University of Brighton

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Abstracts and Conference Materials for the

14th European Conference on Games Based Learning

A Virtual Conference hosted by The University of Brighton, UK

24-25 September 2020

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A conference managed by ACI, UK

Abstracts of Papers
Presented at the

13th International Conference on Game Based Learning
ECGBL 2020

Supported By
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24-25 September 2020

Review Process
Papers submitted to this conference have been double-blind peer reviewed before final acceptance to the conference. Initially, abstracts were reviewed for relevance and accessibility and successful authors were invited to submit full papers. Many thanks to the reviewers who helped ensure the quality of all the submissions.

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ECGBL Preface

These proceedings represent the work of contributors to the 14th European Conference on Games Based Learning (ECGBL 2020), hosted by The University of Brighton on 24-25 September 2020. The Conference Chair is Panagiotis Fotaris and the Programme Chairs are Dr Katie Piatt and Dr Cate Grundy, all from University of Brighton, UK.

ECGBL is now a well-established event on the academic research calendar and now in its 14th year the key aim remains the opportunity for participants to share ideas and meet the people who hold them. The conference was due to be held at The University of Brighton, UK but due to the global Covid-19 pandemic it was moved online to be held as a virtual event. The scope of papers will ensure an interesting two days. The subjects covered illustrate the wide range of topics that fall into this important and ever-growing area of research.

The opening keynote presentation is given by Prof. Nicola Whitton, Durham University, UK, on the topic of From games to play: what's the difference?. The second day of the conference will open with an address by Dr Alex Moseley, Durham University, UK, who will talk about Playful Learning, Teaching and Researching.

With an initial submission of 180 abstracts, after the double blind, peer review process there are 79 Academic research papers, 7 PhD research papers, 2 Masters Research papers and 10 work-in-progress papers published in these Conference Proceedings. These papers represent research from Austria, Canada, China, Denmark, Deutschland, Estonia, Finland, Germany, Greece, Ireland, Italy, Japan, Malaysia, México, Netherlands, Norway, Portugal, Russia, Russian Federation, Scotland, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, UK, USA,

We hope you enjoy the conference.

Panagiotis Fotaris

The University of Brighton
Brighton, UK
September, 2020

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Germany; Prof Mat Warren, Deakin University, Australia, Australia; Dr. Santoso Wibowo, Central Queensland University, Australia; Prof. Trish Williams, Flinders University, Australia; Prof Richard Wilson, Towson University, USA; Simos Xenitellis, Royal Holloway University, London, UK

Biographies

Conference Chair

Dr Panagiotis Fotaris is Senior Lecturer and Course Leader for BSc Digital Games Development and BSc Computer Science for Games at the University of Brighton. He has previously held posts at the University of East London, University of West London, King's College London, and Abertay University. Before entering academia, he spent a decade in the Creative Industries in a variety of roles including mashup artist, radio producer, DJ, graphic designer, web developer, and music journalist. When not playing adventure games, Panagiotis focuses his research on the pedagogical potential of escape rooms, games, and immersive technology in the context of computing and design education.

Programme Chair Co Chairs

Dr Katie Piatt is the eLearning manager at the University of Brighton, with over 15 years of experience in development, implementation and evaluation of educational technologies. Katie has a real passion for technology and how it can make teaching more effective – working with her team to support staff across the university to provide more engaging teaching and learning experiences. Katie works locally and nationally to integrate playful elements into adult learning contexts; projects have included alternate reality games for student induction, the NeverEnding Uni Quiz, gaming the Future of Technology in Education (FOTE) conference, and developing InfoBadges for recognising student information skills. Katie is co-Chair of the Playful Learning Association (http://pla.playthinklearn.net/) and loves being able to introduce techniques and tools to make learning more fun and engaging.

Dr Cate Grundy is a senior lecturer, design practitioner and researcher at the University of Brighton, focussed on the creative application of design thinking and interaction design principles across a range of disciplines. Cate is versed in UX methods and specialises in applying them to three dimensions, from digital games to product design. Using the motivational power of games for social

benefit is of particular interest and Cate currently works with Forestry England creating location-based games inside woodland areas, to encourage outdoor play for older children. Cate has developed new and innovative methods for co-designing games with young people, with a focus on addressing the latent and emotional needs that can lead to game success. She also developed an 'experience map' for games, to scaffold the user research process. These techniques been applied to a variety of projects, including the design of new games for Mind Candy Ltd., the creators of Moshi Monsters and Warriors. During her 18 years of teaching experience, Cate has attempted to introduce a variety of real-world projects to students. She runs a design consultancy, known as Brighton Product Lab, with final years and has project managed teams working for a variety of clients, from designing toys and games for a Gambian school, to medical products. Cate has also worked professionally as a designer with innovation companies, PDD Ltd.

Keynote Speakers

Dr Alex Moseley is Head of Curriculum Enhancement at the University of Leicester and a National Teaching Fellow; he is also a Visiting Fellow at the Centre for Higher Education Futures, Aarhus University. He has had long experience as both practitioner and researcher of course design and development for higher education. His doctorate and research focus are in play based learning for adults in higher education and museums; he has published widely on play and games for learning ('playful learning') and also teaches innovative play-based courses in History, Archaeology and Museum Studies. He designs games – principally non-digital; was part of the team behind the first charity Alternate Reality Game, *Operation: Sleeper Cell*; and is a certified LEGO® SERIOUS PLAY® Facilitator. He chairs the Playful Learning Association, and co-organises the Playful Learning conference.

Nicola Whitton is Director of the Durham Centre for Academic Development and Professor of Education at Durham University. Her research focuses on play in adulthood, in particular games and learning in the context of Higher Education, and the potential of play in teaching, research, and academic practice. Her most recent projects have focused on the potential of escape room design as a model of failure-based learning.

Mini-Track Chairs

Thorkild Hanghøj is a Professor of Games and Learning at the ResearchLab: IT, Learning and Design (ILD Lab), Aalborg University, Copenhagen, where he also co-coordinates The Center for Applied Game Research (CEAGAR). His work focuses on exploring links between games and dialogue, games and literacy, and how to learn through designing games. He currently manages the research project GBL21: Game-Based in the 21st Century (gbl21.aau.dk), which takes a dialogical perspective on how students develop design competencies when redesigning games within Danish (L1), mathematics, and science.

Dr Ian Stewart is Senior Lecturer and Academic Lead of the Management of Projects Research Group at the University of Manchester and Fellow of the Higher Education Academy. In teaching, he contextualises business and management Higher Education for projectised contexts, particularly construction and engineering. He has researched and used numerous experiential learning activities; live case studies, games and simulations. Through this, Ian won 'Education Practitioner of the Year 2018' from the British Academy of Management and a grant from them to support his research into the human and financial costs of experiential learning techniques for academics and students.

Author Biographies

Daisy Abbott is an interdisciplinary researcher and game designer based in the School of Simulation and Visualisation at The Glasgow School of Art. She focusses on game-based learning for Higher Education, in particular for research skills, alongside her other research interests: interactive or transmedia narratives, livecasting, digital and participatory culture, and interaction design.

Shiruk Abdel-Wahed is a student at FH Joanneum University of Applied Sciences, Austria. She received a bachelor's degree in the field of medical informatics. In her present field of research, she deals with electronic medication systems in the German-speaking region. Additionally, she is currently employed by an international hospital information systems provider.

Helena Adam has a background in health informatics. Her resent research includes food recommendations based on the Nutri-Score to improve food behaviour and therefore global health in general. Furthermore, she works as a

database developer at Dedalus. There, she focuses on data warehousing and data analysis of hospital information systems.

Carina Aichinger, MA is a research associate at the University of Applied Sciences Upper Austria. She holds a Master's degree in Communication and Knowledge Management and has worked in e-learning and the IT industry. Her main research interests are game-based learning and motivating learning strategies.

Rasmus Vestergaard Andersen is a master student in Sports Science & Health and is currently a pre-graduate student in the research unit LET's (Learning and Talent in Sport) at SDU. Rasmus is working on his master thesis in creating movement-based design methods cards to be used by students, educators, and professional designers.

Sylvester Arnab is a Professor of Game Science, who explores engaging and empowering experiences through the lens of playful and gameful methodologies and pedagogies. Sylvester is a co-founder of the GameChangers initiative at the Disruptive Media Learning Lab, Coventry University, which has been adapted in other countries, such as Malaysia ,and soon to be expanded into Vietnam and Indonesia towards responding to the UN's Sustainable Development Goals. More: https://pureportal.coventry.ac.uk/en/persons/sylvester-arnab

Riikka Aurava is a PhD researcher at the Tampere University Game Research Lab. She is writing her PhD on game jamming in schools and has a strong background in teaching in the Finnish upper secondary school. Her other interests are the materiality of role-playing games, games in education and the gamification of education.

Susana Moreira Bastos. PhD in Education and Didactics. Senior Lecturer at ISCAP-IPP, Porto Accounting and Business School, Porto (Portugal). Her research fields include accounting and management education pedagogies, active methods on learning process and Soft Skills. Has been responsible for CoSki21 Erasmus+Project and Living-Lab Smart City Project (Matosinhos).

Janet Benson holds a MSc. in Digital Education from the University of Edinburgh and focused on game-based learning in the workplace as part of her MSc. Dissertation. She has worked in L&D with a number of multinational organisations while implementing innovative learning and technology solutions. At Learnovate she works with clients and members to apply best practices in relation to learning theory design.

Björn Berg Marklund has worked with games since 2010. In his thesis, *Unpacking Digital Game-Based Learning*, he worked with developers, teachers, and students

to establish a holistic and critical overview of the creation something as technologically advanced as a digital game and whether they can be implemented to have a positive impact on classroom environments.

Puneet Bhargava is a computer engineer, he holds an MBA and is interested in the areas of emotions and self-regulation and the role played by these areas in student academic outcomes. His current research is focused on exploring the applicability of psychological concepts, such as emotional intelligence, to analytics in the video game industry.

Louisa Bremner is currently a PhD student at the University of Huddersfield. Her main research focus is looking at how game-based technology can be used to support learning for young children with Autism Spectrum Disorders. Her research interests include immersive technologies such as Virtual Reality and Augmented Reality, game-based learning and Human-Computer Interaction.

José Ramón Calvo-Ferrer PhD in Translation and Interpreting from Universidad de Alicante. Teaches different modules on Translation, English and teacher training since 2008. Research lies in ICT in general and video games in particular for second language learning and translator training. Published various papers on video games, multimodality and second language learning in specialised journals (Interactive Learning Environments, British Journal of Educational Technology, ReCALL, etc.) . Visiting Lecturer, Department of Language of Linguistics ,University of Essex, where he delivers lectures and workshops on video games and translation.

Vania Castagnino is a game developer working with studios in both Sweden (An Otter Team) and Peru (Hermanos Magia). She has a Bachelor's Degree in Fine Arts and a Master's Degree in Serious Games. She is a co-founder of FemDevs Peru, a non-profit association working with equality issues in the game industry in Peru.

Samantha Clarke Design-based researcher with ten years' experience and expertise in the design and development of serious games, simulations and gamification applications for education, health, business and governance. She has been involved in working with various stakeholders groups delivering serious games and gamification, including EU H2020, HEFCE and Newton Fund, funded projects.

Naoise Collins is a PhD researcher in TU Dublin investigating situated immersive gaming environments for Irish language learning. He is a part time lecturer in game systems in TU Dublin and VR in NCAD. He is a core member of the ViRAL research lab, an AR/VR software development and research lab in TU Dublin. He is

a Government of Ireland Postgraduate Scholarship Programme awardee and his research project is funded by the Irish Research Council.

Conceição Costa is a PhD in Communication Sciences - Media Studies from FCSH-UNL. She is a Full Researcher at CICANT–UHLT in Lisbon, Portugal. Currently she is the Principal Investigator of GBL4deaf – Game-Based Learning For Deaf Students and MILT- Media Literacy for Living Together, funded by European Commission.

Bob Cruijsberg is a teacher in interaction & UX design at the HU University of Applied Sciences Utrecht, the Netherlands. With a background in media technology and education, his research focuses on design issues in educational settings for the research group Human Experience & Media Design.

Mária Čujdíková is a PhD student at Comenius University in Bratislava. I am studying a program Theory of Mathematics Education at the Faculty of Mathematics, Physics and Informatics. In my dissertation thesis, I explore how video games can develop mathematical thinking and how pupils perceive that they encounter math when playing video games.

Sergiu Dascalu is a professor at the University of Nevada, Reno. He received his PhD in computer sciences from Dalhousie University, Canada in 2001. also the Director of the Software Engineering Laboratory (SOELA) and the Co-Director of the Cyberinfrastructure Lab (CIL). His main research interests are in Software Engineering and HCI.

Jonathan deHaan studies, teaches and designs games and simulations. He is particularly interested in literacy and language learning and teaching. He is an Associate Professor at the University of Shizuoka, Japan where he directs an undergraduate Game Lab. He is co-editor of the Ludic Language Pedagogy journal.

Iain Donald is a Senior Lecturer in the School of Design & Informatics at Abertay University. Iain's research includes the application of games beyond entertainment. His recent work examines the intersection of games, digital media and history with a focus on commemoration and memorialisation.

Viorel Petrut Draghici received the Diploma degree in System- and Computer Engineering from Politehnica
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Lars Elbæk is associate professor and researcher in the unit Learning and Talent in Sport (LET'S), SDU. Lars lecturer and do research in movement interaction and design research and has several years of experience in sport, physical movement, learning, and sport pedagogy. His interest is 21st century skills and creativity in sport and movement entrepreneurship.

Dr Rebecca Ferguson is a senior lecturer in the Institute of Educational Technology (IET) at The Open University and a senior fellow of the Higher Education Academy. As well as researching learning and fun with the Rumpus group, her primary research interests are educational futures and how people learn together online.

Anne Fiskaali obtained her MSc in Psychology in winter 2017 from Aarhus University, Denmark, and began her PhD-fellowship shortly after (complete in October 2020). Throughout her Masters programme, gaming and e-sport has been her main focus of interest, with a particular on gaming's effect on well-being.

Sílvia Fornós is a PhD fellow at the Center for Computer Games Research in IT University of Copenhagen. Her research is part of the "Chemical Engineering Immersive Learning – CHARMING" project, a European Training Network. Her work is focused on game making as a learning strategy for chemical engineering students.

Kun Fu (Ph.D., University of the West of Scotland; Lecture of Fuzhou University) Dr. Fu was a game designer at Foshan Flash8 Ltd from 2009. He currently serves as lecturer in Xiamen Academy of Arts and Design, Fuzhou University. His research areas: Game-based learning, serious game, interactive design.

Sonja Gabriel works as a professor for media literacy at University Teacher College Vienna/Krems (Austria). Her primary focus of research is on digital game-based learning and using serious games for teaching different subjects at school and university as well as evaluation of various projects for learning with games and game-design approaches.

Alexander Gantikow is an academic assistant in the Media Education and Visualization Group (University of Education Weingarten, Germany). He received his Bachelor's degree in Media and Education Management in 2015 and is currently enrolled in the consecutive Master's programme. His areas of interest are technology enhanced learning, human computer interaction and user experience design

Lanlan Gao is an associate professor of computing at Fujian Educational College, China. She is a PhD student in computer informatics at Huddersfield University since 2017. She has published 31 papers and 3 books in China, involving main research areas which are information technology and educational games.

Matt Gaydos is an Assistant Professor at Akita International University. He researches and designs games and play for formal and informal learning.

Ahmed Hassan is a Software engineer by profession. He completed his master's in software engineering from Pakistan and currently doing his Ph.D. at the Department of Informatics of Humboldt University Berlin. His general area of research is Human-computer interaction and specifically, he is working on serious games for children with Autism

Adriana Sofía Herrera Cano is a Biotechnology Engineer graduated from the Institute of Technology and Higher Education of Monterrey with a master's degree in Project Management from the University of Latin America. She works as a high school science teacher in PrepaTec Esmeralda in Ciudad Lopez Mateos, Mexico.

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Dr Angela Hilmi, Associate Professor Coventry University. Biologist, agronomist and socio-economist, with studies in anthropology and sociology of politics. Worked with farming communities, governments and private sector worldwide. She was Senior Officer in FAO-UN, Expert Partnerships and Alliances for Latin America and Caribbean, French Foreign Trade Advisor by French ministerial decree.

Martina Holenko Dlab is an assistant professor at the Department of Informatics, University of Rijeka, Croatia. She received Ph.D. degree in computing from the Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia, in 2014. Her research interests include recommender systems, technology enhanced learning, collaborative learning, and game based learning.

Huei-Tse Hou is a distinguished professor of Mini Educational Game Development Group, Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Taiwan. He is an expert in game-based learning, gamification for teaching, and learning behavioral analysis. Prof. Hou has more than 150 publications in the fields of education and technology, including more than 50 ISI-SSCI-indexed journal articles.

Yuanyuan Hu is a PhD student in Education at Utrecht University. She received MSc in chemistry from Zhejiang University in 2014. Then, she taught chemistry at an IB school in Shanghai for 3 years and another 2 years at a public school. Now she is working in H2020 CHARMING project, the Chemical Engineering Immersive Learning. She studies chemistry game-based learning.

Fatima Jannat is a postgraduate student and graduate research assistant in Faculty of Computer Science & Information Technology at University of Malaya. She completed her BSc degree in Computer Science & Engineering and worked as a university lecture for one and half year. She has three research articles published in IEEE conference proceedings and one book chapter in Springer. Her research interest includes HCI, information security and embedded systems.

Patrick Jost is a researcher in Human-Factors at NTNU University, Norway. He received his Master's in Human Factors from the University of Derby, UK. He also holds a Master of Arts in Design and has been leading international design-science projects. His main research areas are applied gaming and human-centred support in complex socio-technical environments.

Ekaterina Kubina. Her works have been published in international collections since 2018. Ekaterina shows excellent exam results. She is actively involved in extracurricular activities of the university. Ekaterina participates in government programs with business representatives. Her works are devoted to such topics as: modern education, innovation in development, redevelopment of territories. Ural Federal University named after the first President of Russia B.N. Yeltsin

Zoi Karageorgiou is PhD candidate of the School of Applied Arts (Hellenic Open University-HOU) and IT Professor at Vocational School. She studied Applied Informatics (University of Macedonia) and graduated the Master Program of Graphic Arts and Multimedia (HOU). She is actively involved in STEAM Escape rooms, creative writing and narratives, radio shows and theater groups.

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Alexandra Kukumbergova graduated with a bachelor's degree in mass media and a master's degree in digital game theory. She deals in the interference of game mechanics in everyday life and the educational process.

Bobby Law has been a Lecturer at Glasgow Caledonian University working there since 2001 and currently teaching Games Programming and Mobile Development. Prior to this he worked as a Software Developer for J&B Scotland and the Clydesdale Bank.

Søren Lekbo is masterstudent in Sports Science & Health and is currently a pre-graduate student in the research unit LET's (Learning and Talent in Sport) at SDU. Søren is working on his master thesis in creating movement-based design methods cards to be used by students, educators and professional designers.

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Patricia Lyk is a PhD student in the Department of Embodied Systems for Robotics and Learning Unit at the University of Southern Denmark. She has a MSc in Engineering (Learning and Experience Technology) and is working with Mixed reality for education.

Stefania Maggi is an interdisciplinary scholar and child's rights advocate, science fiction author and entrepreneur. She is concerned with the wellbeing of children and youth, and her areas of expertise include education, child development, climate change, and the role of entertainment and gaming in the promotion of cultural sensitivity, emotional intelligence, and positive development.

Rajchada Mahapruksarut is a HRD Manager at Clay Works, a 3D art-learning center in Thailand, with over 12 years of experience in employee development. Rajchada has a real passion for integrating playful elements into internal training in order to provide more engaging and fun learning experiences.

Rasmi-Vlad Mahmoud is a PhD Fellow at the Wireless Communication Section of Dept. Electronic Systems at Aalborg University. He obtained his M.Sc. in Networks in Distributed Systems from Aalborg University. Currently, his research focuses on the creation of advanced scenarios for cybersecurity training, enhanced by game-based learning principles to accommodate the huge gap of skilled personnel.

Gunver Majgaard (PhD) Associate Professor, SDU Game Development and Learning Technology, Mærsk Mc-Kinney, University of Southern Denmark. PhD in Robotics and Learning processes focusing on design of educational tools and learning processes. Interests are emerging technologies; Mixed Reality; design of digital educational tools; game-based learning; participatory design processes; learning processes; didactical design; program and curriculum development. She

is the founder of the engineering program Game Development and Educational Technology.

Ivar Männamaa is a researcher at the Estonian Military Academy and lecturer at Viljandi Culture Academy, University of Tartu.

Ute Massler is a professor of Foreign Language Teaching at the University of Education Weingarten, Germany. Her special fields of interest are, next to plurilingualism, reading, and web-based ELT, CLIL, teaching literature, foreign language teaching. She holds a doctorate in the field of CALL (Computer Assisted Language Learning) from the University of Education Freiburg.

Kenny Meesters is a researcher in information management at Tilburg University. In his research he specializes in information management during crisis response and disaster management. He examines how information can be used to empower both responders and (affected) communities. In his research he uses a combination of methods including serious gaming and field research.

Jonathan Mendels has recently completed his PhD in the Communication studies department at Ben-Gurion University of the Negev in Israel. His research focuses on digital games and dialogue in class, educational uses of digital games, critical education and technology and the tools it offers for education and social change.

David Moffat is a university lecturer in computing and games, at Glasgow Caledonian University, which he helped to make into one of the leading places in the UK for game development, and game design in particular. He teaches serious games, artificial intelligence and affective computing, drawing on his background in the cognitive sciences. Research interests in education have run from serious games to the development of creativity in students. Other research includes artificial creativity, and artificial emotion models.

Natalia Lara Nieto-Márquez currently works at the project IND2017/SOC-7874. She is a PhD student at Camilo José Cela University with an 'Industrial PhD grant' funded by the Community od Madrid. Her research interests are self-regulated learning (SRL), game-based learning (GBL), game design, metacognition, motivation and executive functions. She designs games at Smile and Learn Digital Creations.

Erik Ottar Jensen is a Ph.D.-student at the university College Copenhagen and Aalborg university. His academic background is technology in educations with a focus on mathematics education. His main research interests are use of digital technologies, games, programming and design approaches in classroom teaching and dialogical approaches to learning.

Raziye Oz is a Physical Science educator at Nizamiye School Mayfair, Johannesburg, South Africa. She received her Bachelor's Degree from Uludag University in 2005. She has been a chemistry teacher for the past 6 years and attended several national and international Olympiads as a supervising teacher.

Jaime Palma is a full time professor at Tecnológico de Monterrey, Mexico City Campus at the department of industrial and systems engineering. He holds an EngD (Doctor of Engineering) degree from the the University of Warwick. His current research interests include, supply chain integration, small supply chain firms and SCOR model.

