Digital Literacy Unpacked

Edited by

Katharine Reedy and Jo Parker

Charles Sturt University
LIBRARY

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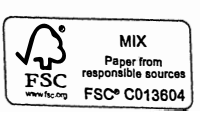

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Notes on contributors

Dr Liz Bennett is a university teaching fellow in the School of Education and Professional Development at the University of Huddersfield. Liz's role is to deliver strategic and operational development for the School's teaching portfolio. She has introduced approaches to self-regulated learning to the School and promoted the D4 curriculum design approach (see Chapter 8) to supporting the development of digital literacies in the curriculum. This initiative has had widespread take up with over 250 colleagues from across the University participating in the workshops. She is currently the principal investigator on a scoping project funded by the Society for Research in Higher Education entitled Students' Learning Responses to Feedback on Their Progress Using Learning Analytics Dashboards, and has published extensively on higher education practices and learning technology.

Dr Bonnie Cheuk is a strategic, hands-on, business-and-results-driven executive with strong expertise in digital transformation, web–digital channel management, information and knowledge management, collaboration, social media and Enterprise 2.0. Originally from Hong Kong, she has more than 20 years of international work experience with multinational corporations in Hong Kong, Singapore, the USA, the UK and Europe.Her expertise lies in blending her deep understanding of information and knowledge management, change management, communication and facilitation principles and practices with her knowledge of the latest technologies to deliver business solutions and drive change. She has led the successful roll out of social collaboration and knowledge sharing programmes for Euroclear, Citigroup, Environmental Resources Management (ERM) and the British Council. Bonnie is currently partnering with business and technology leaders to shape the future digital workplace experience for employees, and to refresh the web, social media and digital

strategy to improve client experience for a global financial services company. Bonnie's doctorate research focused on understanding information seeking and user behaviour in the workplace. Bonnie publishes papers, gives lectures at universities and speaks regularly at international conferences. She is the author of *Social Strategies in Action: driving business transformation* published by Ark Group in 2013.

Dr Mark Childs is a Learning Designer at the Open University. His research is in online collaborative learning, and in learners' experiences of digital identity and online presence. He has co-edited a book on digital identity for Springer (*Reinventing Ourselves*) and co-authored one on the experience of online spaces for Chandos (*Making Sense of Space*). His most recent book, for Routledge (*Online Learning for STEM Subjects*), was published in January 2017. Mark's PhD on learners' experience of presence was awarded in 2010 by the University of Warwick. He is a senior fellow of the Higher Education Academy and a visiting fellow at Edge Hill University. His blog and a summary of his professional work can be found at markchilds.org

Vedrana Vojković Estatiev is an adjunct lecturer in English for academic purposes at the University of Zagreb. She teaches undergraduate and graduate courses to students of communication sciences, using traditional, blended and online delivery, and has co-authored a practice book entitled *English Academic Vocabulary for Social Sciences and Humanities*. She has extensive experience in online course design and moderation, and is particularly interested in how second and foreign language learning may be facilitated in online learning environments. Vedrana holds an MA in English language and literature from the University of Zagreb. Prior to teaching at tertiary level, she was director of studies and part owner of a language school for several years.

Dr Sue Folley is an academic developer based at the University of Huddersfield, with a remit to support the pedagogic development of staff in the use of digital technologies. Her role involves training staff and contributing to the University's strategic developments in this area. She has a postgraduate certificate in education (PGCE) and has previously taught mathematics in the further education sector, but has worked in higher education for the last 18 years. She has a master's degree in

multimedia and e-learning and has completed a doctorate in education focusing on tutors' experiences of teaching online. She is a senior fellow of the Higher Education Academy and the University's representative on the Heads of eLearning Forum (Helf). Sue's research interests include digital literacy, learning analytics and curriculum development.

Josie Fraser is a UK-based social and educational technologist, who works across sectors advising on and implementing the innovative and effective use of technology. Her work focuses on digital literacy, digital citizenship and the digital economy. She was awarded honorary life membership of the Association for Learning Technology in 2017. She currently works for the UK government as senior technology adviser on the National Technology Team, based in the Department for Digital, Culture, Media and Sport (DCMS). Josie is chair of Wikimedia UK (https://wikimedia.org.uk/wiki/Main_Page), a charity dedicated to supporting access to knowledge for all, promoting engagement with Wikimedia projects, including Wikipedia. She blogs at Social Tech (http://www.josiefraser.com/) and her Twitter ID is @josiefraser.

Good Things Foundation (https://www.goodthingsfoundation.org/) is a UK charity and digital social change organisation, with a mission to help everyone benefit from digital technology. The Foundation is a key partner of the UK government; since 2010 it has helped over 2.3 million people improve their lives through digital technology. Good Things works with a national network of 5000 community-based organisations, the Online Centres Network, to reach socially excluded people and help them thrive online, and to design and deliver a wide range of funded programmes with UK government departments, the private sector and grant-making bodies. The Foundation is also working across Australia to build a community-based digital inclusion network reaching older Australians, and with the Kenyan National Library Service.

