples of what we have learned from it. As we explore our complicated dataset, we are discovering that there are three different aspects to students' approach to solving the problems: investigating the problem (actions), analyzing data (graphing), and interpreting the analysis in relation to the problem (answering questions). Interestingly, these are not correlated. We have also found that some students focus on data from traditional scientific tools,

while others use more naturalistic tools. This information helps us create grade reports for teachers to help them understand what their students are thinking. Paper relevance: One of the conference threads is evaluation and assessment of games-based learning. In this paper, we discuss our process for using data mining to assess whether students' problem solving actions indicate what they have learned about the science content and process. It is important for the field to share information on how to make sense of the large amounts of data coming out of game environments.

Keywords: virtual environments, evaluation, data mining

Who Needs Time and Money? How to Design Cheap and Effective Traditional Games

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Abstract: Games have been used to create strong contexts for education and training for centuries, stretching back to the use of detailed board games such as New Kriegspiel (a war game enclosed in a large chest, thought to be the first formal educative game with a rulebook, 1798) and the military games introduced by the British and American armies which followed in the 19th century (Cohen & Rhenman, 1961) and more recently through detailed digital simulations as used for military and medical training. As such context-focussed games entered the classroom, the emphasis has remained with simulation and detailed digital worlds (3D-realistic labs or operating theatres, etc.). This, however, has created a divide between subjects and institutions: simulations and complex digital worlds need time, money and design/technical expertise to develop. Many educators have great ideas for games yet lack the resources to put them into practice; the benefits of game-based approaches to setting strong contexts should be available to all. In stark contrast, traditional games (board, card, word, playground, initiative - such as 'capture the flag' or 'get across the river first' - and other non-digital games) are extremely cheap to produce, require little technical skill either to create or to play, and yet can provide

compelling and memorable activities for players (Whitton & Moseley, 2012). Recent examples of traditional games in education and training settings have induced quite strong contextual aspects (Moseley, 2010) and the authors believe that context can be embedded in the design of traditional games quite simply, with very little cost or specialist skills. This workshop will help participants to identify elements from their own subjects, link them to traditional game design, and use these to create a simple traditional game with contextual aspects. Workshop participants will leave with a skill set for identifying, applying and designing traditional games; and with ideas to apply to their own subject areas.

Bringing Psychology into Financial Capability Games Through Teachable Agents

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Abstract: This article reports on our work of incorporating psychological elements and learning objectives into games for financial capability. Our approach is informed by a pedagogy of teachable agents (TAs) and targets impulsive behaviour in daily financial decisions. This work is conducted as part of xDelia, an EC-funded project that brings together experts from a broad range of scientific and engineering disciplines. A key objective is to develop game-based learning approaches to help improve financial capability of young people. Financial capability is concerned with the knowledge, skills, and competences that allow individuals to make informed financial decisions and take charge of their own financial matters. A proof-of-concept game built around impulsive buying and related financial capability themes demonstrates some of the core principles and ideas.. The learning objective of the game is twofold. First, transmit to the learner a deeper understanding of impulse buying and spending, the risk factors that foster this type of behaviour, and the possible consequences on financial well-being. Second, demonstrate to learners ways to counteract impulsive tendencies and show them in which situations they are useful and where

they might be ineffective or detrimental. We propose that certain key elements of the TA paradigm (Brophy et al., 1998) offer a pedagogy that is well-suited as a basis for achieving these kinds of learning objectives. The original idea behind TA is that students learn by instructing an agent to think in particular ways about its environment, by observing the resulting behaviour of the agent once it has to act and solve problems, and by redesigning elements of the agent in case it makes mistakes. The best known and most developed TA is "Betty's Brain", a system to teach middle school students about the nature and functioning of river ecosystems. Betty's TA system has been used as a framework for educational games (Tan et al., 2005; Blair and Schwartz, 2005) on plant biology and fluvial ecosystems. There are several reasons why we cannot apply this particular TA approach to our game without major changes. First, our principal learning domain is the player's psyche, rather than the external, physical world. Second, since our game is targeted at a general population, the concept maps used in TAs pose some difficulties. Third, our focus on decisions and behaviour precludes sole reliance on the more knowledge-oriented techniques of existing TAs. Fourth, we want to reduce to a minimum the disruption of game flow by extraneous elements such as quizzes, a common element in learning-by-TA. In this paper, we describe our TA-informed approach, which brings together three key learning paths. First, players act in the world and receive 'focused' feedback. Second, players directly manipulate the world or the avatar and explore the effects of the manipulations via normal gameplay. Third, players construct models of avatar behaviour, where incorrect models create noisy feedback. The goal of the player is to bring the avatar under control by learning about its ways of thinking and acting, and by deploying strategies that affect its behaviour. We propose that this TA approach has a significant potential in achieving the learning objectives set out earlier.