Nikolay Panayotov is a PhD student at Abertay University, UK. He holds a BSc (Hons) in Computer Games Technology and a MSc in Psychology. His work includes the design and development of online systems for data gathering and visualisation, as well as the application of machine learning for computer vision and games.

Alexander Pfeiffer is recipient of a Max Kade Fellowship awarded by the Austrian Academy of Science to work at the Massachusetts Institute of Technology (MIT), Department for Comparative Media Studies / Writing and former head of the center for applied game studies at Donau-Universität Krems. . https://alexpfeiffer.mit.edu | https://www.alexpfeiffer.at

Trygve Pløhn is a Research Scientist and a PhD Candidate at the Norwegian University of Science and Technology (NTNU). His research and professional interest are within Pervasive Games, Serious Games and Game Based Learning.

Moritz Philip Recke studied Media Technology and Next Media at Hamburg University of Applied Sciences, conducted entrepreneurship policy research at UNSW Business School in Sydney and focused on entrepreneurial ecosystems, public policy discourse and sociotechnical imaginaries for his PhD. He is a faculty member of the Apple Developer Academy at University of Naples Federico II.

Evan Rushton is a data scientist committed to educational equity. After teaching high school mathematics in Los Angeles, CA, USA for eight years he entered the education technology sector as educator-in-residence at co.lab and learning designer at Glasslab Games. He currently conducts research with SNHU's Innovation Center.

Fredrik Rusk (D.Ed.) is associate professor in education at Nord university, Norway. His research involves the employment of conversation analysis and interaction analysis with video recordings to investigate social interaction and

learning in diverse settings, including screen-mediated interaction; smartphones, video conferences and video games.

Jonathan Sadler, Dr is a Research Fellow at Brighton and Sussex Medical School following 7 years of clinical medicine, mainly in anaesthetics and intensive care. His research is attempting to answer the question of how to teach uncertainty to medical students. His interests are sustainable medicine and games both in and out of education."

Keattikorn Samarnggoon is a lecturer of the digital game curriculum at College of Arts, Media and Technology, Chiang Mai University, Thailand. He received his PhD in computing science from Staffordshire University, UK, in 2016. His main research areas are EEG brainwaves analysis, digital game design and development, robotics, and machine learning.

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Norah Sarhan is a PhD student at Sussex University, UK, and a Creative Technology Group member. She designs language-learning games, particularly through Kinect system gestures, to enhance students' vocabulary. She received her BS in Information Systems from King Khalid University, Saudi Arabia, and her MS in Human-Computer Interaction from Sussex University.

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Antonia Schorer is researcher in European educational projects and PhD candidate at the Innovation in Learning Institute, Friedrich Alexander University of Erlangen-Nuremberg, Germany. Her research interests include different aspects of digital learning and how digital technologies can be used to achieve

educational and social goals, particularly through the use of serious games and game-based learning.

Anna Seidel is a designer and psychologist. In the Learn&Play project, she engages in game-based learning, motivation, user research and evaluation.

Karen Shanks is a PhD research student at Glasgow Caledonian University. After receiving a First-class honours degree in Psychology with Interactive Entertainment, she started her PhD in May 2019. Her main research areas are serious video games, game design and behavioural psychology.

Marina Shcherbakova. Computer science teacher, 2007 to 2018. The head of the professional pedagogical community of Tula . The director of Methodological Center, Tula, 2013 to 2017. The head of the educational game development group «Allotrope: Reaction», NPO "e-Nano", 2018 to 2019. Research fellow, Center of psychometrics, Institute of Education HSE, PhD student, Institute of Education HSE

Martin Sillaots is an associate professor of serious games and the head of the Digital Learning Games international master's programme (dlg.tlu.ee/) in Tallinn University. He is teaching courses like Game Logic, Learning Game Design and Gamification Workshop and is a national coordinator of several international projects like: MAGNUS, G.A.STEM and ALIEN.

Phillip **Smy** is a graduate of Abertay University and worked in the games industry as a Producer working within interdisciplinary teams. Phillip is currently a Research Associate at Abertay University, collaborating with leading global companies on applied research with a focus on digital technology and gamification.

Christopher Sommer is a research associate at the University of Oldenburg. He received his PhD at the University of Auckland in 2016. His research interests are military history, migration studies and E-Learning.

Bernadette Spieler is a visiting professor in Computer Science Didactics. Currently, she is at the Institute for Mathematics and Applied Informatics at the University of Hildesheim. Her work is focused on how to engage teenagers in playful computer science activities, with the dedication to enhance the experiences of girls in particular.

Tobias Staaby is a PhD candidate at the University of Bergen, Department of information- and media studies in Bergen, Norway. In his thesis, he is

investigating how teachers are using digital games as a resource in their curricular design, and as a tool for dialogic teaching.

Antonia Stagge is a research associate at the Media Centre of Technische Universität Dresden. She received her M.A. in Communication and Media Science from Universität Leipzig in 2017. In the E.F.A. project her main field of activity is the media-didactic conception of the serious game.

Matilda Ståhl (M.Ed.) is a research candidate in educational sciences at at Åbo Akademi University, in Vaasa, Finland. Her ethnographic thesis focuses on identity construction online within an educational context, and in particular, identity (co)construction while playing CS:GO within an esports programme.

Frans Stel is managing consultant at CreateNewBusiness and senior research associate at the University of Twente, NL. Frans has held positions as professor international business, director, corporate consultant and sales manager. His main research area is development of 21st century skills using serious games concerning creativity, cross-cultural collaboration, negotiation, innovative entrepreneurship and alliances.

Natalia Stepanova, Graduated Izhevsk Mechanical Institute, got her PhD degree from Leningrad Construction Engineering institute. Associate professor of the Ural Federal University (Ekaterinburg, Russia). Organizer of student R&D. Has more than 100 publications. Research interests: social responsibility, human resources management, development, urban environment and game-based management. Actively use gaming methods for learning.

Anton Sukhov is an associate professor at the Ural Federal University. In 2012 he create (first in Russia) electronic course on the game studies. **In 2016, he received the Award for the Best Presentation and special Crystal Plaque on the** SGEM 2016 conference. His research papers on game studies are in Top2% on Academia.edu (2018).

Arturo Tapia Sánchez is a Mechanical & Electrical Engineer graduated from the Institute of Technology and Higher Education of Monterrey with a master's degree in Educative Technology. He works as a data scientist in Servicios Telepro in Mexico City and as a high school science teacher in PrepaTec CEM in Ciudad Lopez Mateos, Mexico.

Samuel Taylor is a lecturer of English at Kyushu Sangyo University, Japan. He received his MA in TESOL from the Institute of Education, London University in 2017. His main research areas are speaking, augmented reality, and learning

games. He is a member of the editing committee for the Japan Association of College English Teachers.

Will Thomas is an Associate Professor in the University of Suffolk Business School and a Senior Fellow of the Higher Education Academy. He is a board games enthusiast and designs and uses board games as part of his learning and teaching practice.

Daniel Tomiuk's AOTI Department, University of Quebec in Montreal, Canada .research interests include blended-learning; multi-, cross- and omni-channel sales strategies; serious games; and effective online service failure recovery. He has won best paper awards and published in top-tier journals such as Information & Management.

Chioma R. Udeozor is a PhD researcher at Newcastle University. Her research interest is in the use of digital games and virtual reality for engineering education. She is working on developing assessment strategies for evaluating learning gains within game-based environments.

Tone Vold Ass. Prof. lectures at The Inland Norway University of Applied Sciences, Norway, in courses within digitalization of workforms, systems engineering, organizational learning and knowledge management, but with a special interest in games for learning and serious games. She is currently working on a PhD within the area of Enterprise development and worklife research, doing research on involving students in their own learning process to prepare for worklife in organizations.

Iro Voulgari is a member of the laboratory and teaching staff at the Department of Early Childhood Education, National & Kapodistrian University of Athens, and postdoctoral researcher at the Institute of Digital Games, University of Malta. Her main research areas are game-based learning, game studies, virtual worlds and learning, Information and Communication Technologies in education.

Franziska Weidle is a visual anthropologist and documentary filmmaker. She completed her PhD at the Department of Cultural Anthropology at the University of Goettingen, Germany. Her dissertation investigates the role of software in evolving documentary practices. As part of the Learn&Play project, she focuses on media didactics and user research.

Charlotte Lærke Weitze, PhD, independent researcher and consultant in Digital & Creative Learning Lab. Previously assistant professor at AAU and DTU. Charlotte is researching on how students can learn specific subject matters by creating digital

games for learning. Another focus has been the development and measurement of student and teacher motivation and engagement in learning situations.

Jeremy White is originally from New Zealand. He has been in Japan since 2003 teaching English at all levels of education. Currently he is a PhD student in the Graduate School of Human and Environmental Studies. Jeremy's research areas include CALL, MALL, digital stories, and game-based learning.

Yuan Yuan (Ph.D., Hong Kong Baptist University; Assistant Professor of MAD) Dr. Yuan was the lecturer in Beijing Normal University Zhuhai Campus. Currently, she serves as assistant professor in Media Arts and Design (MAD), Division of Culture and Creativity, in BNU-HKBU United International College. Her research areas: media effects, media education, game-based learning.

Boyang Zhang, Ph.D, expert in machine learning, natural language processing, social media analytics, organizational communication, network structure, insurance science, crisis communication, risk management, game related research. He is currently interested in applying machine learning techniques to solve practical problems, and extract different models from big data.

Keynote Outlines

Keynote Outlines

The following are outlines for the Keynote Speeches which will take place at ECGBL 2020.

From games to play: what's the difference?

Prof. Nicola Whitton, Durham University, UK

Approaches such as serious games and gamification for learning are now well established in education and business. In this talk, Nicola will consider the limitations of games, and discuss the concept of playful learning as both series of tools, techniques, and tactics, as a philosophy of learning to support innovation, and as a political manifesto. Using the metaphor of the magic circle of learning, she will consider the benefits of play for fundamentally rethinking teaching, learning and assessment practice, supporting learners to build resilience, manage risk, and develop intrinsically motivated learning communities.

Playful Learning, Teaching and Researching

Dr Alex Moseley, University of Leicester, UK

No matter what your experience or involvement in education - whether student, teacher, designer, researcher or developer - you'll know how serious it can be. Alex has taken it as a personal mission to prove that meaningful and important work can emerge by taking a playful lens to all these areas of practice. Drawing on game design principles, and synthesising play and learning theory, Alex will share his approaches, successes and failures..

Research Paper Abstracts

Beyond Vicarious Learning: Embedding Dialogic Learning into Educational Games

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Abstract: Dialogic learning has a substantial overlap with the characteristics of multi-player game-based learning (GBL). Both dialogic and game-based learning are proposed to be beneficial methods for postgraduate learning contexts with higher order cognitive and skill-based outcomes. Research skills and critical thinking are widely shown to be crucially important but very challenging to deliver effectively. This paper uses three case studies of existing tabletop games to consider how modification to include dialogic learning can improve learning outcomes in a postgraduate context. Games were analysed using gameplay loops and characteristics of dialogic games are identified with recommendations of specific Learning Mechanic – Game Mechanic mappings. Learning Mechanics proposed to encourage dialogue were identified as: Plan, Analyse, Reflect, and Consolidate, typically associated with the following Game Mechanics: Stategy/Planning, Design/Edit, Match, Measure, and Feedback. Game Mechanics which may inhibit dialogic learning are Time Pressure, Competition, and Dexterity. An interaction model is presented with recommendations for dialogic game design which is proposed to increase dialogic learning which can increase student ownership, confidence, and consolidation of knowledge. This contributes to the current research gap for dialogical interactions within GBL.

Keywords: Dialogic learning; game-based learning; pedagogy; serious games; educational games; dialogue

Play in Farming: Seriously?

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Abstract: This paper explores the potential of using playful and gameful approaches for facilitating and strengthening the collective action, networking, and negotiation of individuals, groups, and entities related to the farming sector across Europe, which include farmers and land managers. Framed under the EU Funded BOND project (bondproject.eu), we developed, experimented, and reflected on three playful tools for enabling the 'bonding' of various stakeholders in the sector towards creating strong, dynamic and effective organisations that have a voice and a place in policy design. The paper describes playful tools implemented in the project, which are based on the approaches designed under the award-winning GameChangers initiative (gamify.org.uk) and LEGO® Serious Play®. These tools have been repurposed through engagement with stakeholders from 17 partner institutions across 12 countries in Europe. Findings and reflections from practice-based exploratory investigations are discussed.

Keywords: play, games, GameChangers, gamification, farming

Designing Mini-Games for Micro-Learning: Open Educational Resources on Cultural Risks in Multi-Cultural Organisations

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Abstract: The need for self-directed learning for professional development drives an increase in the delivery of easy to use 'just-in-time' resources that respond to the often-dynamic workplace and work culture. Micro-learning has gained traction in online training, which focuses on delivering brevity through bite-sized learning units or short-term learning activities. Learning content in this case can take many forms, from text to interactive multimedia. These contents are often created on demand, which can sometimes be less contextualised and pedagogically informed. Based on a case study of the need for training on cultural risks in multi-cultural organisations, this paper focuses on the design of mini-games as playful learning resources for supporting an online learning platform that has been developed as a response to this training need. Fifteen mini-games have been developed to complement eight main topics related to cultural risks and to promote reflection, practice and the self-assessment of knowledge acquired through the platform. The main eight topics represent the risk areas identified that include cultural awareness, communication, learning styles, hierarchy, team-working, and stereotypes through a survey carried out with personnel (n=154) from large multi-cultural organisations across five countries - Cyprus, Italy, Latvia, Poland, and the UK. The discussions include unpacking the mapping of pedagogical and gameful design considerations based on Arnab et al 's (2015) Learning Mechanics-Game Mechanics Mapping (LMGM) model. The paper also discusses the findings from the testing of the platform with 71 students. The insights provided will be valuable to researchers, practitioners, designers and developers of micro-learning resources.

Keywords: game-based learning, mini-games, micro-learning, cultural risks, e-learning

Teacher Views on Game Jamming in Formal General Education

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Abstract: In game jam events games are created in collaboration and within design constraints, e.g. time limits and themes. Game jamming is a relatively novel pedagogical method, comparable to hackathons and other accelerated collaborative creation events. Earlier research suggests that game jams have a wide range of potential positive outcomes, such as learning in STEAM skills, working skills, and collaboration, as well as increasing participants' learning motivation and self-efficacy (Meriläinen et al. 2020). Still, game jams have not been widely used in general formal education. In general education jamming faces a variety of challenges, stemming from limitations in curricula, rigid school structures, assessment difficulties as well as potentially negative attitudes. Adoption depends largely on teachers: they are unlikely to use or endorse a method they do not view as valuable or practical. In this qualitative survey study of Finnish expert teachers, we map the pedagogical soundness of organizing game jam events in schools and the practical possibilities and obstacles to wider adoption of game jams in formal learning. The respondents, who had no previous game jam experience, participated in a pedagogical and reflective two-day game jam and completed a survey afterwards. This paper explores their views on both the pedagogical and the practical aspects of game jamming in classrooms as expressed in the survey. In an educational system where teachers choose their own methods and materials, as is usual in Finland, teacher views are especially important when introducing a new method. Game jamming was seen as a pedagogically suitable tool for teaching several 21st century skills, of which co-operational and communication skills were seen as most prominent. Most participants saw game jams as compatible with everyday school routines, albeit with caveats. The most important obstacle the teachers identified related to actual praxis: time restrictions regarding daily schedules. As a solution, several

participants suggested organizing game jams in conjunction with special themed days or weeks, as parts of learning projects or as a voluntary course or club.

Keywords (6): game jam, education, teacher attitudes, pedagogy, game-based pedagogy, game-based learning

Digital Ethnography Development Investigating Children's Agency in Minecraft

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Abstract: Language and literacy developed through playing in digital worlds are part of the out-of-school experiences that students bring to their classrooms. Whilst playing online they communicate through a myriad of ways with people from other locations globally to compete, build and collaborate. The literature discusses the way this leads to friendships with children from other cultures and languages and the development of ways of being and associated capital in the play-based worlds they are in. It also discusses the changes in agency this brings to the role of the "child" in these worlds and the literacy required for successful participation in social and academic contexts. Given that agency is core to students' success in learning, the research proposes to fill the gap in the literature with regard to how children work through the layers of play in the online playfield of Minecraft in a multisite and multilingual learning environment. The reality of the gaming situation includes a complex mix of communication methods which are happening simultaneously and very quickly. It is a complex literacy event with children engaged in many different layers of the gameplay at the same time. The play in an online collaborative team game is very different to the mode and speed of communication in the physical environment of more traditional ethnographic studies. Digital ethnography is an emerging field particularly in the educational research environment. This paper discusses how the analysis tool for this research was developed to analyse how the participation within the online game environment using aspects of Gee's (2012) Discourse Analysis Tool and Pink's (2016) principles of Digital Ethnography.

Keywords: Digital ethnography, Minecraft, Children, Agency, Games, Resilience, 21st Century Skills

Educational Games in Training

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Abstract: Educational game promotes self-learning of students and allows them creating positive associations related with the learning process. The authors conducted a global experiment among Junior, middle, and high school students. Educational game covers all subjects taught at school. This approach contributes to better memorization of information. Although students take part in the game itself, their teachers act as moderators. This allows teachers to develop their organizational skills. The task of the students was to collect all the game keys for correct answers in the lessons. The competition format promotes self-organization of students and self-preparation for disciplines. The game also helps to establish a dialogue within the team. It is important for students to make the right strategic decisions in order to win competitions between classes. At the end of mini games, feedback was established. We have identified the impact of educational games on the learning process and student outcomes. The experience gained will be useful for both novice organizers of game practices and experienced ones. The peculiarity of the developed game is that it affects not only the players, but also the teachers involved in the process.

Keywords: educational game, self-learning, self-organization, team building, education

A Reinvented Education in Business and Accounting using a GBL Approach for soft skills

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Abstract: The vulnerable, dynamic and digitalizing working environments of the 2020s obviously propose new types of 'newcomer' skills. The character of these 'soft skills' is inherent, whereby their learning forms a challenge for educators. Researchers around the world are on the same question: how to make the learning tools and rebuilt the classroom (virtual and face-to-face) in order to cope with this digital generation? This change needs to incorporate new Skills; these skills, called Core Skills, are changing the way to teach and to learn. Motivation is the essential key to have in mind. Creating mind-sets under a strong cognitive engagement is education for the future of professionals. Gamification, Game-Based Learning (GBL), Simulations, Virtual classrooms, digital platforms with contents and many other methods are in use all around the world to change, with motivation, the perspective of students towards their own learning path. The VUCA (volatility, uncertainty, complexity and ambiguity) world brought Higher Education Institutions the discussion of the future for an education of excellence. This article intends to present a case study as a solution to combine Simulation and GBL to promote the Core Skills that students and teachers need to achieve success on the process of teaching and learning. The solution is innovative due to the main scope: the perfect connection of humanity and empathy through the use of Simulation-GBL in higher educational institutions.

Keywords: game-based learning, core skills, personalized learning, accounting education

Bad Game, Good Learning; Examining the Contradictions of Digital Game-Based Learning

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Abstract : This paper aims to explore some of the inherent dichotomies between games and learning. This is not referring to the already thoroughly discussed challenge of merging learning content into appealing and engaging game design, but rather to a more fundamental question whether games, as a medium and as technological objects, are well suited to convey learning content. In order to anchor this discussion in something more concrete, the paper will describe a project in which a learning game was created, and describe some of the main development and design challenges encountered during the project. These challenges revealed a necessity of often going in directions directly opposed to what is considered to be good game design principles, as well as limitations in what type of messages the medium of digital games can efficiently convey. For example, clear goals and progression, feedback on actions, providing players with clear information, and empowering player agency, while often suitable in creating good games, are not suitable when representing complex issues in educational games. Based on these insights, the paper concludes with a broader discussion regarding the validity of some core tenets of game-based learning, and calls for a less instrument-focused and game-oriented way of creating and discussing games' relationship to learning and education.

Keywords: game-based learning development, game design, designing for learning, Flow, game industry

A Framework System for the Design of a Digital Augmented-Reality Pretend play Activity for Children with ASD

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Abstract: Pretend play is a key educational strategy for children with Autism Spectrum disorder (ASD). Pretend play interventions lead to improvements including social skills and theory of mind. Prior research has shown benefits of using digital technologies to enhance pretend play, thereby improving skills. This article presents a framework system to support the design of augmented reality pretend play activities. The framework system emerged from a user-centred design process (with proxy users) to meet the complex developmental needs and heterogeneity of children with ASD. The system is aimed at promoting social conversation and theory of mind. It consists of an augmented-reality interactive game using features of the technology to help the child roleplay, complemented by an adult support application. The child is engaged in roleplay through embodying a character, contextualised within a familiar story. The support application allows an adult to monitor, guide and stimulate the child's progress through participating in the activity. The design process comprised of observations, interviews and focus groups with proxy users, involving three schools who provided participants for the focus groups. Individuals with relevant expertise were independently recruited for the interviews. The proposed system presents a novel opportunity to enhance pretend play by leveraging the unique features of augmented reality technologies and can serve as a reference for developing similar products.

Keywords: Pretend play, augmented-reality, autism, game-based learning, user-centred design

Using Frugal Education Principles and the RPG Maker MV Game Engine to Aid the Co-creation of Digital Game-based Learning Resources

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Abstract: The exploration of digital game-based learning (DGBL) as an educational practice has been received relatively well amongst learning practitioners, particularly from a theoretical standpoint. However, when it comes to original content creation, there are multiple barriers to entry from a digital games design and development perspective. Digital games are typically resource heavy for new adopters who face issues such as: a lack of specialist skill; financial backing; personnel; time allocation; and access to essential technologies and infrastructure. At the same time, the pressure on Higher Education authorities to 'do more with less' without providing the tools and opportunities to do so, leaves little room for experimentation with new pedagogies, such as DGBL. In response to these pressures the paper introduces Frugal Education as a concept for fostering sustainable innovation in education and applies the emerging principles to a design case study. The authors present the design methodology of 'Book Runner: A Library Induction' game created in RPG Maker MV alongside evaluation results from developer/ facilitator-based interviews conducted to assess the tool, development process, and validity of the game. The authors conclude with a discussion on how these results align to our mission of lowering the barriers to creating DGBL experiences and furthers our understanding of Frugal Education within the field of Game Science.

