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THE 10% RULE. MAXIMISING LEARNING THROUGH COLLABORATIVE GAME DESIGN

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ABSTRACT

This paper presents a retrospective view of a game design practice that recently switched from the development of complex learning games to the development of simple authoring tools for students to design their own learning games for each other. We introduce how our '10% Rule', a premise that only 10% of what is learnt during a game design process is ultimately appreciated by the player, became a major contributor to the evolving practice. We use this rule primarily as an analytical and illustrative tool to discuss the learning involved in designing and playing learning games rather than as a scientifically and empirically proven rule. The 10% rule was promoted by our experience as designers and allows us to explore the often overlooked and valuable learning processes involved in designing learning games and mobile games in particular. This discussion highlights that in designing mobile learning games, students are not only reflecting on their own learning processes through setting up structures for others to enquire and investigate, they are also engaging in high-levels of independent inquiry and critical analysis in authentic learning settings. We conclude the paper with a discussion of the importance of these types of learning processes and skills of enquiry in 21st Century learning.

KEYWORDS

Mobile Learning, 21st Century Skills, Personalised Learning, Situated Learning, The 10% Rule, Interaction Design, MiLK the Mobile Learning Kit, SCOOT, SCAPE.

1. INTRODUCTION

The 10% Rule: The likelihood that any 'player' of a learning game learns only 10% of the collective knowledge required to 'make' the game.

Taking the retrospective theme of this year's conference as inspiration, this paper is a reflection on our practice as interaction designers and the intense learning and skills of analysis and synthesis it entails. It outlines how this reflection led us to move from developing mobile learning games *for* students to developing game authoring tools, MiLK the Mobile Learning Kit and Cipher Cities, that allow students to design mobile learning games *for one another*. To illustrate the learning processes involved in designing learning games we introduce the 10% rule, a notion that in general only 10% of what is learnt during the design process is ultimately transferred to the end user. The 10% rule is an analytical and illustrative tool that reveals the large amounts of learning that occur during the design process and emphasises the skills in critical analysis and synthesis that are required to filter data down to what is most valuable to the end user. We present the findings from numerous MiLK user trials to outline the learning processes involved in creating mobile learning games and emphasise the significance of this learning in a world where skills in critical analysis, synthesis, and creative production supersede the need to simply possess knowledge. It is important to note that this research paper, while it includes pedagogical considerations, is written from an interaction design perspective.

2. KEY FEATURES OF GAME DESIGN PRACTICE

Over the past four years we have developed a number of learning games and authoring tools. Each of these projects exploits the technologies and services of both the web and mobile devices in different 'real world' learning contexts beyond the classroom. A number of central priorities of our practice have shaped the design and development of these projects. These priorities include:

- Low-fi technical requirements to ensure broad access
- To support collaborative processes and socialisation
- To promote learning experiences situated in the 'real world'
- To create open learning tools that are applicable across multiple knowledge domains

Each time we begin a new learning tool project we undergo an intense period of learning. We often work closely with learning partners involved in either providing curriculum expertise or domain specific knowledge. The learning process is extensive as it not only requires a sophisticated understanding of the subject matter of the tool but also entails a deep understanding of the client and intended end users, their values, goals and motivations. Our design process is composed of iterative cycles of data collection, context analysis, synthesis and refinement, and translation; translating, often immense amounts of data, into system logic and interface components such as graphics, sound, text and statistics.

Below are short descriptions of two learning games we have developed SCOOT and SCAPE, and the processes involved in designing them. These two projects give an insight into our interaction design practice. They reveal the large amounts of learning that occurs during the design process and outline the methods we employ to frame our process of critical analysis and decision-making. As practice-led researchers who engage in Design-Based Research (Barab & Squire, 2004), being reflective practitioners (Schon, 1983) is an important part of our practice. Self reflection revealed to us the immense learning potential that is embedded in the process of designing learning games, and as such led us to design game authoring tools that allow us to transfer this learning experience to students. Reflecting on our process of designing these tools one of our biggest lessons was the stark realisation that the 'player' of our games probably only learnt ten percent of what the lead design team had learned in the process of 'making' the game. Although this percent at first seems very low and disappointing, it is in fact a realistic estimate that has become a significant provocation and guide in our design approach. We now begin all projects with the proclamation of the '10% Rule'. This paper presents a retrospective account of how the 10% rule was both realised and then applied as a device to improve the learning potential of the projects we design.