Dean Groom has worked as a lecturer and in senior roles in educational development at Macquarie University since 2008. From 2008 to 2013 he was Head of Educational Development and Design and in 2013–14 he was Head of E-learning in the Faculty of Arts and Social Sciences at University of New South Wales, before commencing a doctorate in 2013 at Macquarie University researching the negotiations of play that takes

place between families and digital game media. His work spans early childhood, school-age and tertiary education, continuing a long history of developing innovative learning environments and experiences. In 2014, he received an Australian Postgraduate Awards Commonwealth Government Scholarship for his research into how families and children use digital games as active networks and how this shapes their rituals, routines and belief about media more broadly.

Janet Hetherington is a participatory practitioner specialising in using community arts in a research context. Having established the Arts Programme at Birmingham Children's Hospital, she then worked as a senior lecturer at Staffordshire University, specialising in using community arts as a tool for action research across Europe, and supporting the professional development of artists working in the field. As an independent consultant, she has advised schools, colleges, local authorities and arts organisations on cultural development and creative learning. She currently works in primary education and continues to facilitate and support initiatives to use creativity throughout the curriculum to engage learners and educators.

Dr Charles Inskip is a senior lecturer and the Programme Director on the MA Library and Information Studies at University College London (UCL). His research interests lie around the connections between people, information and technology (of all kinds) and his PhD exploration of the information behaviours of creative music professionals led to an interest in information literacy. He is directly involved in developing and delivering the library studies curriculum and introduced an information literacy module to the UCL MA in library and information studies. He is currently exploring the information work of insurance practitioners with a view to supporting graduate employability and is completing a book on information literacy for Facet Publishing.

Professor Norman Jackson (www.normanjackson.co.uk/) is Emeritus Professor of the University of Surrey and founder of two social educational enterprises: Lifewide Education (www.lifewideeducation. uk/) and Creative Academic (www.creativeacademic.uk/). He is commissioning editor for two digital magazines and facilitator for several Google Plus forums. An important focus of his work over the last 17 years has been

higher education's involvement in developing students' creativity, which is documented in four books including *Developing Creativity in Higher Education: an imaginative curriculum* and his recent book *Exploring Learning Ecologies*. He is currently researching creativity in practice and ecologies of learning and practice, including how technology features in creative processes. He tweets as @lifewider1 and @academiccreator.

Rosie Jones is Director of Library Services at the Open University. She has worked in academic libraries since 2001 taking a particular interest in games and learning, information literacy and learning space development. She is particularly involved in the UK academic library Information Literacy community, currently co-chairs the Librarians' Information Literacy Annual Conference (LILAC) and is the Deputy Chair for CILIP Information Literacy Group. Her LinkedIn profile can be found at https://www.linkedin.com/in/rosiejhjones

Gordana Jugo is a head of the Service for Educational Technologies in the Croatian Academic and Research Network (CARNet). She has been involved in numerous projects and activities aiming to implement technology in Croatian schools to enhance teaching and learning, and develop digital skills of teachers, staff and pupils. One of the most important projects in her portfolio is the national E-schools Project; she focuses on developing a model for digitally mature schools in Croatia. Gordana supports innovative uses of technology in teaching, with focus on pedagogy, and shares knowledge and experiences including about open educational resources. She holds a master's in educational technology from the University of British Columbia. One of the projects she has most enjoyed being involved in is the Comenius project AMORES (an Approach to MOtivating learners to Read in European Schools; http://www.amores-project.eu/), which has the motto 'discovering a love for literature through digital collaboration and creativity'.

Clare Killen has 23 years of experience in supporting providers from the higher and further education and skills sectors with various aspects of staff development including in effective use of digital technologies to support educational practices and ambitions. She has led teams delivering national initiatives and provided consultancy services focusing on whole organisational approaches, transformational change, curriculum design

and improving professional practice through peer coaching. Clare has authored several guides for Jisc (formerly the Joint Information Systems Committee) on topics such as student–staff partnerships, emerging digital practices and digital capability development.

Adam Micklethwaite is Director of Digital Inclusion at Good Things Foundation. He has built partnerships at national, local and international level that support vulnerable and excluded people to benefit from the digital world. Before joining Good Things, Adam was a senior civil servant in the UK government, where he worked on education and skills policy; the funding of further education, and supporting enterprise. This included developing the first student loans system in UK further education, and launching the UK National Careers Service.

Chris Morrison is the Copyright Support and Software Licensing Manager at the University of Kent, responsible for copyright policy, licensing, training and advice. He was previously the Copyright Assurance Manager at the British Library and before that worked for music collecting society PRS for Music. With Dr Jane Secker he is co-author of the second edition of *Copyright and E-learning: a guide for practitioners* (Facet Publishing), and with Jane co-founded the award-winning copyrightliteracy.org blog. Chris is a member of the Universities UK / Guild HE Copyright Working Group, has a postgraduate diploma in copyright law from King's College London and is currently undertaking a master's research project into the interpretation of copyright exceptions in UK higher education.