Keywords: RPG Maker MV, Game based Learning Design, Frugal Education, Co-creation, Higher Education

Motivation in Situated Immersive Games for Irish Language Learning, a DBR Approach

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Abstract: This paper outlines the results of a three-year design-based research study with three separate interventions implementing a virtual reality game designed with Unity and the Oculus Rift with a specific context group of Irish language learners to explore Irish language motivation and vocabulary retention. The paper provides an overview of the key theoretical insights and developments as a result of analysis of the three design phases of the study. This study takes a situated learning theoretical approach to its implementation involving small scale context groups to refine the theory and design. A thorough literature review of situated language learning theory and game-based learning was conducted, and theory was further developed through the analysis of quantitative questionnaires about learning attitudes and vocabulary. This paper examines one context of learning so researchers can gather insights towards their own research designs to see where theoretical approaches and design decisions align in order to achieve a successful learning intervention in a multitude of learning contexts. This paper is the first study of its kind utilising virtual reality to explore its effects on the motivation of Irish language learners. The final case study found a statistically significant reduction in Irish language anxiety among participants alongside an increase in their attitude towards learning Irish. There was also 20% increase in their Irish language vocabulary retention.

Keywords: Virtual Reality, Situated Learning, Irish Language, Motivation, Language Learning

Games User Research with Deaf Students: Research Design and Preliminary Results

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Abstract: The involvement of players with special needs in the early design and development stages bring about complex issues and challenges in games user research (GUR). In the context of the research project GBL4deaf – Game-Based Learning for Deaf Students [PTDC/COM-CSS/32022/2017], a research-based educational game is being designed and developed as a tool to support mathematics learning for deaf and hard of hearing students (DHH). Research on deaf and hard of hearing children's academic achievement demonstrates that deaf children, on average, show a delay in mathematics achievement when compared with hearing students. Game-based learning approaches reveal a significant and positive influence in several areas of cognition, resulting in improved performance in several areas of knowledge such as mathematics. In this paper, Game User Research (GUR) Design of "Otherwordly Math" as well the results of the participatory design with DHH students will be presented. In the participatory design study, the sample was composed of eight deaf students with profound levels of hearing loss and, among them, five wear a cochlear implant. The participants, aged between 12 and 14 years old (five girls and three boys), attended grades six and seven at a school specialised in deafness. A media usage questionnaire was adapted to deaf students and applied with the mediation of a Sign Language interpreter. Most students use smartphones, laptops, and PCs and only one reported to use the TV and console in their everyday life. DHH students reported to access the internet mostly from home, using smartphones with wi-fi internet. In what respects the preferred leisure activities, playing video games is the most selected, followed by watching movies, social networking and hanging out with friends. The participatory design results show that science fiction images were the most preferred. Based on these results, the science fiction genre was chosen for the video game.

Keywords: Games User Research (GUR), digital math games, deaf and hard of hearing students.

Game Monument Valley - Intersection of Mathematics and Art

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Abstract: Monument Valley is a puzzle game which invites the player into an enticing world of optical illusion which has been robbed of sacred geometry. The path to restoring it is filled with numerous puzzles. In our paper we will introduce the game and the way it combines mathematics and art. Next, we will present a case study of three high school students from Slovakia and their experiences with the game. We investigate their overall impression of the game as well as their impression of the incorporated mathematics. We employ observation and interviews in the case study. The participants highlighted the innovativeness of the game, the visual experience and the necessity to use unconventional thinking and spatial imagination. We believe that using this and other similar games would be a beneficial part of the mindful learning process in the 21st century. This game encourages exploration of mathematics and its beauty. This is in accordance with new teaching documents and opinions of researchers.

Keywords: math, logical thinking, art, mobile game

Supporting Croatian Primary School Teachers in Designing Game Based Learning Activities: A Case Study

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Abstract: This paper presents research about supporting primary school teachers in planning game based learning activities in different school subjects. Teachers can describe learning activities in the form of a learning scenario, which usually includes a list of learning outcomes, teaching methods and strategies, materials,

and tools for achieving the learning outcomes. The process of designing a learning scenario can be challenging for teachers, especially those with a lack of ICT skills. Teachers should be familiar with the various ICT based teaching methods, strategies, contents and tools. Therefore, it is necessary to organize educational programmes to support teachers in acquiring appropriate knowledge and skills. The paper describes results of the study conducted during the education for primary school junior grade teachers organized within the Erasmus+ project GLAT that promotes development of algorithmic thinking using games. The aim of the study was to identify the level of participants' knowledge and skills needed to design scenarios with game based learning activities for developing algorithmic and computational thinking among their students. Using questionnaires, the teachers' self-assessment of familiarity with the terminology related to game based learning and possibilities of adapting and using digital contents, games and tools was determined as well as their self-assessment of progress made during the education. Teachers' progress was realized to the greatest extent for elements related to games, learning scenarios, and applying Web 2.0 tools for learning activities. The results confirmed the effectiveness of the GLAT instructional model and showed that teachers need support not only through education, but also by providing ICT tools that will make the process of designing learning scenarios easier for them. Therefore, a future work in this direction is planned within the project *Digital games* and will include development of a web application for guiding teachers in the process of designing innovative game based learning scenarios.

Keywords: Computational thinking; Digital games project; GLAT project; learning scenario; primary school teachers

Evaluation of a Game-Based Learning Approach to Support the Digitalisation of Production

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Abstract: Fraunhofer IPA has developed the simulation game "Digitalised Production Control" (Yesilyurt *et al.*, 2019) to prepare and instruct employees as well as university and high school students about the ongoing fundamental

transformation of the manufacturing industry brought by the fourth industrial revolution. The overarching idea of the simulation game was to place the players in the typical job roles of a manufacturing enterprise, which must handle the increased complexity of producing and delivering multiple product variants, following the principles of lean production in the first game round and digitalised production in the second game round. Simulation games represent stimulating educational tools for teaching and learning key concepts in a risk-free collaborative environment. However, it is difficult to assess their effectiveness in terms of game design, learning outcomes and motivation. A suitable evaluation design is needed which enables the measurement of the knowledge transfer, quality of game experiences and level of motivation. In this paper, the authors expound an evaluation design based on the logical evaluation model of Kriz and present the statistical analysis of the data gathered from the participants by using a quantitative survey with a 6-point Likert rating scale. The questionnaire consists of a total of 22 statements regarding the content, learning outcomes, motivation, execution and organisation of the simulation game. The dataset originates from 62 questionnaires filled-out anonymously by the participants during the year 2019. The findings from the statistical analysis demonstrate that the goals of the simulation game were achieved for all three focus groups, employees of manufacturing companies, university students and high school students. Gathering participants' feedback also serves as valuable input data to the iterative improvement process of our simulation game and forms a sound foundation for forthcoming publications.

Keywords: evaluation, simulation game, digital transformation, lean production, digitalised production, game-based simulation

Innovation Camp as 21st Century Skill Learning Game in K12 PE Teaching

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Abstract: There is a continuing need for innovation across social, economic, and environmental domains in dealing with societal challenges. The continuing requirement for innovation is also evident in the field of sports and health, as gaining well-being and preventing physical inactivity is an ever-present challenge

despite the innovativeness of the growing sports and health sector. In recent years, the development of 21st century skills have been proposed as a key to enable future generations to develop innovation competencies. This elevates the need for education which supports student acquisition of knowledge, and development of competencies and personal values. Mediating 21st century skill learning and developing innovation competence, a 36-hour camp for 80 students in K12 PE was designed. The camp was designed and facilitated by four sports and health graduate students in collaboration with six local PE teachers. Informed by the Gamestorming approach, the camp was designed as a game space consisting of a string of design methods to propose solutions for sport and well-being design challenges. Three challenges were formed in collaboration with the local municipality: 1) Creating better mental health in youth education, 2) Promoting physical activity for teenage girls, 3) Creating facilities for a water sports and adventure park. This paper aims to investigate 21st century skills and social-emotional learning experiences at high school students participating in a sports innovation camp. The students learning experience was captured through: 1) Students self-reported learning expectations 2) Students self-reported learning outcome, 3) Facilitator observations, and 4) Informal interviews. Students indicated that they gained creative skills, got better at communicating, collaborating, and critical thinking. The students mentioned that they got better at listening to each other, gained more patience with, and attention to each other, and they gained competences to concentrate under pressure. Altogether we conclude that a 36-hour high school innovation-camp in physical education have documented qualitative learning outcomes in the development of competences (to act) and personal character qualities (to value) for students in upper secondary education.

Keywords: 21st Century Skills, Social-Emotional Learning, Innovation, Design Game, Design Thinking, Physical Education

Creating a Framework of fun and Learning: Using Balloons to Build Consensus

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Abstract: The relationships between fun and learning are far from clear. Some argue that the two are mutually exclusive, while playful practitioners draw attention to links with motivation, exploration and creativity. This is an important issue in the context of games-based learning – should fun be emphasised, or should it be set aside in favour of other elements? In order to explore the relationships between learning and fun, it is first necessary to understand the meanings of 'fun', a term that previous studies have shown is interpreted in several distinct ways. In this paper, we explore a new approach to researching fun and learning, the Consensus Workshop. This method was used to address two research questions: 'What elements of fun do a group of educational practitioners identify within a Consensus Workshop?' and 'How do participants see these elements translating to a learning scenario?' It was also used to explore whether a Consensus Workshop can be used to collaboratively create a taxonomy of fun, and to identify any practical and conceptual barriers to this being done effectively. Participants in a Consensus Workshop used balloons to help them construct two typologies of fun and its relationship to learning. We evaluate this approach and its outcomes, identify elements of a future typology, examine how understandings of fun are shaped by context, and consider the ways in which participants linked fun and learning. The study highlights the importance of context to understandings of fun, and also finds indications that studies in this area are limited by a tendency to focus on socially acceptable views of fun and its relationship to learning. It finds that a Consensus Workshop has the potential to be used to create a taxonomy of fun. In this initial trial of the method, educational practitioners identified multiple elements of fun and made a range of connections between fun and learning.

Keywords: Consensus Workshop, framework, fun, learning, play, taxonomy

Exploring Institutionalised Esport in High School: A Mixed Methods Study of Well-being

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Abstract: Educational institutions in countries such as Denmark, US and UK are adopting esports as a way of accommodating to a growing interest in competitive gaming, and to attract and retain students in the educational system. In light of inconclusive research on the effect of gaming on issues like social isolation associations between screen-time and mental health, the question remains whether students opting for esport programmes fare worse than regular students in terms of everyday well-being. The current study explored whether students enrolled in sport programmes differ from regular students (gamers and non-gamers) on psychological measures of mental well-being, social and academic self-efficacy as well as loneliness and gaming addiction through a survey conducted at a school offering both esport and regular school programs (N=104). Additionally, participant observation was used to explore how esport students experienced and engaged in their gaming environment. Results showed no significant difference in well-being, loneliness, and academic and social self-efficacy between esport students and regular students. Observations provided insight into an esport environment challenged by both inexperienced coaches and students unaccustomed to participation in formal training environment.

Keywords: psychological well-being, e-sports in school, structural challenges, social self-efficacy, loneliness

Gamification in a High School Class Improved Motivation and Grades

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Abstract: It is often hoped that gamification will bring new ways to engage students to learn better, and it may be that the benefits would be more significant for younger learners, like school pupils. To gamify an activity is to structure it so that it is more like a game, which might increase motivation and make the activity more pleasant or enjoyable. In some ways, gamification might also improve performance. Most educational activities in schools are still traditional however, because gamification is not quick or easy to do, and teachers need confidence in their gamification skills, and in its benefits. In this study high school pupils were taught a part of their subject, which was information technology, by means of a specially gamified activity. As an experimental control, a similar class of pupils were taught the same material by more traditional methods. All the students sat a test afterwards, which showed that the gamified class had learned the material significantly better. Questionnaires from all the students, about their experiences, opinions, and feelings of their activity (gamified or traditional) indicated that the reason for their improved performance was that they were more motivated by the gamification. While it remains a challenge to gamify education, and it depends on the talent and effort of the teacher, results like this can encourage further interest and development. When GBL researchers explore more ways to do gamification, and begin to build a repertoire of techniques, we shall gain a better idea of what works well, and thus help to bring gamification into the classroom.

Keywords: Serious games, Games based learning, Gamification, Learner motivation, Information technology, Self-determination theory

A Systematic Literature Review to Identify Empirical Evidence on the Game Design Framework and Model of Games-Based Learning

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Abstract: Many empirical studies have been undertaken to prove the valuable contributions of games-based learning and serious games, however information is still lacking with regards to developmental approaches and development frameworks for effective serious game design. There are few frameworks for game design integrating instructional design theory and game design theory into one model or framework. This paper aims to advance understanding by examining a systematic literature review ranging from 2005 to 2017 with regards to game design frameworks and models for serious games, especially with respect to game design principles and instructional design theory. The systematic literature review can effectively support the validity of the serious game design framework and model. The search identified 104 relevant papers reporting empirical evidence. The finding revealed that designing computer games was linked to a range of pedagogic design, engaging game design and usability of the interface design. A narrow literature review was carried out to capture these diverse aspects of game design principles. The results showed that the most frequently occurring design aspects are pedagogic design. Moreover, games for learning are being used across a wide range of subject disciplines such as health and computing which are the most popular. The learning outcomes in knowledge acquisition and content understanding are the most frequently occurring. The most popular platform for delivery games is the PC, followed by video games and online games. Simulations are by far the most popular genre. The majority of the studies utilised quasi-experimental designs, and then use correlational designs and RCT designs. In addition, the variety of indicators and measurements employed in the papers are discussed to develop a more coherent understanding of game design framework and model in computer games, together with the limitations and recommendations for the further study. Finally, this study provides an original contribution to knowledge by developing and validating a model/framework for the design of a games-based learning.

Keywords: systematic literature; design framework; serious game; game-based learning

A Study of Motivation for Playing Computer Games at Tertiary Education Level in China

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Abstract: Within the past decade, a number of studies have analysed and investigated the aspects and potential applications of games-based learning. Educationalists and industrialists continue to explore it as it is perceived as a potentially beneficial supplementary learning mechanism, teaching and training approach and perfectly matches the determinants of intrinsic motivation. Previous studies indicate that games can promote learning and engage learning experiences compared with traditional methods, while one of the primary arguments against games-based learning focuses on a dearth of empirical evidence in particular a lack of Randomised Controlled Trials (RCTs) and longitudinal studies. The lack of empirical evidence in supporting the efficacy of games-based learning can be challenged as unsubstantiated optimism. This paper provides empirical evidence by reporting the results of a survey conducted at tertiary education institutions in China. The survey is conducted on the basis of a number of previous studies on the motivation of games-based learning. The survey reports on the evidence from the Chinese institutions where 346 undergraduate and postgraduate students completed the survey in March 2018 over a three-week period. Participants had positive attitude towards playing computer games for learning. The top motivations of playing computer game were: enjoyment, competition and relationships whereas the top motivation of playing games in education were: relaxation, leisure and pleasure. Respondents perceived that computer games could potentially provide the following skills: collaboration, problem-solving and analysis. The paper contributes to empirical evidence in games-based learning through a comprehensive quantitative analysis of data including gender, education, game platform and play types of game comparisons. The results were compared to similar studies conducted at different levels of education in different countries and provide a synthesis. The results will

also provide insight into game design associated with the motivations for using GBL at tertiary education level.

Keywords: motivations; computer games; games-based learning; empirical research; survey

Stop Gaming! - Parents' Attitude Towards Digital Game-Based Learning

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Abstract: Digital games are quite often seen as leisure time activity by the general public. Mostly, they are also connected to violence and addiction but not to the teaching method digital game-based learning which slowly but steadily is also used in Austrian primary schools. Thus, this paper puts the focus on parents' attitudes and presents their points of view towards digital games as a means of learning. The research questions which address the acceptance of digital game-based learning in general, parents' view of acceptable and inappropriate games as well as potential and risks of using digital games at school will be answered by analyzing qualitative interviews with parents of children between 6 and 11 years. In November and December 2019, 42 interviews were conducted using a half-structured interview guideline. First results show that most parents are basically open towards using digital games for learning in primary school although they often demand strict restrictions like time limits on playing digital games at school. Moreover, the games used should enable that children really learn something useful (referring to the curriculum). Another observation made was that most parents do not play digital games themselves or do not know which games are currently popular among children. A reason why parents are not as critical towards digital games for learning as some years before might be the fact that there has been a governmental endeavor to bring more digital media literacy into schools for some years.

Keywords: primary school, game-based learning, parents' expectations, learning games

Why Analog Games Now?

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Abstract: Over the past fifteen years, video games have shifted from being seen as merely entertainment to being 'sometimes-useful' tools in educators' lesson planning repertoires (Schrier, 2019). Practicing educators and policy makers have been convinced that games can be good for learning, but many questions about games' reliable and effective implementation remain unanswered (Takeuchi & Vaala, 2014). Fortunately, researchers and developers have begun to advance important questions of practice, including how educational games can be used and designed effectively (Clark et al., 2015), how to improve games' design (e.g., Burke & Kafai, 2014), on understanding the classroom ecologies in which they're being used (Shah & Foster, 2014), and on teachers' professional development around games' use (Jan et al., 2017). Collectively, this research can be seen as the beginning of an exciting field that combines theories of play, learning, and design across a diversity of contexts, whereby games are designed to mediate and support individual and community learning. As our understanding of play-based learning expands beyond childhood learning to include how to design e.g., games for museums or college-aged students, non-digital games can help researchers better understand how play can be designed for and how to best develop formal and informal learning supports, especially in everyday contexts and in ways that are practical. In this paper, we begin with describing some of the challenges of making educational games go viral, or getting effective play-based learning into effective widespread, and sustained practice especially in formal education. To achieve this aim, and to support accompanying research, we frame the issue as the "last mile" problem of game-based learning and propose that expanding the currently disparate research on non-digital games can help overcome this issue. Using two cases of analog game development that were undertaken for research purposes (Author), we describe the dilemmas and key tradeoffs that we have learned through the games' development and use. It is our hope that such a description will allow us to bridge the research being produced in digital games with the potential of non-digital formats and support the more coordinated advance of play-based learning research and development.

Keywords: Non-digital games, learning, last-mile problem

Co-Creating Educational Project Management Board Games to Enhance Student Engagement

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Abstract: Management education scholarship has long outlined the need to enhance student engagement and participation in business schools, using more innovative teaching practices. This is increasingly motivating scholars to strive for more collaborative pedagogic dynamics between teachers and students. At the same time, research into co-creation of Game Based Learning material such as board games has largely focused on the value added to games when educators involve students in the design process. However there has been scant research examining the qualities of co-creational game design exercises as teaching experiences themselves, thus overlooking the opportunity to conceptualise such activities as an innovative teaching tool that can help educators facilitate student engagement and participation. To address this research gap, this paper presents a case study where Project Management students participated in two co-creation workshops designing educational Project Management games. Data were collected conducting focus groups at the end of the two workshops. Throughout the paper we have sought to present some positive outcomes of such processes as well as some critical points that emerged through the data that were collected. Mentionable outcomes include a series of positive characteristics of co-creative Game Based Learning activities like enhanced engagement as well as a list of challenges when facilitating such activities. The main findings of this research have been organised in two frameworks, one outlining five positive characteristics of co-creative Game Based Learning activities: engagement with knowledge, knowledge assessment, creativity, communication and the second outlining challenges in facilitating such activities: lack of focus, lack of structure and the need for more practice oriented games. The suggested frameworks can assist educators conceptualise and utilise such exercises to create more effective and participatory learning environments.

Keywords: Game Based Learning, Project Management Education, Higher Education, Co-Creation, Student Engagement, Playful Learning

CPS-GBL Framework to Evaluate Game Systems Promoting Intrinsically-Motivating Complex Problem-Solving Processes

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Abstract: Developing complex problem-solving is crucial to deal with the uncertainty, unpredictability and continuous changes that permeate and dynamise our complex world. Accordingly, complex problem-solving skills should be a central focus in modern learning. This requires specific learning environments suitable to promote and motivate holistic engagement (heads, hands, hearts) in meaningful complex problem scenarios. These needs defeat educational paradigms centred on reductionist approaches to problem-solving and the physical boundaries of traditional classrooms. Serious games have the potentialities to address these needs by: i) engaging players in meaningful problem-solving processes set in simulated complex environments; ii) promoting the cognitive, affective and behavioural involvement of players in an integrative way in game-based learning scenarios. Even though serious games have been effectively used to foster problem-solving skills, researchers have suggested that serious games face challenges related to the successful integration of engaging game environments and meaningful game-based learning experiences. Therefore, there is a need for instruments to support the evaluation of serious games, in order to facilitate the identification of games suitable to promote the development of complex problem-solving skills through motivating and meaningful gameplay experience. Motivated by this context, we developed a framework to evaluate game systems suitable to promote intrinsically-motivating problem-solving processes in complex game-based learning scenarios. The framework comprises a theory-based model conceptualising gameplay as a contextualised activity process engaging the players holistically in the management of complex problem scenarios and an instrument to analyse games in order to identify affordances that may promote such processes. This article presents the evaluation framework, along with an exploratory evaluation of the analysis instrument based on an empirical case study.

Keywords: digital games, complex problem-solving, intrinsic-motivation, evaluation framework, game-based learning

Online Quizzing During Corona-Crisis: Games in Education

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Abstract: For several years a quiz game has been used in a course at the Inland Norway University of Applied Science. The course has many registered students, but only a part of them shows up for lectures. Using the quiz game is a part of introducing other elements other than lectures, assignments, discussions, mandatory assignments, and advising sessions. The students report on wanting more mandatory assignments, but that is not possible due to the resource situation with little staff and vast numbers of students. A quiz game consists of questions where there are up to four answers where at least one is correct. Prior to the gaming, the students are to develop the questions in groups and post them via email. The questions are added in the quiz game and at the end of the lecture, they play the quiz. This year our University closed on the 13th of March due to restrictions from the Government. However, the lecturing should proceed. "Business as usual" via the internet and suitable tools, meant that the quiz game also had to be conducted online. The paper presents the results from how this was undertaken in the online setting and how the students worked prior to and during the quiz game. We compare the results from previous years on-campus quizzing with this year's online quiz game.

Keywords: quiz game, games for learning, enhancing learning outcome, games in education

Developing Design Principles for Game-Related Design Thinking Activities

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Abstract: The aim of this paper is to present a framework for understanding how teachers experience teaching of game-based design activities with particular emphasis on teacher agency and dialogical positions. Building on earlier work, the paper presents theories for conceptualising teacher agency and dialogic positions when working with game-based design activities. The empirical context is the large-scale design intervention project GBL21 (gbl21.aau.dk), where students design and redesign games in mathematics, science and Danish. The participating teachers are introduced to a series of predesigned teaching units, which they have to adapt to their local school context. This brings us to our research question: What are the teachers' experiences with the game-based design activities in the GBL21 units? In particular, we will thematically analyse how teachers position themselves and enact agency in data from group interviews with teachers from two schools that participate in the GBL21 project. Our preliminary findings suggest that the teachers put strong emphasis on 1) creating meaningful learning opportunities as seen from the students' perspective, 2) scaffolding subject-related dialogues with the materiality of the games, and 3) balancing their adaptations of the GBL21 units in relation to the expectations to them as participants in a research project.

