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DLTV JOURNAL

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Contents

DLTV Journal
The Journal of Digital Learning and Teaching Victoria

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Digital Learning and Teaching Journal is published as a resource for all educators engaged in the effective use of information and communication technologies for teaching and learning.

The editors welcome contributions to the bi-annual issues from classroom teachers and other educators in the form of articles, reports of school-based projects and other reviews. Text and graphic files may be submitted to publicatons@dltv.vic.edu.au

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The journal is published by Digital Learning and Teaching Victoria, the new association formed from the merger of the Victorian Information Technology Teachers Association (VITTA) and ICT in Education Victoria (ICTEV).

Editorial

Dr Michael Phillips and Dr Michael Henderson
Faculty of Education, Monash University

Welcome to our third edition of the DLTV journal. The past six months have been a busy time as we all gear up for the upcoming DigiCon and, for many of us, a trip to the ACCE conference in Brisbane later in the year. We have both been fortunate to have had the opportunity to travel to international conferences this year, particularly to the American Association for Research in Education (AARE) in Washington DC and Mike also spent time at the Society for Information Technology and Teacher Education conference in Savannah Georgia. While these provided us with great opportunities to talk with influential researchers for across the world, it also provided us with some additional insights into the uses of digital technologies in different contexts.

Digital technology in schools can be difficult to use really well. Combining technological knowledge with content and pedagogical knowledge requires great skill and is not as simple as we might be led to believe by marketing campaigns either by political parties or hardware and software manufacturers. In contrast to the state-of-the-art, the state-of-the-actual in most classrooms is very different. The shape of the digital education revolution has not materialised in the way we were promised.

The 'wicked problem' of educational technology use is not uniform. Technology use varies markedly dependent on geographic location, indigeneity and socio-economic background. The 'messy' reality facing teachers and school leaders is not helped by Pollyanna-ish discussions about 'challenging but reasonable' expectations developed by researchers continuing to peddle an unhelpful 'digital native' perspective. What is required is a thoughtful, mature and critical debate that recognises both the affordances of and limitations of digital technologies in educational contexts. We hope that this edition of the DLTV journal goes some way to providing teachers in Victorian schools with some considered and thoughtful uses of educational technologies applicable in a range of contexts.

The $2.4 billion Digital Education Revolution promised to put computers in the hands of all secondary school students and to "contribute a meaningful and sustained change to teaching and learning in Australian schools that will prepare students for further education, training and work in a digital world" (Australian National Audit Office, 2015). The billions of dollars invested in hardware and software along with teacher education continues, despite a lack of nuanced critical research that is considered by politicians, school leaders and most importantly teachers.

In October last year, the fourth ICT national assessment program (NAP) data was released by ACARA. Unlike the NAPLAN tests which attract massive amounts of attention and debate, the NAP testing for ICT literacy remains remarkably unheralded; indeed, most academic and popular commentators are unaware of anything other than the literacy and numeracy testing that dominates attention in this country. The specific focus on literacy and numeracy testing has once again captured the attention of the nation with data released last year indicating that little significant improvement in students' literacy and numeracy levels have occurred over the past seven years. It is likely that in-depth reviews into teachers' professional development and curriculum changes coupled with debates about the place of standardised testing will follow the latest NAPLAN results; however, the data does reveal significant numbers of Australian students achieving the national minimum standard for both literacy and numeracy, typically above 90%.

Unlike the extraordinary individual and publically available school-based reports that follow the NAPLAN testing, the NAP testing for ICT literacy is only made available in one public report which is routinely overlooked while "participating schools [only] receive a basic report about the performance of their students" (Australian Curriculum Assessment and Reporting Authority, 2013). Despite the dearth of individualised reporting that could enhance the ways teachers and students could use educational technology, the general results made available by the Australian Curriculum, Assessment and Reporting Authority (ACARA) do allow comparisons between the numbers of students achieving national minimum standards in NAPLAN and ICT literacy (ICT NAP) to be made.

Robert Randall, the head of ACARA has expressed concern about NAPLAN results that continued to illustrate more than 90% of Australia's 3.6 million school students achieved national minimum standards in literacy and numeracy; however, there is little public comment or debate about previous ICT NAP results which indicate an increasing number of Year 10 Australian students are failing to meet the national minimum standard for ICT despite the billions of dollars invested in the Digital Education Revolution. Perhaps more startling is the fact that, since ICT NAP testing began a decade ago, no more than 66% of students at Year 6 or Year 10 across the country have achieved prescribed national minimum standards – a far cry from the 90% of students meeting similar standards for NAPLAN testing.

It is important for us to maintain a clear understanding of the progress students are making in terms of literacy and numeracy but perhaps it is time to focus more clearly about what is going on, or rather what is not going on, in terms of the ways in which digital technologies are being used in

Australian schools. Organisations like DLTV are of much importance not only to teachers who are working in these challenging contexts, but also to the broader educational community who are looking to us as members of DLTV to be able to show how state-of-the-art examples can become everyday occurrences in education settings not only here in Victoria but across Australia.

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Australian Curriculum Assessment and Reporting Authority. (2013). Test results. *National Assessment Program*. Retrieved January 12, 2015, from http://www.nap.edu.au/results-and-reports/test-results.html

Australian National Audit Office. (2015). *Digital Education Revolution program - National Secondary Schools Computer Fund*. Canberra, Australia: Australian National Audit Office Retrieved from http://www.anao.gov.au/Publications/Audit-Reports/2010-2011/Digital-Education-Revolution-program----National-Secondary-Schools-Computer-Fund/Audit-brochure

From the President

Melinda Cashen

The past few months has continued to be a busy one for DLTV. We have continued to develop networks and partnerships which allow DLTV to advocate on behalf of its members as well as to be a part of the schools systems. We have been working closely with industry to build connections, working in partnerships and better understanding the needs of our members. We have begun partnerships with the Brainary, Google, Vic ICT for Women and continue our partnership with CentreCom. We have also reached out to other subject associations to develop networks and opportunities for collaborative professional learning.

As schools begin to understand and implement the new Victorian Curriculum, DLTV has been there to support teachers and leaders in planning for their implementation and building teacher capacity. Highly successful webinars have been held with teachers flocking to hear case studies and examples of the new curriculum. The resources and professional learning will continue to flow through 2016 with an emphasis on implementing the curriculum and assessment.

We have also looked towards supporting students with special needs and launched our first webinar to support teachers and school, regardless of setting to differentiate and support students with special needs in the teaching and use of digital technologies.

Earlier this year saw the release of the new VCE Study Design: VCE Computing. A Resource Kit for VCE Computing was developed by a team of experienced teachers under the direction of DLTV. It contains sample SACs, solutions, timelines and advice for all units of the new study design, making it an essential aid in the preparation of the new course. There were also a number of VCE Computing workshops to support teachers in implementing the new study design.

The 2016 membership drive has been a huge success and we are pleased to see an increase in membership, especially in primary schools. Teachers understand the importance of being part of a community of teachers who support and challenge each other, and DLTV continues to offer and build on a huge range of resources and professional learning.

The 2016 AGM was held in May and was a great opportunity to celebrate DLTV's successes over the last year and look forward to a busy 2016/7. I would like to thank the hard working Committee who have supported DLTV throughout the year, ensuring a high quality association for all of its members. A role on the DLTV Committee is more than just turning up at meetings and this has certainly been shown by the Committees' enthusiasm and drive to get projects up and running. We also welcome new committee members, Lauren Sayer and Phil Feain who bring with them a wealth of expertise.

It is also my pleasure to announce a new life member, Nick Reynolds. Nick first joined the Committee over a decade ago. In his time on the ICTEV and DLTV committee he has been a President, Treasurer and Vice President and taken on many roles and advocacy for the future of digital learning. He was integral in the merge between ICTEV and VITTA and his forward thinking was invaluable throughout that process. He was a large part of the ACCE2010 national conference and demonstrated his ability to be ahead of the times, introducing social media back channels, streaming and an app, all which was unheard of in conferences then. For many delegates, this was an entirely new experience that they took back to their classrooms or joined new PLNs.

Nick's Life Membership, along with our 2016 award winners will be presented at DigiCon16 on the 19th and 20th July. The conference is shaping up to be the best yet. Keynotes include Jennie Beekhuyzen, Josh Caratelli, Rosie and Lucy Thomas and Steve Brophy. We also have confirmed Professor Tim Bell as our featured speaker who will be running workshops. The program is now available on the DigiCon website at digicon.vic.edu.au.

Although the weather is getting colder and days shorter, a highlight of winter for me is always Digicon and the DLTV Committee of Management look forward to seeing you all at the conference in July.

From the VCAA Corner

Paula Christopherson

Curriculum Manager | Digital Technologies
Victorian Curriculum and Assessment Authority

Paula is a Curriculum Manager at the VCAA, responsible for managing the digital technologies curriculum from Foundation to year 12. She was actively involved in co-developing both the Australian Curriculum: Digital Technologies and the ICT as a general capability resource for ACARA. Paula has presented professional learning sessions at state, national and international levels and was recently awarded a life membership to Digital Learning and Teaching Victoria in recognition of her outstanding contribution to digital technologies education.

So much is happening in our teaching and learning space. At the senior end of the scale the new VCE Computing study design is being implemented this year and VCE Algorithmics (Higher Education Scored Study) is undergoing a minor review, with a revised study design being implemented in 2017. This study design is currently available for consultation until 1 July at http://www.vcaa.vic.edu.au/Pages/vce/studies/algorithmics/algorithmicsindex.aspx From Foundation (Prep) to level 10, schools are preparing for the implementation of the Digital Technologies (Digi Tech) curriculum in 2017.

Also there is a strong state and Commonwealth focus on STEM, of which Digital Technologies plays an important role, as well as the place of coding in engaging students in this field. Coding is a skill; a technical skill required to convert the design of a solution into a digital solution using a programming language. Coding skills are required within the Digi Tech curriculum, however, at the heart of the curriculum is computational thinking – a knowledge-based activity that involves representing human knowledge in a way that can be executed using digital systems.

The following graphic representation of the role of thinking in the Digi Tech curriculum was created by a colleague, Paul Clapton-Caputo, Program Leader, Digital Learning and Communication, Department of Education and Child Development, South Australia. Thank you Paul, a perfect visual summary.

Digital Technologies

There is a strong focus on the Digital Technologies curriculum at DigiCon16, DLTV's forthcoming conference on 19 and 20 July at Swinburne University. Regardless of your knowledge and confidence with the curriculum you will find sessions appropriate to you. It is not too late to start your planning for 2017 so I would urge you to attend some Digi Tech sessions to learn from your colleagues about approaches to implementing some or all of the curriculum next year.

Recently I was very fortunate to spend some professional learning time with colleagues in South Australia (SA), courtesy

of EdTechSA, the equivalent association to DLTV. In SA secondary schools are in their second year of implementing the Digi Tech curriculum and their first year for the primary years. South Australia still classifies primary education as Reception (Prep) to year 7 so they straddle the band levels 6 to 8.

Over two days we discussed a range of topics associated with the Digi Tech curriculum. Besides increasing our understanding of this curriculum we considered its connections to other learning areas and the capabilities, specifically Critical and Creative Thinking and ICT capability, which is still part of SA's formal curriculum, but not the Victorian Curriculum. In Victoria aspects of the ICT capability are embedded in some other learning areas but not all.

If you are a little confused about the ICT capability you have some strong grounds to be just on nomenclature terms! A quick trawl of the Victorian Curriculum shows that different learning areas use different terms when referring to digital hardware and software. The following table shows some examples of different labelling for the same equipment.

Learning Area	Name for Equipment
The Arts	technologies (Music) media technologies (Media Arts)
English	software
Science	technologies
Mathematics	digital technologies
Geography	digital and spatial technologies

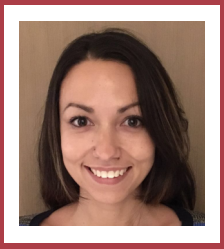
Add to this mix the term used in the Digital Technologies curriculum – digital systems. And the collective capability term for using the digital equipment to support the learning of content and concepts associated with each learning area, and the communication of learnings is ICT. This assigning of different names just adds another mental hurdle when teachers are unpacking curriculum in order to develop coherent teaching and learning programs.

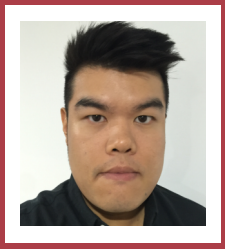
Remember, just because there is not an ICT capability curriculum in the Victorian Curriculum, you should not be forgetting about the power of these tools to support teaching and learning. Students need to be able to select the most appropriate tools to support the development of their understanding of concepts and content in all areas of learning. They need to be able to use tools that help them construct understandings. For example creating a chart to identify trends; editing text to control writing; using a mindmap to show relationships between people and events; modelling an event to predict a change in variable; sequencing events to show order.

Students also need to be able to use tools to create and communicate evidence of their understandings. What tools can support verbs typically found in achievement standards such as present, express, communicate, report, identify, compare? Students need to be explicitly taught not only how to use these tools efficiently but also the formats and conventions associated with the medium. They need to know how best to communicate their understandings, and often the tools, formats and conventions are dependent on the type of data being manipulated such as text, numeric, sound, image (still and moving).

Who teaches these knowledge and skills is a school decision; we cannot be complacent and assume that these students inherently possess these knowledge and skills due to the ubiquity of the technology and the sometimes inseparable relationship between some of them and their mobile devices.

Using Meaningful Gamification to Design an Integrated Unit of Work





Shaheeda Abdulla and Alan Deng

Shaheeda is a graduate of the Masters of Teaching (Primary) degree at Monash University. Currently working as a CRT at Silverton Primary School, Shaheeda is focussed on building upon her teaching practices in diverse educational settings. Shaheeda aspires to bring new ideas into schools by designing learning experiences that reflect innovative teaching philosophies.

Alan is a recent graduate of the Master of Teaching (Primary) program at Monash University. As an avid gamer and tech enthusiast, he is passionate about finding ways to enrich student learning through the use of game-based learning and innovative technologies. He currently works as a casual relief teacher.

As part of undertaking a depth unit in instructional design, we were given the opportunity to design a unit of work that incorporates an online environment. Our broad goal was to create a unit of work for the upper primary years, integrating the humanities and literacy subjects. Our teaching and learning philosophies led us to explore GBL (Game-Based Learning) and other learning areas, modelled on games.

A key feature of games is a reward-based system. To create such a system, game designers must decide what actions within the game are desirable and assign a particular reward/s for those actions. Such a reward system may utilise points, leaderboards and badges. The employment of these features in non-game contexts has come to represent Gamification (Nicholson, 2012). Simply put, Gamification is learning that utilises game features, without being completely housed in a game. We were attracted to the inherent flexibility of Gamification and the ability to blend together online and offline learning tasks.

Of particular interest to us is the area of Meaningful Gamification. In contrast to Gamification, Meaningful Gamification assumes a more humanistic approach to decision-making; that people may have a more intrinsic motivation for engaging in certain behaviours. Meaningful Gamification does not depend on employing an external reward-based system to motivate players. Designers must therefore use other design structures, tools, mechanisms etc. to motivate students.

"Meaningful" is based on Mezirow's (1991) model of transformative learning, where individuals have an intrinsic connection to a new experience or information that can lead to a transformation of beliefs and long-term change. What is meaningful is of course defined by each individual and is too personal and complex for teachers to ascertain for the purposes of design.

Nicholson (2012), however, provides a recipe for teachers wishing to employ Meaningful Gamification in their classroom; play, exposition, choice, information, engagement and reflection. According to Nicholson (2012), if opportunities for these elements are built into the design of a unit, teachers are more likely to achieve Meaningful Gamification.

Whilst it may be easier for designers/teachers to gamify learning environments using external reward systems, providing students with opportunities to make meaningful connections results in deeper, sustainable student learning.

We set ourselves the goal of designing an integrated unit that provides these opportunities for students, by following Nicholson's (2012) recipe.

Framing our Unit as an Alternate Reality Game

One of the most appealing features of video games is that they provide students with a virtual world that is immersive and engaging (Barab et al., 2009). Offline tasks associated with these games often consist of students completing written tasks about what they have done in those games (Maguth, List & Wunderle, 2015). In contrast, a gamification framework presents the challenge of merging the online world with the real world. We wanted to offer students a range of offline resources and tools to draw from, in conjunction with online ones. This reflects the belief that the 'game' does not simply stop just because students have logged off.

We recognised an opportunity to make use of the real world using an Alternate Reality Game (ARG). According to Nicholson (2012), an ARG is an example of meaningful gamification. ARGs use game elements to tell a story that is based upon a non-game setting. The emphasis is on an engaging story that arouses curiosity and allows participants to interact with the ARG in a variety of ways. Additionally, the narrative simulates real events, giving students the opportunity to apply and practice problem-based learning (Barab et al., 2009). Further, community-based aspects enable participants to find meaning through group engagement (Nicholson, 2012).

McGonigal (as cited in Nicholson, 2012) believes that good ARGs present obstacles within a narrative with a wide scope. A broad narrative allows more room to create fictional events and characters, clues and prompts to engage, challenge, guide and scaffold student learning. This provides more opportunities for students to make meaningful connections.

Design Considerations, Choices and Reasoning

We started our planning by identifying three core components; content, communication & collaboration, and assessment. Our design considerations would feed into these components. Then, we identified three design priorities that would be the driving forces of our design. These were flexibility, social-constructivism and student motivation. We wanted these to have a strong presence across our design and be prioritised when making decisions. Although these areas are interrelated, they each drive the design in a significant way and contribute towards achieving meaningful gamification.

Flexibility

Consistent with Collis and Moonen (2002), we designed a unit that is flexible and student-centred, and defined what this meant in our planning stages. For our project this meant flexibility in learning activities/tasks. That is, we wanted the students to choose how they learn. Our unit does this in the following ways:

- Providing a variety of on and offline tasks (quests) that cater to as many students as possible, enabling students to exercise autonomy of choice. This is consistent with Universal Design for Learning theory (Nicholson, 2012).
- Providing open-ended quests so that students decide how they demonstrate their learning.
- Providing students with the option of creating their own quests.