Dr Chrissi Nerantzi (@chrissinerantzi) is an experienced academic developer, open practitioner and researcher working in the Centre for Excellence in Learning and Teaching at Manchester Metropolitan University. Her interests are in creative, innovative and open learning and teaching and her work has been recognised nationally and internationally. Chrissi has conceived and initiated a range of open cross-institutional professional development initiatives. Examples include #creativeHE, #LTHEchat and @BYOD4L, which bring practitioners, students and the public together to learn and develop, nationally and internationally, and have inspired others to innovate and engage in creative and open practices. Through her doctoral studies, she explored the collaborative open learning experience using phenomenography. One of her key

outputs is the framework for cross-boundary collaborative open learning for cross-institutional academic development she developed. Norman Jackson and Chrissi work closely together in the #creativeHE community and as Creative Academic champions. To find out more about Chrissi, please visit https://chrissinerantzi.wordpress.com/.

Dr Joe Nicholls is a principal consultant in Cardiff University Library Services specialising in digital enablement, and a lecturer in medical education tutoring on distance learning postgraduate programmes. He has a background in psychology, human–computer interaction and learning technology, with research experience in the design and evaluation of interfaces to educational technologies and information systems. He has over 20 years of experience teaching university staff and students on the design, development and effective use of digital media and technologies for learning and teaching. His current interests concern establishing sustainable and scalable approaches to enabling the development of staff and student digital literacies and the design of effective pedagogies for online learning.

Judy O'Connell is a senior lecturer in the School of Information Studies, Faculty of Arts and Education at Charles Sturt University. She has also filled the role of course director for bachelor and masters' programmes in information science, and later was the quality learning and teaching lead in online learning, working with academics in a wide range of science disciplines to support online learning design, innovation, social media and technology for learning and teaching. Prior to joining Charles Sturt University in 2011, Judy was head of information services at a range of large independent schools and education consultant in Web 2.0 developments for 80 primary and secondary schools in the Western Region of Sydney, Australia, where she first began researching virtual worlds, games and online environments in influencing the learning dispositions of young people. Judy has received faculty awards for academic excellence (2014, 2016) for her work. She is pursuing doctoral study in digital scholarship at La Trobe University.

Jo Parker is a senior library manager at the Open University Library, with responsibility for developing digital and information literacy strategy. Her current role is leading institutional digital capabilities development. She

is a 'jolly good fellow' – a Winston Churchill Memorial Trust Fellow, a fellow of the Higher Education Academy, and a fellow of the Leadership Foundation, as well as holder of an Open University teaching award. She has co-edited two previous books for Facet Publishing, and was 2017's 'runner up' for the information literacy practitioner award at the Librarians' Information Literacy Annual Conference.

Katharine Reedy is a digital literacy specialist and learning designer. She was active in the field of digital and information literacy for over ten years in different roles within the Open University Library before joining the Open University Learning Design team in 2016. Her focus is on curriculum development, including the award-winning Being Digital collection and the Open University's Digital and Information Literacy Framework. She has a strong interest in learning design and its potential to improve the study experience. Other work includes 'Succeeding in a Digital World', the Open University's free digital literacy course aimed at developing learners' confidence and skills, and writing the digital literacy 'theme' document for the Open University's 2015 Quality Assurance Agency review. Katharine is a senior fellow of the Higher Education Academy and chartered member of the Chartered Institute of Library and Information Professionals (CILIP). Her contribution to digital and information literacy was recognised in 2015 with the award of Information Literacy Practitioner of the Year.

Dr Philip Seargeant is Senior Lecturer in Applied Linguistics at the Open University. He is co-author of *The Idea of English in Japan*, *Exploring World Englishes* and *From Language to Creative Writing* (with Bill Greenwell) and of *Taking Offence on Social Media* (with Caroline Tagg and Amy Aisha Brown), and co-editor of *English in Japan in the Era of Globalization* and *English in the World* (with Joan Swann), *English and Development* (with Elizabeth J. Erling), *The Language of Social Media* (with Caroline Tagg) and *Futures for English Studies* (with Ann Hewings and Lynda Prescott).

Dr Jane Secker is Senior Lecturer in Educational Development at City University London and the former copyright and digital literacy adviser at the London School of Economics, where she provided advice and support for staff and students. She is Chair of the CILIP Information

Literacy Group and the author of several books, including *Copyright and E-learning: a guide for practitioners*. The second edition of this book was published June 2016, co-authored with Chris Morrison. Her research interests include digital and information literacy, copyright education and the role of technologies in supporting learning. She is an honorary fellow of CILIP, a fellow of the Higher Education Academy and co-founder of the Librarians' Information Literacy Annual Conference. She devised A New Curriculum for Information Literacy (ANCIL) with Emma Coonan, which is a framework for supporting learning in higher education, and has written and spoken widely on her research. Jane has been a member of the Universities UK Copyright Working Group since 2006, which negotiates licences for the higher education sector with bodies such as the Copyright Licensing Agency (CLA). Jane and Chris maintain the website UK Copyright Literacy and tweet as @UKCopyrightLit.