Keywords: Teacher agency, dialogical positioning, design thinking, game-based design, intervention study

Francopass: A Community-oriented Gamified Web Application for French Learners and Education Students

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Abstract: Gamification is commonly defined as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, and promote learning" (Kapp, 2012, p. 10). Gamification strategies have been adopted to design educational tools across a wide variety of disciplines. This article focuses on *Francopass,* a gamified web application which encourages university students to engage with the local French-speaking community in Edmonton, Alberta. Canada. Although Alberta is not officially a bilingual province, it plays host to a long-established, vibrant, and diverse francophone community. *Francopass* motivates second language learners by encouraging them to engage with this community. A beta trial of the application took place between September and December 2019. Students taking French courses at the University of Alberta had the option of participating in the study, which included a team's competition that was announced to students on October 18, 2019 and closed on December 6, 2019. Feedback to assess the effectiveness of *Francopass* was obtained using a two-part "Before" and "After" questionnaire. Interestingly, students who identified themselves as less comfortable with French in the "Before" questionnaire had a tendency to score high on *Francopass.* A relatively small subset of students responded to the "After" questionnaire (n=12). They indicated that attending events increased their motivation to learn French, that they had learned about francophone culture in Edmonton, and that the application helped them find ways to engage with the francophone community that they would not have known about otherwise. The trial also concluded that certain game mechanics, namely teams and co-operative messages, are useful in motivating students. *Francopass* is unique among gamified language-learning applications because it places a unique emphasis on the role of the local minority language community and creates opportunities for students to practice their French in an authentic setting.

Keywords: gamification, francophone, second-language, education, linguistic minority

Virtual Experience of The University of Applied Sciences Mittweida Through the Ages

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Abstract: We present consecutive joint work that that was developed during a variety of modules in the master's degree Media Informatics and Interactive Entertainment at the University of Applied Sciences Mittweida. This project pursues the goal of implementing the history of the university via storytelling in an interactively playable and enjoyable learning simulation from the very beginning of its foundation in the middle of the 19th century to the present. The knowledge content to be conveyed is based on didactically motivated building blocks which the player consumes in connected game-based learning scenarios. Thus, a strong correlation between the learning content and virtual elements (tasks, 2D & 3D assets) is created. The starting point is a top-down perspective of the historical city of Mittweida. The underlying game environment and the 3D building models virtually represent the entire and alternating campus environment through the ages. Selected buildings can also be entered in a first-person perspective. By focusing on appealing aspects, the immersion and the accompanying fun factor and the willingness to absorb knowledge in an intrinsically motivated way is increased. This is visually supported by a mixture of comic-like and real scenarios which appear as an interactive function to the game design. In addition, graphical feedback elements have been integrated to send visual feedback to the player. This is based on the approach of gamification by the means of unique rewards to motivate players. The whole game was implemented by using the game engine Unity and a couple of tools from the domain of modelling like Autodesk Maya and Blender, animations from Autodesk 3ds Max and Adobe Premiere, as well as image processing and digital painting programs like Adobe Photoshop and Illustrator.

Keywords: learning simulation, gamification, knowledge transfer, digital storytelling, historical edutainment, economy simulation

Analysing Hint Based Problem Solving Strategy among Novice Programmers through Gamification Technique

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Abstract: All programming and computer science-related courses require problem-solving skills and abilities. Problem-solving skill is one of the most demanding skills in this area. On the other hand, it is also highly noticeable that novice programmers and new programmers face huge amounts of difficulties and obstacles when it comes to solving problems. This research paper analyses the common behaviours and patterns that new programmers make when they tackle problems. At the same time, this research work proposed a noble hint based gamification method for novice programmers to better understand their abilities and improve their skills in a more engaging way. The proposed method had been evaluated with some novice programmers in two-way testing. We also compared the new method with the conventional method in the field level. The evaluation analysis of this work showed that the participants exposed in the proposed method did better than the participants exposed in conventional method.

Keywords: Gamification, Programming Learning, Problem-solving, Hints, Novice-programmer

Exploring the Dialogic Space of a game Elicitation Interview with Fifth Grade math Students

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Abstract: This study is a preliminary analysis of video data of fifth-grade students participating in a research project (GBL21, https://gbl21.aau.dk/) that use design thinking for teaching through game design in mathematics. It is part of a PhD project exploring game-based learning (GBL) in mathematics education in middle school (students aged 10-14). We use material dialogic learning theory and domain theory to understand how domain specific framings emerge and how game materials are enacted by participants in a game elicitation interview. We propose this form of interview as a way to develop photo and video elicitation methods to be used with games as well. The interview consists of a playtest where a student-designed game is played by the designing students and an interviewer. The interviewer will use the playtest and the game as an elicitation device to discuss occurring situations and question students' reasons and behaviour. Because the students are still novices in the game mechanics of their design and because the interviewer asks mathematics domain specific questions, we approach the game elicitation interview as a game-based learning scenario. Our material focus of the analysis is the dice which we find to be involved in specific forms of agency that either widen or deepen the dialogic space. Further, we identify interactions that refer to specific domain framings and discuss how these could have practical implications for GBL didactics. We discuss how the interaction of the dice, the students and the interviewer are enacted, and how the movement of the dice influences on widening or deepening of the dialogical space. Engaging in a game play situation with the students through a game elicitation interview is discussed as a dialogic space, which may unfold detailed reflections on students' approaches to the game and understanding of the subject of mathematics.

Keywords: Game-based Learning, Dialogic Space, Game elicitation interview, mathematics education, student game design, Domain theory

The Challenge Game Frame: Affordance oriented Co-Creation of Privacy Decision Games

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Abstract: Creating Serious Games (SG) involves the challenge of balancing a domain-goal with a game-goal while maintaining an engaging experience. Although several serious game-design frameworks exist, the potentials of dialogical interaction during the game-design process for exploring and matching motivations and requirements of stakeholders is widely overlooked. In this paper, we present an affordance-oriented game-design activity for co-creating engaging serious game-challenges. Displayed in a user study with 29 Norwegian computer-science students we outline the research of a novel card-based toolset – the Challenge Game Frame (CGF) – that creates dialogical interaction through the roles of players, teachers, designers, and scientists for balancing domain- and game-goals. Using the provided board and card set for ideating, the groups created game-challenges addressing awareness in privacy decision-making. For guiding further development of the CGF toolset, we assessed the qualities of the game ideation activity by questionnaire on effectivity/applicability of the tools and interviewing groups while additionally analysing the resulting privacy decision game-concepts. Outcomes indicate that the affordance-based game frame helped students balancing domain and game-goals. Utilising the affordance-cards helped students ideating privacy decision games as the board aided structuring and visualising the balance of the game-concept. The students' envisioned game-concepts were interestingly favouring unofficial play over official play in classroom settings. Conclusively, game-challenges for raising privacy awareness are suggested to be played independently of strict educational context. Implicated design development of the CGF is finally outlined and should include settings where researchers and teachers are part of the dialogical interaction during applied game creation.

Keywords: Serious Games, Game Design, Card-based Toolset, Co-Creation, Affordances, Privacy Decisions

Escape Rooms for STEAM Education: Comparing Design Phases

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Abstract: The use of Escape rooms in education shows a constantly increasing rate, since schools need to operate with different paradigms of learning. Teachers often incorporate such live action games in their practice either as formative assessment tool or as a method for experiential, peer-group, game-based learning. In vocational schools it's important to encourage and motivate students in order to help them find their professional rehabilitation. This paper addresses the design phases that took place at a vocational school in Greece during the development of two different escape rooms. As part of their Creative Activities Zone (CAZ) classes, 12 STEAM students created a Christmas-themed Escape room for a local council. This project was built upon another escape room developed at the same school the previous year by 39 multi-disciplinary students. In both games, one student took the role of a non-player character (NPC) and interacted with the players throughout the game. This article presents and compares the design stages for the aforementioned action plans in order to assist educators and other stakeholders with incorporating escape rooms into their teaching practice. Designing escape rooms that combine technology, creative writing and drama games, can offer students opportunities to think outside the box, develop problem-solving, decision making, and strategic planning skills, as well as become useful citizens to their local community.

Keywords: escape room, design, education, technology, creative writing, theater

Opportunities for Gamified Learning in Purchasing and Supply Management Education

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Abstract: Gamification has been used in a wide variety of subject-specific education contexts. Examples of such usage in the Supply Chain Management (SCM) context include the oft-played beer distribution game, developed by MIT Sloan School of Management (Forrester, 1961), which simulates the coordination of typical problems in supply chain processes, promoting information sharing and collaboration throughout a supply chain (Sterman, 1984). Purchasing and Supply Management (PSM), a subset of this wider SCM area, focuses on the direct relationships between organisational buyers and suppliers, covering aspects such as establishing trust, identifying and selecting suitable suppliers, managing supplier performance and the overall relationship. A systematic review of the PSM gamified learning literature establishes that there has been limited research to date and that which there is tends to focus on quantitative representations of managing overall supply and demand, using wider SCM elements. This suggests that there are opportunities to gamify PSM learning, in particular focusing on the human element in PSM and developing soft skills, as strong buyer-supplier relationships can generate significant benefits to both parties. To provide a more focused PSM contribution, a second systematic literature review distils the relevant principles, techniques and processes to inform the development of two gamified PSM learning activities. Negotiation and supplier relationship management rely heavily on personal interactions and are both seen as key activities at different stages of the PSM process. The development of the two gamified learning activities is strengthened by being underpinned by a synthesis of the literature review's key findings, ensuring they are domain-meaningful abstractions of reality, contain rewards and rankings based on clear objectives and have appealing gameplay. It is hoped that this paper provides a platform for future domain specific PSM research and will be of use to educators in this field in developing their own gamified learning.

Keywords: Purchasing and Supply Management, game elements, education, decision tree

Method Cards for Movement-Based Design Activities: A Survey of Free Online Toolboxes

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Abstract: Card-based design tools have proven useful in both industry and academia in the fields of interaction design, human computer interaction (HCI), and the umbrella of fields overlapping user experience design. Wölfel and Merritt classified the design dimensions of physical card-based methods into five categories: 1) Intended Purpose & Scope, 2) Duration of use and placement in design process, 3) System or Methodology of use, 4) Customization, and 5) Formal Qualities. Furthermore, they identified three graduations of intended purpose & scope, ranging from very general to context specific: 1) General/repository card systems, 2) participatory design, and 3) context specific/agenda-driven. This paper draws attention to the methods involving human movement or movement-based methods, which constitute to one of the categories of agenda-driven methods. The design activities, particularly for the development of systems and services involving human movement, should build on movement-based methods for involving both designers and users for the increased emphasis on domain-specific human-centred design. We find that in the multi-disciplinary domains involving play, sport, fitness, games, and health, the movement-based method cards have become crucial in the new study programs and design projects involving innovation, creativity, and entrepreneurship. There are numerous articles on how cards are used in the design activities including examples of human movement-based methods. However, an overview of movement-based method cards has not been conducted and articulated. So, adopting an approach for systematic literature review, this paper identifies 20 free online resources resembling card-based design toolboxes from an organic Google search and discussion with colleagues in the HCI field. Studying the toolboxes containing 55-85 cards each and identified eighteen unique names for the movement-based design methods. The methods are mapped into Stanford D. school's five categories of design activities, empathize, define, ideate, prototype, and test. The methods grouped

into each of the categories are presented briefly followed by discussion on practical implication due to similarities and differences. Four of the 20 card-based toolboxes were excluded as those do not contain any movement-based method. The paper concludes with the scope of further development of card-based design tools particularly for movement-based methods for the human-computer interaction practitioners and education programs.

Keywords: method cards, design methods, design tools, movement-based design, bodystorming, embodied ideation

Gamification of Strategic Thinking: A COTS Boardgame for Learning Strategy Development and Strategy Implementation (COVID-19 Improvised Online Facilitation)

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Abstract: The Bundeswehr Command and Staff College (BCSC) conducted a seminar 'Gamification of Strategic Thinking' from 16. – 18. March 2020 with students from the Hamburg University of Technology (TUHH) and Fernhochschule Hamburg. This paper describes the seminar from construction to end, the improvised online facilitation and reflects on the results and findings. Thereby, it contributes to the discussion of how to implement commercial of the shelf (COTS) conflict simulations (wargames) to education, in particular for political science and management. The seminar used the COTS board game 'Scythe' as the environment for strategy development and strategy implementation. Seminar goals were the application of management tools like SWOT Analysis, Kanban Board and the OODA-Loop (Observe, Orient, Decide, Act) to strategy development and strategy implementation in a competitive environment characterised by volatility, uncertainty, complexity and ambiguity (VUCA). Five teams consisting of five players each competed for two days, had to use the decision-making process several times and had to face the consequences of past decisions. Furthermore, four team members (80% of all participants) had to red-team other competitors

and thereby learned how to implement a (business) wargaming technique into the decision-making cycle. 100% of the participants had to develop a strategy, either their own or their adversaries' strategy. Several surveys evaluated students' perceptions and performance. 90% of the participants would recommend the seminar and 80% would recommend Scythe as a tool for teaching strategic thinking. The insight is particularly fascinating for the community of professional wargamers regarding the question of how to introduce new personnel to the field of professional wargaming. The lead author planned the seminar as an on-premise seminar. However, due to COVID-19, the TUHH and the BCSC cancelled all on-premise seminars. The lead author had to facilitate the seminar entirely distributed out of his living room using a variety of web 2.0 collaboration tools like Slack, Trello, Adobe Connect, GoToMeeting and, of course, WhatsApp.

Keywords: Game-Based Learning, Gamification, Wargames, Strategy Development, Strategy Implementation

Universal Strategy Game

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Abstract: Authors combined experience of past gaming practices and developed a survival game for the people of different ages. It was suggested that it is possible to develop strategic thinking, analytical skills, risk assessment and rapid response skills through training games. Authors developed a game with an unpredictable outcome for users of all ages. Gameplay was unified by means of presenting a plot using Microsoft PowerPoint. Game practice was based on player-moderator interaction using messengers. All selected player decisions were displayed on a main screen. Game plot allows users to concentrate attention on developing a "survival" strategy. The plot is based on the concept of Viking life. Each player acts as a Viking who is going to become a leader. At the end of the game, the player that was bravest and most successful wins. Game requires continuous moderation. The game was tested by players from three age groups, namely schoolchildren, university students and teachers. The strategic decisions of teams

were very different from each other. After the end of gaming sessions, feedback was collected, and behavioral characteristics of the players were identified.

Keywords: educational game, survival, strategy, tactics, generations

A Preliminary Study of a Business-Management/Strategic-Planning Board Game with Situated Learning Mechanisms

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Abstract: Recently, board game-based instructions have gained much attention for human resource training in enterprise. However, studies of educational board games designed based on the situated learning theory with authentic enterprise data and experiential-learning-based mechanisms that assist business management and strategic planning learning are still rare, especially in life insurance industry. To explore how educational board games can assist business management and strategic planning learning, this empirical study developed an educational board game – *WinWin Insurance Plus.* The game was developed not only for business management learning and strategic planning, but also for life insurance management based on situated learning mechanisms. All data and information in this game came from a real life insurance company for authentic context simulation. The game mechanisms were designed based on metacognition and experiential learning principles to promote learners' strategic planning and reflective thinking. In this game, the players played a role working in an insurance company. The players were responsible for sales, investment, project management, recruitment, risk control, and department planning in the game. The case and information in the cards were adapted from the real data provided by multiple departments of a real insurance company, so this game could simulate real business situations and contexts. The game mechanism provided feedback and progress to the players so that they could adjust their business strategies to obtain good reputation and

outcomes for the company. This preliminary study evaluated the game based on the players' acceptance, flow state, and gender difference. The study also adapted a qualitative analysis to investigate learners' gain. 48 students from a university in northern Taiwan participated in this study. The results of this study provided valuable references for human resource training and and business management learning. This board game also showed the potential of gamification-based instructions in human resource training in the future.

Keywords: educational board game, game-based learning, authentic enterprise data, situated learning, flow, experiential education

Endowing a Game-Based Learning Hub for Augmenting Teaching and Learning: Design, Constellations and Perceptions from a Teachers Perspective

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Abstract: Game-based learning is viewed as an immersive and pedagogically rich approach to enhancing teaching and learning in schools. However, teachers may feel overwhelmed from the dispersed, disorganised and invalidated plethora of game-based resources circulated over the Web that needs to be collected, reviewed and repurposed for designing and orchestrating game-based learning. This paper presents the design requirements of a game-based learning platform that may help teachers to find, retrieve, re-use and share game-based learning along with opportunities of augmenting teachers' creative potential and professional development. The paper also contemplates on qualitative findings of a small-scale study (n=18) on teachers' different perceptions of game-based learning and constellations of employing a digital platform for increasing awareness and practice in the classroom. An empirically-based framework is developed that maps perceptions to actual practice. The findings may contribute to developing discourse on processes, practices and strategies that teachers would employ, which in turn would inform the design of GBL systems dedicated

to support teachers in their effort to use game-based learning most relevant to them.

Keywords: perceptions of game-based learning, approaches to game-based learning, game-based platform, schools, game resources

Could Decision Fatigue be a Problem for Serious Games?

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Abstract: Decision fatigue is a psychological effect of willpower becoming weaker after a long period of having to make decisions, as if the ego becomes tired. It can lead to lower performance as well as worse decisions. This experiment aims to test whether the effect might present new problems for serious game design. Because games can motivate players to continue playing for long time periods, it may happen that their willpower eventually weakens. That would lead to careless or incorrect decisions in the later stages, which could defeat the ultimate purpose of a serious game. In this study a simple Twine text adventure game was made to cause players to make many choices in order to sap their willpower and bring about a state of decision fatigue. They are then shown an unsolvable puzzle within the Portal 2 engine and asked to solve it, in order to see how long it takes people to give up or ask for hints. Results indicate that a state of decision fatigue can occur while playing the text adventure game, depending on how many choices the player has to make. In consequence, the performance in the later, second game can drop significantly. It thus appears that designers of serious games might wish to be careful, not to undermine the learning opportunities in the later stages, by making the gameplay too engaging from the start.

Keywords: Games based learning, Serious games, Decision fatigue, Willpower depletion, ?, ?

A Preliminary Study of Correlations Explaining Student Interest in Digital Games-Based Learning

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Abstract: Digital games-based learning (DGBL) aims to increase student interest in learning in the context of game play. Interest, or a sense of willingness to be involved (Schiefele, 1991), has a positive influence on working with computers and can be distinguished as situational and individual interest (Hidi and Renninger, 2006). Existing works have highlighted that interest is linked to intrinsic motivation, self-efficacy, affordances, and flow, but few empirical studies examine the relationship between their underlying dimensions and interest among children. Affordance (Gibson, 1979) could explain what makes the user want to use a DGBL environment for studying. Self-efficacy (Bandura, 2003) describes the beliefs that lead the individual to believe in his or her abilities and performance. Flow (Csikszentmihalyi, 1990) can be observed through complete absorption in an activity. To better explore the elements that may arouse student interest, a preliminary case study has been carried out in a primary school. A total of 111 students, aged 9 to 12 years (M = 9.78, SD=0.78), participated in this study; the data was collected via questionnaire (Cronbach's alpha coefficient α=0.928). This study indicates that gender (rho = 0.11, p = 0.26) doesn't have a significant effect on students' situational interest within DGBL. It shows that contentment (rho = .54, p < .001), autotelic experience (rho = 0.61, p < .001), action possibilities in-game (rho = 0.52, p <.001) and pleasure of play (rho = 0.60, p < .001) are highly correlated with situational interest. Although some other variables have a limited effect on interest, they also promote it during gameplay.

Keywords: Games-based learning, interest, intrinsic motivation, affordance, self-efficacy, flow

Attack and Defend: Combining Game-Based Learning with Virtual Cyber Labs

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Abstract: With the increasing focus on cybersecurity from both authorities and enterprises, the growing skills gap in cybersecurity is one of the biggest cybersecurity concerns. Therefore, there is an urgent need to motivate young people to choose education and careers in cybersecurity, but also to increase competencies among both students and professionals. At the same time, many of the topics of cybersecurity are well suited for gamification: This is the case for both technical topics, where Capture The Flag competitions have gained wide recognition, but also for the less technical topics such as incident-response. There are already several well-established platforms to support the former, but in most cases, the exercises offered are quite simple (find a flag and get points), and as such do not reflect the complexity of systems to attack/protect, and if more complex scenarios are covered these often are static, and it requires a significant amount of work to create new scenarios. This paper presents the overall architecture of a new platform, designed for user-friendly and automated generation of complex gaming scenarios for learning about cybersecurity. This makes it possible to create very realistic scenarios for training both technical skills and the participants' abilities to act and make decisions in stressful situations. Moreover, it offers the possibility for users to interact with each other, both within and between teams, raising their abilities to communicate and solve challenges. The platform is envisioned with both technical perspectives and game design for learning in mind. This means that the platform is not only able to create realistic virtual labs, but the labs are created based on game scenarios that are considering specific learning objectives. This also makes it possible to create games that go beyond the traditional "point collection" and engage the users in a setting that feels more realistic and absorbing.

Keywords: Cybersecurity, Platform, GBL, Attack, Defence

Virtual Experiential Learning, Learning Design and Interaction in Extended Reality Simulations

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Abstract: Extended Reality (XR) covers both Augmented Reality (AR) and Virtual Reality (VR). How do we design immersive experiences in XR for teaching and learning? Immersive experiences are one of the unique virtues of XR simulations. A VR simulation can instantly teleport the user into a VR party or up on to the top of a building looking down. The experience immediately triggers sensory feedback and suspension of disbelief. Can theory about experiential learning support the design of VR and AR simulations for learning and the associated learning design? The article introduces three perspectives on successful design of game-based learning in XR. The first perspective is Virtual Experiential Learning inspired by Kolb's experiential learning cycle theory. The theory is applied to two illustrative examples: one in VR and one in AR. From an educational technology design view, the goal is to design digital encouragement for the potential transformation of the virtual experience into new knowledge: a knowledge ready to be applied in real life. Secondly, we propose that educational technology designers should develop ready-made learning designs to go with the XR applications. Learning design is a plan for facilitating the learning process in three steps: introduction, XR experience and debriefing. An effective learning design supports deeper learning and retention in the experiential learning process. Thirdly, in XR simulations, feedback is often unclear and navigation often unnecessarily complicated. We discuss how to improve interaction in the XR systems to support the immersive experience and the learning process. The paper is intended for designers of educational technology and game-based learning, practitioners and students in further education.

Keywords: Experiential Learning, Virtual Reality, Augmented Reality, Immersion, Design, Feedback, Interaction

What Games Will Military Leaders Need?