Project 1: SCOOT. A Mobile Game Experience

SCOOT is a mixed reality game that employs web, mobile devices and public displays as tools of play to guide groups through unique public places. Normally set in a museum, university or park, SCOOT is a virtual carnival bringing pending chaos to these spaces. Players join forces with SCOOT Agency (http://scootgame.com) communicating via secret SMS frequencies to find and defeat the Dodgy Carnival Creatures that have hidden strange console games creating disturbances throughout our important cultural sites. Along the way players solve clues by seeking out facts about the sites and also participate in creative group activities. SCOOT has been commissioned by and deployed for festivals, cultural institutions and educational organisations across Australia since 2004.

Each time we design a new SCOOT event we have the task of exploring a new location of physical, cultural, historical, technical, temporal, and spatial components and contingencies. This exploration uncovers vast amounts of data available through multiple access points including artefacts, books, local stories, histories, observed activities and more. Primarily we begin gathering data by walking around the site with local stakeholders, observing points of interest, writing notes and taking photographs. However, not all of this data is relevant to the client needs or of interest to our intended players. To aid the process of collecting, selecting, refining and linking the data we begin by establishing stakeholder (all participating contributors) core values and possible expected outcomes that will sustain both player motivation and client satisfaction.

1: A group of SCOOT Players at Federation Square, Art Play and The Australian Centre for the Moving Image in Melbourne, Australia.

After designing multiple SCOOT events we developed a set of key design resources for improving the process of collecting, refining and synthesising data into a logical and entertaining game format. We developed 'integrated game script' templates that consist of a series of 'game nodes'. A node is either a virtual or a physical point where a player will potentially interact with data to progress in a SCOOT event. Each game node in the template details the location of the node, a description of the point of interest (notes and photographs), comments regarding required game media to be created (motion graphic, console game, poster etc.), notes relating to the SCOOT Carnival narrative and finally, how the node relates to other nodes. Each time we design a new SCOOT event we improve and refine our game script templates in an aim to improve our process of synthesising location data and the SCOOT Carnival narrative and translating it into a game format.

Observing the players of SCOOT, we noticed that although SCOOT was not presented as a learning game, the players accepted being 'tricked' into learning through the game. One player commented, "I found myself learning". In fact the players seemed to enjoy learning when information was embedded within the game. Recognising how SCOOT had been developed from information about the location, the players highly motivated to contribute to the SCOOT narrative and expressed interest in designing their own games. Since noting players' desire to contribute their own knowledge and creative ideas, SCOOT has always included a point in the game play for players to contribute to the game narrative.

Project 2: SCAPE. A Collaborative Neighbourhood Design Simulation Game

Similarly to SCOOT, SCAPE is essentially place based and draws upon data from the site in which it is played. SCAPE is an interactive simulation developed to educate students about sustainable urban design. SCAPE is installed in and based on the Kelvin Grove Urban Village (KGUV) in Brisbane Australia. Visiting school groups move through the 'actual' site both before and after they play with the virtual simulator allowing them to compare and reflect on the potential impact of their decisions regarding land use, density, housing types, and transport options. SCAPE brings together education, urban professional, and technology expertise in order to simulate accurate real-world scenarios. The 3D environment is built on sophisticated logic and provides real time visual, statistical and character satisfaction feedback to the players. SCAPE was developed in collaboration with The Hornery Institute, a non-for-profit urban sustainability organisation, the Housing Department of Queensland, the Brisbane City Council, and education consultants from a number of local schools.

Like a SCOOT event, the SCAPE project began with a vast amount of data. Each of the collaborators brought to the project their own priorities, agendas and potential data sets. These contributions ranged from curriculum, urban development, and policy and regulation expertise. Due to the complexities of the relationships between the collaborators, it became our role to negotiate project priorities and agreed upon learning outcomes. To do so the early stages of this project involved an intense period of discussion and learning from one another.