Dr Caroline Tagg is Lecturer in Applied Linguistics at the Open University. Her research is in the language of social media. Her previous publications as author are *The Discourse of Text Messaging* (Continuum), and *Exploring Digital Communication: language in action* (Routledge), and as co-author *Taking Offence on Social Media: conviviality and communication on Facebook* (Palgrave, with Philip Seargeant and Amy Aisha Brown); she also co-edited *The Language of Social Media: identity and community on the internet* (2014, Palgrave, with Philip Seargeant).

Dr Geoff Walton is Senior Lecturer in the Department of Languages, Information and Communications at Manchester Metropolitan University. He is currently working on a project on information discernment and psychophysiological wellbeing in response to misinformed stigmatisation funded by the CILIP Information Literacy Group. Geoff previously worked at Northumbria University where he was involved in a British Academy–Leverhulme Trust funded project with Dr Ali Pickard and the late Professor Mark Hepworth. He has also worked on the EU-funded research project AMORES. Geoff's main research interests are information literacy, information behaviour, technology-enhanced learning, data literacy and public libraries. A list of his publications can be found at https://scholar.google.co.uk/citations?user=UwsIXpUAAAAJ&hl=en.

5

Digital games: providing unique digital literacy challenges in childhood

Dean Groom and Judy O'Connell

Introduction

As they become more accessible and more mobile, digital technologies are increasingly crossing the contexts of home, school, workplace and communities, and offering an expanding range of educational and social affordances (Haddon and Livingstone, 2014). This is a challenge for families and those seeking to better understand, engage and implement digital games in children's education. Technology has become an important feature of family life in many households with children using some form of device with a screen every day (Gutnick et al., 2011; Holloway, Green and Livingstone, 2013; Vandewater et al., 2009. Children use and enjoy technology more and more, in a world of expanding technologies, access and media forms (Buckingham and Willett, 2013; Tyner, 2009; von Feilitzen and Carlsson, 2000). Ongoing improvements to technology have enabled children to access new media and technologies from an early age, and the YouTube clip of a baby manipulating a touch screen is all too familiar. Leathers, Summers and Desollar-Hale (2013) argue that babies who have had ready access to touchscreen technologies since birth learn to point at screens by the age of 10–14 months.

Children do not need to wait until they can operate a keyboard and mouse to begin interacting with digital media. Today, pre-verbal, non-ambulant infants have parents who are comfortable with their children

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using these child-friendly touch screen devices. Nikken and Schols argue, 'through age 7, children are honing their fine-motor skills, which makes it gradually easier for them to manipulate touchscreens, small keys, gadgets and controllers' and are 'adept at using symbols, playing pretend games, interpreting relevant cues in their social environment, and gain knowledge of story grammar, which is essential for the formation of interpretive schema for processing more demanding media content' (2015, 3423).

This chapter takes a focused look at the emerging opportunities provided by digital games and provides a rationale based on research to encourage individuals and organisations to consider games and gaming as mainstream channels of digital literacy engagement.

Digital childhoods

Digital games are an integral part of children's environments, with findings pointing to continued growth and regular game play across a range of devices, driven by curiosity, challenge and interactivity (Blumberg and Fisch, 2013). Some researchers discuss children's media use as 'screen time' rather than information and communication technologies (ICT) in order to try and encapsulate the ongoing diversity of devices being used, human interaction, preferences and experiences of use as well as the now common interoperability and synchronicity enabled by the internet (Clark, Demont-Heinrich and Webber, 2005). This interest in the notion of 'screen time' (Clancy and Lowrie 2005; Ernest et al., 2014; Randall, 2013; Stager, 2010) increasingly connects the home–school environment, indicating that educators need to consider children's home use of screen time as part of their overall educational development.

Carson and Janssen (2012) investigated the screen time habits of children under the age of 5 in Canada, in order to gain a better understanding of the factors that influence the use of television, video and computer games. They argued that intrapersonal, interpersonal and physical environment factors within the home setting are essential to children's use of 'screens' and that parental cognitive factors at the interpersonal level were of particular importance. This suggests that children's experience of digital media remains diverse but, more significantly, they are actively engaged with media at a very young age. It was found that 37.9% of children (≤ 5 years old) played video games and

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93.7% watched television. The authors found increasing parental awareness towards recommendations of 'screen time' improved their self-efficacy to refuse access and better regulate their children's media diet (Carson and Janssen, 2012, 7).

Hakanen (2007, 3) argues that identities are being formed on the social grid and shaped by the dominant medium of the era, which includes digital video games. As players, children are placed into these mediums and their digital identity in part emerges from discourses salient to what media is offered to them and how adults think about what constitutes the self. The image of the child playing as an avatar in a game is a significant expression of the convergence of children's corporeal and hypermediated worlds, also providing an enlarged sense of what media and communications are involved in digital childhoods (Hjorth, Burgess and Richardson, 2012). The real and the imaginary worlds come together to create new forms of engagement, motivation or places for play.