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Abstract: Games-based learning has its historical roots in the military context with examples such as chess and Kriegsspiel. Nowadays, digital games and simulations are widely used in military training with a focus on operation planning and mission command. However, the rapidly changing global situation calls for new types of leadership skills, both in the civilian world and in military service. To be efficient in the military context, a leader must be competent in three areas: technical, social, and conceptual. As the nature of military conflict evolves, army officers must be ready to act in ill-defined situations and interact with diverse populations. Currently, the games and simulations designed for leadership training generally address technical and managerial skills, whereas the social and conceptual skills are neglected. It is suggested that the social and conceptual skills of military leaders should be given particular attention during both pre- and in-service training. The development of conceptual understanding and personal awareness cannot depend on traditional learning methods, and the games-based approach offers potential for filling this gap. This paper introduces a basic model of the competencies needed in the military sector, which could be developed with the support of games-based methods. Many studies have described the core elements of an effective educational game, and researchers agree on the basic stages of game development. Because the terminology used is frequently ambiguous, a basic taxonomy of the stages of game development will be included in the paper.

Keywords: competencies for command, conceptual skills, game design, game development, military leadership, social skills

GameLet: Seeking Media-Supported Fun in the Training of Reading Fluency

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Abstract: This paper presents *GameLet* (Gamified media-based training of reading fluency), a research and development project funded by Erasmus+ (2018-2021). The project is dedicated to developing a training programme for reading fluency (RF) with the specific aim to foster struggling readers improve their RF by means of a multilingual, gamified, media-based approach. At the core of *GameLet* lies a fictional audio story that should encourage learners to read more, hence improve their reading skills. Moreover, it allows learners to successfully record their role in a digital *Recording Studio,* both in class and at home. Increasing RF practice is aimed at by means of media-supported individual and cooperative learning phases with various reading training methods, application of playful learning scenarios and materials, and interactive elements. The paper describes how data from the second formative evaluation cycle in winter 2019/2020 was used for the design principles, future modifications, and material developments of the *GameLet* web version.

Keywords: digital games-based learning, gamification, learning environment, reading fluency, school and foreign language learning

Fighting Oppression Online: Digital Role-Playing Games as Means for Critical Dialogue

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Abstract: This study incorporates Paulo Freire's "Pedagogy of the Oppressed" and Augusto Boal's "Theatre of the Oppressed" theories to create an innovative digital role-playing game with Arab-Israeli teachers, who are members of a marginalized minority in Israel and suffer from discrimination and limitations on their freedom of speech in class. The study was conducted using a game platform originally designed by 'To-Be-Education' for the role-playing of sensitive issues in class. As part of the two stage process, the teachers learned about digital games, game-based learning and how to implement games in their classroom; they raised oppressive events they experienced, conducted a blended critical process regarding the possible reasons for these events and adapted them into digital role-playing game scenarios on the "To-Be" platform. They then re-enacted these situations using Boal's "forum theatre" method on the digital stage, conducted a critical dialogue regarding the power relations behind the evets and debated possible alternative outcomes. The scenarios the teachers wrote depicted their personal and professional lives. Through the games they created they were able to discuss the bigger problems their society deals with, such as poverty, unemployment, violence in the streets and in their classroom and political silencing. The use of the platform, along with the unique characteristics of digital games (such as fantasy, anonymity and personalized avatars) allowed the teachers to discuss these issues with greater freedom of speech and provided them with fresh means of dialogue. After the study concluded, many of the teachers reported they felt empowered by the use of the game platform, that they felt they could express themselves with less restrictions online and that the games offered them an arena in which they could simulate different approaches and behaviours without real-life consequences. In this respect, the use of the digital game platform lifted some of the barriers placed on these teacher's freedom of speech.

Keywords: Digital role-playing games; Dialogue; Critical Pedagogy; Teacher education; Marginalized communities; Theatre of the Oppressed

Assessing Impact of Self-Regulated Learning Using Educational Games on Intelligent Platform

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Abstract: Nowadays, developing competences in our students to face future learning and work is an educational necessity. This can be committed by training students for personalized, Self-Regulated Learning (SRL). In this sense, digital materials oriented through game mechanics, involving feedback and rewards associated with curricular contents, can help students in cultivating SRL. In this article, after comparing the present variety of SRL models in the literature, we gathered their conclusions in order to assess the level of application of SLR strategies in the usage of game activities within the educational intelligent platform Smile and Learn. Our main goal is to analyse the impact on SRL that games designed by Smile and Learn make in children of elementary education. As second goal, we purpose to describe the most common traits supporting SRL appearing in these games and, thus, satisfying the characteristics according to scientific literature. As of March 2020, the platform Smile and Learn offers more than 5000 educational games activities, targeted for children aged 3-12. Activities are classified in different topic-related worlds, corresponding with most of the curricular subjects: Mathematics, Science, Literacy, Spatial, Emotional Intelligence, Multiplayer, and Arts plus a personal world. To test the games' effect, we ran a series of usage experiments with students aged 7-11, corresponding with 3rd, 4th and 5th grades of elementary education. Participants were selected from a state school in the Community of Madrid (Spain). The instrument chosen for measuring SRL is the Self-Rating Scale (SelfReg). This questionnaire records data from 7 SRL variables: Distractibility, Sustained Attention, Emotional Control, Motor Activity, Motivation, Inhibition, and Speed of Processing. Both, variability in usage among the different worlds, and their specific impact on SRL, are rates assessed via data collected from users' performance interacting with games. Data are analysed by a linear regression analysis. Implications on educational field and connections with SRL models are

discussed. We suggest to explore implementing more variegated types of games, as a future direction, especially promoting collaboration, teamwork troubleshooting and emotional intelligence while evaluating their impact on SRL.

Keywords: Self-regulated learning (SRL), Educational Technology, Game Design, Assessment, Primary Education

Gamification and Self-Directed Learning

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Abstract: Gamification is a learning technique that transfers game mechanics to the educational environment in order to achieve better learning results, change participants' attitudes towards the learning process, develop knowledge and student skills. One of the advantages of using gamification is that motivates students to investigate and design strategies in order to achieve a better performance in the game. There are many studies that highlight the different benefits of using gamification in the classroom, among some of these benefits gamification improves student participation, motivation and commitment, encourages more collaboration between students, increases content understanding, among others. On the other hand, it is necessary to understand that the paradigm of employers has changed. Companies today need more flexible people, with different skills, with the ability to "learn to learn". This skill is essential to cope with the complexity of interactions that people frequently face. This is why many companies prefer to have employees who manage their time and achieve results independently (without the direction of supervisors, trainers, or educators). Day by day it is more important that people develop the ability to acquire new skills, new knowledge and self-management. For the past two years, with other colleagues in the logistics area at our university, we have worked on designing a course based on an online game called Logistic Simulator (or LOST, for short). The intention of the game is that students can acquire knowledge in an easy and fun way. To improve their performance in the game, they must investigate and learn different topics of the course on their own, and even investigate content that is not found within the syllabus. This study aims to point out how gamification influences the student's perception of self-directed learning. The study shows that students significantly change their perception of some of the areas related to their participation and the degree of responsibility they have

for their own learning, in particular, students improve their abilities in the search for information, autonomy and self-management.

Keywords: Gamification, Self-Directed Learning, Higher Education, Educational Innovation, Serious Games, Game based learning

A Dynamic Bonus System to Increase Player Participation in Pervasive Learning Games

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Abstract: A pervasive game blends gaming with the real world and makes the experience pervasive according to the players' everyday life. Pervasive games typically last for days or weeks and have successfully been used within advertising and social relationship building. A pervasive learning game intentionally removes the walls of the classroom and makes learning something that happens everywhere at all times. However, lessons learned in previous research on long-lasting pervasive learning games have shown that not all players/students participate enough in the game to achieve the desired learning outcome. The-Last-Shall-Be-The-First (TLSBTF) is a method to overcome this problem by rewarding players that activate passive players. Activated players also receive special bonus that – given that they from this point on actively participate in the game – gives them the opportunity to get ahead and even win the game. The method has shown promising results in experimental long-lasting pervasive learning games. In this paper, the method is refined and presented as mathematical formulas. Formulas make it easier to integrate the method into similar types of games. Another important contribution is the clarification of the elements of the model behind the method that makes it easier to conduct research on the effect of the individual parameters in relation to increased player participation in long lasting pervasive learning games. Furthermore, the mathematical formulas presented in this paper, provide a good platform for further development of the TLSBTF method. The main contribution of this paper is the presentation and description of the mathematical model that make up the dynamic TLSBTF bonus system method.

Keywords: Pervasive games, Education, Serious games, Player Participation, Dynamic Bonus System

A Modern Game-Based Technique for Learning Software Engineering Course

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Abstract: Traditional teaching methods can be perceived as ineffective and boring by many students. Although teachers continuously incorporate novel teaching methods, it is believed that today's institutions face major problems around student motivation and engagement. Game-based learning is one possible solution to address this problem. Due to the abilities to teach and emphasize not only knowledge but also important skills such as problem-solving, teamwork, and communication the use of game-based learning is a promising approach. The main goals of this work were to encourage the use of game-based learning techniques over traditional learning methods, develop a quiz game to learn software engineering topics, conduct a study to compare the effectiveness of game-based learning with traditional learning, and compare gender effect on game-based learning with traditional learning to understand if game-based learning technique is effective across both genders. The quiz game developed displays the questions for the user to answer and provides an explanation for the questions that are answered incorrectly and awards trophies for every correct answer. Qualitative and quantitative analysis is done to study the effectiveness of game-based learning. Our study was a 14 participants x 2 learning technique experiment. Quantitative analyses included marks and trophies earned in traditional paper-based quiz and quiz game as well as gender effect on game-based learning and traditional learning. The questionnaire was designed using a five-point Likert scale. The factors included in the qualitative analysis were user interface design, functions and feedback, and learning. Based on analyses we noticed a better overall performance of the participants using game-based learning compared to traditional learning. In addition, both male and female participants performed better in quiz game over paper quiz. The qualitative outcomes show that participants were satisfied with game-based learning and

that they believe that the quiz game offers more scope of learning software engineering concepts compared to paper-based quiz.

Keywords: Software Engineering Course, Game-based learning, Modern learning technique, Software Tool, Educational System, Teaching Content

Emergent Narratives in Project Based Software Development Education

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Abstract: The nine months formative education program focussing on software development for the Apple technology ecosystem offered at University of Naples Federico II (Italy) utilises the Challenge Based Learning (CBL) methodology. As a collaborative and self-guided, inquiry-based learning method, it focuses on intrinsic motivation of learners, working on real world problems organised in projects (Challenges in CBL) with an experiential and progressive approach to apply acquired knowledge in real world scenarios, ideate solution concepts and build innovative digital products. The authors applied storytelling principles and narrative theory to design the program's educational experience for the academic year 2019/2020 as a cohesive journey within a communal learning environment with a coherent and connected structure of learning Challenges. Recently, scholars have developed digital interactive systems (e.g. Games, Interactive Storytelling) to design unscripted narratives, affectively driven by its characters, within educational contexts using emergent narrative concepts. Building on these systems, the authors present concepts to develop their approach further towards an emergent narrative experience design to manage the educational journey as it develops, rather than scripting it. This paper introduces a Narrative Experience Design Canvas to model educational experience design that encourages unscripted, emergent narratives for experiential education with the aim of fostering learners engagement, agency and creativity. Derived in part by models mainly developed for digital interactive storytelling or educational video games, it categorises the components for designing an in-person, embodied educational experience that allows the learning progression to be driven by learners as co-authors and describes mechanisms that allow unscripted narratives to emerge based on intrinsic motivation. For the future, the authors indicate action points to

develop this model into an Emergent Narrative System for designing narratively driven and experiential software development education.

Keywords: emergent narrative, experience design, challenge based learning, narrative theory, software development, experiential education

Leveraging Local Expertise: Design of Game-Based Formative Assessments for Broader Adoption

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Abstract: 21st Century Standards and the Deeper Learning movement in the U.S. emphasize the ability to think critically and solve complex problems, to work well in teams and to communicate effectively as core objectives of teaching and learning. While traditional classroom activities can certainly meet these objectives, digital games and simulations provide unique affordances. In particular when designed to incorporate formative assessment functions, they can be instrumented to capture detailed data on learners' performances and provide learners with immediate feedback. In spite of their strengths, practitioners' adoption of game-based and simulation-based formative assessments can be slowed where design does not account for requirements that arise in local classroom and school environments. This paper presents the Integrated BEAR Design System (IBDS) as one way of engaging practitioners in principled design and development of game-based formative assessments in order to design for broad adoption by accounting for local needs. The Integrated BEAR Design System (IBDS) extends existing principled design approaches by engaging practitioners working in diverse teaching and learning environments. We outline the four building blocks of the IBDS while referring to our experiences designing and developing a prototype game-based assessment - Little Fish Lagoon. The game is a formative assessment of collaboration and communication skills that puts players in charge of a North Atlantic fishery. It supports exploration of scientific, communal and governance issues that arise with common pool resources. Participatory design involved 6 schools in the U.S. to plan for broad adoption of the multiplayer collaboration game in diverse classroom settings. We illustrate an iterative process to engage practitioners in the first three building blocks of the

IBDS: (1) construct maps (2) the items design and (3) the outcome space. The result is a game-based formative assessment poised for broad adoption.

Keywords: Integrated formative assessment, collaboration, participatory design, user-centered design, BEAR assessment system, broad adoption

Exploring Peer Mentoring and Learning Among Experts and Novices in Online in-Game Interactions

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Abstract: Becoming a competent player of online games involves complex processes and networks of online and offline life where the player is socialized into social norms and expectations. An important aspect of what constitutes gamers learning trajectories is guidance from experienced players. Games are public spheres where learning is social and distributed and where players often are enabled to learn new and advanced competencies. However, there is little educational research on how these competencies are cultivated and employed within a competitive gaming scene. In the current paper, we analyze the mentor-apprentice relationship between an expert and a novice in the multiplayer FPS CS:GO within an eSports and educational context. By assuming a dialogic approach to meaning making, we will examine how novices and experts uphold and talk the relationship into being and how the peer teaching and learning manifests in the in-game interaction. The ethnographic data was collected in collaboration with a vocational school with an eSports program in Finland in 2017-2018. Students (aged 17-18, all male) playing CS:GO shared screen recordings of their matches and took part in interviews. The participants play in two different teams. Here, we focus on Martin (expert) and John (novice) from team one. Martin was the highest ranked team member, something his team members are aware of and make relevant in interviews and in-game interactions. This position seems to provide him authority and leadership within the team. In the interviews, Martin aligns with being the leader and repeatedly mentions that he coached John to become part of the team. This relationship is also evident in the in-game

data where Martin, together with the rest of the team, often provides feedback and support for John. The learning appears to be how to become competent in the game, and there are strong indications of other aspects of learning that relate to sociality and leadership.

Keywords: multiplayer, esports, dialogic learning, ethnography

An Application of Microcontroller for Cooperative Learning Games

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Abstract: This paper presents the design and implementation of a system that facilitates the development of new mechanics for a cooperative gameplay. The system utilises a microcontroller with sensors and actuators to create a gameplay that requires players' interaction as a team to complete the game's objective. Players are separated into two roles that each role possesses unique abilities and information i.e., a field player and a control centre player. The former has the ability to move and take action around the battlefield while the latter has the ability to detect the hidden enemies and can send the reinforcements to the field player upon request. Therefore, players need to act in collaboration to fulfil the game mission. The result shows that the system can encourage players to have more mutual engagement, increase face-to-face interaction, enhance the collaborative gameplay environment. These encouragement factors could provide an improvement in game-based learning experiences and applications.

Keywords: Microcontroller, Asymmetric Collaborative Games, Cooperation, Mutual Information, Mutual Information Gameplay

Tangible Grammar: Prototyping Playful Physical Tools for Foreign Language Learning

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Abstract: This paper introduces the results of our exploration into designing playful physical tools for foreign language learning in classroom settings. Although playful physical tools have been used for centuries in educational settings to support learning, limited research has explored physical tools for language learning. For this reason, we prototyped five different tools to teach basic Portuguese grammar and conducted user-testing with English speaking students at the University of Southern Denmark. The focus of this paper is however not on the prototypes we designed for this research. Instead, the paper investigates how users respond to learning grammar with playful physical tools. Additionally, we highlight challenges and opportunities that affect the design of physical tools for language learning, such as the presence or absence of corrective feedback, as well as how the sense of touch affects users' individual learning experience.

Keywords: Playful learning, tangible interaction, foreign language learning, designing tangible tools

Modding Tabletop Games for Alignment with State Standards: Developing the Geographic Literacy of Elementary Level Learners

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Abstract: Looking at the effects of globalization from numerous perspectives: economic, spatial, cultural, and environmental; it has become abundantly clear that today's students must possess geographic knowledge and associated skills to

be prepared for civic life and informed decision-making. Yet, the current state of geographic proficiency among U.S. youth remains a concern. The amount of geography instruction that students receive, the preparation of their teachers to teach geography, and the quality of instructional materials are inadequate to prepare students for the demands of the modern world. This study intends to contribute to the research literature in geography education using game-based learning to develop geographic literacy. Its design calls for the modification of commercial board games aligned with state standards, game play with third grade students and data collected based on geographic concepts taught in the game. The primary research question is, *Does the use of geography games influence the development of geographic literacy of third grade students?* A secondary research question was, *After modifying a game to meet state standards and leading a game with elementary students, do teacher candidates see value in using games as teaching and learning tools?* The paper describes the requirements of a game task and provides a review of games modified by teacher candidates to develop third grade students' (8-9 years of age) geographic knowledge and skills, specifically in the content area of space and place. It provides a view of teacher candidates' attitudes about game modification and use for teaching and learning. The empirical portion of the study, originally planned for April 2020 was placed on temporary hold due to the COVID-19 pandemic and now scheduled for Fall 2020 or Spring 2021. The subsequent analysis of what third graders learned through this intervention will be added at that time.

Keywords: preservice teachers, attitudes toward GBL, tabletop games, modifying games, standards alignment, geographic literacy, elementary level learners

Investigating Student Preferences on Gesture-Based Interactions in a Vocabulary Game

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Abstract: There is evidence from second-language learning research that acting out vocabulary can improve learning and recall. Gesture-based language learning games have the potential to support this method of learning. A within-subjects design was used to explore student preferences for interaction styles in

vocabulary games. Three types of game interaction technologies were examined: a gesture-based game in which the student points to select the vocabulary; an acting game in which the student acts out the meaning of the word to select the vocabulary; and a mouse-based game. The goal was to explore students' interaction preferences and the reasons behind their preferences as well as issues that could occur while acting out the (abstract and concrete) vocabularies. Thirty-six participants (16 males and 20 females) aged 7–9 played each of the three games in a randomly assigned order. The play sessions were video-recorded, and students participated in a short interview and survey after playing all three games. Overall, most participants enjoyed playing the acting game, suggesting that this interaction approach could be pursued in future educational game design.

Keywords: Gesture-based system; second language learning; vocabulary game; acting; embodied learning

Emotions and Challenges During Game Creation: Evidence from the Global Game Jam

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Abstract: The Global Game Jam (GGJ) is an annual worldwide event that brings together game enthusiasts of different backgrounds, motivating them to create games collaboratively under a common theme in a 48-hour timeframe. The constraints on time and theme, as well as the social nature of the event, often leads to an emotionally intense game creation process. This paper examines the emotional experiences of the attendees, specifically collecting data from GGJ participants from five different jam sites in three European countries (N=42). A self-report, open-ended questionnaire gauged respondents' emotions during and after the game design process, their reasoning for reporting these emotions, and the challenges they faced throughout this event. The qualitative analysis of the responses confirms that the creation process is laden with emotions, emphasising the importance of the 'team' and social relationships in how emotions are experienced. Participants referred to time limits and team coordination as the main challenges of the experience. The results are presented through the lens of Positive Psychology, focusing on Positive emotions, Engagement, Relationships, Meaning, and Achievement. Results indicate that (collaborative) game creation

can shelter positive emotional and social experiences that can contribute to an individual's sense of growth and well-being.

Keywords: Global Game Jam, game design, emotions, Positive Psychology

Paper Prototyping as a Method for the Evaluation of Serious game Concepts

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Abstract: Learning experience design (LXD) describes the art of creating experiences that help learners fulfilling the learning outcomes they desire. Thus, learning scenarios need to be created in a user-centered and goal-directed way, which in turn has a positive impact on the learner's motivation. Also during the development process of a serious game the concept of LXD comes into play. This concept is strongly interlinked with design thinking which is a more general approach to generate creative and effective solutions to specific challenges. It focuses on a specific "user" rather on the "learner" but nevertheless both concepts share key principles: they are user-centered approaches and function in an iterative way. One method, stemming from the concept of design thinking, that is expected to be an efficient way for user-centered usability testing and gameplay development is paper prototyping. This paper describes how the method of paper prototyping was used within the project "E.F.A." which aims at the development of a serious game for workplace safety. Paper prototyping has been applied during an early stage of the development process in order to test the game mechanics and game elements of the serious game. The paper aims at answering the following research question: To which extent is paper prototyping an appropriate method to test and refine the concept of a serious game in an early stage of development (before digital realization)? In order to gather data on those aspects the project team conducted seven test runs to test the paper-based version of the serious game. The participants which were experts in the field of media didactics were asked to think aloud while playing and were interviewed afterwards. After each test run the paper prototype was modified according to the feedback given by the players. The results indicate that paper prototyping is an appropriate method for testing game mechanics and to some extent the learning outcome in the development process of serious games. The paper poses

recommendations on how to use paper prototyping in the context of serious game development and captures the benefits and limits of low-fidelity paper prototypes.

Keywords: serious games, game based learning, paper prototyping, learning experience design

The Learn&Play Project: Developing a Serious Game to Motivate for and Foster the Self-Concept of Ability in STEM Studies

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Abstract: Despite the broader range and better quality of STEM study programs, the interest is stagnant if not dropping. Factors significantly predicting the choice of study and academic achievement include one's self concept of ability as well as interest in relevant school subjects and the subject of study itself (Eccles & Wigfield, 2002). Once enrolled, elementary students are faced with a series of challenges that can lead to poor exam performances or even study termination (Dammann, 2016). Among them are the abstract nature of the learning content and the highly formalized problem solving procedures. The question, then, is how the heterogeneous group of prospective students can be motivated to prepare themselves for these challenges. The serious game under development focuses on the gameful introduction of basic knowledge and skills in engineering studies. The underlying model combines game-based learning methods with applied exercises that are adaptive and personalisable. This approach is used to support the students' motivation, interest and self-concept of ability (Eccles & Wigfield, 2002). Players can customize their own avatars, choose between different learning paths and access the glossary in different language registers. Moreover, the learning content adapts to their level of expertise. Furthermore, an elaborated two-tier feedback system is provided (Narciss, 2012). The applied exercises are designed to illustrate coherences and offer the possibility to try out common problem solving procedures (Lehner, 2019). The game setting combines these different aspects by forming a loop of task selection, user behavior and feedback (Garris, Ahlers & Driskell, 2002). After implementing the first fully functional prototype, the next step will be to evaluate the game as well as its underlying model on the basis of

motivational and cognitive variables and test its use in different (higher) educational contexts.