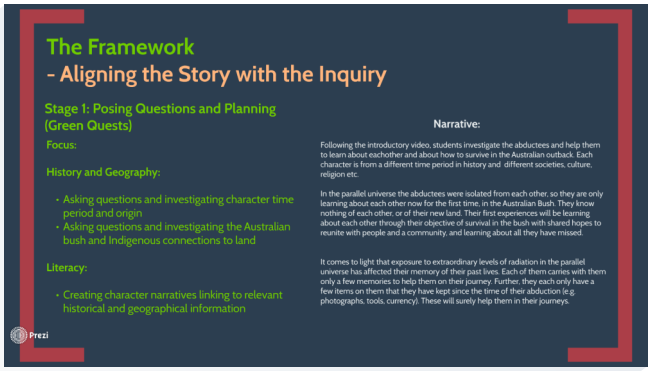
Social-Constructivist Theory

Another driving force behind our project that is manifested in our design decisions is Vygotsky's (1978) social-constructivist theory. We recognised an opportunity to align this theory with our gamification framework by sequencing our unit of work in accordance with the inquiry learning process. An inquiry framework complements curriculum integration, particularly in the humanities (Gilbert & Hoepper, 2014).

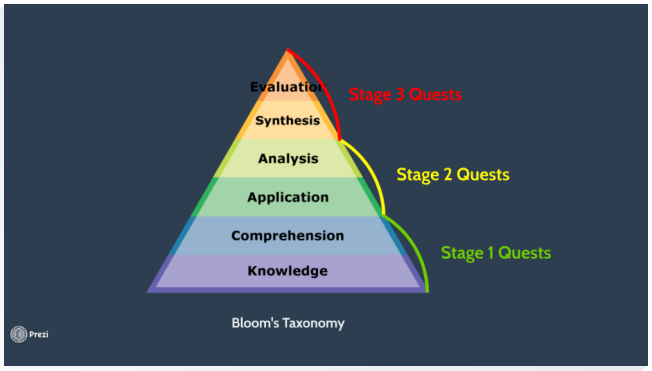
Additionally, inquiry is an organic process within a game-like learning scenario, where players can pose questions and investigate situations. Internet-assisted inquiry, such as WebQuests provide prompts for exploration, investigating alternative ideas, and stimulates students to learn autonomously (Lin, Liang & Tsai, 2012).

As ARGs promote active and experiential learning, they create an ideal environment for inquiry learning, through active and experiential learning. Adopting the inquiry model further shaped our unit by allowing us to sequence narrative scenes using the stages of inquiry as a guide.

We aligned our narrative with three broad stages of inquiry; posing questions & planning, finding out, and concluding, reflecting & responding.



With each new stage of inquiry comes new quests, new perspectives, new questions and new ways of thinking. Additionally, segmenting the unit in this way provides clear points of progression to assess student learning.



This allowed us to design tasks considering students' different levels of thinking based on Bloom's (1956) Taxonomy.

Motivation

Given our decision to use a meaningful gamification framework, our decision to include certain game features in our design became just as important as our decision to exclude certain game features. For example, the decision to exclude extrinsic rewards, such as points and badges is a significant one. Rather than rely on such extrinsic motivation, we wanted students to make meaningful connections with the unit (Nicholson, 2012). It was crucial to articulate specifically how we would achieve this. We did this through the following features:

- Student choice, and the ability to customise characters and create content within the narrative provides students with a sense of autonomy and control over their learning that increases motivation (Nicholson, 2012).
- An engaging narrative that unveils new information, characters, clues and mystery visitors.
- Multimodal technology and Connectivism using social media tools.

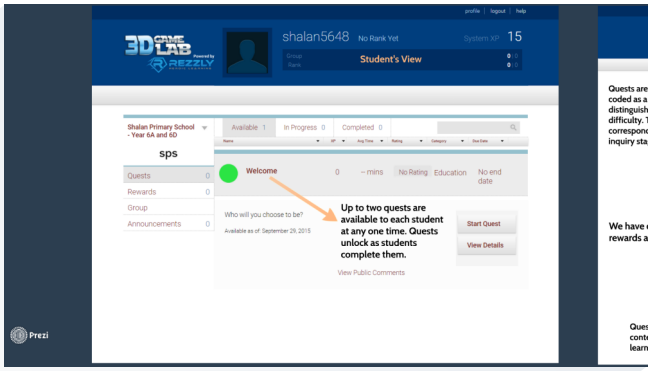
Clues are a key source of motivation in our unit. In contrast with a point/rewards systems, clues provide a sense of fun but are not dependent upon levels of performance. This is in line with Nicholson's (2012) definition of Meaningful Gamification. Students receive clues after completing each stage of the inquiry and each clue helps students with the subsequent stage of inquiry. Clues thereby act as intrinsic rewards that motivate students to progress through the inquiry process in a meaningful way.

An example of a clue tied into the unit narrative.

Content: Quests, Instruction and Multimedia

Online Platform

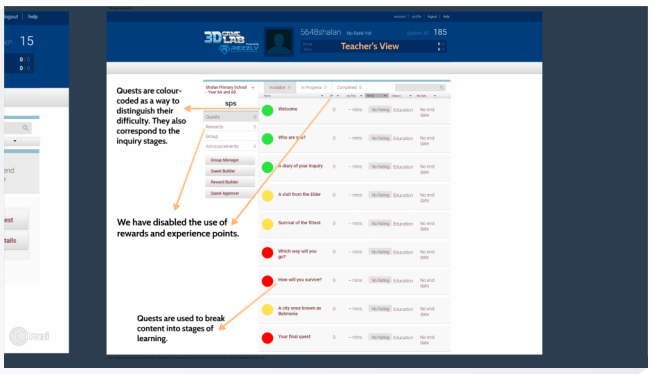
Acting as a gateway into the online world, we used a gamified Learning Management System (LMS), 3D GameLab, to present stimuli, provide instructions, present multiple learning pathways, track student learning and provide feedback and assessment.



In this space, students communicate, collaborate and explore multiple resources as they complete quests individually and in groups.

Quest-Based Content

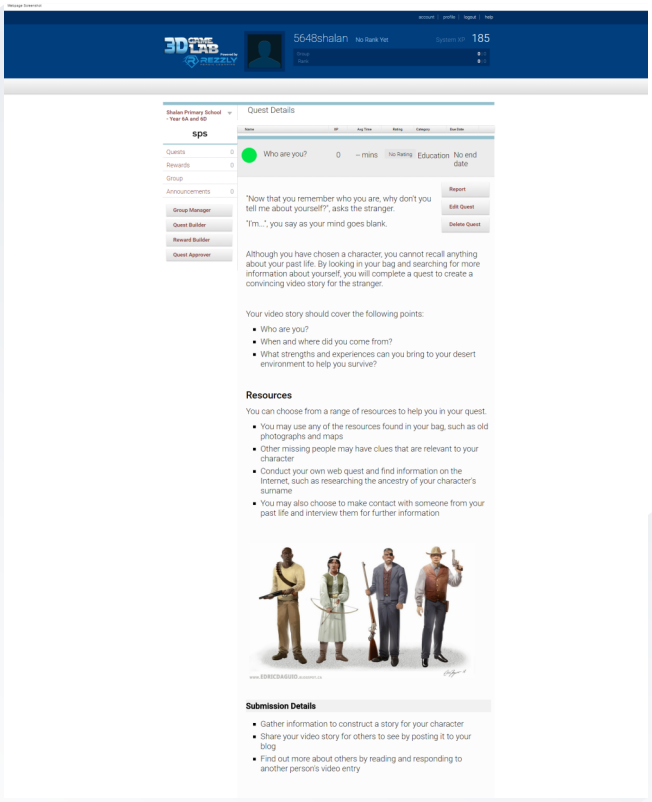
We segmented curriculum objectives into various tasks or quests, allowing us to identify student needs and provide appropriate scaffolding. Quests helped us to organise the content of the unit and complemented the inquiry learning model (Vygotsky, as cited in Hmelo-Silver, Duncan & Chinn, 2007).



Traditionally WebQuests guide students to locate and explore information that is often entirely online (Gilbert & Hoepper, 2014). We endeavoured to build upon past research by finding opportunities to make our unit more immersive and engaging in offline settings. We used Barab et al.'s (2009) work on Quest Atlantis as a model. In Quest Atlantis, students complete quests that reflect real-life scenarios within a virtual world. Additionally, we incorporated a variety of multimedia tools, including elements of augmented reality. For example, we explored Aurasma and Geocaching. These technology tools provide another dimension of understanding to class posters, maps, timelines and character charts.

We designed all quests to be authentic (students complete tasks that reflect real world settings), with embedded choice (students are motivated to learn because they choose what they want to do) and elements of play (students can explore real world challenges with imaginative thought).

By providing a range of quests and ways to complete them, the unit caters to Gardner's (1991) multiple intelligences and enables students to exercise their personal preferences (Gilbert & Hoepper, 2014). This is also a way of differentiating content and allowing all students to complete the unit, by following their own unique learning pathway.



Stage 1: Posing Questions and Planning (Green Quests)

Instructional Content

Incorporating an online world into our design presented many considerations and challenges. Giving students the ability to navigate through their own learning online requires a great deal of thought be put into the way students are presented with information and instructed to complete tasks.

Our unit is both delivered and understood in multiple forms, including verbal and non-verbal modes. This assists students to create more useful mental models and caters to learning styles and intelligence profiles of a greater range of students. Our unit draws on a range of research relating to online content, including but not limited to the following:

- Sweller's Cognitive Load theory (as cited in Paas, Renkl & Sweller, 2003)
- Mayer's (2009) Principles of Instructional Multimedia
- Henderson and Henderson (2006)

Instructional Multimedia Content

Following Mayer's (2009) Multiple Representation principle, we designed for the incorporation of multimodal presentation within quests. Our goal was to enhance student interest whilst reducing students' extraneous cognitive load (Paas, Renkl & Sweller, 2003). We did this through a combination of the following:

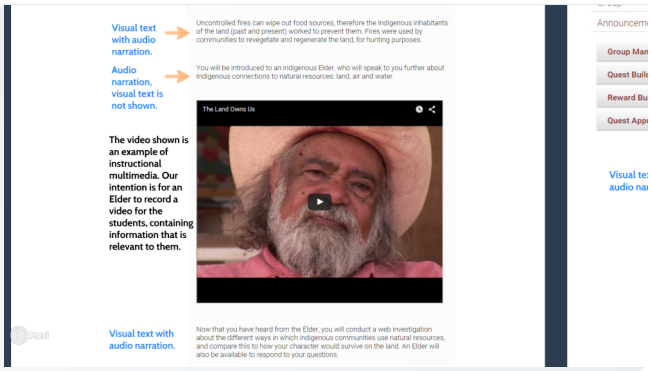
- Narration
- Instructional animation videos
- Instructional character videos (e.g. by the teacher, an expert or a fictional character)

Instructional Audio and Narration

We used a conversational style in our narration of quests, advocated by Mayer's (2009) Personalisation principle. Providing audio narration and employing character voices decreases students' extraneous cognitive load as they do not have to read on-screen text.

Instructional Animation and Character Videos

Animation videos engage the students and arouse curiosity. We segmented audio/visual information to make it easier to view and to build suspense, rather than present blocks of text for students to read.

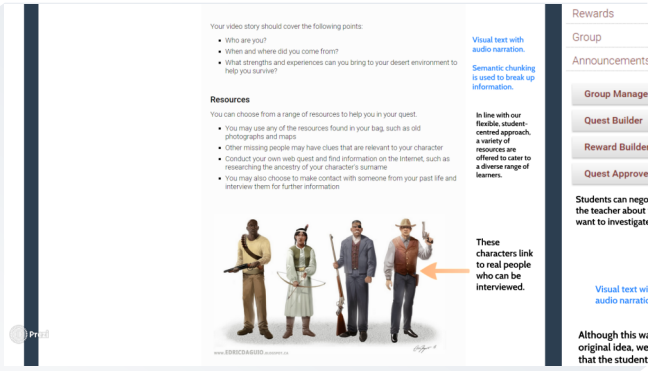


In terms of user control, our intention was to host all of our video content on YouTube so that students can pause, skip, rewind, speed up and slow down to their own preferences. Giving users control over their presentation leads to a better level of comprehension in comparison to fixed settings (Mayer and Chandler, 2001).

Content Design Principles

The format of quests is consistent and draws on content design principles discussed by Henderson and Henderson (2006), including:

- Semantic chunking, used to group together key information
- White Space
- Minimal colours, fonts, font sizes

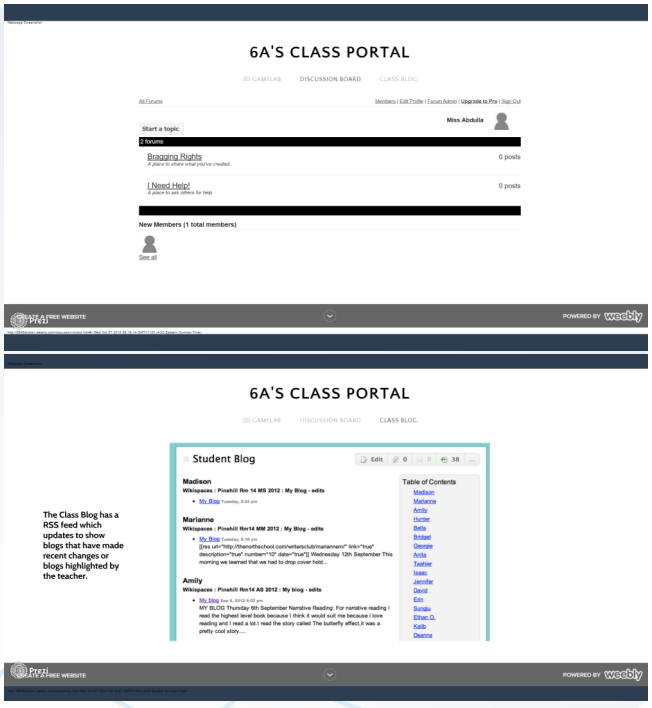


The 3D GameLab platform helped guide our content design by disallowing us from using too many colours, fonts and font sizes. Our quests promote readability through minimising unnecessary text and leaving space between our key ideas.

Communication and Collaboration

Interdependence of Learning

Communication and collaboration is a key component of our design that was considered in the earliest stages of our project. Firstly, we recognised the need to create a sense of community that would translate across the inquiry unit, in both online and offline worlds. We created an online space for students to communicate and collaborate through a Class Portal.



The facilities within the Class Portal, including 3D GameLab, discussion board and class blog, provide a private space for student-teacher dialogue, as well as a public space for both teacher-student and student-student dialogue. The Class Portal is a safe, contained environment, similar to Gee's (2013) analogy of a 'sandbox'.

Our design choices with respect to communication and collaboration reflect a loose alignment between Salmon's (2002) 5 stage model and our inquiry model. For example, in the initial stage of inquiry, quests require characters to familiarise themselves with the Class Portal's facilities and each other. In the later stages, the narrative requires students to knowledge-share and problem-solve together.

Consistent with inquiry, quests are designed to promote a participatory and contributory-oriented pedagogy in the following ways:

- Collaborative quests with students working in pairs or groups as 'guilds' (e.g., completing a map quest for resources, completing the class summative assessment etc.)
- Interdependent quests - students must knowledge share using Web 2.0 tools and augmented realities to progress through the inquiry

Rather than have the students respond to each other's blogs or forum posts after they have completed quests, we wanted quests to foster student communication and collaboration whilst students are questing. In line with our social constructivist approach, we wanted collaboration to influence perspectives and mould learning. The unit also gives students the choice to form alliances with other characters if mutually beneficial and request to work together.

Social Media Tools

The main communication and collaboration tool in our design is social media. This is due to the important inquiry aspect of community, connectivism and collaboration. Drawing upon Kaplan and Haenlein's (2010) definition of social media, its role in our design is to allow the creation and exchange of User Generated Content. In some instances, quests direct students to use particular social media tools, whilst in others students have a choice of social media tools. A list of example social media tools utilised in our unit follows.

- Blogs (e.g., Hosted by Wikis)
- Microblogs (e.g., Class Twitter account)
- Wikis
- Discussion forums
- Video sharing (e.g., PowToon, YouTube)
- Image sharing

Social Media plays a significant role in students navigating their way through the narrative of our unit. As students remain in

character throughout the unit, much of their communication and collaboration is essentially role playing. This pedagogy is particularly beneficial for the humanities and literacy (Gilbert & Hoepper, 2014). Social media tools help the students' characters create and share content, and role playing provides students with a safe and fun space to ask questions and offer help to others.

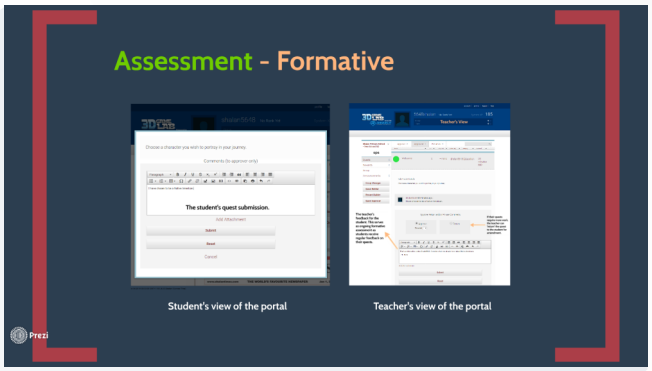
Additionally, we designed social media tools for teacher instruction, feedback and assessment.

Assessment

We aligned the assessment with the learning tasks, resources and supports provided in the unit. Our core influences of flexibility, gamification and inquiry naturally created an ideal environment for an authentic assessment.

Formative Assessment

Formative assessment is ongoing in our unit of work, as each student's progress is monitored both online and offline. Feedback is provided both during and after students' quests have been submitted on 3D GameLab. Student-student and student-teacher dialogue within forums are also part of formative assessment because they demonstrate what students are learning, as well as helping students improve their work.



When students receive formative feedback after submitting their quests on 3D GameLab, they have the opportunity to make adjustments. In essence, the students work to continuously improve their work throughout the unit. Ongoing formative assessment reflects students' growth throughout the process, rather than measuring whether they have reached a standard at a particular point in time. Gee and Shaffer (2010) stress the importance of focusing on growth with respect to assessment.

Summative Assessment

The summative assessment in our unit is an extension of the ongoing narrative and inquiry process, and is designed to encapsulate all student learning in the unit. It made most sense to design an open-ended, collaborative task to close the unit that could be assessed both individually and collaboratively.

Summary & Teacher Tips

The Framework

- **Use an ARG to frame the unit.** Narratives enable you to segment and connect curriculum objectives through the use of scenes and emerging themes. Learning can then be paced by introducing content in gradual arcs or stages.
- **The scope of the unit will impact the breadth of the story.** A multidisciplinary approach requires a more complex story than a unit that is designed for a specific subject (e.g., literacy). This will require additional time and work. It is easier to design an ARG by starting with a broad story and then narrowing its scope accordingly.
- **Use curriculum objectives to guide the creation of the ARG's story.** This in turn assists with the design of other fundamental components of the unit, such as instruction, content, communication & collaboration, and assessment.