New literacies in and out of the classroom

Digital technologies have become common in children's homes and schools, yet a survey of 2462 teachers about their use of technology at home and in their classrooms suggested that while educators outpace the general adult population in personal technology use, 42% of teachers feel that their students know more than they do about using digital tools (Purcell et al., 2013). Technology use in the home context has been the focus of research (Burnett, 2010; Marsh, 2006; Pahl, 2010; Plowman, Stephen and McPake, 2010) with strong arguments for the need to continue to examine children's literacy and learning practices in these contexts, all the more crucial given the home–school nexus.

A fundamental requirement of learning is to be able to read. But what does 'read' mean in the 21st century? Lamb (2011) argues that reading goes beyond interpreting text to also include graphics, sound, motion and other kinds of symbols in addition to or instead of text. To become fully literate, students must become proficient in the new literacies of 21st century technologies (International Reading Association, 2009). Literacy educators have a responsibility to integrate these new literacies into the curriculum. This interpretation (for example) is supported by the *Australian Curriculum: English*, which states that students 'listen to, read, view, speak, write, create and reflect on increasingly complex and sophisticated spoken, written and multimodal texts across a growing range

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of contexts with accuracy, fluency and purpose' (ACARA, 2014, par. 1).

These new literacies are multimodal, comprising multiple modes – visual, sound and text – and are more participatory (Wilber, 2010). In other words, literacy as metaliteracy action (Ipri, 2010) – where information being accessed and read takes many forms online and is produced and communicated through multiple modalities (Mackey and Jacobson, 2011) – happens whenever children and young people read and interpret their world, as many young people comfortably use a wide variety of the literacies associated with new technologies to construct and distribute knowledge (Coiro et al., 2014; Lenhart et al., 2007).

Essentially the field of new literacies focuses on how language and literacies are shaped by the ongoing development of new tools and technologies. Learning in online environments involves skills and processes that are common to print literacy but also important skills that are unique, such as using search engines, reading websites, selecting appropriate hyperlinks, and comparing information (Asselin and Doiron, 2008). Understanding how the use of technology is distributed in multiple settings includes understanding how, when and why access to information and novel kinds of technologically mediated learning environments – such as online special interest groups, tutorials or games – can support learning for children on their own terms (Barron, 2006, 194).

Digital games

A digital video game as a concept is an 'electronic' game that involves human interaction with a user interface to generate visual feedback on a device. The forms grow increasingly diverse and some of the most commonly used games by children or for educational purposes with children includes alternate reality games, massively multiplayer online games, multiplayer online battle arenas and social, casual and mobile games.

The alternate reality game genre is much more than simply being a pre-coded application, and can be flexible enough to allow teachers to create a narrative or plot, and to use some free web-based tools to create a playful and immersive environment which is not real, but which engages with the real world in a way that draws players into the fantasy narrative. Popular alternate reality games include Ingress (2013; www.ingress.com) and Pokémon Go (2016; www.pokemongo.com). Alternate reality games can also be games driven by storyline and typically supported through some

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type of online game portal that manages the game, such as a website. They often remain active online for some time, such as World Without Oil (2007; http://worldwithoutoil.org). Examples of massively multiplayer online games are World of Warcraft (2004; http://us.battle.net/wow/en) and World of Tanks (2010; http://worldoftanks.com). Multiplayer online battle arenas include League of Legends (2009; http://oce.leagueoflegends.com) and Robocraft (2016; http://robocraftgame.com). Popular casual and mobile games include Angry Birds (2009; https://www.angrybirds.com), Minecraft (2011; https://minecraft.net) and Highlights Monster Day for pre-schoolers (2016; www.highlights.com/store/apps/highlights-monster-day).

These digital games demonstrate the developments taking place in the history of this genre. The rapid expansion of game types, platforms, experiences, media-convergence, human interfaces and growth of game popularity in our society increasingly requires parents and educators to address the challenges, opportunities and potential of digital games.

Player participation and engagement

Players do not just engage in ready-made gameplay but also actively take part in the construction of these experiences: they bring their desires, anticipations and previous experiences with them, and interpret and reflect the experience in that light (Ermi and Mäyrä, 2003). Digital games allow 'the full experiential flow' by linking perceptions, cognitions and emotions with first-person actions (Grodal, 2003). Digital games provide a fertile environment for learning (Gee, 2005). Role-playing games allow child players to take an ontological position that may be unavailable in their lived existence. This allows a player to make sense of the play experience and construct an interpretation of the game that draws on personal and social contexts of their life or builds beyond current situational, social or cultural contexts. Additionally, games are a force in the (re)construction of contemporary childhood (Papazian, 2010); this provides models of good learning practices which can be used to develop practical competencies and social practices in early childhood (Manessis, 2011). Because children test out an idea by acting on parts of it, the boundaries between the real world and the game world can become blurred.

Where games differ from other media is that they require the participation of players and, unlike older media, the actions of players

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themselves play a key role in reshaping them as a multimodal experience of enjoyable playful interaction. Digital games provide an active process of meta-cognitive engagement and decision making within creative action. They can provide authentic learning situations, promote social interactions, increase motivation, encourage higher-order thinking, and foster 21st century skills (Qian and Clark, 2016) as well as promote collaboration, problem solving and communication (Johnson, Adams and Haywood, 2011).