Keywords: teachable agent, financial capability, online game, psychology, behaviour change

Serious Sports; Assessment of Sport and Movement Based Games

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Abstract: The Serious Sports project aims to develop a digital sports game and reusable framework that will help to support and train sports coaches by offering them the opportunity to simulate physical conditioning, training content and structure in different (training) seasons for a European-wide popular sport. The project also intends to research, enhance and promote the use of game based learning in all areas of sport and support the recognition and evaluation of social, communication and organizational skills acquired in all possible learning scenarios. The DEIS Department of Education Development in Cork Institute of Technology is working with a group of specially selected institutes from across Europe, chosen for their expertise in the areas of sports, digital games, instructional design and to ensure a wide geographical spread for collaboration and dissemination of the project results. The institutes are FH Joanneum (Austria), London South Bank University (UK), Semmelweis University (Hungary), Oulu University (Finland), Simsoft (Turkey) and Scienter (Italy). The project wants to establish a central European bank of resources and information for sports trainers, which will provide information related to digital sports games, enabling trainers & coaches to promote and support the use of game based learning in the area of team sports. The project Serious Sports also intends to research, enhance and promote the use of game based learning in all areas of sport and support the recognition and evaluation of social, communication and organizational skills acquired in all possible learning scenarios. The ongoing work in WP2 accommodates assessment of 35 available COTS sports or movement based games regarding their potential for their usage in sports, and usability tests of various game input devices with the perspective of transferability of competences into sports. The research is carried out by all partner institutions and is facilitated by templates and accompanying guidelines. The result from the research phase will be pre-

sented at the conference and will be also collated in the form of a catalogue of games for sports.

Keywords: game-based learning in sports disciplines, game assessment, game input devices, usability tests, transferability of competences

Potentials of Using Game-Based Learning in Training: A Detailed Field Research

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Abstract: The Project GREAT aims to provide methodology and guidelines for using Game-Based Learning (GBL) in education and training. GREAT (Game-based Research in Education and Action Training) is an EU Leonardo da Vinci funded project, started in October 2011 and lasting two years, that aims to provide documented ways of using Game-Based Learning within teaching-learning processes by transferring innovative methodologies, and corresponds with the ICT/digital preparation of European citizens in 2020. In this paper we will present results from the research phase of this project. The questions being asked are to define the challenges and requirements for the future of training and education coming from Game-Based Learning, to identify Key Policies that will achieve effective GBL use in training throughout Europe, and to outline the challenges and requirements for the Learning processes and methods coming from the use of Game-Based Learning. The overall objectives of the research are to develop a common vision for the role for GBL in training and education, to identify the key policies and instruments that may be needed (taking barriers and obstacles into account) and to develop a common view of the scenarios, contexts, content, environments for better use GBL. Parallel to the thorough desk research, the project partnership compiled an online survey, carried out in depth interviews with stakeholders and an international expert focus group meeting hosted on 26-27th of February in Graz, Austria. This expert focus group was organized with the aim of providing a

platform for international experts on serious games, game-based learning, e-learning and training, to have the opportunity for joint discussion on the subject matter, analyse the state of the art, and to enable discussion on focused issues. Following the results of the survey, the partnership will gather information from companies, training institutions, and stakeholders about the existence and the use of games for learning and training. At the time of writing, there were 540 completed responses to the survey from 32 different countries, both inside and outside the European community. Over 20 stakeholder interviews in Austria, Hungary, Slovenia, Portugal, Romania and Turkey were carried out, and 16 international experts were contributing to the focus group. Results will be collated and provided within this paper and conclusions will be outlined for the contribution to this conference.