- **Specific learning experiences can be designed within these stages that gradually scaffold students towards deeper levels of thinking.** We advocate basing this on the inquiry model and/or Bloom's taxonomy. Importantly, students should continue to be challenged.
- **An ARG offers a flexible and engaging way to immerse students in learning.** By starting with a broad narrative, teachers and students have the ability to veer the unit in multiple directions and add/subtract content as necessary.
- **Motivation is a key factor.** Consider the source of student motivation and the impact it will have on student learning. To achieve Meaningful Gamification, it is important to identify sources of internal motivation, such as hints and clues.
- **The unit is for the students!** Give students opportunities to make choices that shape the outcome of the narrative and keep them engaged.
- **Create an authentic learning environment that reflects real-world ideas and issues that are relevant to students' lives.** This allows students to take on different roles and consider various perspectives through character role-playing.

Content

- **Use a LMS such as Moodle, that possesses the ability to host the social media tools and multimedia content you require.** This creates a better user-experience for both teachers and students, as all the desired features are in one place. Additionally, it minimises teacher workload.
- **Use multimedia and social media tools that you are familiar with.** Although it is exciting to explore new technology that will enrich learning, it can be time consuming and exhausting to familiarise and upskill yourself with too much at once.
- **Chunk content in quests so that it is easier for students to read.** One of the benefits of using 3D GameLab is that it only shows content that students require. If you present students with too much information, it becomes difficult to navigate and things can be easily overlooked.
- **Ensure clear and effective presentation of quest content.** Narration is a key form of multimedia that will enrich learning, simply by being available to the students. For example, having text read to students in quests allows them to focus more on the content presented and less on reading comprehension.
- **The teacher plays a key role within the game as a facilitator of learning, particularly as a side character.** For example, the teacher can use clues to scaffold students who are falling behind, and provide new challenges to students who require it.

Communication & Collaboration

- **Provide spaces (i.e., discussion forum) for students to communicate and collaborate with each other.** It is important for teachers to actively monitor these spaces to build on student discussion, and encourage students to share content and ask for help.
- **Design quests as co-dependent tasks to promote communication and collaboration.** This way, students will learn from each other and gain new insights to challenge their current understandings.

Assessment

- **An ARG provides teachers with a rich number of ways to provide formative assessment to students, such as through the LMS, social media tools and in the classroom.** Teachers can keep the game moving by providing formative feedback to students in character and providing them with clues for their next task.

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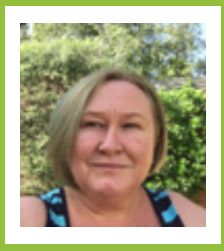
Technology

Its Implementation and Benefits to a Small Committee Run Kindergarten



Cathie Antony
Ferntree Gully 3 Year Old Kindergarten

Each year in the early childhood sector, I have felt that there was an increasing pressure placed on educators, in regards to the amount of administration and paperwork we are required to do to meet the outcomes expected. Two years ago, this pressure set me on a journey into the world of technology. I realised technology held the answers to not only fine tuning my workload but allowing me more quality time with my students. To ascertain what I needed to help me on the journey, I took a step back and critically thought about the work I did, the technology I was using, and how I could link my technologies together for best practice.

I found central to all these aspects, was the use of Wi-Fi, which then led me to request that my committee resource to seek out such technology for our kindergarten. Having a committee who understood what I wanted to achieve was paramount to improving our service through technology. Once this first step was taken, we increased our fundraising efforts so that we could obtain a Wi-Fi enabled printer, laptop and iPad.

The next few months were a case of trial and error, as I tried many differing apps until I found one that worked for me, and had everything required within the planning cycle, to enable us to increase our chances of an exceeding rating in the National Quality System. I found such an app in *Teaching Made Easy* which has become my 'go to' app for all my programming and

evidence needs. I print the resultant observation, and extension plans, using our Wi-Fi enabled printer before placing them in each child's portfolio. These portfolios are then kept in the classroom for ease of access for both parents and students.

The introduction of these portfolios into our classroom has seen the children question if they too can take pictures for their books. The interest displayed by the children, was proof that technology is ever present in their world. It enables them to connect with their learning, making it more meaningful, as it integrates technology into the classroom thus increasing their schematic development.

Purchasing digital cameras to extend this child interest was difficult for some parents to understand. Why would I permit a child to use an expensive item they could break? The photos the children take have a very different perspective to those I take, yet they are important visions of what the children see in our room and what's important to them. The children have yet to break a camera and are in fact, great at policing their peers if they see usage or handling out of the normal bounds for camera use. To show parents the importance of the children's photos to our program we installed a digital frame. The frame is perhaps our most popular item in the room. It

aids children's recall of information, increases their social interactions and enhances their sense of belonging to the program.

The parents often ask for copies of the photos the children have taken. This sharing of information had me reflecting again on how we could extend our reach into our community, and bring our families closer through technology. In response to this need I turned to Facebook. A Facebook public page for our kindergarten was instigated to increase our student catchment, keeping our enrolment numbers high and bring our wider community closer to us. A closed secret group was also created. This group connects with our families for the year. We share information about the kindergarten, exchange programming information, and facilitate general communication amongst our parenting cohort. The idea was to join new parents each year and remove parents from the previous year. Our parents, having established connections with us, would then move over to our open page and help increase our numbers through liking and sharing our open page.

Technology has definitely worked to our advantage as a result of these improvements. We now have a waiting list of students, double our allotted places available, and are heavily involved in our local community with links to primary and secondary schools, local vets, shops and retail services, librarians and many more all thanks to the liking and sharing of our page.

Discovering where to next has been a difficult step as its meant stepping back yet again, and critically reflecting on what we do and how we want to improve. Increasing our use of technology has meant we have needed to source information on how technology aides a child's development, without it taking away from a child's physical activity levels, which we found was the main source of interest for our parent cohort. To answer these queries, we looked to Denmark, as they have excellent physical play spaces. Discovering an article, *Connecting children to nature with technology: sowing the seeds for pro-environmental behaviour* held answers to our parents' reservations (Cumbo, Paay, Kjeldskov, Jacobs, 2014). The article allowed me the confidence to answer any concerns our parents may hold as it suggests that technology does not take away from a child's physical development but rather enhances it, enabling those connected, meaningful schema to develop further.

Further spending has since occurred in our kindergarten. We now have more iPads to use in our program. This year our children are very interested in videoing techniques, particularly slow

motion and time lapse videos. Our children request games they like – *Ant Smasher* and *Candy Crush Saga* hold significant interest due to their epistemic nature. We utilize our iPhone for music which is then connected to a Bluetooth enabled stereo. This surprised the children the first few times but has since become a part of our practice. If a child requests a song, no matter where in the room, we are we can make it happen which brings more children into the play at hand, increasing our ability to connect with more children at once. We have also begun using our immediate technology, such as iPhone or iPad, to answer questions that we would have previously had to wait until later to answer, by which time the moment is lost. A question raised recently, by the children, was in relation as to what types of dinosaurs we had in the room. They wanted the real names. We immediately investigated types of dinosaurs, and then extended this further by talking about habitats and differentiating between carnivores, herbivores and omnivores and connecting those facts to our lives – what were we?

In embracing technology and trusting the abilities of my students I have been able to create an inclusive, responsive and reflexive environment for all of us to learn together. Technology in my classroom has been relatively easy to introduce thanks to an understanding committee and fellow staff members who also embrace my passion for it in my teaching pedagogy.

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Google GLASS within education

David Costolloe

David completed his Master of Teaching in 2015, with methods of Geography and General Science. Before this he worked as a geologist in Western Australia since 2006, a role which needed practical skills within a variety of information systems, which he is looking to bring with him into his new role as an educator.

The possibilities and problems of the use of Google Glass within education

Google Glass, or just simply Glass, is a relatively new piece of wearable technology first released on a trial basis in April 2013. Glass is worn on the users head, with a small single screen display for one eye (see Figure 1) that appears around 25 inches is size to the user, and connecting via Wi-Fi to the internet (Borthwick, Anderson, Finsness, & Foulger, 2015). Glass's hardware and broad range of ever expanding programs bring together multiple forms of technology in an effort to link people to the digital world, in a fashion remarkably similar to the famous robot vision in the classic movie series 'Terminator' (see Figures 2 and 3) with the user seeing a digital layer on top of the real world (Strain, 2013).

The possibilities for Glass within education were immediately apparent to educators and educational organisations, with many participating within Google's initial 'Explorer' program so as to discover its potential (Nield, 2015; Otane 2013). This program allowed for a limited amount of units to be bought and used for $1500 USD, however only after the applicants passed an interview process designed to allow only those with beleifs in line with Google's famous "Don't be evil" motto to introduce Glass to the public at large through their own usage (Paterson & Glass, 2015). Individuals or organisation who received the product have since been allowed to experiment

Figure 1: *The beta version of 'Google Glass' from the 2013-2015 'Google Explorer' program. Retrieved from http://discovermagazine.com*

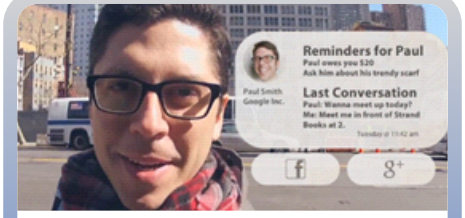

Figure 2: *A representation of one of the multiple functions of Glass's heads-up display. Retrieved from* http://www.techrepublic.com

Figure 3: *One of the multiple functions of Skynet's fictional anti-hero, the Terminator. Cameron, J. (Producer & Director). (1991). Terminator 2: Judgment Day [Film] Los Angeles: TrsiStar Pictures.*

with Glass, creating their own freeware applications, whilst providing feedback to Google.

As to the trials of Glass within an educational setting, by and large all have provided positive feedback accross a range of areas, with a noted increase in engagement of students both in the use of Glass and in the consumption of media generated by it (UWIRE, 2014). The work by educators using Glass has already illuminated many of the possibilities and drawbacks of the use of Glass within our schools, allowing for easy utilisation of many of the pedagogical techniques related to the incorporation of technology within education, and the creation many new ideas related to the supporting a variety of learner types (Mishkin, 2015; Nield, 2015).

The possibilities of Glass within education are seemingly endless, as it has the oppurtunity to be the next evolution in ubiquitis computing, whereby the technology itself retreats into the background, where it seamlessly becomes a part of the fabric of our lives, ever present, in contrast to desktop computing which is only accessable in a specific context (Skiba, 2014). In many ways, the general use of Glass by both the teacher and students has the possibility to allow the digital world to enhance education. However due the relatively new technology and the limited supply of these units academic research as to how Glass can be used within education has so far been relatively superficial. This is even further inhibited by problems within Glass's rollout, leading it to be redesigned and re-released at an as yet undisclosed point in the future (Bradley et al., 2014). As such the information I have used to create the following ideas about possible incorporation of Glass into a teaching model, and possible drawbacks, are based on concepts and theories with varying levels of supporting research.

Opportunities of Glass in education

General use of Glass across all subjects

In a theotetical classroom where the teacher and all students are wearing Glass, students will be able to perform ad hoc searches for relevant information to immediately understand any unknown terms or concepts (Skiba, 2014), and can access differentiated videos and information allowing for different avenues to learning (Borthwick et al., 2015). This could also serve a function whereby students who were absent or wish to review material can watch practical recordings made by the teacher during these lessons or even students who were present (Strain, 2013). A teacher's ability to communicate quickly and efficiently with students can also increase, responding to queries of students in the order in which they are electronically submited, also allowing more reserved students to communicate with the teacher in a way that does not make them feel uncomfortable. Teachers can also benefit from Glass via facial recognition programs that can automatically identify students names and even take the roll with very little effort, removing one of the more tedious operations needed currently in every class (Borthwick et al., 2015; Paterson & Glass, 2015).

A number of software programs have been developed by members of the 'Explorer' program for specific subjects to address specific needs of teachers and students, or providing oppurtunities for educational experiences not possible before this technology was developed. One such program was developed to immediately allow musical timing to be analysed and reported to the wearer, allowing a music teacher to give immediate feedback to students in both conducting and instrumental music classes, a much more efficient method than the usual method of videotaping each student and playing this back with feedback at the end of the lesson (Otane, 2013).

A variety of other programs have been developed to assist students with special needs, such as; 'FingerReader, a read aloud programs to assist visual impairments (Marks, 2013), integrated auditory trainers connected to hearing aids to assisst hearing impairments (Borthwick et al., 2015), 'Emotient' a program to recognise emotions to aid students with down syndrome (Paterson & Glass, 2015), and a range of other programs for a variety of conditions.

Private companies or Google itself also create more complex programs for the larger market which can still be used in a educational context. One such program is 'Word Lens', recently bought by Google, which automatically identifies characters, translates these into a specific language, and projects these translated words over a digital copy of the image

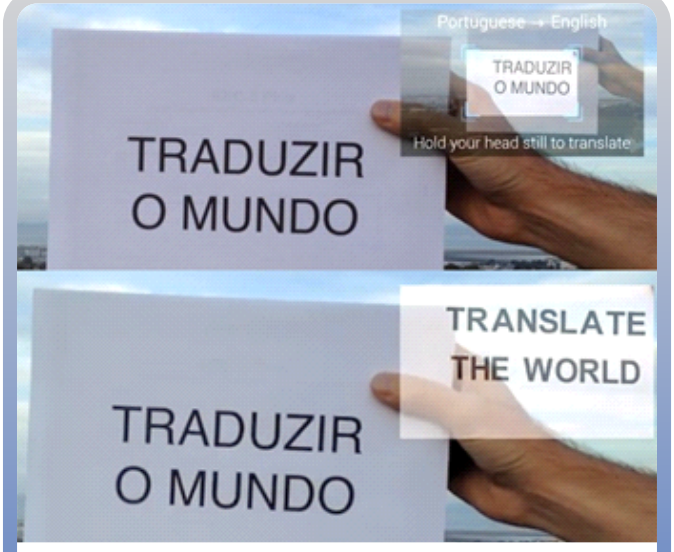

***Figure 4**: A representation of 'WordLens' being used by Glass, translating Portuguese to English. Screenshots of video retrieved from https://www.youtube.com/watch?v=pZKWW3rzT2Q*

(see Figure 4). This is a great tool to allow non-native speakers to comprehend content much more rapidly than identifying unknown words and looking up the translation (Golson, 2013; Marcinek, 2013 in Borthwick et al., 2015). A foreseeable problem that will need to be investigated is how the use of such automatic translator programs could impede language aquistion due to students developing an over-reliance upon them, resulting in the student not actually learning sufficient vocabulary from the target language (Baker, 2006).

Enhanced field trips

Outside of the classroom Glass can also allow for an enhanced field trip experience, an example of this is a freeware program already in use entitled 'Field trip', developed by members of the 'Explorer' program. Within this program the user can look

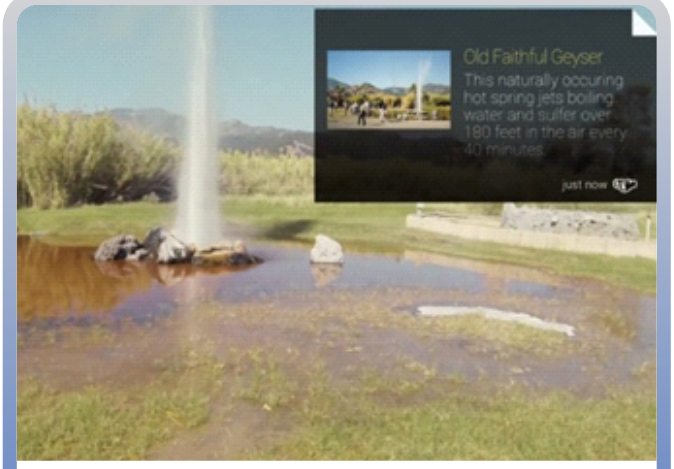

Figure 5: *A representation of 'Field Trip' in operation, retrieving information about a geyser. Retrieved from http://venturebeat.com*

at various structures and have information of that structure retrieved from the internet and displayed on Glass's transparent screen whilst the structure remains in the field of view (see Figure 5). This is made possible by the geolocation data provided by its inbuilt GPS, magnetic and gravity field sensors (which most smart devices have). By using this program, if the data is available, students can learn about any location as they explore them (Borthwick et al., 2015; Paterson & Glass, 2015). I do see a need however to filter such information based upon the purpose of the field trip, as an abundance of information could have a disengaging effect for students, such as we see in museums when people are given the electronic guides.

Additional functions within Glass that could also prove useful during investigative field trips is the video capture function which allows for impromptu short interviews with people met by a student or simply pictures and video/audio recordings of locations with geolocation stamps to give them context. A problem does exist though due to the emergence of negative opinions amongst some members of the public towards users of Glass, which could lead to negative reactions amongst interviewees, impacting on interviews (Paterson & Glass, 2015; Tsukayama, 2014). This negative reaction is explored later within the section 'Negative profiling of Glass users'

Augmented Reality

Augmented reality is an area in which Glass has a great potential to transform in class pedagogy, by it's ability to introduce a interactive digital layer over the physical world, complementing reality, rather than virtual reality, which simply aims to replace it. One of the most utilised methods of augmenting reality is the embedding of videos into physical objects by use of QR codes, specific text or imagery which Glass can scan and play, overlayed onto the same area. This technique allows for 'discovery' of extra information, and if linked via appropriate real-world content, such as related materials (imagery or words), can forge strong mental connections and greater understanding of the content by the students (Borthwick et al., 2015; Gittlen, 2013).

The leading application at this point for such augmented experiences is 'Aurasma', which has been on the market since 2011, designed for all recent smartphones and tablets, with a working version for Glass likely not too far away. This technology already engages students in classrooms by bringing word walls to life, assist in treasure hunts and creating living textbooks and immersive worksheets that link to video's and websites. The limitation at this point is a students needs to hold their smartphone or tablet over their field of vision to experience these augmented experiences (Borthwick et al., 2015). Similar programs on Glass can actually add this extra layer seamlessly over the real world by use of its transparent screen, without the filter of the external device, creating a much more immersive and seemingly 'real' experience (Borthwick et al., 2015; Riterfeld, 2009).