Craft (2003, 42) identifies that this action of creativity involves passing of control to the learner; placing a value on learners' ownership and control to encourage thinking and debate as well as co-participation in learning. Reilly argues that children are learning through new media as a 'set of social skills and cultural competencies, are not tied to traditional curriculum standards and practices, but instead are best developed through creative and engaging projects' (2011, 473). These new literacies merge the creative modes fostered through a variety of media tools, to encourage socially constructed meanings and forms of self-expression. There are strong links with discourses surrounding digital childhoods (Buckingham, 2013) and implications for education (Steinkuehler, Squire and Barab, 2012). Essentially, this process of creative 'dialogue' reveals how metaliteracy transactions are being transformed in digital games.

Gaming literacies

During gameplay, gaming literacies (elements of game play and complex understanding of computer systems) as a metaliteracy are used to accomplish difficult but motivating tasks in order to develop new knowledge by navigating a complex, changing virtual environment (Apperley and Walsh, 2012). Learning can become an immersive participatory experience (Barab and Dede, 2007) where the knowledge learned in the game and the knowledge learned at school scaffolds disciplinary content (Barzilai and Blau, 2014). Games can also convey meaningful messages that young people value, and through active game creation can motivate and improve the capacity to learn (Altura and Curwood, 2015). Games give educators the opportunity to introduce layers for conceptual learning and new taxonomies for pedagogical design, and herein educators are understanding the complex learning that gaming can involve (Steinkuehler, Squire and Barab, 2012, 271).

Felicia (2011) argues that playing video games stimulates affective,

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cognitive and communicational processes, thus facilitating the emergence of knowledge. These strategies can be viewed through a pedagogical classification of games; they can develop psychomotor, intellectual, identity and relational skills, which support a range of academic, problem solving and sense-making situations. In essence, games provide spaces for accelerated and simultaneous information processing, competence and skill development (St-Pierre, 2011), however understanding how information behaviour affects game design and gaming interactions is also critically important.

Boundaries of engagement

When playing digital games, players must make choices about game mode and challenge levels (Sit, Lam and McKenzie, 2010), retrieve information to solve problems or make sense of situations, in a variety of ways that may well be different from their other experiences (Adams, 2009). Knowledge construction in games is also an extension of game design, which ideally supports the learner's needs within the information-seeking context while also generating successful immersive experiences for problem solving (Liu, Cheng and Huang, 2011). It is also suggested that in games it is helpful to create a flow experience (Thin, Hansen and McEachen, 2011), in which students are motivated to apply trial-and-error, learn-by-example and analytical reasoning strategies. Inal and Cagiltay (2007) also found that challenge and complexity elements of games had more effect on flow experience in an interactive social game environment than clear feedback only.

A game does not exist without players (Bourgonjon, 2014, 4) and the learning that takes place is an intersection of the experience designed by the game designer and the intentions of players (Steinkuehler, Squire and Barab, 2012, 247). Zimmerman outlines these intersections as gaming literacy through systems, play and design (2008, 24). Harviainen, Gough and Sköld (2012) introduced the concept of games as information systems, in the sense of systems that inform. The authors explain that in order to progress through digital games, players must recognise and process information from the user interface, cues and clues embedded in the game environment, and through interacting with non-player characters. They also explain that as reasons for seeking game-related information touch on cognitive issues, the conceptual connection between information seeking and information behaviour is significant to the

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construction of games as information systems.

There is also evidence of games as being an important constituent of media education, literacy and information fluency learning (Beavis, Dezuanni and O'Mara, 2017; Buckingham, 2007; Buckingham and Burn, 2007; Buckingham and Willett, 2013). All games are systematic and use an array of information and techniques to communicate with players (Squire, 2006). Video games often provide players with just-in-time information through a range of audio, visual and haptic clues triggered by choices and interaction with the game world. Steinkuehler and Williams (2006) say that the way information is revealed to players is part of the socialisation needed for them to behave in certain ways. The information from the environment is then processed by players, who then select appropriate behaviours. Players in multiplayer games are part of the information giving process. For example, watching the mistakes of another player is a way of processing information to improve a player's performance without verbal communication between those players. Information giving is common in games (asking others how they did something, what they need, how to find and so on). Players are involved in an ongoing social relationship with an audience, drawing on language and communication to reproduce information. In this way, the hardwired, 'designed in' informational boundaries are supplemented with additional knowledge inside and outside the game.

Digital player identity is another complex topic related to literacy through body, gender, age, race and ethnicity to demonstrate affiliation and relationships as players adopt certain storylines and discourses in online gaming (Thomas, 2007, 9). Martin (2012) argues that player self-identity is an important component of online play where participants' skill and level in the game as well as their play style and information practices influence their success at school.

It is important, therefore, not to see digital video games as a homogenous whole, but rather as a complex and changing set of technologies which by their very nature include literacy requirements and experiences. Through gameplay and narratives found in today's digital video games children are clearly being immersed in transmedia navigation, which is contributing to the ongoing development of theories about the literacies of game play in formal and informal settings (Barnett, 1976; Kafai, 2006; Kangas, 2010; Yee, 2006). Previous boundaries between informal and formal learning are blurring and so are the required literacies

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that reflect contemporary life (Hagood, 2009).