Keywords: game-based learning in training, new training methods, key policies, strengths, inhibitors

Minecraft in an English Class

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Abstract: We know that games help students gain insights in many ways. While they initially are learning the skills needed to be collaborative, when playing a MMOPRPG, they are also learning about citizenship, collaboration, problem solving, spatial reasoning, and creativity. There are many books devoted to the educational aspects of games (Prensky,2006, Gee, 2007, Thomas & Brown 2011). Clearly games have potential if used by teachers who are able to transform traditional lessons into engaging and creative ones. This paper presents a study of one English teacher in a private school in New Hampshire, U.S. who used Minecraft software for his students understand "point of view" and "characterization." Minecraft is a MMOPRPG that is described as a "sandbox" game. It can be played in single player or multiplayer modes. Players build things using blocks that look a bit like "Legos™ on steroids." The game, designed by Markus 'Notch' Persson, can be downloaded for free, or purchased for a nominal amount. Playing the game allows teachers to give students opportunities to show how creative they can be, while also working collaboratively with others in

their classes. Minecraft is like Second Life in that it is real-time, environments built belong to the user, and the purpose or goal is user defined. (Oliverio, J. & Beck, D., 2008) However, Minecraft requires the user to logon to a dedicated server, rather than a totally open-to-the world system, which makes it safer for use in public schools. In addition, building within the Minecraft game means you have to develop your materials (chop down trees, mine stone, create a furnace to manufacture charcoal, and more). Only by learning how to develop your own materials are you able to build and develop your environment in Minecraft. This qualitative study, which follows one English teacher using Minecraft to teach about "point of view" and "characterization," will describe the process by which this teacher introduced Minecraft to his students and how the students then used the game to develop scenarios and answers to the assignment. The assignment was as follows: "Conflict / assignment sheet: Conflict - Parents are out of town and kid is being pressured to host a party. He/she agrees and the party quickly gets out of hand. Students must determine ending and should be able to explain how that might impact the theme/main idea. For instance, very different main idea if kid gets away with it versus say younger brother dies of alcohol poisoning, or police come and jail everyone."

Keywords: Minecraft, exploration

Stories From the 20th Century Czechoslovakia; Serious Game for Teaching History

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Abstract: In the context of curricular history education both commercial entertainment games as well as serious games specifically tailored for educational purposes were employed and their learning effects examined. Several studies reported that usage of the latter type of games yields promising outcomes. At the same time, the coverage of Czech contempo-

rary history (in particular the contentious 2nd half of the 20th century) by Czech educational materials remains largely fragmentary. Therefore, in 2011, we have started to develop a large-scale serious game to fill this gap. The target audience are 13 to 19 years old high-school students. The key educational objective of the game, developed under the code name Stories from the History of Czechoslovakia (SHCS), is to present to the students the key events of the history of Czechoslovakia in the second half of 20th century (to 1989) and to enable them to "experience" these events from the perspective of different actors. By doing so, the game aims to develop deeper understanding of the complex and multifaceted political, social, and cultural aspects of this time period. Emphasis is given on the diversified historical experiences of various segments of the population. The game is a single-player dialog-based adventure game with a strong narrative, featuring interactive comics. Importantly, the content of SHCS is based on personal testimonies of eyewitnesses of the respective periods. The player assumes a different role in individual modules and interacts with the eyewitnesses in the present and "travels" back in time on memories of the eyewitnesses yielded during conversations. The simulation will be enhanced by a multimedia encyclopaedia which will present to the students factual information, including authentic materials, such as photographs, reportages or radio recordings. The educational methodology also supports in-class discussions concerning the given periods and events. Presently, we are finishing the game engine and the first module covering the 2nd World War. We have already conducted the concept evaluation on 71 high-school subjects during winter 2012. In this evaluation, the most important questions we asked were: a) Would the students accept the chosen game genre (comparing it to e.g. RPG)? b) Would they accept comics-based 2D graphics (comparing it to 3D graphics)? c) Would they appreciate that the game's content is built around real personal stories (as opposed to fictitious stories)? All three answers were generally positive, further refining the development process. Larger evaluation of learning effects will take place during 2013. The research questions will be formulated in the context of Mayer's cognitive theory of multimedia learning. The game is being developed at the Faculty of Arts and the Faculty of Mathematics and Physics of the Charles University in Prague and the Institute of Contemporary History of the Academy of Sciences of the Czech Republic. The personal testimonies of eyewitnesses on which the content of SHCS is built were collected by the nongovernmental organization Post Bellum. The project is funded as the grant project DF11P01OVV030 by the

Ministry of Culture of Czech Republic under the program of applied research and experimental development.