The next step, as is see it exists in the possibility of linking objects in the physical world to the digital world, allowing for a great way to understand more about specific objects and materials. This is already used within clothing where embedded scannable chips connect external devices to online data sources with relevant information (Borthwick et al., 2015). Imagine, for example, holding different types of metal in your hand, with associated short videos appearing, each describing the different ways each metal can be utilised in industry, or manipulated by the students themselves within practicals. This methodology would be far more engaging than simply having students read information or watch a class video at the front of the room. This increased level of reference would further reduce any necessitated mental leap between the material and the information, leading to a reduction in a students necessitated cognitive load, increasing the likelihood that this knowledge will be transferred into long term memory (Cooper, 1998).

Gamification

An oppurtunity also exists with Glass to bring the techniques of gamification to life. Gamification is the concept of extracting the elements inside games, designed to promote the user to keep playing for extended periods whilst learning and operating complex systems, and then applying these concepts to educational methodology (Deterding, Dixon, Khaled, & Nacke, 2011). This generally takes the form of point systems, where students are allocated points when completing educational tasks, with some related bonus scores for fulfilling specific criteria (i.e. all questions correct in first attempt, completion of task within a short timeframe, etc). These points are then accrued and form the basis of the marking system, with possible inclusion of extra game elements, such as leaderboards to promote competition, or levels and rewards which can be reached by continued participation in the program. (Attali & Arielli-Attali, 2015; Deterding et al., 2011). This type of gamified educational method is still in it's infancy, and the limited studies investigating it have produced mixed results, with often little academic benefit compared to traditional educational techniques, although generally there are short term gains in engagement. These studies though, were all conducted in a rather bland computer based format, with varying amounts of access to the activities and feedback, along with limited sample sizes (Lee & Hammer, 2011).

Glass however, via a mix of its augmented reality capability and these gamified elements can begin to make the classroom iself a game, allowing students to access open data sources to compare the other students progress in real time. This could not only further drive competition amongst the students it could also promote communication and collaboration, as students see who has completed specific tasks and can then learn from each other. (Borthwick et al., 2015). Glass can also allow students to exchange information instantly from anywhere they are completing activities, impacting on both the speed and competition of these activities. The competitor network need not be only within the one classroom or even school, allowing for the creation of large game communities where the tasks can be compared and discussed at the students leisure, though care should be taken that such collaboration does not simply mean copying answers (Borthwick et al., 2015; Personas que Aprenden, 2014). There are some dangers that such comparisons amongst students could lead to conflict amongst students as their abilities are likely to differ, leading to a variation in results, as such the educator should take this into account when designing activities and be ready with an appropriate response if such a situation still occurs (Attali & Arielli-Attali, 2015).

Flipped classroom

Perhaps the one instructional method which can be immediately and heavily impacted by use of Glass is the use and effectiveness of flipped classrooms. A flipped classroom involves a student being introduced to a concept via online content which they access outside of class, generally at home, freeing up class time for more engaging, generally collaborative actvities which can reinforce and build upon these previously understood concepts (Hodges & Weber, 2015). This is in contrast to the traditional teaching method where students are both introduced to concepts and engaged in related activities during classtime, with any work outside of class just reinforcing those learnt concepts. Generally the content accessed by students is created either via handheld cameras, fixed cameras on tripods or a screen capture recording of what the educator is viewing on a computer. This technique became popular is relatively recent years, after it gained popularity in the USA in 2006 (Milman, 2012).

Since it's inception flipped classrooms have received much attention from both educators and researchers and has been found to be an efficient method of instruction across a broad range of subjects. The advantage of this method however relies on the following to occur; the quality of the video lecture is of a high standard, all students view and pay attention to the video content, and finally that the concepts can either be sufficiently understood by the students or communication still could ensue between student and educator after or during the viewing to clarify any necessary points. (Carter, Qvarfordt, Cooper, & Makela, 2015; Milman, 2012).

The ability of Glass to revolutionise this process is via the creation of much more engaging media content, created by the educator with Glass in a dynamic and engaging first person format, providing a seemingle 'lived' experience for the viewer (Carter et al., 2015; Paterson & Glass, 2015). Whilst devices such as GoPro can provide a similar recording, Glass has an advantage over these, with possibility for immediate feedback from any users concurrently logged during its live recording and broadcast, less need to consult the device before and after recording, and possible digital overlays of information generated by the many programs which Glass can run (Carter et al., 2015). Although no actual large scale studies have been created to assess specifically how effective Glass is for the flipped classroom, a number of participants in the 'Explorer' program have already begun using Glass in this way, with positive results. One educator stated, in regards to computer science tutorials, that Glass was much more effective than previous screen capture videos in regards to its fluidity, due to its ability to capture the perspective of the computer user with the viewer able to see how the mouse and keyboard were being utilised (Jones, 2014).

In a study of the creation of 'how to' videos by Carter et al. (2015) it was found that veiwers preferred Glass videos in any activity that needed to be completed in a non-tabletop environment, especially with larger objects that required multiple angles. Glass was also preferred by the author, due

mainly to its ability to shift their attention from the capture device, allowing them to focus on activity being completed (Carter et al., 2015). An application of such tutorial video's has already been implemented in a online hair stylist series of videos, with students accessing videos created by reputed professionals in the industry who wear Glass whilst they work. This allows students to see the creation of specific hairstyles the professional's point of view, supplemented with commentary, providing a unique, more personal perspective. Whilst interesting, it should be noted that there is no related study into the effectiveness of this specific application. (Introducing Matrix Class For Glass, 2014).

Possible problems with Glass in education

Negative profiling of Glass users

Up to this point, this essay has dealt with the range of possibilities which exist for Glass within education, however there are a number of limitations and even dangers which have to be addressed. One of these is the emergence of a negative stereotype about the users of Glass, primarily in Silicon Valley where there currently is a large amount of Glass users who have begun to wear the system in their everyday life. Within this region there has already been a recent emergence an anti-gentrification movement, resulting from dramatic price rises in property and the rise of a tech-elite culture that is perceived to be out of touch with the rest of society. Many people have begun to feel threatened by the possibility of being filmed by Glass without permission, and have begun collectively derogatorily referring to wearers as 'glassholes' (Paterson & Glass, 2015). Although the majority of the public does not share these sentiments, a handful of attacks on users have already been reported. Ill sentiments about Glass have also begun appearing in restaurant owners, for privacy issues, and movie theatre owners, for piracy concerns, a number of whom have begun banning the use of Glass on their premises. Whilst current laws on driving do not take into account such wearables, police have begun pulling over and fining its users, irrespective of whether the device is active or not, although these were later repealed (Borthwick et al., 2015; Tsukayama, 2014).

All these incidents have been occurring within the limited amount of users of the 'Explorer' program, which itself has a vetting process for its members and frequent communication with them about how to act as 'positive ambassadors' (Tsukayama, 2014). When, however, Glass will be released to the public at large, Google will have no control over its users, and the possibility for conflict and the rise negative stereotype will likely increase. As such we have to understand these safety issues before we, as responsible educators, hand out devices to our students due to such a possibility of harassment and violence.

Internet Addiction Disorder

A physiological danger also exists from a possibility of excessive use of Glass due to a possible connection with Internet Addiction Disorder (IAD). IAD is a relatively new concept and has yet to be recognised by the 'Diagnotic and Statistical Manual of Mental Disorders', the primary reference guide for groups and individuals that have a professional connection to treatment and management of mental disorders. This is likely to change with its next revision as many other prominent publications, such as 'The American Journal of Psychiatry' have recognised IAD as a legitimate clinical disorder, similar to other addiction disorders, with an ever growing amount of people being diagnosed with the condition and recognition of symptoms including isolation, sleep deprivation, mood swings, withdrawal and even seizures (Bishop, 2015; Shea, 2015; Yung, Eickhoff, Davis, Klam, & Doan, 2015).

IAD has been especially prevalent in China and South Korea where it is seemingly quite common for large amounts of the population to spend excessive amounts of time connected to the internet. South Korean governmental reports estimate that around 2 million school age children either suffer from this disorder or are at risk and within China there are reports that state that at least 10 million adolescents suffer from IAD (Bax, 2013; Shea 2015). For the South Korean example, the government is already running centres that attempt to deal with IAD en masse via a variety of techniques, ranging from counselling to a highly questionable use of 'magnetic shock therapy' (Shea, 2015).

As such any possibility of such a disorder being promoted by use of Glass should be thoroughly investigated, and unfortunately there has already been one documented case of IAD from excessive use of Glass by a participant of the 'Explorer' program. This patient would often spend 18 hours a day using Glass, both at work, as it allowed him to function more effectively, and at home, removing for only sleep and bathing. Symptoms of frustration, irritability and argumentativeness began to be noticed of the patient after extensive periods of use, and, upon seeking treatment, he reported problems with short term memory and clarity of thought, even having his dreams as if looking through Glass. After a 35 day treatment consisting of therapy and non-use of Glass, all symptoms except for the dreams recorded significant reductions in occurrence. It should be noted that this patient did have a history of drug abuse, as such was already predisposed to addictive tendencies (LaPlante, Nelson, & Shaffer, 2012; Yung et al, 2015).

Due to both the seeming predisposition of youth within today's culture to acquire IAD and with a case already occurring within a relatively small sample of people and timeframe, any attempt to incorporate Glass to a large extent within the education system should be taken with care (Bishop, 2015; Yung et al., 2015). We should remind ourselves however that this is just a

single case, and as such further research should be undertaken about this possible connection to IAD, especially in regards to adolescents.

Privacy of students and teachers

Possibly the largest barrier to Glass's acceptance within education is the concern relating to the production of large amounts of media by and of students, and the possibility of the privacy rights of these students being violated when this data is handled improperly. This issue links onto a larger perceived problem facing society of 'big data', whereby massive quantities of media are being created by members of the public, with vague legalities upon who, if anyone, owns this data (Kelly, 2013; Paterson & Glass, 2015). As such, within a school context where the data relates to underage students, if such data became available to members of the public, large legal and moral implications will inevitably occur. Seemingly the only option available to address this is secure onsite storage, rather than storage provided by external private organisations, with an implicit understanding of teachers that this data is to be deleted once it is no longer needed (Brickman & Geolitz 2014 in Borthwick et al., 2015). This process however is not fool proof students can store their information wherever they choose as long as they have internet access, which will likely occur even if instructions advising against this are communicated.

Generally the teachers who themselves are interested in using Glass in their classes see this technology as an opportunity to approach teaching from a different direction and allow learning processes to become easier and more fluid. Within the faculty at large however there are many teachers that are concerned by the implications of Glass and the implications it brings for them and are often acting to stifle attempts by other educators to introduce Glass and other wearable technologies into schools. (Borthwick et al., 2015; Vaughan, 2013). These educators often fear that mandated or allowed usage of such technology, with students ability to record and immediately broadcast teachers' actions to the world and could result in their actions whilst teaching misconstrued (Skiba, 2014; Strain, 2013).

Technical problems

Due in most part to Glass being only available in the beta stage, a number of hardware problems and software difficulties have surfaced, along with a variety of suggested improvements to the device which could improve overall functionality.

A common problem noted by users is the tendency for the arms of Glass, which is where the battery is stored, to become overheated and uncomfortable for its users, even powering down when it reaches a critical temperature (Jones, 2014). This is a result of the devices small size and weight of 36 grams, which also limits battery life to around 5 hours, with a need to charge up daily (Bregger 2013; Paterson & Glass, 2015). There is no obvious solution for this problem, other than creating a larger, heavier device, which is not what the general public would not want. Larger alternatives to Glass with better functionality are available but are predictably proving less popular with the market (Bregger, 2013). One problem, distinct from the others listed here, is that most users simply find Glass to be ugly, which, over all other problems, is the main drive behind the current re-design of the product (Marks, 2013; Paterson & Glass, 2015).

In terms of software, there is a range of small problems, including no preview for photos, special selection needed for video clips longer than ten seconds and no option to auto-upload content (Carter et al., 2015). The most troublesome software issue, especially in a multi-user school environment, is the limitation of only one Google account logged into each unit, with a factory reset necessitated if a alternate user wishes to login to the device (Paterson & Glass, 2015). As these issues are not linked to the hardware of the device it is likely that subsequent updates to the core software could fix these problems, which will likely occur in the near future, or simply be included in the updated product (Marks, 2013).

Whilst some problems with the current features have emerged there are also a range of suggested improvements to Glass, especially towards the goal of ubiquitous computing. Currently Glass picks up on verbal commands, specific images, motion, orientation, proximity and eye winks, however there is also opportunity for it to respond further to wearers gestures such finger clicks and hand waves. Another idea is to utilise face capture technology, already existing in other products, which allows an image of the user to be created by stitching together videos from multiple cameras recording different sections of the face, which can then be included in chat or video recordings (Carter et al., 2015; Marks, 2013). A further idea is the inclusion of gaze tracking technology, where a sensor analyses the user's eye movements to identify what the user is looking at. The applications of this could range from simple warnings if the user is looking at too much 'junk', all the way to creating an ever more immersive experience where a menu can be activated simply by looking at it (Marks, 2013).

Looking ahead

Whilst the Glass programme is undergoing its current overhaul, any widespread use of this technology in the classroom will have to wait. Microsoft is also preparing to release its product to rival Glass, the HoloLens, although with much less hype and attention than Glass has received. The incorporation of Glass within education, if it happens at all, is likely to be an incremental one, as has already been occurring on a small scale with the few units already in circulation. Initially some teachers will likely begin attempting Glass for the uses I have described in this essay, as well as for other novel uses. In doing so many will likely come across a variety of problems,

possibly including those I have described here, and it is in how they overcome these obstacles, or in turn are overcome by the obstacles, that will likely determine the future of Glass within education. However if these 'pioneers' of Glass do manage positive results, I look forward to the future of classroom where both students and teachers can take full advantage of Glass and other wearables, and, in line with the ubiquitous computing ideology, allow technology to support learning in an open and reflexive manner, rather than impede it by creating a unnecessary technological barrier.

Top tips for educators

If an educator is interested in the possibilities of Glass for their classroom I recommend these 3 top tips;

1. Start Small

Rather than going all in and buying a unit for evey student in the class I would recommend firstly the educator themselves begins experimenting with how they can use a single unit to create and utilise material, both in and out of class, as in the flipped classroom example. This also limits legal complications as the students do not have the opportunity to misuse the technology, and give the educator an understanding of how to best handle this difficulty if the decision is made to incorporate student use.

2. Become part of the community

Being the first educator within an institution to attempt using Glass can seem isolating and overwhelming, especially given how complicated many of these BETA applications can be, however you are not alone! Many others have been experimenting and sharing their insights online, and they are eager to build their community. Joinng the Google+ community through groups such as 'Google Glass in Education' can make this process less daunting , access the following link to have a look; https://plus.google.com/communities/107609996462187425150

3. Lead by example, don't be shy!

It's difficult to change the whole culture of an educational institution all at once, however if effective use of this technology is achieved, an educator should be proud of their achievement and discuss, and even incorporate, other faculty members in the use of Glass in the classroom. Cultural shifts within school take time; however, as we have seen with other technology, educators are adaptable to such shifts in practice if they can see such positive uses in action.

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Making Friends:

A serious game for enhancing wellbeing and developing positive social relationships

Emma Beaton and Samantha Simmons

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Due to the increasing influence of digital technology on educational practices, we have proposed the development of a serious game for P-6 learners in primary school to help them develop necessary social skills and build positive relationships. This paper will focus on the specific details of level one learners however the format of the serious game will feature a series of levels whereby users can build knowledge throughout (this will be discussed on more detail later). Focussing on a specific level enables us to be more specific with regard to addressing the learning outcomes and ideas behind our thinking for our serious game. Below we will outline to you the need to address the health and well being of children in primary school and why a serious game is an appropriate platform to achieve this goal. We will make reference to current and relevant research and draw upon curriculum documents to justify our concept. We will then go into detail about the instructional design of this serious game we pose, focussing on the first level that the level 1 learners would undertake. The scope of this serious game is to have p-6 learners undertake their own learning tasks that correspond with their year level.

For young Australians there are goals that have been developed by The Melbourne Declaration, which sets out what educators should aim to achieve with their young learners. Two goals within this declaration explain that learners should become active and involved citizens (MCEETYA, 2008), which is also supported by Drake (1998). Therefore with this understanding it is clear to see the need to embed learning about social relationships and also promoting physical activity into the students' curriculum as this may assist them in leading a more healthy and active life. By promoting and educating students about building friendships and forming social relationships, we are encouraging students to become more informed citizens who are actively involved within society.

St Ledger (2006) explains that if young learners are to receive some basic knowledge and understanding on different health issues then it is more likely that the individual will adopt behaviours that will enhance their health. With a study done by the National Health and Medical Research Council (NHMRC, 1996) it was discovered that most children did not follow and lead a healthy lifestyle (Lindsay, 2010). The incidences of obesity and chronic disease associated with physical inactivity, despite national recommendations in the USA, continue to increase (Johnston, Sheldon & Massey, 2010). It is also said that it is particularly important for young people to understand and change their behaviors early in life, otherwise these established behaviors from childhood (such as lack of physical activity) will carry forward into their adult life (Johnston, Sheldon & Massey, 2010). Therefore it is important that we teach our young learners how to lead a healthy and active lifestyle by

embedding the appropriate behaviors, attitudes and actions into our lessons as teachers (Donatelle & Davis, 2004).

When a student undertakes physical activity, there are social, emotional and physical benefits for the individual, which is directly related to their health and overall wellbeing (Jago, Brockman, Fox, Cartwright, Page & Thompson, 2009; Morgan & Hansen, 2008). Landy and Burridge (2002), also support this theory by explaining that we must consider not only the physical aspects associated with health and wellbeing but also the social and emotional aspects to achieve a holistic experience in the classroom. Undertaking physical activity will also assist students to prevent risk factors associated with cardiovascular disease, assist developing their physical fitness, and improve self-esteem. There is also links with improvement in academic performance as supported by Meaney and Kopf (2010). There are implicit links between physical health and mental health, which support the development of learning environment whereby these two constructs are addressed.

Kids Matter (2013) explains that at any age, friendship is an important concept and the benefits associated with friendship include providing the individual with support, and promoting mental health and wellbeing. Children that have friends tend to perform better academically than those who do not have friends (Kids Matter, 2013). Children that find it difficult to make friends generally feel lonely an unhappy with themselves, and this feeling of rejection can lead to significant distress to the individual. It is also noted that children who are good at making and keeping friends generally use positive social skills (Kids Matter, 2013). The information provided by Kids Matter (2013) highlights the importance of friendships and the necessity for relevant social skills to be included in the classroom. Social networks can be used to endorse health-promoting norms in primary schools (Everley & Macfadyen, 2015).