Games and gaming action involve a dynamic, active process of knowledge construction in which learners constantly strive to make sense of new information. This information behaviour is influenced not just by information seeking that a participant may engage in, but also by the game mechanics that have been established in the game itself.

Examples in action

Quest Atlantis (now maintained as part of the Atlantis Remixed Project at http://atlantisremixed.org) was created by Indiana University and allows students to complete educational tasks in 3D multi-user environments. In this digital game students can move around freely and complete quests based on educational goals and chat to collaborate with other students about work and tasks. The most beneficial part of Quest Atlantis is its inclusion of curriculum-appropriate tasks that students are required to complete directly connecting curriculum and learning goals in the game (Turkay et al., 2015, 3). Quest Atlantis encourages students to take risks and use their failures as exploration of topics (Gee, 2005, 35). Students develop better motivation, confidence, knowledge and understanding, creative thinking and negotiating skills (DEECD, 2011, 14). Other key learning outcomes included enhanced motivation, confidence, reading and comprehension skills (DEECD, 2011, 21–7). Students had also begun to develop their creative writing skills, by creating their own characters and quests for other students to complete (DEECD, 2011, 14). It was also found that Quest Atlantis allowed students to develop or extend knowledge at their own rate without feeling overwhelmed (DEECD, 2011, 18).

Scratch (https://scratch.mit.edu/) is a game created on the Scratch platform using blocks of code in a drag and drop interface, to manipulate sprites on the screen. Scratch promotes mathematical and computational skills as well as creativity, reasoning and collaborative working. The internet is populated with Scratch resources and professional learning opportunities, including Code Club Australia, which is establishing a network of events for students aged 9–11. There is a wealth of literature on the application of Scratch for learning (Breen, 2016).

Minecraft (https://minecraft.net/) is not simply a digital game that allows children and youth to build and create virtual worlds, but also an educational tool used as a vehicle for teaching critical content. Through

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the ability to take control and be active learners, motivation is enhanced in areas as diverse as science, maths, history, engineering, architecture and computer coding (Ellison and Evans, 2016).

Transmedia storytelling (https://www.coursera.org/learn/transmedia-storytelling) provides a digital game experience and learning tool that has the power to motivate, persuade, entertain as well as educate. Inanimate Alice creates an experience that immerses the reader in the complexity and emotional journey of a story through the impact of sound and vision of the multilayered story, with new storylines emerging to enrich the tale, making Alice a unique digital reading experience built on the mesh of game, puzzle, sight and sounds to embellish a story (Fleming, 2013).

Unity (https://unity3d.com/) is a complex digital programming game tool with advanced graphic capabilities. Free learning resources can be accessed via the Unity website and there is a wide variety of assets and a community of developers across the web. An understanding of general programming language such as C# or UnityScript is required to make best use of the features. However, this does not prevent youngsters from becoming capable and enthusiastic game builders. In a short video 12-year-old Cooper explains that Scratch can be too easy and describes what motivates him to play Unity (YouTube, 2017). Learning what 'real' game engines are and becoming involved in the game-building opportunities of coding provides such youngsters with unique meta-cognitive and metaliteracy learning opportunities.

On a novel twist on digital games, Breakout EDU (https://www.breakoutedu.com/) is similar to the popular 'escape room' game, but has a marked difference as this game is about opening a locked box. It is a timed challenge that involves solving puzzles, discovering clues, finding hidden items and red herrings, and ultimately figuring out how to unlock a series of locks to open the box. The sessions have an underlying theme or story that underpins each Breakout, focusing on collaboration and problem solving. Breakout EDU is often used to introduce new concepts, reinforce learning, bring closure to a lesson, and reinforce skills and concepts learned, all in a fun way (Goerner, 2016). While this is a 'physical' game, Breakout EDU Digital (https://www.breakoutedu.com/digital/) encourages teachers to play alongside students to model a growth mindset playing the game completely online. This has been used successfully to create many game challenges. Among the many available a game on the French Revolution, Escape the Guillotine! (https://sites.

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google.com/site/escapeguillotine/), involving solving various clues about events around the revolution, has been used successfully in Years 11 and 12 curriculum studies in Australia. The riddles and puzzles resulted in social interaction between group members creating multiple stories, confirming the finding that students learn more when they are left to engage with a game in a group competition (Admiraal et al., 2011).

Museums are developing serious games to engage students in history content with successful results. The project Playhist (http://www.experimedia.eu/2014/02/25/playhist/) in Carnegie Mellon University uses 3D technology to immerse students into the environment of Tholos (virtual theatre) in the Foundation of the Hellenic World of Athens, requiring players to engage in some mini games. Progress in the game through 'learning by playing' provides a better understanding of an historical subject (Perez-Valle, Aguirrezabal and Sillaurren, 2014).

The portability of devices for gameplay is also demonstrated by Game 1910 for learning history, which allows a player to live through the 1910 revolution that led to the establishment of the republic of Portugal (Cruz, Carvalho and Araújo, 2017). This game was designed after research into students' game preferences to understand rules, obstacles and choices, and players need to learn through failures to be successful (Gee, 2007).