Keywords: serious games, digital game-based learning, educational games, history, Czechoslovakia

Gamified Innovation: Investigating and Defining Games for Creativity and its Application

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Abstract: This paper reports how advanced inventive thinking and creative problem-solving can be simplified and gamified to suit a wider user community. Innovation (Inne Novare) represents something new which happens inside or within an older system/context, and it's a process of practical application of a creative idea, breakthrough or invention. Furthermore, games that go beyond pure entertainment are winning more acceptance within education and industry as highly motivating tools that can effectively facilitate and support learning. Therefore, a phenomenon of game-based invention might be used to enhance problem-solving and solution-finding and, by meeting the demands of the 21st century thinking trends and media literacy, address real-world, professional, formal/informal and tertiary education challenges. The question is whether game-based innovation can appeal to any User and whether it can transfer a high level of both specific and abstract knowledge efficiently and in a satisfactory manner. A proposed overview presents a selection of insights and studies that provide a theoretical rationale for using game-based learning in the context of sequential and repeatable innovation. This seems relevant as, according to innovation specialist Anja-Karina Pahl, there are over 110 varied innovation and creativity tools including very complex ones such as: Horowitz's "Advanced Systematic Inventive Thinking" (ASIT), Altshuller's "Theory of Inventive Problem Solving" (TRIZ), or Pahl's "The Theory of Inventive Problem-Solving, Modernised" (PRIZM) just to name a few. Most of them are used in engineering design as a series of steps that guide expert teams as they solve problems. Since innovation is a high demand and unique field it

might be useful to propose a separate game category to distinguish games that are strictly related to innovation from other categories. In order to address these issues, and to consider other dilemmas related to game design, the author of this paper suggested a definition for games that boost creativity and help find ways for its application. Also, the structure of the game design that is interwined with a specific flavour of the process of creating and design will be analyzed and the Integrative Model for Invention Games Design (IMIGA) will be introduced. The model aims to provide an open structure for the game-based innovation and its functionality. Moreover, the general process of creating, mainly grounded in psychology, but also in other disciplines, will be explained, illustrated and implemented within the model. This paper aims to provide theory and background to help game designers, educationalists and researchers better understand and use game-based innovation appropriately in a given situation.

Keywords: innovation, game-based learning, game design

Psychology, Pedagogy and Technology of Online Remediation of Reading Fluency Problems

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Abstract: Some children struggle with becoming fluent in reading. This, in turn, may compromise their reading comprehension and make them uninterested in pursue reading-related activities. The problem is hard to remedy. Reading practice (especially guided repeated oral reading that included guidance from teachers, peers, or parents) typically leads to improvement, but such practice may be hard to arrange in a resource-squeezed school. Guided repeated reading practice in the form of computer games offers an opportunity to supplement more traditional forms of instruction and remediation.

To address this, we developed Graphogame-Fluent – a set of online computer games designed to improve reading fluency. The original Graphogame (developed at the University of Jyvaskyla, Finland to help beginning readers learn basic letter-sound correspondencies; see https://graphogame.com/), was amended to make it suitable for older primary school children (3rd – 6th grade). Graphogame-Fluent comprises of several separate games, exercising reading fluency on the level of syllables, words, and sentences. The games implement an adaptive learning algorithm that adjusts the speed of material presentation (or response time given) to the player's accuracy, so that fast yet accurate responses are encouraged. Apart from immediate feedback on the accuracy of each response, players can also track their progress across playing sessions. Separate reading assessment tasks are also included. English language and Polish language versions of the game were developed.

We report an experimental study on the use Graphogame-Fluent, involving slow readers in Ireland and Poland. Following the initial assessment of reading and related skills, slow readers were invited to play the games individually at home or at school for half an hour a day for period of approximately one month. We addressed the following main questions:

1) Effectiveness:

- Does playing Graphogame-Fluent makes significant impact on reading fluency?
- Does the magnitude of that impact depends on the parameters of the games? Specifically, we explored two of them:
  - The size of the orthographic unit trained: whole words only, as opposed to whole words as well as individual syllables
  - The frequency of the trained units: highest frequency words and syllables only (which, according to Zipf's law, are responsible for the vast majority of material encountered in a typical text) as opposed to any words and syllables, irrespective of their frequency.

2) User satisfaction and overall feasibility of Graphogame-Fluent as a pedagogical tool:

- What was the uptake of the games?
- What the typical duration and intensity of play?
- What were the factors that predicted 'stickability' – children's willingness to persist at practice?
- What did children – and their parents – think of the games?