Learners exhibit learning preferences that require teamwork skills, are experiential in nature, are structured, and ones that also use technology (Oblinger, 2003: Oblinger, 2004). One way to incorporate both physical and social interactions into the classroom to include these learning preferences is through the design, development and use of a serious game. Raisamo, Wallden, Suhonen, Myllymaa, Raisamo & Vanni (2012) explain that there are game designers and psychologists that strongly believe in the concept of gamifying daily life experiences to ultimately produce a society that is healthier, more productive and contains more engaged citizens.

Curriculum links

The Australian Curriculum (Australian Curriculum and Reporting Authority, 2015) outlines some key areas that level 1 learners need to achieve in relation to communicating, health and physical education, Information communication technology and interpersonal development. Level 1 learners are expected to be able to experience a variety of different ways to communicate, including through the use of technology. With regard to health and physical education learners are expected to work toward a number of things. This serious game will allow for moderate to vigorous activity at times, challenge users to think strategically, communicate and cooperate to allow performance enhancement and improve their game performance. It also allows students to consider what it means to be physically, socially and emotionally healthy and also get them to work in small groups to solve tasks (ACARA, 2015).

The serious game will also address the curricular strand of interpersonal development by allowing users to develop certain skills and behaviors that will allow them to connect to a variety of groups including peer groups and community groups. They also consider what influence they may have on others behaviors and how others may impact on their behavior and emotions. Our serious game has been developed with several considerations and links to areas of the Australian Curriculum.

Serious games

Interest in the use of serious games in educational settings is particularly relevant to primary school aged children due to the availability and popularity of general video games for primary school aged children (Beavis, 2012). The current reality is that by the time students get to primary school; they would have already had significant engagement with new technologies and media (Beavis, 2012). 'The new generation of students is fundamentally different from former generations, mostly because of changes in their media consumption' (Bourgonjon, Valcke, Soetaert & Schellens, 2010, p.1145). This concept of students growing up in this technologically rich environment has sparked suggestions that these students require a new educational approach to accommodate such changes. It is also suggested that through this increased use of technology, these students are able to gain and develop new ways of thinking as well as specific technical skills (Bourgonjon et al. 2010).

"General trends in research indicate the increasing popularity amongst learners for using serious games and simulations to support curricular objectives" (Guillen-Nieto, & Aleson-Carbonell, 2012, pp. 435). The 'trends' that are referred to here are represented in the statistics that 'Australian children aged 8 – 11 spend an average of 30 minutes on the internet per day, while around 30% [have] a game console of some kind in their bedroom' (Beavis, 2012, p. 17). The same paper reports that three of the four activities young people like to do for fun are electronic-media related. These findings confirm the

notion that the influential role of digital technology is continually increasing.

Serious games provide opportunities to practice key soft skills such as decision-making, problem solving, inquiry, multitasking, creativity and collaboration. Not only this, but serious games can also be utilised as a means for active construction of knowledge rather than passive reception. Connolly and colleagues (2012) support the concept of serious games as a means for conceptual learning as they highlight that learning is most effective when it is active, experiential, situated, problem-based and provides immediate feedback, all of which are features that can be included in a serious game.

Serious games not only assist students to learn particular content knowledge and promote certain skills, they also have an abundance of other general benefits for individuals by simply engaging in, and playing the game. The increasing popularity of serious games in both formal and informal contexts emphasizes their level of enjoyment. Connolly and colleagues (2012) and Arnab and colleagues (2012) inform that student enjoyment is in itself, a positive outcome. The same studies report that students or game users are more likely to retain information and are overall generally happier when they enjoy doing the activity. As our particular topic of interest pertains to assisting students to develop positive social relationships, it is imperative that they enjoy the serious game to ultimately provide them with optimal opportunities to learn skills and strategies to effectively do so.

Playing a video game for a limited amount of time has been shown to lead to improvements in selective attention tasks, academic performance, addition, working memory and auditory perception (Connolly et al., 2012). In relation to skill-based outcomes, serious games have been associated with increased technical and motor skills. Similarly, game users have also been shown to increase their fine motor skills and typing capacity. There are also several positive cognitive outcomes that result from engaging in serious game play. Research has shown that serious game usage can lead to improvements in both declarative and procedural memory (Connolly et al., 2012). Other skills that can be developed through serious game play include self-regulation, collaboration, communication and teamwork. Serious games also have the potential to change players' beliefs and attitudes and can also alter their emotions in addition to helping them learn. Some serious games have even been shown to increase empathy (Connolly et al., 2012).

Specifications and goals

Our particular game '*Making Friends*' is developed with the intention of assisting primary school students across all year levels. Within the game, there are a series of different levels that can be selected based on the age of the user. Content and objectives will be different for each level and are dependent on the specific skills necessary for users to develop their social skills.

The overall goal of this serious game is to assist students/users to ultimately develop sufficient physical, emotional and social skills so they are able develop into happy and healthy functioning members of society. By developing a serious game centered on building positive social relationships, we intend to provide students with an engaging and enjoyable experience where they are able to develop valuable social skills to ultimately build healthy friendships. We also want to provide students with an environment where they are able to practice collaboration and teamwork, as these are skills that are valuable in assisting students to develop friendships and build positive relationships and social skills.

Instructional design

Instructional design and development really consists of three parts, which are Analysis, Design and Development (Iuppa & Borst, 2010). Given these three constructs will determine the content of a serious game we put a lot of emphasis and thought on these components. The instructional design of our serious game will ultimately tell us how to present the information in a way to assist the learner in understanding the outcome of the serious game. Therefore before we delved into our game design a lot of time and effort was spent on the instructional design aspects given the importance of it for a high quality finished product. (Iuppa & Borst, 2010).

Game Analysis

The analysis of what the learning problem is was surrounded by the notion that children need to develop positive social skills, which requires an interaction with others. Given that the health and well-being of a child is composed of 6 elements, which are social health, physical health, intellectual health, emotional health, environmental health and spiritual health (Donatelle & Davis, 2004), we saw it necessary to combine more than one aspect of health into the instructional design of the serious game. Given that physical activity can be a very social activity we believed that combining the learning of both of these elements of health and wellbeing into the instructional design was appropriate (Donatelle & Davis, 2004).

The learning problem is based on the idea that primary school students are currently not provided with a forum through which they can develop and practice social skills as well as build content knowledge on the importance of physical health and mental wellbeing. By educating students about the long-term

benefits of physical activity on emotional health, we endeavor to encourage students to partake in social and physical activities to improve their overall health and wellbeing.

Game Design

Given that we want learners to use positive social skills and develop these through play in the game, we decided to incorporate elements of collaborative play within the game. Levels of the game will involve tasks that need to be carried out with three or more players. It is shown by Wendel, Gutjahr, Gobel & Steinmetz, (2013), that by using collaborative learning tasks in serious games; learners must use social skills such as teamwork and communication to solve the tasks.

To promote physical activity we have included the need to be actively involved in the game itself. Such ideas would involve jumping, bending, ducking, lifting and grabbing objects. Mandryk, Gerling & Stanley, (2014) suggest that children and teenagers need to do about 60 minutes of vigorous activity a day to benefit their health. Given children spend a lot of time at school during the week, and the curriculum outlines the need for physical activity to be incorporated into the classroom (ACARA, 2015), designing a fun and interactive serious game that includes these things can only be beneficial to their health and their learning.

Serious games can be used to address issues that affect health and well being of children whilst still remaining fun. The elements of the game can include that of a challenge, risk, defeat, success and they can be applied in a way that will teach the children a lesson, get them involved in an activity or even potentially change the learner's behaviour (Edgerton, 2009).

Public health professionals have known for a while now that simply providing information about health and how to be healthy will not motivate people to change their behaviours. Actions need to be taken that will allow the individual to make a behaviour change.

The social cognitive theory is seen as the way one behaves based on their understanding of the world they live in, their existing knowledge and skills and incentives in their life. The social cognitive theory has certain elements whereby these elements can be used to change a person's knowledge or skills, can also influence their understanding of the different benefits of behaviours, and can also provide the capacity for them to behave differently.

Gaming is an ideal opportunity to model behaviours where we want the individual to adopt these behaviours. It provides a safe environment for the individual to experiment and practice these behaviours without any real consequences. They can learn to see the behaviours are positive ones and can learn to adapt and use them in their daily lives.

Peng & Liu (2009) did some research which also supports the use of the social cognitive theory as a theory to use with the development of serious games. We decided that this would be beneficial to incorporate into our serious game given its past effectiveness in students learning. Peng & Liu (2009) found other games that were successful in changing behaviours related to health by using the social cognitive theory as their basis for design.

The social constructivist theory is another theory we were also interested in fusing as motivation for our serious game design. The social constructivist theory is primarily a theory of cognitive development, where there is shift from the individual as the meaning maker of the interaction between the individual and the environment (related to Piagets theory on constructivism) and the collective construction of meaning (Sivan, 1986). It can, in other words, be described as a process of socialisation, acquisition of skills, knowledge and the ability this gives them to participate in society or environments with other peers (Sivan, 1986). The benefit of using this theory is it addresses motivation issues by integrating it into the learning (Sivan, 1986).

Game Development

We propose the development of the serious game 'Making Friends' in order to provide students with an engaging and immersive virtual environment to develop their social skills and improve their physical health and mental wellbeing (See Figure 1.1 for opening page).

Figure 1.1 Front page of our serious game 'Making friends'

The beginning of the game will contain an introductory page. This page will consist of a series of links whereby users can find out information about the game. The first link on the introduction page is labeled *General information* and contains a summarised blurb of the information presented above pertaining to the necessity to provide students with and engaging environment where they are able to develop an understanding of positive social relationships and positive social

behaviours. This link acts as a rationale for parents, teachers or supervisors of game users and provides research-supported justification as to why students will benefit from playing our serious game '*Making friends*'. The next link is labeled *Sound Settings* and will enable users to control the volume throughout the game. Options will range from mute to maximum volume. When the mute setting is selected, communication throughout the game will manifest through written text displayed on the screen. When lower levels are selected (levels F, 1 and 2), the sound options will not include mute, as students at this level may not have the reading and comprehension skills to understand and therefore fully benefit from the game. Although there is no mute option for these levels, communication will still occur via written text as well as auditory communication. This feature provides younger game users with the additional benefit of being able to practice their reading and comprehension skills as well as learning how to build positive social relationships. The next link, labeled *How to Play* will pertain to the rules and objectives of the game to provide users with an overview of what they are required to do throughout the game. Once game users feel informed about their role, they can select the *Start* button displayed on the introductory page (see Figure 1.2).

Figure 1.2 Introductory page and selections

Once the *start* button has been selected game users are taken to the next stage of the game whereby they are required to design their character (Figure 1.3). This includes selecting a name for their character as well as developing an overall look including gender, hair colour/style, eye colour, skin colour and outfit selection. This feature of the game allows users to express themselves and their creativity in developing their character. By ensuring students are involved in the development of the character from the start, we are allowing them to form greater connections to their character to assist in contributing to an overall engaging and immersive experience. When it comes to selecting the characteristics of their avatar, students will be presented with a series of links labeled *name, hair colour, clothing, skin, eye colour* and *gender*. When game users click on each of these links they will be presented with a variety of options to select from.

Figure 1.3 Design your character page

The aforementioned game screens (introductory page and character selection) are general aspects of the game and applies to all users. The next stage of the game pertains to the level selection. Users will be presented with a screen (Figure 1.4) where they are required to select the level they will be working at. The levels are based on students' capabilities as determined by the teacher. It is therefore up to the educator to decide where the child is academically and developmentally at, to ultimately determine which level the individual should start. Each level starts off quite simple and addresses basic concepts and builds up to help students accumulate knowledge and skills about how to form positive relationships and build friendships. In Appendix A we have attached a basic outline of the focus of each level based on the information presented in the Kids Matter brochure (2013).

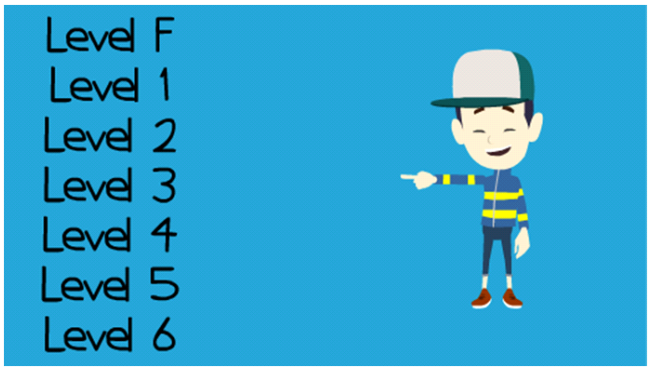

Figure 1.4 Level selection page

Once a level has been selected, users are taken to the first stage of their selected level. Each stage begins with an animation, which is used to describe what is going on at the particular level. We have incorporated animations at the beginning of each level to act as an interest device to engage learners and situate them into the learning environment

(Collins, Brown & Holum, 1991). We will be discussing in detail the first stage of level one for level 1 learners, to provide insight into the format of the game. As mentioned, this stage begins with an animation. This animation is comprised of a group of four students (the user's character and three other characters) walking in the woods. If there is only one student playing the game, the other three characters are computer simulated. However, if there are other students playing the same level at the same time (which is the intention), then all characters are made up of other game users.

As the four students are walking in the woods, a large tree falls and blocks their only way out of the woods (see Figure 1.5). Game users are alerted to the fact that the tree blocks their only way out of the woods via auditory communication and written communication. Once this has occurred, users are asked to report how they are feeling at that current moment using an emoticon selection panel. Students will be presented with a series of four emoticons, which represent different emotions (such as happy, sad, frustrated, angry). They will be asked to select how they are feeling since learning that they have a problem (the tree blocking their way out of the woods). The next part of the game requires game users to consider how other characters in the game may be feeling by again, selecting from a series of emoticons. This feature of the game has been included to encourage users to not only consider their own feelings, but also take into account how other people may be feeling in a particular situation. As students at this level are beginning to learn to read and write, all prompts throughout are communicated via auditory prompts as well as written text. To ensure that students are not distracting others, they may be required to wear headphones. Each player is alerted to how other game users are feeling and are encouraged to think of ways that they can assist them. This is achieved through an 'active chat room' where students can discuss their emotions in regards to the tree blocking their path. This chat room is also the medium through which game users can discuss how they can work together to solve the problem of moving the tree. Students will use the chat box to discuss their own ideas and listen to other game users ideas. Ideally, the discussions in the chat room will take the form of written (typed) communication, however younger students may not be able to converse effectively in this way. Out intention is to develop the game in a way that allows students to partake in verbal communication via microphones in the computer to allow game users to practice talking and listening to others. This encourages students to talk and listen to each other, which (Kids Matter, 2013) identifies as essential in building positive social relationships.

Although Figure 1.5 doesn't show it, the fallen tree in the game has four large branches diverging off the main trunk. Game users are asked to direct other characters to a branch of the tree to ultimately lift it and remove it from their path. Once the game user has correctly allocated each player to a specific branch on the tree, an animation begins whereby the four characters lift the tree and safely remove it from their path. The animation ends by revealing a cleared path in the woods, with the text 'Level 2' whereby students can click on it and proceed to the next stage of the game.

Once students select the level 2 button, they are presented with a 'wrap-up' or 'debrief' of the level that have just completed. Guillen-Nieto & Aleson-Carbonell (2012) note that a debriefing report provided within a serious game can act as a valuable learning tool. It allows game users to process the information they have just learnt and consider its implications for real world contexts. Within our game briefing report, users are asked to consider why it might be important to take other peoples feelings and emotions into account rather than focusing simple on their own feelings. For this particular level, students are also asked to think about how they would be feeling if they were on their own and tried to move the tree (further debriefing is talked about in the assessment section of this assignment).

Once students are ready, they may progress to the next stage of the game. The next stage of the game begins with an animation to situate them into the learning environment and provide them with insight into the characteristics of being a good friend. This trend of animation, scenario, solution, debrief continues throughout the various stages and levels of the game.

Figure 1.5 Screen shot from the beginning animation of Level 1

Critical design issues, difficulties and reflections

One notable issue we came across through our research is the vast amount of people; knowledge and skills that are required to analyse, design, develop, implement and evaluate a serious

game (Cannon-Bowers, 2010). For this serious game we have been developing, there are only two of us with very limited experience. We are of the understanding that in order to develop a serious game that is successful in achieving the desired learning goals, there needs to be a multitude of professionals working together to achieve the desired objectives. The considerable time, effort and resources used to develop a serious game presents as a limitation when there are only two individuals involved in the entire process.

Also given our limited knowledge and experience with serious games we found it difficult to use many different game design applications. A couple of the programs we trialed were Yo Yo Games and Unity. They didn't require any coding in the game however this didn't make them any easier. We tried different things within them and always fell short. They seem to be really great programs, however we believe more time and education would be beneficial on this area if we were to develop the actual game itself. We therefore decided to leave the trying and move onto the content of the game so as not to waste too much more precious time. It was a great eye opener to the difficulties behind game design.

Assessment of learning

We anticipate that assessment of students learning from the game 'Making friends' will be achieved through more informal measures such as discussions, interactions and observations. By getting teachers to observe students' behaviours after playing the game and comparing them to their prior behaviours, teachers are able to make judgments about the level of learning. Formal methods of assessment are not necessary to measure students learning throughout the game, as the game itself poses as the assessment.

Given that our serious game is underpinned my socio-constructivist theory whereby there needs to be a third party in presence of them and their environment in order for learning to occur, we are also assessing the learners in this context as well. With the debrief, there will also be small group debriefs with the teacher present. This will occur after the children have completed levels and the teacher has had a chance to look over their chat sessions during the game. The idea is for the teacher to start up further dialogue around their social interactions and conversations and try and develop them further.

By creating a serious game, we are providing students with an engaging and immersive learning environment where they are able to practice skills and build knowledge to ultimately develop positive social relationships.

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Appendices

Appendix A

Focus of each level within the serious game *Making friends*. The tasks within our serious game are developed based on the foci below. Students are required to participate in activities that allow them to develop social skills and build positive relationships using these social skills.