Keywords: game-based learning, serious game, start of study, technical didactics, STEM

Developing Mobile Games that Enables Young Adults, with Severe Mental Disorder, to Learn Everyday life skills Enjoyably

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Abstract: Multiple Complex Development Disorder (MCDD) is a debilitating but little-known disorder characterized by a dependent style of behaviour and a lack of social adaptation. We present an approach to developing mobile games acceptable by people with MCDD and describe two games in which we implement the suggested approach. The games are designed primarily for the independent use by people with severe mental disorders, so to make the games accessible by such users, they are designed to minimise any uncertainty in gameplay. The first game is aimed at helping people with MCDD to develop the skills of recognizing and distinguishing objects surrounding the person with MCDD in his everyday life. Information about the objects is grouped into categories: each category is represented by a set of objects. For the first version of the game, the categories and objects were selected which people with MCDD constantly deal with in everyday life, such as Clothes, Vegetables, Pets, etc. The gameplay is limited by viewing the categories, category objects and videos showing when, where and how these objects are used in everyday life. The second game is dedicated to the development of speech and communication skills of people with MCDD by using the PECS cards (Picture Exchange Communication System). The game includes two modes: recognition of actions and composing sentences. The application was tested on a group of young adults with MCDD who live in Volgograd Home for disabled people. All the young adults participated in testing with great interest, and almost all of them were able to manage the game without the help (or with

minimal help) of the staff of the boarding house. The results of testing showed that the mobile games can really help to train everyday life skills of people with severe mental disorders, and in a way they clearly find enjoyable.

Keywords: Multiple Complex Development Disorder, MCDD, mobile game for people with MCDD, everyday life skills, PECS cards

Gamifying Classroom Presentations: Evaluating the Effects on Engagement Across Demographic Factors

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Abstract: Despite the increasing recognition of the importance of active learning methods and initiatives aimed at promoting them, lecture- and presentation-based teaching remains the dominant instructional strategy in many fields. Major reasons for this include teachers' lack of time for preparing more engaging learning activities, as well as their lack of know-how and confidence in applying active learning methods. However, not all active learning methods demand much additional effort on the lecturer's part or require a significant time investment to learn. A case in point is gamification, at least at the basic level of introducing immediate feedback, extrinsic performance rewards, and a playful frame. Combining such light-weight gamification with traditional presentation does not require much time for preparation, but may help increase audience engagement. When teaching various game-related courses, we designed classroom presentations in the form of a quiz: before providing a new piece of information, a question about the current topic was asked, and the audience had a chance to answer. Correct answers were rewarded with points and the winners of the quiz received a prize. Our objective was to find out what level of engagement a gamified presentation could reach. We used the model of flow and a short questionnaire at the end of every presentation in order to collect feedback from a diverse assortment of students both at the university level and in continuing education. An analysis of the resulting data suggests that gamification led to participants being moderately engaged in the activity. Comparing the results across various demographic categories indicates that such factors as age, gender, nationality, and occupation have little to moderate effect on participants' engagement.

Keywords: gamification, classroom presentation, active learning, engagement, quiz, demographic factors

Training air Traffic Controllers Through Digital Mobile Applications Versus Traditional Methods

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Abstract: Safety-critical industries, such as air traffic control, are highly regulated, with rigorous processes and procedures to ensure that safety remains of paramount importance despite the business environment. Training personnel in safety-critical industries is therefore typically a lengthy and expensive process. Gamification and the emphasis on fun, entertainment, progression and retention of concepts has been shown to deliver strong engagement amongst learners but remains at odds with training for safety-critical industries. This paper explores the impact of gamified digital applications versus more traditional training methods for the training of air traffic controllers (ATCs) and other roles relating to air traffic services. We explore the impact of the user experience on engagement and learning retention through the testing of two digital mobile applications, Location Indicators (LI) and The Aircraft Control Positions Operator (ACPO) Starter Pack. These prototypes examine how air traffic control training could be improved by digital applications. In an industry where the rate at which trainees can be trained is projected to fall short of the demand for staff to work in the air traffic industry (BBC, 2018) this project examines potential opportunities for changing established training methods. Each application presented key learning areas for trainees in the air traffic control industry and offers an alternative to the equivalent training currently used. The prototypes were designed to provide a succinct user experience that sat alongside gamified elements to improve engagement. These were then evaluated to determine whether they were effective in potential trainee learning.

Keywords: User Experience, Games-Based Learning, digital training, m-learning, e-learning

Design, Complexity, and Coding: A Framework to Evaluate Games

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Abstract: Game development-based learning and creative coding activities are seen as an opportunity for young people to acquire programming skills and overall, Computational Thinking (CT) skills in an entertaining way. The goal of such activities is to create playable gaming artefacts. While learning to code is becoming more and more important, young game designers miss a clear map to know how game and design elements can be organized and in which situations, specific elements or structures are appropriate. The aim of this paper is to present a valid assessment for structuring games created with visual coding languages. In different workshop settings (out-off school workshops, school workshops) 84 participants between 10 and 15 years old have individually created gaming applications with our Catrobat environment. Games created during these workshops (2017-2019) were analysed and structured in game elements, design elements, and game complexity. This method is based on various existing frameworks, for example, the Mechanics, Dynamics, and Aesthetics (MDA) framework, which provide a consistent structure to define game elements, goals, and rules, thereby delivering a common framework and vocabulary for games. The transfer of game concepts in a consistent structure should support the overall clarity of the game and should help to focus students on the relevant elements of games. We argue that students need guidelines to be able to implement more complex games even with visual programming languages. The result, the Playing, Engagement, Creativity, and Creating (PECC) Assessment Template should support the process of evaluating gaming apps in visual coding languages, can be used by researchers as a valid method for structuring games, helps all students to adhere to good game design principles, and teachers can use the analysis to evaluate games created with visual programming languages.

Keywords: game design, mobile gaming, mobile learning, game design patterns, game analysis

"Clementine Will Remember That" On Dialogic Teaching, Ethics, and Zombies

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Abstract: Despite the generally positive discourse surrounding digital game-based learning, studies of in situ use of games in educational contexts are lacking, especially in the perspective of dialogic teaching and learning. There is need for more empirical research studying how teachers use games for dialogic teaching in everyday settings (Arnseth, Hanghøj and Silseth, 2018). The aim of this paper is to provide more insight into this subject by reporting on the preliminary findings from an ongoing project examining how teachers at a high school in Norway use The Walking Dead (Telltale Games, 2012) as a resource for classroom dialogue. Preliminary analysis of field notes, interviews, and video recordings of seven teachers and their classes suggest that the game serves as an important resource for teachers asking authentic questions, and for creating a dialogic space that assists students' reflection and learning. The game's main component is a set of difficult ethical dilemmas, all woven together in an intriguing story. As the main curricular goal is to teach the students how to base their arguments on various ethical theories, these dilemmas provide a solid overlap with the course's knowledge domain and learning goals. Furthermore, the dilemmas are designed in a way that offer no obvious and clear-cut solutions. The dilemmas therefore provide the teachers with an important contextual resource for encouraging multivoicedness, dialogue and interthinking.

Keywords: dialogic learning, digital games, ethics, game-based teaching, The Walking Dead

The Serious Games in the Territorial Socio-Economic Systems Development

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Abstract: We consider the important role of universities in urban development of the cities of the future. The new promising live gaming practices, business communications, and strategy games can help with it. During a few years we have been actively using promising new technologies in a playful way. The purpose of the games is to identify the leaders of future changes, to involve the public organizations, business communities and city administrations in joint venture. The proposed project activity in a team game combines lightness, creativity, game, logic, expert knowledge and communication. On the basis of real city cases, a space is created for open and trusting cross-social communication between representatives of government, business, public associations, and active citizens. Through solving the cases, the participants analyze the role of various communities in the economy, law, politics and social sphere. They also exchange methods of studying the communities' functioning and how to assess these community's impact on the development processes of institutions and territories. Game practices are accessible to everyone through the disciplines of educational programs, additional training and socially significant events of urban communities. Thus, forming an active civic life position, games involve active citizens and young people in resolving issues of urban development.

Keywords: Strategy games, serious games, urban development, leaders, projects, improvement.

Religious Discourse of Video Game-Based Learning: Virtual Paganism and the Problem of Breaking the First Commandment[1]

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Abstract: Many modern video games contain entire religious systems, which often are not monotheistic, but polytheistic and neo-pagan. This can lead to such an unusual case when a gamer (who considers himself to one of the world monotheistic religions) faces the problem of a clear violation of the first commandment of the Decalogue. It is possible to determine two problematic aspects in the study of the religious discourse of video games: external and internal. The external aspect focuses on the problem of the relation of world religions to video games. Modern Judaism marked immersion to the virtual worlds negative (games distract from the spiritual life and cultivate violence). Eastern Christianity defines video games as a "sin" and the promotion of satanic activities. Western Christianity blames violent video games that deprive too much time. Contemporary Islam allows games if they do not distract from the prayer and do not violate the monotheistic principle. Unlike the Abrahamic religions, Buddhism reveals the psychotherapeutic and meditative value of video games. The "inner" aspect represents monotheistic and polytheistic religions within the virtual worlds of video games. The virtual representation of Judaism is a rare case in video games ("FIVE: Guardians of David"). Christian video games ("Bible Adventures", "The Bible Game", "Catechumen") may be regarded as a relevant example of religious game-based learning. Islam is not widely represented in video games as Christianity (historical strategies). Eastern religions presented in video games in explicit and implicit forms (JRPGs). There are several characters from historical and neo-pagan polytheistic cults in action games ("Wolfenstein", "Prince of Persia"). Since most of the RPGs are not historical but represent fantasy worlds ("Dragon Age") or fantastic worlds of future ("Mass Effect"), religions usually represented by a variety of neo-pagan polytheistic cults ("The Elder Scrolls", "Gothic"). At the same time, it is possible to find historical polytheistic

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pagan cults (Olympic, Scandinavian cults) in action RPGs. Strategy games represent historical monotheistic and polytheistic religions ("Total War"). "God games" represent the violation of the main principle of monotheism and teach gamers to use occult magical practices ("Black and White"). In terms of methodology, the study uses the dichotomy of monotheism and polytheism, the diachronic principle of historicism, the dialectics of historical and fantasy neo-pagan cults, the dichotomy of ludology and narratology, non-reductionist approach of I. Bogost, the concept of the involvement of E. Goffman, the transpersonal methodology of S. Grof. The findings of the paper may be useful for modern religious, cultural, and game studies.

Keywords: video games, computer games, religion, game studies, game based learning,

Science Gamified: Designing and Implementing a Gamification Model in Science Courses

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Abstract: This paper presents the design, implementation, and results of a gamification model in four science subjects in the PrepaTec Esmeralda high school of Tecnologico de Monterrey (State of Mexico Campus). The investigation was conducted over two years, starting with a pilot model applied to a total of 80 students belonging to three different groups, using a gamification model with more than 30 activities (missions) built using *Rezzly*. The student performance results in gamified activities, and the opinion survey conducted at the end of the semester showed a wide acceptance of the model (more than 50%). Consequently, the gamification model was redesigned, based on the Octalysis framework proposed by Yu-Kai Chou, and constructed using *Google Classroom* for its implementation during the August-December 2019 semester. The final model included 45 gamified activities implemented for 650 students in 20 groups (classes) in four science subjects, namely, *Energy and Transformation* (17), *Matter and the Environment* (1), *Fundamentals of Life* (1), and *Physics for the IB Diploma* (1). The following statistics indicate the success of the model and the feasibility of using gamification to motivate and engage students and improve their academic

development: a) in total, the students performed 21,673 activities; b) student participation grew from 77.8% in the first period to 83.3% in the final period, and c) the results of the mid and final student opinion surveys indicated that 93.4% of the students would like the model to be replicated in other classes, and 77% of the students considered that the activities helped "pretty much" in their learning process. Based on these results, we propose this successful gamification model, which can be adapted and implemented in other subjects, and we provide the evidence of the most significant gamification elements, as specified by the high school students in the research. Also, this work can be used to create a free-access gamification model for science subjects.

Keywords: Gamification in education, educational innovation, Octalysis, highschool science, gamification models

Designing an Augmented Reality-Enabled Smartphone Campus Guide Learning Game

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Abstract: The following paper details a research project concerned with the design, implementation, and assessment of the educational impact of a digital mobile learning game on learning and pedagogy in Japanese higher education. It describes “KSU Treasure Hunter”, an instructor-developed educational smartphone application that utilizes Augmented Reality technology and learning game design principles to expedite the contextual learning of campus facilities. Grounded in a Design-Based Research approach, the paper describes multiple sources of evidence including end-user survey data and anecdotal evidence generated from researcher and stakeholder testing, and is grounded in references to underlying theoretical assumptions and design principles. These include the ability of Augmented Reality materials to enable engagement with higher-level problems, gamified narratives, and the discovery of ‘hidden’ content. Brief discussion of the use of Augmented Reality in educational contexts, and Augmented Reality-enabled campus knowledge systems, suggests that Unity 3D software can be used to reduce the technical complexity of location-based applications, through the negation of the need for location-tracking technology. Description of the application is achieved through explanations of the identification of application requirements, which are shown to consist of

technical, experiential, and narrative components, as well as, the design of the application system architecture, which allows the user to be immersed into the learning of campus services. A focus on the design of the learning game reveals how instructional goals, instructional content, and game mechanics are integrated with the first three levels of Bloom's taxonomy - remember, understand, and apply – so that a 3-level, multiple-choice format structure requires application users to engage progressively higher-level thinking skills. It is shown how an end-user survey was used to select instructional content, and how scoring and feedback were integrated to encourage both the learning of content and game progression. Testing-based refinement of the learning game is discussed before the paper concludes with plans for the testing of the application by instructors and students upon publication in the Autumn of 2020.

Keywords: Digital learning game, Mobile augmented reality, Game-based learning, Design-based research, Educational smartphone application

A Framework for the Selection and Design of Serious Games

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Abstract: How should educators choose appropriate games for use in serious contexts? What factors might inform design choices for the creators of serious games? As ways to mediate and support learning, the choices made in the use of serious games are critical, affecting the quality and nature of the participants' learning. The framework presented in this paper offers educators and game designers support with these decisions based on an understanding of the learning they intend to support through the implementation of a serious game. This exploratory paper draws on theoretical elements as well as the author's own experience as the designer of a serious game used in a higher education setting. It offers insight for the educator and the game-designer, facilitating the development and selection of serious games and their later evaluation as classroom tools. This paper considers the impact of design elements in games primarily intended to facilitate and support learning: 'serious games'. Evidence from published evaluations of educational games suggests that two factors are particularly important in ensuring that they support the learning of students: the game must engage students with suitable learning objectives and students should

be encouraged to reflect and discuss their experience of playing the game. The purpose of this paper is to offer an analysis of 4 elements important to the design of 'serious games' considering the impact that they have on these two factors. It discusses the development and design of 'Persuasion: a game of management and motivation' from the perspectives of game design, focusing on theme and mechanism, and design for learning, focusing on pedagogical issues of skills and content. The result of this discussion is a conceptual framework which will be of value to educators, learning and development professionals and game designers.

Keywords: Serious Games, Learning Objectives, Game Design, Pedagogy, Design Framework

Crying in the Game: An Inductive Analysis of a Game that Portraits Benevolent Sexism

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Abstract: Sexism in digital games has received a lot of attention in recent research. Most such studies are addressing the perception of sexist content in games and the attitude in gaming communities. This article analyses the digital game *Behind Every Great One,* which portraits benevolent sexism, i.e. sexism that may appear positive but that has a damaging effect. What is unique with this game is that it is played from the victim's perspective, a housewife. The article presents an inductive analysis of the game using a triangulation of three different methods: a textual analysis, a player study, and an interview with the developer. The result shows that the game manages to convey benevolent sexism to players and evoke empathy for the victim. This is achieved through a combination of mechanics, narrative, and visual and musical aesthetics. For example, the physical space available for the protagonist is constantly shrinking and crying is used as a powerful mechanics in the game. The player needs to find an empty space for the protagonist to cry and this provides insight into her emotional state. Through the game, the developer reflects upon his own behaviour towards women and the consequences it might have had for them. In particular how his, and other men's, self-absorption forces their female partners into an undesirable social role, in which their needs are constantly neglected. The combination of a meaningful

gameplay and the use of game mechanics to convey a message lead us to suggest that the gameplay can be characterized as a persuasive meaningful play. The game has a potential to be used in educational environments as a starting point for discussions regarding gender roles and benevolent sexism.

Keywords: benevolent sexism, meaningful play, persuasive games, educational games, games for change, textual analysis

Exploring Collaboration and Exploratory talk in Microworlds

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Abstract: The behaviourist model of drill and practice is most commonly prevalent in Computer Assisted Language Learning Software (CALL). However, the use of CALL within a constructivist model remains untapped. Recent research has shown that micro-worlds, whose attributes fall within the constructivist framework, can be utilized in CALL software. Though the effects of micro-worlds on language acquisition is a controversial discussion, there remains prospect in its use. At the heart of the usage of microworlds and the constructivist framework is the promotion of critical thinking through exploration and collaboration with the goal of language acquisition. To explore these concepts, we created a dialogue-based micro-word using Minecraft in combination with an 8th grade level English as a foreign language (EFL) curriculum. We implemented the game in an 8th grade EFL classroom of native German speakers. This paper briefly explores the design and implementation of the Minecraft game and focuses primarily on the language used during game play. We used the categorization of disputational, exploratory and cumulative talk in order to explore the benefits of constructivist CALL software and its promotion of critical thinking, exploration and collaboration in language learning. In our discourse analysis we found that for most of the experiment the students relied on collaboration and spoke a majority of the time about the game in English. Though their talk involved strategizing game play, a majority of their talk was focused on task completion throughout the game. We additionally identified more disputational talk than exploratory and cumulative. Our research will help in the implementation of software in language learning

classrooms in general as well as add to the debate of how to promote exploratory talk among students and in turn utilize critical thinking in language learning.

Keywords: Minecraft, microworlds, CALL, disputation talk, cumulative talk, exploratory talk, constructivist, critical thinking.

Movement-Based Design Methods: A Typology for Designers

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Abstract: The perspective that the human body is not only an object in the world, but a lived body with feelings and sensations that creates meaning in interaction with the world is emerging in interaction design. Utilising movement as a part of the design process is a new discipline in the field of design. Movement-based design methods (MbDM's) are techniques, procedures or tools that contain movement to stimulate experience, understanding, or creativity within the design process. MbDM can be situated, enacted, context specific or, but not limited to, the use of somaesthetics to gain insights in designing services and products. Although differences exist between these movement-based approaches, they share the commonality of conceptualising physical movement as a material in the design process. Utilising MbDM in a design process can be a daunting task, and with no existing overview of MbDM the development of a practical tool which provides an overview of existing MbDM's and supports the planning of design activities. The aim of this paper is to present a typology of movement-based design methods to be used as a practical tool for designers and facilitators. Through an overarching constructive design research approach, we first did a search in literature and identified seven articles and 23 MbDM. With a phenomenological hermeneutic analysis and critical discussion, we created a typology for mapping identified MbDMs. The 'movement-based design method'-typology consists of two dimensions: 1) seven submediums that stimulate, form or catalyse movement and 2) the type of design stage for which the movement will gain insights. By displaying the 23 identified MbDMs in the typology, a structured overview gives a practical tool for design professionals, practitioners, and educators to plan a design process with movement. By using the typology as

a guide, the designer gets an overview of available methods in different mediums and design stages.

Keywords: Embodied Design Methods, Movement-based interaction design, Design, Typology, Embodiment

Student Teachers' Game Preferences, Game Habits, and Attitudes Towards Games as Learning Tools

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Abstract: Our aim in this study is to examine the gaming habits and game preferences of university students / pre-service teachers. Teachers' confidence to use and attitudes towards technology, and their experience with digital games seem to be some of the most critical factors determining the use of digital games in the classroom. Furthermore, personal game preferences are important factors for motivation and engagement in game play and the educational effectiveness of games. By examining the gaming experience and preferences of future teachers, we can better design relevant courses and curricula for supporting student teachers and prepare them to use game-based learning and teaching in their future classrooms. Data were collected through an online survey. Our sample (N=274) includes students from different universities, different university departments, and different academic years of study. This allows us to gain a more holistic view of the topic, based on the perceptions of student teachers from different disciplines and backgrounds. Trying to address the complexity of game classification for identifying preferences, a typology of games based on two main axes is proposed: a) the format of the game, the mechanics, and gameplay (e.g. simulation, action, strategy, puzzle, role-playing) and b) the content of the game and the narrative context (e.g. story oriented, fantasy world, sports, science fiction). We mapped the participants' preferences based on this typology. We further collected and analysed data on their game-playing frequency and preferred gaming device. Their intention to use games in their classrooms, and their perceptions on the educational value of digital games were further examined. Findings suggest that perceptions on the learning potential of games are linked to their intention to use them in the classroom; also, players who

prefer games such as role-playing, open world and exploration, set in a fantasy or science fiction world, assessed the learning potential of games and their intention to use them in the classroom higher. The findings allows us to gain a better insight on current trends in attitudes, experiences, and preferences of student teachers in various disciplines, as well as to identify possible ways to support them in their studies.

Keywords: Game-based learning; student teachers; game classification; higher education; game preferences

QUALY: A Money Management Application for People with Cognitive Impairments

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Abstract: Individuals with cognitive impairment often struggle with everyday tasks. In the present study, we identified four main issues related to common daily activities. These issues include difficulty in social interaction, transportation, managing money and self-management. However, we found the most frequent and serious issue was a difficulty in managing financial affairs. While individuals with cognitive impairment are typically assisted by family members or professional caregivers in matters of financial affairs, the self-determination of individuals with cognitive impairment can be limited or even inhibited. In order to increase the self-determination of this target group, we propose a game-based learning concept for a mobile application aimed at improving financial competence. To reach this objective, we developed a multimedia application comprising three different modules: 1) money world, 2) game map and 3) money manager. While the first module is aimed at improving the understanding of money and its worth, in the second module new knowledge can be applied. This enables the user to develop better financial knowledge gradually, which can then be applied to the real world. The third module includes a money manager, which aims to reflect and prepare the users for real-life situations. Due to a lack of products targeted toward individuals with cognitive impairment, especially when it comes to money management, we believe our multimedia application could be

of potential value. Additionally, the user is guided through the whole application. This guidance is provided by the mascot “Qualy", which acts as a constant companion whenever it is needed. We evaluated the concept design in a user study with individuals with cognitive impairment and their caregivers. Based on the constructive feedback we are able to identify components in the design which have to be enhanced in future work. Furthermore, a clickable prototype should ensure the user-experience of the design. Future studies have to be performed focusing on the improvement of financial management skills through the application.