We will present result and conclusions concerning a) the cognitive psychology of fluent and dys-fluent reading b) the technology of reading fluency games c) the pedagogy of game-assisted fluency training.

Keywords: reading difficulties; dyslexia; fluency; repeated practice

Learning and Enjoyment During After-School Hours; Evaluation of an Integrative Model

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Abstract: A model which integrates an online game unit with an interactive learning unit, aiming to create a positive experience of learning social practices, values and norms was investigated. This model sets the design principles of "Al-Hagova" websites in http://kids.gov.il/, founded by Direct-Gov and Snunit center for the advancement of web-based learning. While in a previous study (Broza & Barzily, 2011), the effectiveness of the model for formal learning in school was investigated, the focus of the current study is free-choice learning after school hours. The effectiveness of the model was explored in a pilot by collecting data from 130 kids aged 8-14 through an online questionnaire, interviews, and one month site data as provided by Google Analytics. Three games and corresponding learning units were chosen from three websites in the portal, dealing with different subject matter (financial education, environmental protection and local consumption), and aiming to transfer values and norms in the specific subject. Research questions include: to what extent do kids enter the learning units compared to the games during after-school hours? How do they evaluate the combined learning experience? And to what extent does this model help in transfer of social values and norms? Findings from the online questionnaire, personal interviews and site data reveal that kids play the games as well as enter the interactive learning units after school hours. The statistical analysis supports the hypothesis that the desire to win the game creates motivation to enter learning units. Although children identified the units as educational, they reported enjoying playing the game as well as

the interactive learning unit, and they saw the benefit of combining learning with fun. Evidence for assimilation of social practices leads us to conclude that the model can combine free-choice learning with enjoyment.

Keywords: educational games, microworlds, informal learning, free-choice learning, game-based learning

Improve or not to Improve? Comparative Investigation of Game-Based Learning in Technologically Advanced and Non-Sophisticated Environments

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Abstract: Game industries and related areas increasingly become subjects of technological improvements. The paper challenges the idea that game-based learning in similar activities is more effective in the technologically advanced environments. Based on evidence from the field and accounts from the theories of improvisation (e.g. Cuhna et al. 2002; Eisenhardt & Tabrizi, 1995; Orlikowski and Hoffman 1997; Yanow 2001) and individual learning (e.g. Argyris 1977; Kritz 2003; March 1991), I illustrate that technological constraint and restrictions might act as an effective enabler of successful learning, creativity and increased perfomativity. The methodology of this work-in-progress is based on qualitative in-depth comparative case study analysis (Markus 1983; Myers and Avison 2002; Walsham 1995; Yin 2009). The research setting incorporates two game frameworks: "Planschet" and "Lineage". While both games provide a background for individual learning in goal-setting, team work and decision-making in uncertain and turbulent environments, they differ significantly in technological tools supporting players. Thus, "Lineage" is an example of the game-framework supported by technologically advanced tools (advanced 2D graphics, professionally developed game settings, etc.). "Planschet" follows the same logics of being multi-party, real-life and role-playing game with settings similar to the "Lineage". However, technologically

"Planschet" is based on pen-and-paper tools and human game-master. The results of preliminary study illustrate that, despite significant technological differences, both platforms enable similar learning effectiveness. This study aims at comparing both platforms in order to build a detail understanding whether and how individuals learn in technologically advanced and non-advanced environments. Based on theoretical analysis and findings from the field, I develop a concept of a "learner-entrepreneur" and reveal the process by which learners-entrepreneurs manage to successfully enact technology gaps and limitations for their own benefit. By doing so, the paper contributes to the theories of informal learning, creativity and improvisation, and technology use. Practical contributions of the paper are twofold. First, the paper aims at enhancing our understanding of the process and effective methods of technology –enabled and game-based learning and creation of effective learning environments. Second, the paper provides real-life examples of how technology restrictions are transformed into competitive advantage. The investigation is planned to be grounded on multiple data sources (Creswell 2007; Yin 2009) including semi-structured interviews, field observations and in-depth assay of the involved documents and artifacts. Further stages of this research will embellish the findings of the preliminary study and provide deeper theoretical and practical accounts on the question

Keywords: game-based learning, technology, learning environments, learner-entrepreneur, case-study