Level	Focus
Level F	• Playing well in a small group (two people) • Approaching other people to play with
Level 1	• Seeing other people's viewpoint • Considering other peoples feelings
Level 2	• Taking other people's feelings into account
Level 3	• Playing fairly • Talking and listening to others
Level 4	• Forming groups with mutual interests • Trusting others and being trustworthy
Level 5	• Negotiating • Respecting one another • Sharing confidences
Level 6	

MINECRAFT AND GRADE 6 SCIENCE

Fiona Milo

Conducted with two classes of Grade 6 students during consecutive 50 minute sessions, in total 42 participants were involved with my project (24 boys and 18 girls). A 1:1 iPad program has been implemented at this large, South Eastern suburbs government school and all students with their own devices are able to access the school server, enabling students to join each other's worlds to work collaboratively on the challenge. Additionally, the classroom was equipped with an Apple TV which allowed designated students to Air Play the construction of their Minecraft world as well as their resulting structures. At the conclusion of the session, students were encouraged to complete the accompanying survey accessible via QR code.

Hypothesis/Problem to solve

How can Minecraft be used with Grade 6 students to effectively teach scientific concepts and facilitate student engagement?

Despite many experts in the field of education advocating that "an education in STEM subjects is the ticket to a decent-wage paying career in the economy of the 21st century" Morrison & Bartett, 2009, p. 28(), Cooper, Kenny and Fraser 2012() establish that at a primary school level, science teaching has the second lowest allocation of time in the Australian school curriculum. During the infrequent occasions when science is being taught to primary students, a lack of pedagogical knowledge often results in teachers "following the text book very closely" and the delivery of classes which are "teacher-centred and didactic" Ma, 2004, p. 183(). Supporting a pedagogical shift from a teacher-centred approach, the National Science Resources Center (1997) emphasises that science teaching should provide students "opportunities to ask questions, to plan and conduct investigations, to use appropriate tools, to think critically and logically, to construct and analyse alternative explanations and to communicate" p. 69(). However, rather than facilitating student learning through hands on experiences and inquiry learning, Nowicki, Sullivan-Watts, Shim, Young, and Pockalny (2013) argue that many inexperienced teachers continue to "spend more time 'telling' students scientific facts rather than guiding them to construct knowledge" (p. 1137).

While knowledge of contextual scientific terms is important to facilitate comprehension, Fitzgerald (2013, p. xxi) argues that teachers "delivering content as a series of indisputable facts for students to memorise and regurgitate" is incongruous with alternative "rich approaches" for instruction. Anderson and Moeed (2013) outline that disengagement from science amongst upper primary students is often the result of negative student perception. Student motivation and engagement are dramatically reduced as a result of negative connotations regarding the topic (such as a lack of relevance and inadequate intellectual challenge). This disengagement resonates with arguments presented by leading gaming advocate Jane McGonigal (2011, p. 4) who contends that more than any other generation, today's "born digital" students are suffering in traditional classroom environments where "low motivation and low-challenge" persist for the majority of students. Furthermore, Prensky (2001, as cited in Wilkes, 2006) suggests that more appealing approaches to instruction rather than re-designed content is the key to student participation.

Many experts in the field of education are now embracing the idea that computer games may in fact provide teachers with an unrivalled instructional tool by which to engage and motivate their students. As Wilkes (2006) proffers, the interactive nature of digital games enables students to "create learning environments where they learn by doing, they receive immediate feedback, continually build new knowledge and enhance their level of understanding" (p. 43). Virtual worlds provide opportunities for students to practice fundamental scientific skills such as conducting experiments to test hypothesise, making observations and collaborating with their peers to solve problems and debate assumptions. This, as Perrotta, Featherstone, Aston, and Houghton (2013) discuss, is the inherent appeal of utilizing games for learning – students are afforded the opportunities to interact with ideas or topics through simulations that they may not be able to experience in the 'real world'. According to McGonigal (2011) tackling epic challenges and failing without fear are also pivotal benefits to virtual learning environments.

My hypothesis therefore evolved essentially from these two main strands - a lack of science content in primary classroom and enhancing student engagement. Having previously worked with this particular student cohort two years prior as an integration aide, I was aware of their existing scientific knowledge. Possessing established relationships with the majority of the students in these classes also provided me with the confidence to experiment with my novel idea. As Beutel (2015) articulately explains there is a discernible distinction between "being an expert user of ICT and being a teacher who makes creative and effective use of ICT" (p. 193). My knowledge of Minecraft would undoubtedly situate me in Beutel's second category however I was confident in not only my ability to successfully facilitate the activity but as Wilkes (2006, p. 43) discusses, the notion that the students possess far more "technological sophistication and experience" than me.

Theoretical framework

Although research shows that game based learning has the capacity to considerably impact the cognitive abilities of students, Robinson (2014) reasons that while it is important for schools to embrace digital technologies within their classrooms, pedagogical approaches must be adapted to meet the learning needs of students. By failing to consider the learning styles of modern children and the pedagogical implications of these preferences, digital games become "merely replications for the type of teaching already occurring in non-digital classrooms" Robinson, 2014, (p. 33). As "today's students are no longer the people our education system was designed to teach" (Prensky, 2001 as cited in Wilkes, 2006, p.42) a more hands on, student-centred approach to learning is now popular within the education field.

Cognisant of theories developed by influential figures such as Piaget, Dewey and Vygotsky, constructivist learning advocates that students do not simply 'absorb' what they are taught. Instead, learners 'construct' their understanding through the interplay of prior knowledge and new experiences. Embracing the concept of lifelong learning, theorists profess that the most "meaningful learning occurs when people actively engage with making sense of their world" Churchill et al., 2013, (p. 213). This pedagogical approach places students at the centre of the learning process. No longer simply passive receptors of information from teachers long regarded as the "sole purveyors of knowledge" Waniewski, 2012, (p. 1), constructivist learners take responsibility for their own learning, co-constructing their knowledge in collaboration with their teachers and peers.

In her article 'Boys, ICT & Engagement', Wilkes (2006) suggests that introducing digital technologies into the classroom requires teachers to be unperturbed by the fact that the majority of their students will bring to the classroom considerable "technological sophistication and experience" (p.43). This idea resonated with my approach to the Minecraft sessions – I openly acknowledged with the students that they were the 'experts' with this technology, I was merely posing a challenge for them to investigate within a virtual world. By empowering the students to become "agents of their own learning" Gerber, Schamroth Abrams, Onwuegbuzie, & Benge, 2014, (p. 28), they were able to demonstrate their technological expertise together with higher order thinking skills such as problem solving and creativity. A noteworthy

theme throughout my readings into effective science teaching emphasised that simple, practicable experiments which enable students to (independent of teacher intervention) "solve problems with their peers, learn from their classmates and repeat experiments to check results" Fogleman, McNeill, & Krajcik, 2011, (p. 152) increase student achievement. This was essentially the appeal of the Minecraft experiment – it represented simple, hands on challenge for the students that they could complete in collaboration with their peers, devoid of significant intervention from the teacher. Conversely, Gerber et al. (2014, p. 30) demonstrate that "heavily scripted and uni-dimensional tasks" restrict "socially constructed meaning making". Student-centred learning necessitates a flexible pedagogical approach which allows for student "ideation and iteration" Gerber et al., 2014, (p. 30) both independently and in collaboration with peers.

Inquiry learning embraces constructivist practices and encourages students to be hands on, to participate in student led experiments and to liaise with their peers. The National Science Resources Center (1997) emphasises that conceptual understandings are enhanced when students are afforded regular opportunities to participate in 'hands on' experiences. Gee agrees, (Thorn, 2013) reasoning that "learning though doing" is not only an essential component of the learning process, but is also an inherent characteristic of gaming.

Despite the growing evidence indicating that students who participate in gaming for learning programs are "more engaged in curriculum content and demonstrate deeper understanding of concepts" Krotoski, 2010, (p. 695), controversy still surrounds the effectiveness of games to transfer meaningful knowledge. Gerber et al. (2014) examine the argument that rather than the digital technology itself, it is in fact socially constructed learning that facilitates knowledge acquisition for students. The authors elaborate further upon this contention by stating that although games which have been designed specifically for educational purposes can benefit students, off-the-shelf games regularly lack specific links to the curriculum and are often limited due to inaccurate content. Simoes, Diaz Redondo, and Fernandez Vilas (2012) allege that in these circumstances, "learning only occurs as a side effect" (p. 2).

Gaming for learning campaigner, James Paul Gee Thorn, 2013() however speculates that "games, not school, are teaching students to think". Digital gaming enables students to apply the facts and the information they have learnt to "well designed experiences in problem solving" Gee, 2013, (p. 18). Morrison and Bartett (2009, p. 28) concur with the relevance of Gee's statements outlining that the ability to solve "problems by applying knowledge to design solutions" will be a requisite skill for an increasingly STEM orientated workforce. Although digital technologies present teachers with an engaging and effective instructional tool, the successful implementation of a gaming for learning program is ultimately determined by its pedagogical approach. Despite their enthusiasm for gaming, researchers such as Gee and Wilkes, continue to recommend that teachers still need to focus on desired learning outcomes before considering how gaming can be implemented to facilitate learning.

Results

Link to Australian Curriculum: Grade 6 – Science Inquiry Skills

ACSIS232 – Questioning and Predicting:

- *With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be*
- *applying experience from previous investigations to predict the outcomes of investigations in new contexts (ACARA, 2014)*

What did the students do?

Hearing a rumour that we would be using Minecraft in the classroom definitely sparked the curiosity of the Grade 6 students! They were extremely eager to find out what we were doing and to make a start on the challenge. Cognisant of the students' prior knowledge, I invited students to share their knowledge regarding who Sir Isaac Newton was and what he discovered about gravitational force. Following a brief tuning in exercise where a bag of sand and a feather were dropped simultaneously, I asked students to then consider the properties of gravity in the virtual world of Minecraft. By applying their existing knowledge of gravity to a new context, the learning intention of this activity was to investigate whether gravity exists in the Minecraft world and whether it is accurately represented.

Before the students began, we also established that the blocks in Minecraft are representative of one cubic metre. I proposed to the students that, in the real world, a cubic metre of sand is roughly the equivalent weight of a large brown bear. Students then predicted that blocks of sand and gravel should fall considerably faster than snowballs in their Minecraft gravity experiments.

Dot point instructions were written on the board for the students as I felt that in their haste to begin the challenge, some students failed to carefully listen to the guidelines (Appendix PDF). Although the majority of students had their own iPads during the sessions, some students did not have Minecraft

installed on their devices. To facilitate involvement, these students were paired with classmates able to access the game.

The first class of students made an enthusiastic start to the activity. They diligently set about co-operatively building their structures and discussing how to solve the problems associated with releasing the objects to test their fall. One well-organised group quickly discovered they could fly above their target.

The 'flying' group members then dropped their objects while other members observed from the ground and timed the falling items. They conscientiously tested and re-tested their experiment and recorded their data.

Another group constructed a tower to house their blocks of gravel and sand. They then smashed the obstructing blocks, allowing the test blocks to fall to the ground. Again, a third member of the team observed the results from a vantage point below. Attempting to simultaneously release their objects was challenging for the students, necessitating repeat experiments to achieve accurate results. Additionally, some groups experienced technical difficulties in relation to joining worlds with other group members. These experiences were not necessarily negative for the students involved and may in fact illustrate meaningful engagement with the activity. Phillips, Horstman, Vye, and Bransford (2014) speculate that emotional experiences such as frustration are often genuine catalysts for future learning. Rather than simply evaluating engagement in relation to compliant student behaviour, Phillips et al. (2014, p. 551) claim that the "persistent re-engagement" demonstrated by the students (staying focused, displaying a commitment to completing the task, opting for challenging tasks) is equally critical to the learning process.

Interestingly, the second Grade 6 class participated in the activity in a markedly different way. Some students, rather than building new structures, adapted creations they had constructed previously in their own Minecraft worlds. One group of students diverted slightly off task and began testing the trajectory of cannons by firing snowballs and gravel blocks. Another student carefully modified a rollercoaster

which launched items towards a target. He then measured which items travelled the furthest distance – ultimately experimenting with perpetual motion rather than gravity but an interesting aside nonetheless!

However, a considerable portion of the second class engaged in off-task behaviour during the session. Often resulting from difficulties with joining worlds with other group members, these students continued to play Minecraft but independently delved into their own Minecraft worlds. Sabotage also became an issue among the students – rogue team members were destroying their own team's creations while some students infiltrated the worlds of other groups primarily to sabotage their structures.

What did the students discover about gravity in the Minecraft world?

Through their experiments, the students discovered that although gravity does exist in the virtual Minecraft world, it is a far from accurate representation. Blocks of sand, gravel and even snowballs all fall at relatively the same speed when in fact, the variations in their mass should result in significant differences.

Student feedback

34 of the Grade 6 participants responded to the accompanying 10 questions survey. Accessible via QR code, the survey provided an insight into student gaming behaviour as well as their opinions regarding the Minecraft activity and gaming for learning.

The most striking result was an overwhelming 75% of students indicated that they would like gaming for learning to be included more regularly in their classrooms. Student's commented:

- *"I could show my work in a fun way"*
- *"I wish we could use gaming for school more!!"*
- *"Gaming can be viable although a child's learning can be somewhat distracting"*
- *"I think that it will get kids involved in learning"*

These comments indicated that students found the activity to be engaging and that they also appreciated the opportunity to demonstrate their creativity within an alternative medium. When asked to identify their favourite aspect of the activity, 40% of the students indicated that using games for learning was the most appealing component. Interestingly, other secondary aspects such as collaborating with friends, testing scientific concepts in a virtual world and participating in a challenging task all received an equal share of the student vote (13%).

Blyberg (2015, as cited in Lorence, 2015, p.28) claims that "the longevity of Minecraft's popularity is unprecedented". While this may definitely be the case, the off task behaviour exhibited by some members of the second group made me re-consider the appeal of Minecraft to this particular age group. The resulting survey results to some extent confirmed this concern, indicating that the majority of the students (67%) only occasionally still played Minecraft at home.

Despite the problems with students in the second group sabotaging each-others work, the replies to the survey showed that 63% of the students felt they had experienced no problems during the activity. Although a number of students commented on the sabotage obstructions and issues with group dynamics, most students were pleased with the structures they were able to construct.

- *"Our platform got set on fire so we rebuilt"*
- *"One person was too controlling"*
- *"We started off slow but when we got further in we were more efficient"*

Only 6% of students indicated that they felt the lesson was not engaging. A small number of students in each group did not have access to Minecraft via their iPads and despite my efforts to partner these students with others who could access the game, not all teams equally shared resources. Students excluded from directly participating in the game may therefore have responded negatively in relation to engagement with the activity. 48% of the students however, responded extremely positively on the engagement scale with comments such as:

- *"It was fun, I recommend to do it again sometime this year"*
- *"It was great, I liked it because it was fun and I actually wanted to do it!"*
- *"Little more time for structures and experiment but the rest was enjoyable"*

Encouragingly in relation to the curriculum guidelines for the session, 45% of the students surveyed believed the activity had enabled them to apply their scientific knowledge in a new context.

Is Minecraft an effectively designed instructional tool?

In relation to teaching science, the "pedagogical design capacity" (Brown & Edelson, 2001 as cited in Fogleman, 2011, p.151) of computer games such as Minecraft ensures that materials can be readily adapted to meet the learning needs of students while still preserving the original intent of the game itself. Lorence (2015) concurs stating that "the simple interface provides students in the classroom with endless possibilities to demonstrate creativity, think critically, communicate, collaborate and solve problems" (p.27). Additionally, Bilton (2013) explains that games like Minecraft encourage students to participate in 'parallel play' where learners are "engrossed in their game but are still connected through a server or are sharing the same screen" (p.9). These elements are extremely appealing when considering implementing Minecraft into my classroom. By researching how other teachers are using Minecraft for educational purposes, I found a plethora of information regarding science, maths, literacy, history and language instruction. Many teachers have not only created their own worlds for students to explore (including accurate representations of The Forbidden City or fantasy worlds where students can examine the impact of sustainable practices) but many schools have adopted Minecraft Edu - a relatively new educational version of the web based game. The online social network supporting Minecraft is immense providing an excellent resource for novice teachers like myself.

Despite its pixelated graphics and lack of gamed based instruction, critiquing Minecraft in relation to Gee's '36 Learning Principles' Thorn, 2013() highlights the effectiveness and appeal of the game. Firstly, Gee recognises that in relation to the development of problem solving skills, 'sandbox' games such as Minecraft enable gamers to explore within a protected environment. Secondly, effective digital games empower learners to become co-designers of their own learning – they are able to customize not only their learning experience but also domains within the game itself. Finally, the cost of failure is

low. Minecraft particularly in creative mode where adversaries (such as zombies and creepers) are non-existent, allows students to experiment with alternative solutions, feel "pleasantly frustrated" (Gee, 2013, as cited in Thorn, 2013) by the challenges associated with the game and immerse themselves into the 'situated meaning" of the virtual Minecraft world. This cognitive immersion, according to Phillips et al. (2014) is a powerful motivating component to gaming. Cognisant of Csikszentmihalyi's theories regarding 'flow', gamers often lose themselves in virtual worlds feeling as if their own body has gone into the game space.

Improvements

Reflection is an integral component of my role as a teacher. At the completion of my Minecraft sessions, I was fortunate to be able to discuss the effectiveness of the classes with a teaching colleague. These discussions primarily revolved around the intriguing behaviour of the second group (my colleague did suggest that some of the behaviour could also be attributed to the fact that the session was the final class of the day!). In addition to these discussions, my own reflection regarding the structure of the activity and its implementation highlighted a number of issues which I believe would require modification before I again undertook a gaming for learning activity.

The key issues which arose from my reflections were:

Limitations of the Minecraft app – initially inspired to undertake the gravity experiment by the blog of US based science teacher Bob Kahn (www.middleschoolminecraft.com), I soon discovered that the Minecraft iPad app lacked a number the features associated with the desktop version of the game (for example, objects can-not be thrown and equipment such as levers, trapdoors and feathers are not accessible). These limitations necessitated alterations to the first model of my experiment. However, although initially frustrating, I believe these limitations actually increased the challenge for the Grade 6 students to negotiate.

Consolidating student learning – although my activity was aligned with ACARA documents, to consolidate the learning of the students further, the development of a group hypothesis to guide their science inquiry would be advantageous. Additionally, results could be correlated into statistical graphs or displayed on scaled geographic maps to integrate the session with other subject areas.

Time for student discussion and reflection – the time constraints associated with attempting to facilitate the activity with two Grade 6 classes restricted my ability to provide adequate time for student reflection at the completion of the session. One of the surveyed students suggested that to improve the activity "more time and more interesting things to test and explore" would be valuable. Ideally, groups would have utilized the Apple TV to showcase their structures to classmates. A whole class discussion would have enabled students to share their findings and to consider their results.