According to Squire and Steinkuehler (2005), when Santa Monica Public Library, CA, hosted gaming nights for teens to come and play games, there were many positive benefits. Not only did the gaming nights reorient young people towards the library and allow librarians insight into youth culture, but half of the students who attend game nights and played games such as Age of Empires (https://www.ageofempires.com/), Civilization (https://www.civilization.com/) or Rome: Total War (https://www.totalwar.com/) ended up borrowing a book based on an interest generated through gameplay. Such games require serious thought and stimulate an interest in multiple topics including history, politics, economics and geography. For many, they raise curiosity, spark passions and inspire lifelong interests, and should be included and promoted in public library collections for these reasons (Squire and Steinkuehler, 2005, 41). Brown and Kasper (2013, 756) argue that games can be fused with library agendas and posed three questions to investigate how games affect reading, learning achievement, information literacy and library use:

- What do participants in a library's video game program learn?

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- How do library gaming programs assess participants?
- What steps can programs take to improve their assessment?

Next steps

When we think about game-playing, where fun and immersion drive meta-cognitive, reflective experiences playing games such as World of Warcraft, Destiny, Halo, Guild Wars, Lord of the Rings and so on, many players are almost entirely focused on the gap between their current position and the 'next level' and the term 'levelling up' is a common phrase applied to gaming success. The game level, or rather information processes at that game level, are entirely designed to give feedback to players such that no external 'judge' is required. Arguably, educational games are more likely to be considered for implementation if the intended learning outcome has recognisable curriculum facing materials. Where teachers and designers are required to deliver the object of study as concepts, definitions, formulae, facts and problems, the intention may seem less obvious and so lead to questions about implementation.

According to Burgun (2012) planning to incorporate digital games in community or education contexts should involve asking what kinds of actions will be possible in the game and what types of interactions could take place. Burgun suggests we begin by asking, 'Will interactivity help me do what I want to do? . . . Will a game system, with its goals, its competition and its player interaction be helpful?' If the answer is no, then a game might not be the right medium (2012, 21).

Some educational games are simple in design, focused on content with low levels of literacy demand, which emphasise drill and practice or memorisation. Research has shown that other games can promote meaningful learning by providing players with adaptive challenges, curiosity, self-expression, immersion, collaboration, competition, variable rewards and low stakes failure (Qian and Clark, 2016). Such games can provide situated learning, promote social interactions, increase motivation and engagement, and provide opportunities to develop valued 21st century skills (e.g. collaboration, creativity, communication and critical thinking).

Games in general, and educational games in particular, pose unique requirements on the perception and processing of information by gamers–learners. Any education or community organisation is able to introduce games and gaming in the context of the services to children and youth, and provide intrinsic integration of learning content for knowledge and

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skills exploration and acquisition. Schools and libraries share in the unique opportunity to foster literacy and knowledge construction through digital games. Games fit the mission of libraries to promote literacy and informal learning as they encourage reading and information literacy, and are great for students with diverse learning styles, by people of all ages, families and other intergenerational groups (Gilton, 2016, 37).

Digital literacy and/or metaliteracy transactions are the enabling factors connecting literacy, systems, play and design. Ultimately, where knowledge has been successfully integrated, the game mechanics can also serve as platforms for trying out and experimenting with ideas that have been acquired outside of the game:

> Imagine learning about avionics and how wing designs affect speed and manoeuvrability, or reading historical descriptions of the British longbow and how it changed the way battles were fought, and imagine having a tool to try out and experiment with those concepts, seeing how they play out and how changes made by the player effects the outcome.
>
> Mozelius et al., 2017, 352

Conclusion

The growth of digital video games is likely to continue and therefore remain a fixture in educational discourses. Likewise, digital games have also captured the attention of institutions that wish to harness the engagement and motivational qualities of games for a variety of non-gaming purposes from consumer loyalty to advocacy and education (McGonigal, 2011).

Children have been shown to play video games as part of their leisure and learning time in numerous studies. Arguably, this has helped to drive teacher interest in using games (Kenny and McDaniel, 2011). Young people are increasingly engaging in practices that remix traditional and newer literacies (Gainer and Lapp, 2010), creating an imperative to understand the knowledge construction process in games as information systems, driven by new and emerging literacies as metaliteracy transactions, digital identity and knowledge construction. Game play can consist of single or multi-aged player groupings, and can support developmentally determined expectations beyond the normal curriculum learning and teaching imperatives. In such contexts, the importance of new and emerging literacies become a priority consideration. To succeed

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in today's interconnected and complex world, workers need to be able to think systemically, creatively and critically. Equipping students with these 21st century competencies requires new thinking not only about what should be taught in school but also about how to develop valid assessments to measure and support these competencies (Shute and Ventura, 2013). Digital games provide a unique environment for engaging with conceptions and constructions within digital childhood experiences – and understanding the participatory new literacies involved provides a rich field for ongoing and expanding research in digital childhoods.

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