Keywords: cognitive impairments, money management, statistics, cognition, definition, autonomy, self- determination, financial training, concept, mobile application

Assessing Barriers in Information Sharing via Serious Games: A Case Study of DIMB

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Abstract: The rapid advancement of information and communication technologies have made ever-increasing amounts of information available. Individuals and organizations are gradually familiar with and accustomed to living in an era with overloaded information. The adoption of a wide range of ICT tools and services has indeed reduced the technical barriers for people to access relevant information. Despite the decreased technical limitation, the information exchange between actors involved within the same network is more often confronted with organizational attributes which are often subjective and intangible, such as institutional willingness, group capabilities or cognitive capacity to ingest and share information. What makes this type of research difficult is to collect quality and in-depth data on information sharing activities. Serious games have been widely adopted as an approach in analyzing and designing complex systems with an explicit touch on the social context of the research domain. The immersive environment created by the games is not only for the participants but also serves as a great source for data collection. In this paper, the authors present a case study on using an augmented reality game,

Disaster in My Backyard (DIMB), to explore and examine the institutional barriers in information sharing. It presents the experiment of playing this game with professionals in crisis response. In this paper we discuss the implications of how the design of numerous game elements creates the communication environment and help to facilitate the identification and assessment of barriers in information sharing. With the insights obtained from the case study, the effectiveness of game-based learning in the context of information sharing is also well reflected and discussed in this paper.

Keywords: serious gaming, crisis response, information sharing, design, organizational barrier, ICT

Developing Digital Literacy Through Design of VR/AR Games for Learning

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Abstract: Digital literacy is becoming accepted as part of the necessary 21st century skills for students in many countries all over the world. Although there is consensus about the necessary 21st century competences, there is a need to operationalize and examine how students may reach these competences. This design-based research study investigated how the design of digital games for learning could support students in developing specific digital literacy competences. Based on the hypothesis that students can become digitally competent by developing educational games, this project examined a new curriculum for digital literacy proposed by the Ministry of Education in Denmark. In the present project, K7–K9 students used a game-based learning design to create educational VR games using the CoSpaces Edu (2020) tool, which is an interactive 3D application. The students were guided through iterative design phases and discussions as they created educational games for their peers with the help of two game-based learning design frameworks. Next, an analysis was conducted on the elements in the students' digital game design processes that contributed to them reaching specific learning goals of the new digital literacy curriculum. The findings of the analysis indicated that by going through the

various design and development phases of creating digital games for learning, the students were able to develop 14 out of the 17 learning goals of the new digital literacy curriculum.

Keywords: Game-based learning, Educational VR games, Digital Literacy, Students as Educational Game Designers, Educational Game Design

Bibliography-Based Social Network Analysis and Geo-location map of Gamification

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Abstract: The identification of novel scientific collaborators is vitally significant in the growth of academia. The services of Social Network Analysis (SNA) support the recognition of potential collaborators to cultivate novel academic collaborations. This research provides bibliography-based social network analysis in the domain of Gamification. And real-world geographic map is provided to visualize the geolocation locations of academic collaborations. The purpose of this research is to explore the collaboration networks in academic publications from Scopus database. Social Network Analysis is used in this research to de-compose the academic network for advancing world-wide cooperation in gamification. Eight major communities are detected within the academic network. Additionally, the summary of the publication keywords towards the target communities illustrate different research interests of communities.

Keywords: Gamification, Machine Learning, Social Network Analysis, Geo-location

The Measuring Metrics of Weak Ties: A Quantitative Analysis of Network Structure of Online Game Community and Text Categorization

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Abstract: The purpose of this research paper is to explore measuring metrics of weak ties in the online social media game community. Weak ties are able to obtain new information and new knowledge, efficiently disseminate simple and novel information, provide innovativeness and creativity. This research sheds the light on the measurement of weak ties especially in online game communities, seeking answers towards what is being measured and what patterns have been used. A constructive model is provided to advance effective measures in analysing the usage of weak ties about online game communities. This study has gone way towards enhancing the understanding of performances of weak ties in the perspective of network structure and text categorization, revisits the significant of weak ties.

Keywords: Social Networks, Game Communities, Weak Ties, Modularity, Text Categorization

PhD Research Papers

Feasibility of Using Serious Games for Teachers' Professional Development: A Review of the Current Literature

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Abstract: In recent years, the potential of using serious games for teachers' training has been widely discussed from different perspectives, including the acquisition of specific knowledge and skills, increasing motivations and engagement, and fostering positive attitudes towards game-based learning. However, there is a dearth of research actually investigating the impacts of serious games for teachers' professional development. The aim of this study is to explore the viability of serious games as an effective tool for teacher training. For this, we searched existing literature regarding serious games and teacher training between 2010 and 2020 in the Scopus database. Articles were included in the review if they reported any impacts on teachers, such as on their knowledge and skills, their motivations, perceptions and attitudes. Results revealed that: (1) most studies were conducted using different approaches regarding the learning environment to support teachers' learning (e.g. some use virtual game environments, others real scenarios blended with serious games); (2) only four studies reported knowledge development outcomes, however, mixed evidence was found regarding the impacts of SGs on teachers- knowledge development; (3) from the perspective of attitudes, most papers reviewed reported positive impacts; (4) research was mainly conducted in European countries; (5) most games are targeted to prospective teachers. In general, findings suggest that serious games can be good tools to promote teachers' professional development, but future research should explore which game characteristics are more suitable and effective for specific training aims and different teacher characteristics.

Keywords: serious games, teachers' training, effective tool

Creating a more Immersive and "VR-like"360-Degree Video Experience: Development of an Immersive and Interactive Alcohol Resistance Training Tool

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Abstract: The presented design case gives an example of how to create more engaging 360-degree video applications. In contrast to VR, users of 360-video are often passive observers; they cannot move around in the virtual environment nor affect it. This limits the user's chance of feeling immersed and present in the environment, resulting in less engaging experiences and poorer conditions for experience-based learning. This article examines immersion in 360-video through the design case VR FestLab (ed. In English PartyLab), which is a party simulation for alcohol prevention, consisting of 125 360-degree movie sequences. The application is used in a virtual reality headset, where users create their own unique experience through a choose your own adventure experience. The application is an example of a new approach towards more engaging 360-degree video content. In the light of this, we suggest six elements that should be considered, when designing an engaging, motivating and immersive experience with 360-degree video. The six elements are 1) user influence, 2) noticed user existence, 3) 3D environment, 4) spatial sound, 5)" movement" in scene and 6) technical aspects. Further tests are needed to fully determine the extent to which these six factors enhance immersion and presence.

Keywords: 360-degree video, virtual reality, immersion, presence, spherical video-based virtual reality

Developing Educational Computer Game in Terms of Multimedia Principles and Cinematism-Animetism Notions

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Abstract: Interactive environments that exist in digital games are considered as a fun and effective medium for the transfer of educational content. Educational context makes it possible to transfer the approaches appropriately to the game environments i.e. in the context of the target audience by the use of pedagogical or androgogical basic assumptions. Although there are many studies in the literature on the realization of learning processes with digital game environment it is seen that the studies on how the format, colour and dimensional approaches of educational game design should be limited. In this study, a literature review was carried out for the use of colour and form elements, which are among the basic design elements in the process of educational computer game design. It has been found that the studies that can be taken as a result of the literature review conducted are included in the field of emotional design and that meaningful learning is accompanied by positive emotions. The effectiveness of colour and form for the existence of positive emotional state was investigated and the outputs were applied with the character and space designs of Papyrus educational computer game design. The transfer of the visual designs to the gaming environment involves a two-stage research process. The first stage of the process was carried out with the question of how visual perceptual variables are formed with dimensional differences. In this context, studies carried out in the field of neuropsychology that have been examined and analyzed for game asset development. The second stage was carried out on how the structuring of the navigation experience in the game should be structured without preventing educational transfers. The dimensional and perspective arrangements of the visual elements designed in this context were carried out by discussing LaMarre's theory of animation which studies Paul Virilio's cinematism theory and the published cartoons studies on the field of dramatology and it reveals a new perceptual approach based on Virilio's cinematicism approach. Hence, this study transferred the process of educational content in digital gaming environment on the basis of the principles presented within the scope of multimedia theory.

Keywords: Game-based learning, colour and shape design for learners, cinematism, animetism, adult Learning,

Effects of Serious Games and Game-Based Learning on Learners' Achievement Emotions

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Abstract: The development of new skills and knowledge often leads to challenges. The emotional experience of the learner while confronted with the learning object is crucial for the learning process. Learners who approach a subject with interest and curiosity, and thus value the learning activity with positive emotions, achieve a more promising effect than people who perceive the content as boring, challenging and frightening. Providing positive learning experiences, is the main focus of serious games. Emotional experience, in relation to achievement activities in serious games, are not comprehensively addressed in the scientific debate (Pekrun, 2006; Loderer et al, 2019). In some, approaches which are conceptually closely linked to the perspectives of achievement emotion, for instance in terms of self-efficacy (Ketelhut, 2007; Meluso et al, 2012), are taken into account. The perceived self-efficacy of an individual can be seen in the sense of achievement emotion, as a cognitive evaluation process for a specific learning and achievement event and confirms the assumption that the use of serious games can affect learners' achievement emotions. The objective of this work is the theoretical analysis of the effects of game-based learning on the learner's achievement emotions and on whether the systematic use of serious games has a positive effect on existing negative mindsets. This research is part of an Horizon 2020 project called NEMESIS. The aim of the project is to combine education, technology and social innovation to sensitize today's youth to the social concerns and create the changemakers of the future. Through the use of the NEMESIS serious game, the expectation of self-efficacy is to be promoted, and awareness of the concerns of the social future and empathy is to be raised. This paper focuses on the theoretical consideration of the connection between serious games and achievement emotions in relation to the didactic conception of the game, in which the active engagement with the topic of social innovation and the emotional experience during the learning process is addressed.

Keywords: Games, Game-based Learning, achievement emotions, social innovation, self-efficacy,

Introducing a new Design Tool to Inform Serious Game Behaviour Change Interventions

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Abstract: Poor health behaviours established in adolescence can have lasting consequences in later life, such as obesity and sedentary behaviour. Interventions aimed at changing health behaviour typically have poor results. Serious video games have the potential to offer an intervention grounded in a fun and engaging world. Currently, there is no standard design tool used to help guide developers through the process of designing a serious video game to provoke healthy behaviour change. This paper will review behaviour change techniques (BCTs), discuss game design tools and why there is no current standard and will introduce a card-based design tool that was developed as a result of this analysis. This PhD project has implications for both serious game developers and behavioural psychologists as the design tool will allow stakeholders in game design and behavioural psychology to communicate more effectively in order to realise game-based health interventions. The outcome will be an alternative way to visualise and map behavioural theories in the early-stage development of serious games for healthy behaviour change.

Keywords: serious game development tool, serious games for health, behavioural psychology, behaviour change techniques, behaviour change game, behaviour change game tool

Methodological Approach for Instructional Design of Programming in Allotrop:Reaction (MMO RPG)

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Abstract: This paper describes methodology approaches for designing and integrating tasks in programming training in the game environment, considering the game's elements and design. It describes the development and implementation of programming training in serious game «Allotrop:Reaction» (MMO) in 2019 (http://reaction.allotrop.ru/). The development of educational content and its integration into gameplay has been implemented iteratively, with transformations based on testing. The Game environment was created for training with three functions, specified in the professional standard of a programmer: formalisation and algorithmisation of objectives, writing of the programme code, definitions and manipulations of data, and checking and debugging of the programme code. Training is implemented in a visual language with Python syntax. The main idea of this work is to focus on the instructional design of serious games which are: used in school programmes as part of formal education;resistant to changes in game and narrative design during game development.

Keywords: Serious Games Development, Serious Games, Game Based Learning, Instructional Design of Serious Games

Gender Differences in GBL: The Japanese Higher Education Context

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Abstract: Japan has a problem; it is stuck in the expanding circle of English influence. The concentric circle model (Kachru, 1985) depicts three circles of English influence; inner, outer, and expanding, of which Japan is currently located

in the expanding circle. The Ministry of Education, Culture, Sport, Science, and Technology (MEXT) is focused on implementing new strategies to move inwards. In April of 2008, MEXT revealed its plans for English to be a compulsory subject from the fifth grade of public elementary schools from April 2011 (MEXT, 2008), and from 2020 MEXT moved compulsory education to the 3rd grade of elementary school (Japan Times, 2013). Although there is a desire to be effective English communicators, with the current teacher-centered grammar-translation teaching methodology this has not and does not seem likely to occur. Clearly there is a need to consider complementary was of teaching English as a foreign language such as game-based learning (GBL). The author will present data from a qualitative study involving six Japanese university students completing tasks in Minecraft using only English chats as their means for communication. The paper will focus how the males and females in the study played and interacted during the gaming lessons and the differences and similarities between their play and interaction. Results of this research will show that at first the females within the group were less involved in group play and task-based interaction than their male counterparts, however by the end of the research period the females were just as involved in group play and more interactive than the male participants. The author will discuss the reasons as to why this occurred using data from observations, interviews, and transcripts within the game.

Keywords: Gender, GBL, Japan, online games, play, interaction

Masters Papers

Participatory Digital Educational Game Production with Fifth Graders on Biodiversity (SDG15)

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Abstract: This design-based-research examines how a digital educational game on the topic of biodiversity on land (Goal 15 of the UN Sustainable Development Goals) using the example of the wolf was created by and with a grade 5 class based on a school project. A mix of methods of project learning, education for sustainable development, constructionism and media-based global peer-learning was combined and used. In addition to ensuring the greatest possible proportion of creative design by the children involved, a focus was placed on connecting analog and digital learning in order to enable the imparting of cross-context transferable knowledge. To promote an intercultural perspective on biodiversity, the class exchanged online views with peers in the Balkans, where humans coexist with wolves peacefully. The project provided clear indications that learning motivation and acceptance of the content-related topic of the students was significantly increased and that astonishingly creative ideas were jointly developed and implemented by them. On the other hand, it was found that the school learning space has to be introduced very carefully to this interdisciplinary methodology, otherwise due to seniority, resistance from the teaching staff can occur. Based on the results, it is discussed to what extent the resulting artefacts can be used of third parties in educational work as participatory learning tools. Thus, the continuous participatory production, use and reworking of teaching aids could make it possible to actively accompany the constant paradigm shift resulting from the transformation in the interests of the pupils. The Wolf-game was rated with excellent success in November 2019 as a master thesis by the author at the Institute for Applied Game Research and at the Danube University Krems. The Naturschutzbund Deutschland awarded the game as part of the "Der Wolf macht Schule" competition.

Keywords: Participatory Game Design, Education for Sustainable Development, Media-based Global Learning

Using Game Design Factors to Create a Learning Game for an Onboarding Program: A Board Game for the Clay Works Onboarding Program

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Abstract: This paper explores the process of designing a board game intended for training and acclimating new employees ("onboarding"), using Clay Works, a 3-D Art Learning Center in Thailand as a case study. The result of this research was a game called 'The Experience of SMILE' (EoS). The research focused on how to develop an effective board game in order to encourage new hires to learn and assimilate knowledge and explored the potential areas of game improvement. The methodology involved two steps: research through design (RtD) to develop a prototype, then a qualitative evaluation of the prototype. The EoS game was developed by integrating multiple board game design factors identified from a study of the literature. After that, we used the prototype game to examine game factors in order to explore areas for improvement. Thirteen participants were divided into three groups to play the game. Then, we collected their feedback using focus group interviews and analyzed the responses using Content Analysis. This paper demonstrates how each of the board game factors was used in the process of game design and explores how the factors can be used to improve the EoS game for effective onboarding at Clay Works.

Keywords: Game design research; Game factors; HRD; Learning game design; Onboarding; RtD

Work in Progress Papers

Experiencing Project Management and Controlling through a Business Simulation Game

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Abstract: Business simulation games (BSG) are used in many different learning contexts and offer a wide variety of benefits. They allow learners to experiment and adopt an active learning style, which has shown to improve learning outcomes (Freeman et al., 2014). At the University of Applied Sciences Upper Austria, a BSG on project management accounting is being developed. Its goal is to create a holistic learning environment in which students can actively apply their theoretical knowledge and simulate some of the challenges regarding management accounting that occur in many companies. The game can be integrated into a blended learning or inverted classroom environment and follows a half-open approach. This means that some tasks require students to follow a specific path, whereas the open parts of the game allow players to find their own solutions. The practical application of theoretical knowledge about project management accounting in an active learning environment is expected to lead to increased student motivation and improved learning outcomes.

Keywords: active learning, game-based learning, business simulation games

Co-designing the Adaptive MyPractice Sim for Undergraduate Students

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Abstract: To improve retention rate of factual knowledge for health students we set out to design a game which challenges students to continue testing themselves during their studies. Since we intend for them to play this game for at least two years, we had two major challenges to overcome. Firstly, how can students feel motivated to continue playing for two years on end, and secondly, how can enough content be generated for a two-year game play. The first challenge was solved by tapping into a core motivation of health students: many intend to start their own practice and for that, they want to be involved with other practitioners. We, therefore, proposed a sim-type game in which students cannot just practice on virtual patients but also on practitioners logged in as a patient. The second challenge was tackled by building a flexible framework for case collection, and including the production of those cases in the curricula of the involved programmes.

Keywords: Content generation, Sustained motivation, Continuous testing, Health education game, Adaptive sim

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Super Mario Maker 2 as a Tool for Educational Game Design

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Abstract: This paper describes the setup of a case study to test how to use a platform game for a hands-on learning experience that extends traditional methodologies. More precisely, it concerns the use of the level editor of a popular off-the-shelf commercial game, Super Mario Maker 2, as a co-design tool with

chemical engineers and chemical engineering students. Participants use the editor to make platform game levels that represent chemical processes. Data is collected to identify patterns on how to effectively align chemical engineering content with platform game mechanics with a view towards later creating a custom-made game editor. The study is expected to show the efficacy of participatory game design, commercial games and platformers in engineering education.

Keywords: co-design, participatory game design, platform game, commercial game, learning, education, chemical engineering

Towards a Theory of Transformational Ethical Gameplay

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Abstract: The rapid advance of technology and science is increasing the gap between what we *can* do, and our understanding of the ethical ramifications of our actions. In light of these developments, ethics education is more important than ever. From an educational point of view, ethics is a challenging domain, in part, due to the inconclusive nature of ethics content. Ethics, rather than a static set of principles, has to be understood as a contextualised and dialogic practice. Therefore, adequate ethics education combines a broad spectrum of educational objectives - from knowledge about ethical guidelines to ethical sensitivity and cultural competence. Simultaneously, little is known about suitability of different educational arrangements in ethics education; for example, discussion-based arrangements, though well-liked amongst students, may not always be adequate depending on educational objectives. Recently, games have entered the ethics education discussion (e.g., de Sousa et al., 2018). With their ability to immerse players in narrative-rich scenarios, in which players become ethical agents 'forced' to weigh in on complex ethical problems, games can be uniquely advantageous for ethics education. In this work-in-progress paper, we describe the design of a new ethics game, the challenges we encountered when applying existing theoretical frameworks for educational games (e.g., Barab et al., 2010; de Sousa et al., 2018), and describe how we are addressing these challenges. The game under development is a narrative-driven role-playing experience that models

graduate student research and publication practices. It will be played by incoming graduate students as a part of a research ethics course at a large research university in Western Europe. In the game, players make ethics-related decisions pertaining to authorship, originality, and honesty. Based on our current experiences in designing the educational ethics game, we contend that current games ethics frameworks need to expand the judgment-action-feedback loop and incorporate ambiguity in gameplay as a catalyst for learning. The approach we are working towards also seeks to clarify the role of instruction in game-based ethics education.

Keywords: Ethics education, game, transformative play, Dewey

PlayMINT : Still Playing or Already Leading? Design of a Digital Learning Game to Promote Female STEM Students' Innovative Work Behavior and Digital Leadership

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Abstract: Although the proportion of women in Science, Technology, Engineering, and Mathematics (STEM) professions has increased significantly in recent years, they are still striking underrepresented in study programs and companies of the STEM area. Moreover, women only occupy 21% of STEM leadership positions in Germany. These numbers underline a serious gender gap in the STEM field. To address this gender gap and benefit from the work and innovation potential of STEM women for companies in times of the digital disruption, we develop the competency-based learning game PlayMINT. PlayMINT intends to stimulate interest in and prepare female students for STEM beyond study programs to encourage women to start STEM careers and to promote them into STEM leadership positions. Based on existing research in leadership and management, we design PlayMINT with the goal of teaching concepts and competencies, which are relevant to leadership, innovation, and digital transformation. Our

assumptions underlying PlayMINT are that creative self-efficacy, effective interpersonal communication, and general business knowledge are predictors for higher innovative work behavior in the STEM area and that empowering, envisioning, and general business knowledge promote digital leadership. PlayMINT aims to realize these suggestions for female STEM students, in particular from computer science, electrical engineering, and mechanical engineering, because these fields show the most pervasive gender gap within the STEM fields. PlayMINT leads participants through the innovation process in a robot company by playing the role of a female engineer. Her mission is to implement a medical robot for spinal surgeries as a new business idea. PlayMINT will provide valuable contributions to STEM study programs, to STEM companies, and society in general.

Keywords: STEM, gender gap, competency-based learning game, serious game, innovative work behavior, digital leadership

Zirkus Empathico 2.0. A Serious game to Foster Emotional and Collaborative Skills in Children with Autism

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Abstract: This research aims to develop a serious game mobile application Zirkus Empathico 2.0 to facilitate and provide training to children with Autism Spectrum Disorder (ASD) to foster their socio-emotional and collaborative skills by using conventional gaming concepts. Children with ASD have limitations in their social behavior and have difficulty in understanding emotions. It is a multi-player mobile game; where children with ASD can recognize and produce basic emotions and can also train collaboratively with their peers online/offline. The effectiveness of the game will be inspected soon in a scheduled clinical study.