Monitoring off task behaviour – this is a particularly interesting issue because despite the sabotaging that occurred among some groups of students, the feedback from the majority of the students was that they had no difficulties during the activity. So although my initial reaction to this behaviour was that tighter regulation of student participation was necessary, most students did not appear offended or upset by the behaviour. However, this was a one off activity - would students still view sabotage lightly if a more detailed Minecraft activity was included in a larger unit of work? Introductory lessons regarding online behaviour expectations and structured consequences for misdemeanours would definitely be necessary if implementing a gaming for learning program.

(Nb: following the lesson I have learnt that players are able to block unwanted participants from their worlds by switching off the 'local server multiplayer' function)

Was my activity equitable? – As part of their study into this approach, Gerber et al. (2014) discuss the equitable components of their own experiments with game based learning classrooms. This discussion prompted me to consider whether my activity had in fact been equitable. Although school policy encourages all students to bring their own device to school a small number of students did not have their iPads with them for the session. Additionally as discussed previously, a minority of students did not have access to the Minecraft app. Were these students ultimately disadvantaged because they were unable to fully participate in the activity? There is no doubt that their effective engagement in the activity was negatively impacted. Confirming prior to the activity that all students had Minecraft loaded onto their iPads or alternatively, arranging for school devices to be available for student loan would have facilitated the inclusion of all students.

Conclusion

Conclusively, my investigation into the effectiveness of Minecraft to teach scientific concepts has revealed that the adaptability of the game enables teachers to implement a wide range of game based activities to compliment the Australian science curriculum. In addition to core scientific topics such as physics and biology, Minecraft particularly lends itself to teaching students about ecology and sustainability practices. The open-ended nature of the game encourages students to demonstrate their creativity through building, exploring and collaborating with their peers.

The positive feedback received from the participants in this project strongly indicated that implementing digital games in the classroom was engaging for the students. This style of student-centred learning empowers students to apply their knowledge of digital technologies to their classroom based learning. Students are engaged in experiential learning which utilizes a range of tools and skills with which they are well acquainted. As the 'Quest to Learn' website acknowledges "these games not only engage students in the learning process, but also allow teachers to assess students in real time and provide feedback on the learning experience immediately" Quest To Learn, 2015(). As Hayes and Gee (2010, as cited in Robinson, 2014, p.33) persuasively proffer games are essentially "learning systems built around a popular culture".

This project has however, left me with one lingering question. Research shows that the adoption of gaming for learning strategies continues to proliferate across the world. At the Viktor Rydberg school in Sweden, Bilton (2013) notes that Minecraft is now a compulsory learning tool. Game based learning is at the core of the learning experiences offered by the 'Quest to Learn' school in New York. But does making gaming compulsory within school take the fun out of it for the students? Conceivably, game based learning is popular among students because it is innovative and kind of feels like play. Popular games like Minecraft could lose their appeal with students if they are routinely used as instructional tools. Further research into the long term benefits of game based learning will hopefully reveal the answer to this lingering question.

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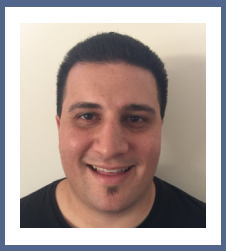
Focus on Physical Education:

Using technology to support student skill development.



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Matthew is a current Physical Education teacher at Mentone Primary School with previous classroom experience teaching in both Australia and the U.K. He is invested in looking for opportunities to meaningfully integrate technology into Physical Education to support student learning, thinking and skill development.

Digital Technology and Physical Education – Strange companions?

Using Digital Technologies in primary Physical Education (P.E) is still quite a ground breaking ideal, however one gaining great traction in educational circles through the ideas and work of experts such as 'The P.E. Geek' - https://thepegeek.com/. However the sedentary stigma attached to children sitting in front of a device is seen as a major deterrent, as it can be seen to limit a student's physical movement and level of exercise during a lesson. Nevertheless harnessing digital technologies effectively when making instructional design choices can have a profound impact on student learning, the learning area of P.E. is no different. It does have its challenges however and there needs to be an awareness of the core ideals and curriculum of Physical Education involving motor skill development, game sense knowledge, movement and student fitness. Any use of technology in P.E. must support student development in these areas, rather than being the sole focus of the lesson.

The lesson sequence that I have developed as part of my Monash Master of Education studies outlines a method of integrating student iPad use into a Physical Education setting. This involves instructional video layered through Augmented Reality technology as part of a unit on Athletics skills. However it is important to understand the theory behind both effective implementation and the purpose for choosing to utilise the digital technology.

Augmented Reality – Expanding beyond traditional teaching?

Augmented Reality is defined as, *"An emerging experience in which the real world is enhanced by computer-generated content tied to specific locations or activities."* (Yuen, Yaoyuneyong & Johnson, 2011, p.119)

There are many benefits in the use of Augmented Reality (AR) in education. The New Horizon report outlined by Billinghurst (2002) identified that AR was predicted to show major growth in its use in educational institutions. Current media reports, such as that by Bloxam (2013) on AR as an emerging trend have proven this to be a fact. AR technologies can be used to appeal to different human senses, which allows them to appeal to a variety of learning styles and intelligences that have been historically identified by (Gardner, 1993).

Yuen et. al. (2011) argues that AR has tremendous potential in fields where rapid transfer of information is critical. This I feel is extremely relevant to a Physical Education setting, where valuable learning time can be lost to whole class teacher explanations and modeling. AR can help teach students about content and subject matter interactively from experts that

could not be simply gained by first hand experience alone, a notion supported by Kerawalla, Luckin, Selijefot & Woolard (2006). It also allows the scope for students to receive timely and immediate feedback when designed for use in a lesson appropriately. Particularly as Yuen et. al. (2011) argues in applications related to skill mastery or completion, which this lesson sequence aims to achieve.

Aurasma – Augmented Reality Application

Aurasma is an Augmented Reality application that is available on most smartphone and tablet devices on both Apple and Android platforms and has been selected for use in my AR lesson design. The article by Elliott (2014) reviews its appropriateness to education settings. Some of its features include the ability to create user generated AR content with the camera tools on their device that can be shared; it also includes a simple tutorial to assist first time users. Another review by Nesloney (2013) muses that Aurasma allows students to share, interact with and explain their learning within their own virtual world. Aurasma fits in perfectly with the design of the lesson, as it runs on mobile devices such as iPads and students can collaborate, create and evaluate using the technology at their own pace. It also suits the circuit style rotation of the lesson. With students able to move from point to point to access the different AR Aurasma triggers to both get information and instruction, and create their own content and triggers to share with others.

Mayer's Principles of Multimedia Learning

The Cognitive Theory of Multimedia learning identified in the research by Mayer & Moreno (2003), presents a number of principles that apply to the instructional design of this P.E. lesson sequence involving Augmented Reality. These include the Personalization Principle, which states that you can better engage the learner by delivering content in a conversational tone. Also the Coherence Principle, which theorises that explanations are understood more clearly when extraneous sounds and images are limited. Finally, the Modality Principle identifies that is better to present words as auditory narration rather than visual text. In a lesson sequence that involves the use of video and auditory cues, particularly with the use of Augmented Reality, we had to ensure the lesson's instructional design catered for these principles to avoid what Mayer & Moreno (2003) describes as "Cognitive Overload" (p.45). This overload can result in a reduction of student success in any learning program or activity.

Using Instructional Video

Using instructional videos as part of a lesson design or sequence is an ideal that is not new to education. However with the advent of Youtube and other streaming sites it has become more common and accessible. However as Ertelt (2007) has argued, we cannot make the assumption that every student is capable and confident in the use of these technologies from the start and must plan as such. Schwartz & Hartman (2007) identified the key design consideration of using instructional videos being firstly to identify the audience and goal of the video. In this case the goals of the videos being used are two fold. To teach students how to complete an Athletics skill and also students creating their own videos to analyse their performance of an Athletics skill, with their audience being the peers in their class as well as the teacher.

(Schwartz & Hartman, 2007, p.7) also outlined a model for further aligning the underlying educational goals with the genre for video design. This model is broken into 4 sectors: classes of outcomes, learning targets, assessments, and genres. Analysing the purpose of the videos used in this lesson sequence across these areas helps to reinforce and formalise the goals of using instructional video in our lesson design. The instructional videos used in this Athletics lesson sequence fit under multiple sectors and categories in this model, which is an indicator of the richness of the learning tasks.

Putting Theory into Practice:

This specific lesson sequence is targeted at a primary school level for students in Grade 5 and 6 learning about Athletics events and skills, but can be adapted to cater for other levels, groups and P.E. topics. The number of students in a lesson or class is a major consideration when considering implementing digital technologies into a student-learning program, as lack of access to technology can be a major issue and barrier. This lesson design can work with varying access to devices, from 1:1 to just simply one class tablet. The Apple iPad has been chosen to demonstrate, as being a tablet it is a highly mobile device that supports both the mode of learning (Augmented Reality) and the large outdoor expanses of the P.E. teaching space with its mobility. Other tablets running Android software can also be used to achieve the same outcome.

Links to Curriculum Outcomes

There are a number of relevant standards under the Digital Technologies learning area of the Australian Curriculum ACARA (2015), which are focused on in relation to the use of Augmented Reality and sharing learning experiences across

devices and the Aurasma communities. The critical ideas covered within the AusVELS P.E. curriculum VCAA (2013), involves students working collaboratively to analyse and evaluate their skill development, understand safe space and equipment procedures and the ability to provide feedback on the performance of themselves and others. Sport specific skill sets involving students developing understandings of certain Athletics events and skills, documented in expert curriculum documents such as those by Brown, McBride & Leon (2013) are also a key goal. The notion of sharing, creating and communicating information and ideas in relation to Physical Education and Athletics, over a digital medium in particular, is also embedded within this lesson sequence.

Physical Education Unit - Using AR to teach Athletics skills

Pre-Training:

Prior to this lesson sequence there is an expectation that students have some experience in the use of the application 'Aurasma'. They need to be familiar in both using the viewer to load existing auras and create new auras using the both camera function of their device and uploading to a private account. In regards to the physical aspects of the lesson, students will range from beginners to intermediate in their understanding and confidence in skill completion. All students may have had previous experience in training for the athletics events of shot put, discus & long jump and could be quite familiar with the equipment required. The students having this element of pre-training in both the technology they are using and the physical skills they are training for assists in decreasing the cognitive load on a learner, which is supported in the Principles of Multimedia Learning by Mayer & Mano (2003).

Student Learning Objectives

The following statements below are student W.A.L.T (What am I learning today?) learning objectives written in child friendly language in regards to this lesson sequence. Students are made aware of these prior to beginning the learning task and have opportunities for peer and class discussion around these learning objectives, to help clarify their understandings of what they are trying to achieve and learn. They are also embedded within the student task assessment rubrics. The example of the student assessment rubric can be found at: https://goo.gl/vaJaJU

Lesson WALT Statements:

1. I can throw a shot put safely and correctly.
2. I can throw a discus safely and correctly.
3. I can complete a long jump with a correct and safe landing.
4. I can use the application Aurasma to view auras and create my own.
5. I can provide constructive feedback to my classmates on their successes and areas for improvement in completing an Athletics skill.

Equipment/Resources Needed:

An example of the set up for equipment required for this sequence of lessons is outlined in the photo below. The full list of equipment needed includes: Rubber Discus (500g), Shot puts (1-2kg) and Long Jump landing mat and sandpit. Also laminated safety and instructional trigger cards for each athletics event, which are shown in the main lesson content below. A folder with a differentiated photo of each student in the class is also required for students to upload and layer personal aura videos, outlined in the picture below. The application Aurasma is also needed to be installed onto the Apple iPads

Time:

The time frame for this lesson is two one-hour lessons, 120 minutes in total to complete the physical activities and learning/reflection tasks. One session will be conducted outdoors, with the follow up session undertaken in an indoor classroom space.

Lesson 1:

1. The students are introduced to the lesson WALT statements and given a walk through of each sports station (Shot Put, Long Jump and Discus), revising the Athletics events and equipment used. They are also introduced to the assessment rubric for the task to ensure they understand the direction and links between the assessment and the learning taking place.

2. The teacher models how to load both safety and instructional video auras for viewing. Also revising how to record a student action, then upload and create a new Aura using the student's portrait as a keystone.
3. The students will have an opportunity to visit each skill station and watch both the instructional videos and safety videos. The information provided in these videos has been segmented and also include narration rather than text. These are all solutions that Mayer & Moreno (2003) suggests as part of the Multimedia Principles of learning.
4. The relevant aura cards and video links are outlined in more detail below in the relevant station images.
5. Students scan the skill instructional video with Aurasma and watch the layered expert instruction on Athletics skills in Discus, Long Jump & Shot put.
6. Students scan the layered station safety video with Aurasma and ensure they understand the safety requirements before completing the activities.
7. Students in pairs video each other completing each different athletics skill at each station. Having a few practice turns if necessary.
8. Using their own photo in the class skill folder as a keystone, they upload and layer the video of themselves completing an Athletics skill.
9. Students need to test their created aura triggers to ensure they are layered correctly and linked to their personal photo. They also need to check that they have been uploaded to their Aurasma account and are accessible, ready for the follow up lesson.

Students scanning auras and watching expert instructional videos.

Follow my Aurasma account 'mcardamone' to view all the layered Auras.

Station 1 – Shot Put

Shot put Skill Instructional Video Aura image from Clip Art Sheep (2015) – Video Layered via Aurasma and sourced from Sports and Outdoors (2015) at https://www.youtube.com/watch?v=tHVMufMECPo.

Shot put Safety Instructional Video Aura image sourced from Clip Art Panda (2015) – Video Layered via Aurasma and can also be viewed at https://vimeo.com/142234718

Station 2 – Discus

Discus Skill Instructional Video Aura image sourced from Hassle Free Clipart (2015) – Video Layered via Aurasma and sourced from Griff15garfield (2015) at https://www.youtube.com/watch?v=e5e16U5hnzY.

Discus Safety Instructional Video Aura image sourced from Foto Search (2015) – Video layered via Aurasma and can also be viewed at https://vimeo.com/142234082

Station 3 – Long Jump

Long Jump Skill Instructional Video Aura image from Pic Gifs (2015) – Video layered via Aurasma and sourced from Teach PE (2015) at https://www.youtube.com/watch?v=5v9p5jBN_Hg.

Long Jump Safety Instructional Video Aura image from Clip Art Panda (2015) – Video layered via Aurasma and can also be viewed at https://vimeo.com/142235105

Lesson 2:

1. The WALT statements for the lesson sequence are revisited through class discussion and the assessment rubric for the video skill analysis is revised for students to work by. The use of rubrics at various stages of a lesson sequence is supported by Andrade (2005), who argues that they assist in clarifying the learning goals or objectives of an activity for students.
2. Students select the aura keystone of another student in the class for each athletics skill (Discus, Long Jump & Shot Put), and using Aurasma follow that student's Aurasma account and view the video of the completion of their athletics skill. They also have access to the original safety and expert instructional videos to help them identify key skill development and safe completion components.
3. Students provide written feedback to their peers using the online Google assessment form. An example is located at http://goo.gl/forms/GpH5FPcHXr. They identify areas of success and improvement for their peers, which is supported in the feedback model by Boud & Molly (2013).
4. The teacher's role during this session is to provide technical support where necessary and assist students in analysing their peers' skill performance according to the indicators identified in the expert instructional videos.
5. Students can elect to share their skill completion videos with the rest of the class using Apple Airplay on the projection screen or interactive whiteboard and verbally discuss with their peers.
6. Students can then be emailed a summary of their written feedback from their peers by the teacher through Google Forms, to assist them with their further development of their skills in future lessons. This could lead potentially to a third lesson.

Assessment & feedback

Feedback forms an imperative part of any lesson sequence and instructional design and P.E. is no different. As was identified in the research by Hattie & Timperley (2007), feedback has been identified as one of the biggest positive influences on student learning and outcomes. The feedback practices of this lesson sequence, aim to follow the feedback model of Boud & Molloy (2013), which has the ambition to create students who are curious and consistently evaluate their learning. This model involves student orientation and introduction towards the set learning objectives and goals, followed by learning experiences enhanced by digital technology which allow students to judge their own work and then gain feedback and judgments made

by their peers which they can act upon. As Boud & Molly (2013) have theorised, this model leads to students having an active role in soliciting and using feedback to improve their performance. The use of both Google Forms and AR technology makes the feedback process more immediate, targeted and effective for the students.

Tricks and troubleshooting – Lessons from my experience

1. The use of Augmented Reality in this lesson design opens up opportunities to both streamline this process and flip the learning to allow students to learn at their own pace and access learning resources to both model and assist in improving the mastery of their skill development. It also allows for a simpler feedback, assessment and data collection process.
2. The barriers that may be present in using Aurasma relate to Wi-Fi access and such a large outdoor space as there may be issues with signal and the Internet connection dropping out from time to time. You can set your trigger cards up in a little hub near to an area where there is solid Wi-Fi signal and get students to move back and forth.
3. Students can be prone to being too heavily focused on the device and unaware of their surroundings. As Yuen et. al. (2011) argues, this can create safety risks for students around other equipment, particularly athletics equipment and can also induce student cognitive overload (Mayer & Moreno, 2003). This reduces the educational and academic value of using the device and learning environment.
4. Getting students to create their own Aurasma accounts prior to the lesson makes creating and layering Auras simpler. Also getting students to link and follow both the accounts of the teacher and students in the class they will be working with makes the feedback and assessment process more efficient and reduces any technical errors with loading layered Auras.
5. Aurasma provides a web-based version of their application called 'Aurasma Studio'. For auras that require mass access such as the Athletics station images, it's best to create these auras using the online version. This is also better suited to more complex trigger images. These auras are then available via the app.
6. Answers to frequently asked questions around the use of Aurasma for educational purposes can be found at the following link: https://goo.gl/VafuYG

Please follow me on Twitter @mrcardamone for further ideas around Physical Education and technology.

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FROM TABOO TO TRENDING

FORMERLY RESTRICTED, SOCIAL MEDIA IS THE NEW LEARNING TOOL IN CLASSROOMS

Gail Marshall

Gail Marshall is a writer and editor for The Fresno Bee, a major metropolitan newspaper in California. She also owns and operates a freelance business, Marshall Arts Communications Consultants.

It's the first day of kindergarten in Williston, Vermont, and Sharon Davison is sitting beneath a tree outside the classroom, sharing treats with her students.

"What kind of sounds are you hearing?" she asks her little tribe.

The wind, cars and some birds, they observe.

"What are the birds doing?" she asks.

"They were kind of talking," one child says.

"No, they were going tweet, tweet, tweet!" says another.

"Perfect," Davison replies. "Oh, my gosh! Everyone look up. These trees are their home. These trees are like their platform, so when they are on their platform or their home, that is where they are talking to each other."

She explains that is what her students, too, will be doing together in kindergarten, making connections with others in just the same way but with a little different platform.

"That platform we're going to be using is called Twitter," she says.

She turns around her MacPro laptop, letting them see what Twitter looks like and shows them the feed.

"Co-o-o-o-o-o-l,"comesthe response from the children.

"You know, when we are having conversations with each other, we are also going to be tweeting like birds. Except we are going to be using words, and Mrs. D. will be the one who will be typing the words.

"Why do you think this might be important for students to tweet or to share things that we are doing in the classroom with the world?

"So why do you think we might want to talk to other people outside our class?"

The kids think about that and surmise, "Just to talk about what we are doing and maybe what we could ask them."

"I think that is a great idea," Davison says. "Anything that we're tweeting or we're sharing with the world is always about things we're learning or observing in our classroom."

NOVEL APPLICATIONS

And so begins big adventures in social media for one class in the United States. How far we have come from the days of forbidding educators to use Facebook at work or to "friend" a student or parent. In many schools, there is an entirely new and fresh approach to social media.

What's behind this trend of not only tolerating but teaching the effective, appropriate and responsible use of social media in learning and teaching? According to teachers both nationally and internationally, many schools are discovering novel applications for this tool that is now clearly trending rather than taboo.

The ISTE Standards clearly support the notion that students must learn the skills and knowledge needed to thrive in an increasingly global and digital world. Social media is becoming more prevalent in that world every day.

Take Davison's classroom on a recent afternoon. Helen Knauf, Ph.D., a university professor from Germany, has traveled thousands of miles to visit and see these children at work with their Twitter. She read about the students in Davison's class on a blog.

Davison puts a schedule up on the board every morning so the children see what's ahead for their day.

One of the things the students asked right away: "Mrs. D., do we have any tweeties?"

"Yes, we do have some tweets!" Davison said.

One of the children in the class was out sick last week. "Hi, we miss you," the children tweeted her. "We hope you feel better."

She wrote them back.

Another classmate was also out that day, so the children said, "Mrs. D., why don't we just tweet her?"

"Let's do that!"

They used the class Twitter page to tweet not only the student about their upcoming plans for the day, but also her mother, who became a new Twitter user to understand the platform. Quick answers came back.

Davison was introduced to the idea of tweeting with her kindergarten students via her own Twitter connection with another kindergarten teacher who became a technology integration specialist in New York City.

"It really opened my eyes to what was possible," Davison says. "Here I am as a professional using Twitter to learn a variety of platforms and connect with other people. I am also able to model this kind of etiquette in a safe and responsible way, so it is always about learning."

It's also all about the ISTE Standards for Teachers, which advise educators to model digital age work and learning, and facilitate and inspire studentlearning and creativity in virtual environments.

ENCOURAGING CONVERSATIONS ABOUT LEARNING

Tweeting from kindergarten can pretty much signal the end of the two-word "Oh, nothing," answer to parents' queries about what their student did in school that day. Davison finds it phenomenal that early learners are using social media to have conversations about educational topics outside the classroom. It is a way to share their lessons and accomplishments and emotions with parents and the community.

But it takes some time to teach the children what is appropriate for Twitter, Davison has found. The first week of school, for example, someone suggested, "I want to tweet my mommy and tell her that I love her and I miss her." That sparked a conversation in the class about what is appropriate.

Davison thanked the child for her request but posed the question, "Is that something you can tell your mom face to face when you see her today, or is that something we should be sharing with the world?" The children discussed it, and the kindergartnerdecided, "Oh, no, I'll probably just tell her that when she picks me up today."

"That would be a great idea because, remember," Davison said, "all these people who are following us are following because they're really interested in what it is that we are learning."

SET APART BY SOCIAL MEDIA

Knauf says she was most impressed with her day in Davison's classroom, expressing surprise and enthusiasm for how natural the interaction was among the children, the teacher and the social media platform.

Germany is behind the U.S. in this arena, Knauf says, but in her daily life as a university professor who teaches teachers, she is working with young interns who are very excited about getting into early childhood education. She was intrigued by the idea of using social media with children of such a young age and had never seen it in practice, so she wrote a grant asking to spend time in Davison's classroom and study her techniques.

Now Knauf cannot wait to show her education students what is possible.

Patrick Larkin, assistant superintendent for learning for Burlington Public Schools in Massachusetts and an ISTE member, was recognized as one of three national Digital Principal Award winners by the National Association of Secondary School Principals.

Sophisticated social media skills are something that can set students above their peers not only in class, he has found, but in

the competitive world of college applications and jobs. Most students applying to the top colleges will have good grades, a fine essay, lots of activities and plenty of recommendations. Their social media presence can set them apart—for good or ill.

Students who are careless with their posts can hurt their chances of going to that dream college or getting that great position.

"Our students will be judged on their ability to use these tools proficiently enough to leave a mark that will allow others to find them, see who they are and learn what they are capable of doing," he wrote in a recent column titled"Social media presence is the new resume."

Larkin believes in teaching his students that lesson in a very practical way early on. One year, he watched the Twitter postings of many students in his school to keep tabs on what was circulating. One weekend, he found profane tweets going around about a New England Patriots football game. So the next week, he pulled all the upper classmen into the auditorium for a meeting. He put his own picture up on a screen with a speech bubble that repeated the four-letter word a student had used in a tweet.

He then asked the students what they thought a stranger's first impression of him would be if the stranger did a quick search and found the offensive tweet. After a group conversation, he then said, "This came from one of you this weekend," and there were a lot more examples.

"They didn't really understand how easy it was for somebody to find a Twitter stream and that information," he says. "And it was from a pretty good kid."

STARTING THE CONVERSATION

Larkin understands that the student was just talking the way he and many young men would have talked 20 to 30 years ago in the locker room, in a closed area among their friends. Except now, they're putting it out on the internet where anybody can find it.

"I did it to show them how easy it was to find this stuff and warn them they should be more careful. I think they appreciated it. I wasn't calling people in to yell at them. I was calling them in to teach them because I think it's very prevalent today. People jump on [social media], and they still don't understand how far and wide these things can go," he says.

It is an eye-opener to most students.

"If I'm a high school kid with 75 Twitter followers, do I understand that an admissions director at Brown University is going to do a Google search of my name, find my Twitter account pretty quickly and maybe that's going to be the one thing that gets in my way? Even though I have perfect SAT scores and a list of activities second to none, that's going to stop me from going where I want to go," Larkin says. He believes K-12 schools that don't have these kinds of conversations are doing kids a disservice.

Conversely, students who are taught to manage social media well and become adept can get some exciting breaks.

In addition to ongoing conversations with students, turn to Common Sense Media for curriculum and resources educators can use to empower students to think critically and behave safely in the digital world. Students can also experience a real-world scenarios related to digital literacy and safety via the Digital Driver's License (otis.coe.uky.edu/DDL/launch), part of the Open Tools for Instructional Support initiative at the University of Kentucky.

THE STUDENT PERSPECTIVE

Timmy Sullivan, 17, attends Burlington High School in Larkin's Boston-area school district. After being encouraged to put up his resume on LinkedIn, he was invited to present at a conference of ed tech teachers and he got an internship at EdTechTeacher, an organization that provides professional learning on incorporating technology into the classroom, in Dorchester, Massachusetts.

LinkedIn captivated him.

"I was fascinated by what I saw," Sullivan says. "Experimenting, I created my own account and filled it with all the information thatI felt made me a competitive student. I then started connecting with professionals and responding to job requests.

"Some of the employers were very surprised to see a student on LinkedIn, let alone [one] willing to work. Then, through a combination of Patrick Larkin's reference, Twitter and LinkedIn, I was offered a summer internship with EdTechTeacher."

Sullivan says his social media experience has not been with traditional projects or classroom assignments but is a way to collaborate with his peers, have further discussion with teachers and discover learning opportunities in the global community.

His high school has a student-run help desk to give tech assistance to students in their 1:1 program. He frequently uses

Twitter in his work on the help desk and Spanish classes. In Spanish, he uses social media to communicate with native speakers and to practice writing and reading the language in a contemporary way.

He sees social media as having changed the dynamic of Burlington's online community. By interacting with teachers via the web, students become more aware of their posts and generally improve their online behavior.

His advice to schools is to simply allow social media to be. Blocking access doesn't help.

“Students need to be aware that these tools exist,” he says, “that professionals use these tools, and how to use them like professionals. Skip the lectures. Lecturing students too often will develop a counterculture. Instead, display positive online culture and allow students to emulate it themselves.”

MAKING SOCIAL SAFE

As educators continue to harness the possibilities for use of social media in the classroom, they also grapple with ensuring its safe and ethical use. That's where the ISTE Digital Citizenship Academy comes in. The academy's six online modules provide a comprehensive understanding of the issues surrounding digital citizenship and how to address them. They courses also provide ideas for collaborating with other groups, such as families and community members, to help students and parents become better digital citizens.

Raphael Raphael, Ph.D., co-author of the ISTE book Let's Get Social: The Educator's Guide to Edmodo, is another big booster of social media. He lectures for the College of Education at the University of Hawaii at Manoa and has taught for 20 years in the United States, Asia and Europe in K-12 settings, international schools and universities. Currently, he's working in Athens, Greece.

With safety and digital citizenship in mind, he prefers to use Edmodo, a social network designed specifically for learning communities. Some people call it “Facebook for schools,” but he doesn't agree. Yes, it provides personal connections, but it shelters students from mistakes that cannot be taken back.

For example, he explains, no data within the groups created in Edmodo are searchable from the internet. Personal information is not required, and teachers are in control. They can moderate, edit and delete any post by students. They can also control the amount of access students have to their digital classrooms, whether posts need to be moderated or whether they can post at all or are limited to reading posts by the teacher and/or other students.

Before Davison uses Twitter with students, she puts safety measures in place. She gets permission from parents before the year begins. She does not post the children's names with any photos. The children draw pictures of themselves to post with their comments. She is in charge of everything that gets put up and types it in herself, since most kindergartners cannot write yet.

Guided social media experiences are crucial, Raphael says. They allow teachers to sculpt young peoples' digital citizenship consciousness so they are informed of their rights and responsibilities as digital citizens and set on a positive path as digital citizens.

"A guided social media space can have all the Utopian benefits of [open] social media spaces, yet cull out some of the ills of the open web."

Screen time in the balance

It's what you're doing that matters most

Linda A. Estep

Linda Estep is a former reporter for McClatchy Newspapers and was the public information officer for a large school district in California. Today, she works as a freelance writer covering education policy.

There's never been a better time to be a K-12 student.

Take, for instance, ISTE member Douglas Kiang's high school computer science class in Hawaii, where he challenged a team of 20 students to design an underwater office using the popular online game Minecraft. The exercise required collaboration, planning, online research, problem-solving and teamwork. The students' final plan was brilliant, according to Kiang, and in the process, students with natural leadership skills emerged, as did those comfortable in putting the pieces in place. The students learned firsthand the importance of having both types on a team.

Then there's The Ellis School, an all-girls school in Pittsburgh, where the former director of its Learning Innovation Institute, Lisa Abel-Palmieri, Ph.D., says remixing class space and class time with blended learning and the flipped classroom approach created a whole new world. After using the Gallop StrengthsFinder tool to pinpoint individuals' skills, students are paired up with real clients in the city to deliver on projects. The result goes far beyond reports and some tweaks to places of business. "They build empathy for each other, learn how to fail fast and take calculated risks, they gain the skills to be innovators and change agents," described Abel-Palmieri.

ISTE member Pam Simon, who co-founded a STEM-based after-school program in Portland and Eugene, Oregon, called Fidgets2Widgets, incorporates technology in a fun and fast-paced environment for children ages 9-14. Simon and her business partner, Sydney Ashland, felt that a child's creative spark diminished as they progressed through school. They decided that instead of complaining to the schools, they would develop an after-school environment that would reignite the flame of creativity and curiosity.

"As an educational tool, Minecraft is a wonderful platform for learning while having fun," she says. "You have to have mathematical understanding to build sound structures. Architecture and design features allow for innovation ... Minecraft affords myriad opportunities to do just that. A child who is motivated and challenged, allowing the innate curiosity to fuel their interests, will most certainly use these skills in a future career."

Of course, to achieve each of these milestones, education relies on a screen.

Time to chill out

Screens, the chestnut goes, are not good for children. Today's students spend too much time staring at computers, tablets, smartphones, gaming consoles and televisions and not enough time participating in physical activity. Concerned parents are often the first group to bring up this objection, but teachers and even some students will argue against "excessive" screen time at school board meetings and on social media.

In some places, the debate is jeopardizing technology initiatives in education.

The good news is, research is refining that stance. In May 2015, the RAND Corporation and PNC Bank's program PNC Grow Up Great hosted a one-day forum for advocates, educators, researchers, policymakers, funders and parents to discuss this notion of screen time. Their conclusion: the narrow focus on screen time should give way to a more comprehensive definition of developmentally appropriate technology use by young children, one that considers *what* technology and content are being used, *how* they are used, and *why* they are used.

After all, the original screen time research was built around watching television, not interactive devices like tablets. So the fact that these devices are this generation's learning tools is, perhaps, the most powerful argument.

Karen Richardson is an education technology specialist and an ISTE member active with the Virginia Society for Technology in Education, ISTE's affiliate in Virginia. She also is the owner of Ivy Run, a company dedicated to showing educators how to integrate digital technologies in the classroom. In a blog published by ISTE in 2014, she wrote, "While I will defend reading to my dying day as a wonderful way to learn and engage with the author, it is not a particularly interactive or hands-on way of learning. When I was introduced to a new interest via a book, pursuing that topic meant dragging out the encyclopedia or a trip to the library."

Today, such pursuit can be handled with a search engine and a mouse click or touchscreen.

"I do worry about kids on an iPad all day long who never look up," Richardson notes. She believes teachers and parents must be models for their students and teach the tenets of digital citizenship. She also stresses to teachers that just because a certain technology is present in the classroom doesn't mean it must be used every day.

Peter Gray, a research professor emeritus at Boston College and the author of *Free to Learn: Why Unleashing the Instinct to Play Will Make Our Children Happier, More Self-Reliant and Better Students for Life*, has spent much of his career studying child behavior. He contends that, when asked what they liked about playing video games, most children talk about freedom, self-direction and competence. Indeed, a study commissioned by IBM concluded that the leadership skills exercised in many interactive, role-playing video games mirror those required to run a modern company in the real world, just as Kiang's students demonstrated in their project-based assignment.

"It doesn't surprise me that children are attracted to computers," Gray adds. "Kids play obsessively with the tools of their own culture, whatever is available to them, whether it is a computer or bow and arrow."

Even the American Academy of Pediatrics (AAP) has softened its guidelines regarding screen time.

Their original guidelines recommended no screen exposure for children younger than 2 and a limit of two hours a day for children over the age of 2. Today, AAP recognizes that while media can have both positive and negative effects, children are doing what they have always done, only in another environment. As a result, they no longer advise age-specific screen time limitations and acknowledge that content is more important than the platform or time spent with media.

ISTE Standards fit

In her ISTE blog, Richardson describes the importance of having a "balanced approach to the world," noting that time with technology, nature and tools is one way to achieve balance. For instance, if she wanted to teach someone about the life of a beekeeper, she could use her phone as a camera for demonstrations, a paper and pen for personal journaling and then a digital journal to share with others also interested in beekeeping.

"The ISTE Standards focus on teaching and learning in the digital age and how digital tools can support that work, and I think it is essential that students are given opportunities to engage with those tools in meaningful ways," she explains."If you are going to have a phone in your pocket at all times, you should know how to use it to learn, create and share. Rather than focusing on doing research or completing assignments, they should see how to use them to support creativity and productivity."

For example, Nannette McMurtry, an ed tech specialist with the Boulder Valley School District in Colorado and an ISTE member, uses nature and technology to foster creativity in children. Her own young daughter hones her storytelling skills by hiking with a mobile device and documenting her adventure using background music and narration in a video to share with faraway grandparents.

"It allows her to tell a story in a way she couldn't tell otherwise. The filming adds another layer. To me, it is not about screen time as much as it is about using a tool to accomplish or create something," McMurtry explains. "It's what you are doing with screen time that matters."

McMurtry's role in her district is to coach and mentor teachers and district personnel, but she also taught high school students, and used technology in a way of bringing her classroom closer together. She created an online forum for students to discuss assignments that would be covered the next day in class. Students who showed shyness in class found it more comfortable to disagree with posted opinions online. It was empowering, and those students began to engage more comfortably in face-to-face discussions the next day. "It was a

confidence builder," she says.

She believes parents and teachers must establish a relationship with children and their use of technology.

As Richardson puts it, "Just giving kids and iPad and not interacting is not helpful. Maybe the secret is, it is too early to blame technology for everything."

Screens and family time

Dion Lim is the founder and chief executive officer of NextLesson, a company he describes as "engaging students in problem-solving through topics they love." Here, a team of teachers develops lessons and projects for K-12 classroom use, serving more than 50,000 teachers and 2 million students nationwide. Lim refuses to believe screen time is an evil force. At the same time, he views technology as a privilege rather than an entitlement.

"I think of myself as an educator, not a policeman. When my daughter got a smartphone I told her, 'Convince me it will be beneficial.' In our family we talk about how screen time impacts family. At the dinner table and traveling in the car, there is no phone usage at all." There are occasional exceptions such as when someone in that environment wants to look something up. The family votes to decide if it is permissible, and the vote must be unanimous. Lim is the father of 13-year-old twin daughters and a son, 11.

Lim sees technology falling into three distinct categories:

- **Creational** — Allows a student to meet a goal of creating something original and consequently gives the student creative confidence.
- **Functional** — A practical use, like writing a letter or conducting research. It is the modern version of going to the library.
- **Recreational** — Activities such as reading sports scores on ESPN or playing a video game for relaxation. "There is value here, too. The challenge is when this piece of the pie becomes the whole pie," Lim adds.

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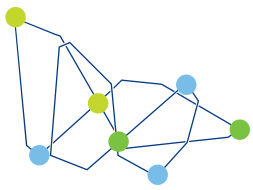

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