Keywords: Autism Spectrum Disorder, Serious Games, Emotional Intelligence, Social Behavior

A Pedagogical Approach to Teaching Game Programming: Using the PRIMM Approach

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Abstract: Students repeatedly find programming a complex subject to grasp and this can be compounded when teaching within a computer game context. Comprehending the concept of programming beyond the syntax of the chosen programming language can present many barriers for the student to overcome. Students frequently associate the term "programming" with the creation of "text-based" language-specific code neglecting the associated problem-solving activities of developing pseudocode algorithms, computational thinking, problem identification and pattern recognition. Specialising the programming for games can persuade students to neglect problem-solving activities and perceive the programming fundamentals taught in introductory first-level courses as not applicable. Suggesting that the teaching methodology employed at an introductory level does not meet the needs of the student. Various academic studies would suggest there is a need for an approach to programming that brings together as many, if not all, the cognitive aspects of programming - pseudocode algorithms, computational thinking, problem identification, pattern recognition as well as the development of coded solutions. The Predict, Run, Investigate, Modify and Make (PRIMM) approach carefully developed for effective use in schools lends itself nicely for use in a game programming setting. The PRIMM approach is predicated on the spheres of programming research - Use-Modify-Create, Levels of Abstraction, and reading and tracing code for understanding. It provides a framework for the educator to administer "scaffolded" and directed exercises to the student to aid their understanding. Although developed as a general pedagogy for teaching the fundamental aspects of programming, the methodology provides an approach that could improve the teaching and delivery of game programming modules. This paper will discuss an initial attempt to improve the teaching and student understanding of games programming through the application of the PRIMM methodology to the module delivery.

Keywords: Programming, Pedagogy, Methodology, PRIMM

Linking Gameplay Metrics to Computational Thinking

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Abstract: Computational thinking (CT) is considered to be a fundamental skill underlying not only programming ability, but also an entire array of computational problem-solving competencies in a data-driven world. The need for accessible and engaging educational tools for CT has recently been acknowledged as significant by educational authorities. Glitchspace is a first-person puzzle game where the player has to manipulate objects in the game world through a visual programming interface in order to escape the cybermaze and win. The game received critical acclaim for its innovative and engaging gameplay, including a British Academy Scotland Award (BAFTA). However, the educational potential of Glitchspace in relation to CT ability has not been sufficiently explored. As success at playing the game relies on the players' ability to program the game world to suit their goals, it is hypothesised that common measurements of CT will positively correlate with game ability (measured by game metrics, such as completion times and number of failed attempts of various sub-tasks). We propose to develop methodologies to explore the relationship between gameplay behaviour and computational problem-solving ability in the game Glitchspace. Such methodologies will allow researchers to investigate which game mechanics elicit and promote CT in a reliable and measurable way. The outcome of this research will be of great value to instructional designers seeking to leverage games for CT education, as well as learning game analysts seeking to map gameplay behaviour to learning outcomes.

Keywords: game analytics, computational thinking, computer science education, game-based learning, programming ability, game metrics

Game on! Enhancing Tertiary Student Engagement Through Co-development of Interactive Treasure Hunts

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Abstract: Self-directed learning is a new paradigm at tertiary institutions. Developing intrinsic motivation to pursue one's interests, conduct research and engage in academic discussion - without prompt by a tutor or lecturer - is the goal. However, few first-year students possess the ability to self-direct their learning innately. Traditional seminars do not foster this ability by design. We propose that a format, encompassing co-development of educational games (e. g. interactive treasure hunts), is better suited to equip students with this skill. During the winter term at the University of Oldenburg a student-led project developed the concept for an interactive treasure hunt via the App Actionbound on the topic of 'Digitization of Knowledge Production'. This report focuses on our experiences implementing our concept in the following summer term against a global pandemic: the efficacy of self-directed learning, task design with Actionbound, preliminary evaluation results.

Keywords: Treasure-hunt, Actionbound, knowledge production, self-directed learning, blended learning, digital literacy

Are you a Great Negotiator? Game-Based Learning of 21st Century Negotiation Skills in the Netherlands and Japan

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Abstract: Increasing global stress during the era of COVID-19 compels the necessity of international cooperation skills to achieve a common goal within a limited time and effort through constructive negotiation. Therefore, training of 21st-century communication skills boosting international deals becomes increasingly essential. To promote awareness and train collaboration competencies, we developed serious games to simulate negotiation experiences and tested the games in two cultural settings: i.e., the Netherlands and Japan. Our negotiation games are to evaluate distributive aspects (zero-sum or win/lose) or the integrative aspects (win-win). We question whether the negotiator's positive self-judgment, the negotiation process, and the relationship between negotiators can predict negotiation performance. We also examine whether negotiation performance depends upon personal characteristics and cultural background of negotiators and their counterparts. Positive self-judgment among Japanese participants provided clues to predict negotiation performance (especially in distributive negotiations). Besides, we found a diverse impact of emotionality, extraversion, agreeableness, openness, and emotional intelligence on negotiation performance. In the Netherlands, less agreeable and less extraverted negotiators achieved better outcomes when engaged in distributive negotiations. Emotionality and openness are detrimental to integrative negotiations. In Japan, emotional intelligence reduced negotiation performance. We provide practical recommendations for skill training based on the above findings.

Keywords: Social Value Indicator, personality, emotional intelligence, negotiations, serious games

Abstracts Only

Game-Based Learning into Today's Workplaces: Who's Winning?

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Abstract: Game-based learning has often been sold as a means of engaging and inspiring learners, providing interactive and exciting learning experiences, and allowing learners a greater degree of autonomy and control over their own learning. After all, games are different from any other media because "one literally learns by playing" and usually does not sit down to read a manual first (Sandford & Williamson, 2005). But has the corporate world really embraced this approach to learning? And if so, how have workplaces been using game-based learning and what are their experiences of its implementation? If something is seen as enjoyable, then surely it can't be taken seriously? In this presentation I would like to discuss game-based learning in the workplace, taking real-world examples for discussion, and seek to establish some best practices when taking a game-based learning approach to workplace learning, particularly with regard to initial adoption of the practice, and buy-in from stakeholders. I also intend to present some insights from my own MSc. dissertation which concerned the topic of game-based learning in a pharmaceutical industry workplace. • What are the perceptions of the feasibility of adopting a game-based learning approach to pharmaceutical industry workplace training including the perceived barriers? My study was essentially a feasibility study and sought, through use of initial surveys and semi-structured interviews of current pharmaceutical industry employees, to determine if the use of game-based learning techniques within an industry environment could promote effective and motivating learning experiences and greater involvement of employees in the learning process. The key takeaways for attendees of this presentation will include some state-of-the-market insights on the implementation of game-based learning in today's workplaces, as well as some practical advice for implementation of these approaches based on the current literature and the industry today. Ganguin, S. (2010). Präludium. In Computerspiele und lebenslanges Lernen (pp. 11-15). VS Verlag für Sozialwissenschaften. Sandford, R., & Williamson, B. (2005). Games and learning: A handbook from futurelab . Bristol,UK: Futurelab. Van der Post, L. (2010). Jung and the story of our time. Random House.

Keywords: game-based learning, workplace learning, gamification, implementationgame vs play,

The Dialogic Space the Pedagogy of Multiliteracies Created in my Game-Based Teaching

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Abstract: While some game-based education research has explored teacher mediation in detail, game-based language education overwhelmingly promotes games as "magic bullets." To integrate games into language classrooms, pedagogies and teaching must be explored in more depth. This presentation will elaborate two aspects of my continuing agenda on games in language/literacy development: an explicitly dialogic pedagogy, and practical results of dialogic interactions within that pedagogy. First, this presentation connects Arnseth, Silseth and Hanghoj (2018)'s dialogic (i.e., who-, why-, how- and what-driven) game-based teaching framework with the "pedagogy of multiliteracies" (New London Group, 1996) that prioritizes student agency and transformation, sociocultural critiques of texts, participation in public and professional spaces, and careful sequencing of teachers' roles and actions. In my on-going pedagogy of multiliteracies-based courses, students and I (1) reflect on prior experiences and future goals (2) purposefully play games (3) discuss game play deeply (4) conduct sociocultural research projects and (5) participate using these experiences and discussions in various local and online communities. As Arnseth et al. describe, this pedagogical framework has created a dialogic space around games in which I perform teaching moves such as questioning, connecting, and challenging. Second, classroom data (e.g., dialog transcriptions, conversations around projects) from two implementations of this "improvisational-transformational" pedagogy will be shared focusing on the effects of student-teacher dialog. Dialog has "succeeded" in numerous instances and led to students' (a) better understanding of linguistic, social and game studies concepts and (b) participation in various ways in local community and in online game affinity spaces. Dialog has "failed" in some cases, too, specifically (c) where student group work was neither collaborative nor dialogic, and (d) where sociocultural meanings around games were difficult to engage with dialogically. Efforts will be made to help other teachers and researchers connect this pedagogical framework and lessons learned for their contexts.

Keywords: pedagogy, multiliteracies, dialog, language, participation

A Meta-Analysis About Game-Based Learning in Chemistry Education

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Abstract: Previous systematic reviews on the effects of game-based learning (GBL) on students' learning outcomes yield complex results. The present meta-analysis focuses on chemistry education and aims to: a) estimate the effect magnitude of GBL in chemistry education on cognitive, motivational and affective outcomes in comparison to traditional instruction (media comparisons) and, b) reveal the more effective game design and instructional design characteristics (value-added comparisons) and c) identify possible moderators of the effect in both the media and value-added comparisons. The mean effect sizes used a random-effects model while the moderator analysis assumed a mixed-effects meta-regression model. Results from the media comparison suggests GBL was more effective only for cognition ($g = 0.692$, $k = 30$, $n = 3881$), but not for motivation ($g = 0.311$, $k = 6$, $n = 740$). No study reported affective learning outcomes and studies considering value-added comparisons of games with or without specific design element ($k = 6$) were not large enough to perform a meta-analysis. To explain the substantial heterogeneity ($I2 = 84\%$) for cognition across studies, moderator analyses implied students in Asia potentially benefit more from GBL than those in America and Europe. Publication bias was not taken as a threat.

Keywords: game-based learning, cognition, motivation, emotion, chemistry, meta-analysis

Socially Responsible Applications of Game Analytics: The Contribution of Psychological Sciences

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Abstract: Video games have historically been very popular among young people, globally. As a consequence of the prolonged confinement due to the current COVID-19 pandemic, more young people are turning to video games for entertainment and socialization, raising concerns amongst parents who worry about how spending too much time on screen and being exposed to potentially inappropriate content may affect their children. Parental concerns are not unfounded. The gaming industry has been criticized for its tactic to include 'addictive' features in their gameplay to maximize players' engagement and retention, which they achieve with carefully crafted game analytics strategies. In part, these game analytics approaches have been informed by psychological sciences. To measure and improve learning goal attainment, for example, researchers have looked into various facets of gameplay. Researchers have applied gamification to personality assessments in order to address the lack of motivation in completing such assessments. And it has been found that different game design elements satisfy different self-determination needs. While badges and performance graphs seem to satisfy the need for competence, avatars and teammates seem to satisfy the need for relatedness. In-game autonomy and competence, in turn, independently predict game enjoyment. Changing game mechanics, such as difficulty or in-game goals, based on a players' personality has also been used to enhance enjoyment and meet players' expectations. While game analytics in the mainstream gaming industry has been primarily applied to improve player engagement and retention, game analytics has tremendous untapped potential that could effect significant positive changes among gamers, as individuals, but also as members of a large global community. In this presentation, we advocate for a collaborative approach where industry and psychological scientists work together to promote a more socially responsible approach to game analytics. To this end, we outline the various ways in which psychological sciences can contribute to the gaming industry by offering an overview of theories of perception and cognition, personality, motivation, behaviour change, emotional intelligence, and resilience and coping. In this presentation, we will also discuss how these approaches to socially responsible

game analytics can be extended for a greater impact on the positive development of young gamers.

Keywords: data, analytics, psychology

A Bilingual in-Game Tutorial: Designing Player Instructions for an Educational Game Accessible to Deaf Students — A Work in Progress

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Abstract: Portuguese official guidelines on deaf children education aimed at implementing a bilingual education model, guaranteeing linguistic growth and social inclusion of deaf children. Portuguese Sign Language (LGP) has a crucial role in this model as deaf child's natural and first language. In the specific context of math learning, it is estimated that deaf children are about three and a half years behind hearing children in mathematics achievement. In the context of the research project "XXX", a research-based educational game is being designed and developed as a tool to support mathematics learning for deaf and hard of hearing students (DHH) of 3rd cycle of Basic Education. "YYY" is an adventure game, accessible to DHH and hearing children, where the player obtain game resources by solving different puzzles involving basic and advanced math skills. This work in progress presentation aims to share the development process of the bilingual tutorial of the game. The fact that this game is inclusive, in the sense that it can be played simultaneously by hearing and DHH children, raises several problems in addressing the message, such as the simultaneous presence of text and videos in LGP and a careful vocabulary selection. The results obtained from a usability study conducted on a sample composed by 28 DHH students attended to Grade 5 - 9 of three Basic Education, lead to a major redesign of the tutorial. It implied several changes, like the simplification of the LGP message, a significant text reduction and the integration of images in the text. The usability study results and the promising feedback obtained in informal tests of the new approach, point out to the following conclusions: long LGP videos lead to dispersion of attention; LGP message understanding benefits from short videos and objective content; the text must respect a simple vocabulary and an objective message; the integration of

images in the text helps to identify objects and objectives; the instruction block must be divided into sections and interspersed with in-game actions. These are preliminary conclusions to be validated in the next usability study, which results we count to integrate into this research work.

Keywords: bilingual, sign language, educational game, game user research, deaf and hard of hearing,

Are Games Ready for Medical Students? Are Medical Students Ready for Games?

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Abstract: When doctors struggle, it is frequently due to non-clinical skills such as communication and team working. This is often due to lack of relevant experience rather than lack of knowledge. Medical schools are currently experimenting with different ways of preparing their students. Brighton and Sussex Medical School (BSMS) are currently teaching team working through games. Students were placed into teams of 3-5 and given one hour to score as many points in a pseudo-scavenger hunt style game, with minimal instructions on how best to complete the 13 tasks. Example tasks included: finding specific coordinates (2.3km away from starting point) or drawing each other. At the end of the hour, teams were ranked and the winning team was given a prize. Following the game, a debrief was conducted in groups of two teams to compare styles of teamwork. We examined the students' responses to the game through observation of their participation, the debriefing discussion, and feedback collected as part of our usual processes. Many different approaches were taken to participating in the game. These included designating a leader, prioritising, voting, team planning, setting up sub-teams and even non-participation. The debriefing discussions included themes of individual motivation, inequality and how this related to students' future work. Unfairness, which was inherent in the game to enable discussion in the debrief, also caused much frustration, with a lack of instructions being cited for scoring poorly. However, most students understood the merits of this active learning game, enjoyed the morning and could see how it reflected on their future work. The feedback for the game was generally positive. Some students struggled with the lack of direction (initiative), not being able to relate

the game to clinical work (relevance), working together with less motivated members (team-working/communication/leadership) and not performing well despite trying hard (competition). So to answer our initial questions: Are games ready for medical students? This game was mostly successful in achieving our goal of teaching students about teamwork. Are medical students ready for games? Our feedback shows they are, and they enjoy them!

Keywords: Practical Games, Teamwork, Medical Student, Leadership

Player Experience and Preferences: A Case Study on Volunteering as Playtesters

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Abstract: Playtesting is established as part of game development (Flanagan & Nissenbaum, 2008), however, research on volunteering for playtesting appears to be limited. In this work in progress, our aim is to explore who volunteers for playtesting and how their attitude towards video games in general might have affected their experience. Different player motivation theories, such as Bartle's (1996) player typology, are often employed in game design, yet such a practice might result in the typologies becoming self-fulfilling (Tuunanen & Hamari, 2012). Accordingly, in this descriptive case study (Schwandt & Gates, 2018), we will analyse the data inductively. The ongoing data collection started in October 2019. The data consists of pre- and post-questionnaires (SAM, SMEQ, AttrakDiff, and player immersion questionnaire by Jennett et al, 2008), post-test interviews and video data including eye-tracking. Here, the interviews function as primary data, the questionnaires as secondary data and other sources of data as background information. Lab X at University Y facilitated these tests, based on heuristic game evaluating (Nielsen, 1994) and free explorations usability test, for game developers in Ostrobothnia (Finland) and Westrobothnia (Sweden). The data will include approximately ten games under development and 35 playtesters. The volunteers test one game each and all games will be tested by at least three volunteers. Currently, with 23 conducted playtests, the mean age is 24,3 and 17 participants identified as male and 6 as female. Lab X advertised the need for playtesters through multiple channels; by engaging with students at campus,

posters at local university campuses and mass emails for students at University Y. The volunteers filled out a screening survey on gaming habits and preferred devices, from which the playtesters were recruited in line with the intended age group specified by the game developers. The volunteers received a gift certificate of 20 euros for participating. As the campus in question primarily offers programs in education, health and social sciences, this might have affected the selection of potential volunteers. The preliminary results indicate that players who considered themselves as gamers tended to rate the games more critically with more specific comments regarding what features they liked and disliked.

Keywords: playtesting, player experience, player attitudes, player motivation

Evaluation of the Use of a Serious Game for Chemical Engineering Education

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Abstract: Game-based Learning (GBL) has continued to be of interest to researchers and practitioners in the field. Although there have been several reported uses and benefits of GBL, there are still a number of challenges with regards to using games in formal classroom education. One such challenges with GBL implementation has to do with how to measure learning. Assessment of learning in GBL environment have been generally done with questionnaires and pre- and post-tests. However, these methods have been considered insufficient and invalid for GBL. While questionnaires assess learners subjective views and opinions, pre-and post-tests are generally detached from the learning activity itself, denying practitioners and decision makers the ability to make valid and objective evidence-based inferences of learners' skills. In this study, a serious game (CosmicClean, LuGus Studios) is used to teach first year chemical engineering students the principles of separation operations. The study aims to evaluate students' perception towards games for learning purposes, their experience with the game and their game play performance. Quantitative data are collected using questionnaires and log files. Log data are analysed for a more objective assessment of students' mastery of the skills taught. Results obtained from this study will contribute to the growing literature on assessments in GBL geared towards helping practitioners effectively evaluate students' learning in game environments. Preliminary findings have shown that students are generally

happy to use games to learn. There however, seems to be gender differences in their acceptance of GBL. From observation, there are wide differences in game levels completed during the allocated time. Students' overall experience with the game also differed. Further analyses will give more information students' game play such as time taken to complete tasks, number of errors made and any differences in game play based on demographic data.

Keywords: Game-based learning, serious games, educational games, chemical engineering, assessment

Late Submission

Educational escape room for disaster preparedness and response training

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Abstract: Human-made and natural disasters are constantly occurring, and citizens need to be aware of their protection. Although disaster education is considered an important aspect of disaster preparedness, it relies mostly on conventional lectures given by experts on disaster prevention. However, a fundamental problem of this method of delivery is that lectures are based on the information transmission fallacy, the idea that students learn just by being told. Although lectures may increase risk perception, they do not automatically enable youth to know the importance of pre-event preparations and to take action to reduce disaster risk. To overcome the key obstacle of lack of motivation, this study proposes an alternative approach to lecturing – active learning activities using escape room concepts. This paper provides considerations for researchers and organisations concerning the development of a portable educational escape room about disaster preparedness. A total of 84 young adults aged 13-20 participated in a 30-minute escape room activity and postgame debriefing. An attitude questionnaire and focus groups were used to evaluate student experience in terms of satisfaction, quality of the escape room, and the impact of the escape room on learning. Most participants found their experience very engaging and reported that the game helped them gain new knowledge about fire safety and disaster response. These findings suggest that the escape room intervention can be used as a potential avenue to facilitate learning and increase disaster preparedness and response knowledge.

Keywords: Educational escape room, Breakout box, Game-based learning, Disaster preparedness, Disaster response training.

Additional Materials

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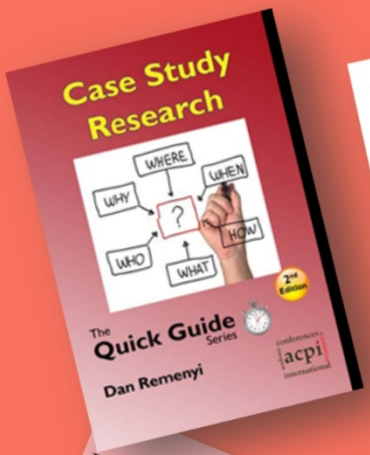

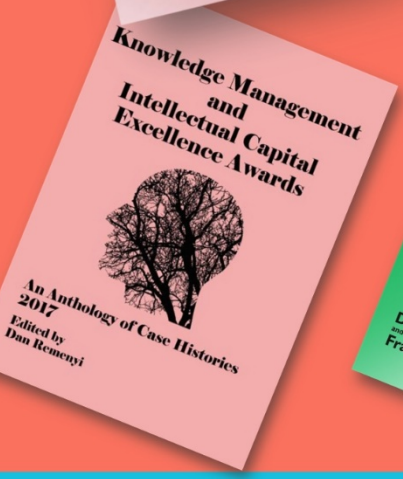

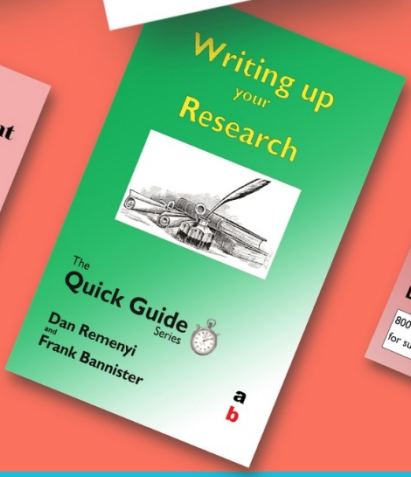

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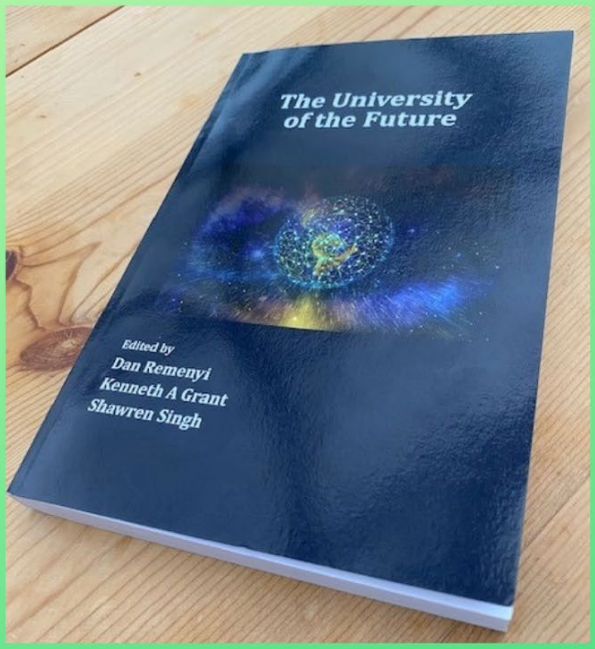

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