To meet these project priorities and use them as selection criteria for data, we developed an engagement strategy that relied upon role-playing a number of community characters, elderly, shopkeepers, politicians, students, environmentalists, and developers. Role-playing became an important learning function for us as designers, allowing us consider interpretations of data from different perspectives. It also became the basis for the engagement of students playing SCAPE. Each student in a group would take on a different character dossier. The students worked together exploring sustainable design from multiple viewpoints from the neighbourhood. A use case scenario for each of these community characters was developed through storyboarding so we could test how the players would progress through the game and learn on behalf of the character. This design process of using profile-based storyboards helped us to select data and design effective feedback mechanisms that resulted in a dynamic and flexible learning tool. While it was not our explicit goal, through this design process we learnt a great deal from many different knowledge domains and developed a sophisticated understanding of sustainable urban design.

2: Students negotiating sustainable neighbourhoods on behalf of their game character.

"I really enjoyed the urban village simulation. It was a good way to pretend you had a say in your village. My team negotiated very well and at the end stage all our neighbourhood characters were happy." 13 year old student. St Pauls School, Brisbane Australia

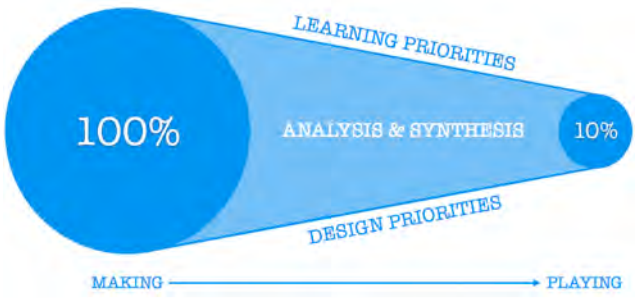
3. THE 10% RULE: GAME DESIGN AS A LEARNING PROCESS

It was through reflecting on our design and development process on a number of projects including SCOOT and SCAPE that we identified the reoccurrence of what we call the 10% Rule. We found that at the end of a project, of all of the learning that we had done through developing the project, only about 10% was ultimately transferred to the end user. While 10% may seem rather minimal we see this 10% as evidence of good interaction design practice. It is our job to learn a lot about the given topic and the motivations of the end users and the client in order to make educated decisions on behalf of the user and client. We imagine this is the experience of most teachers when designing curriculum for the first time.

The 10% Rule reveals two key points. Firstly it illustrates that the practice of interaction design involves a great deal of learning beyond that which is represented in the final interface. Secondly it emphasises the important role of critical analysis, synthesis and refinement play in the design process.

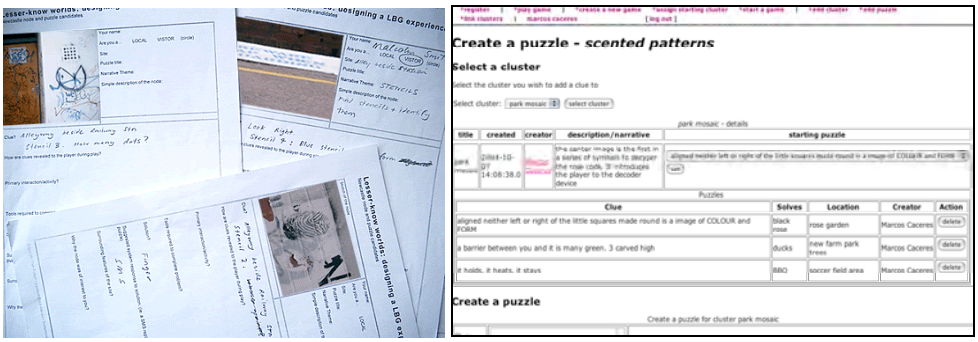
As can be seen in the examples above, SCOOT and SCAPE, we developed a number of custom design resources (node templates and storyboards) to help improve the processes and methodologies involved in making a learning game. These design resources were used, explicitly concentrating on achieving the most effective analysis and synthesis of data on behalf of the learner (see Figure 3.).

3. 10% Rule Diagram



Recognising the 10% rule at play in our design practice, we realised that a simple way to translate this learning experience of design learning games was to put these custom design resources for the analysis and synthesis of data in the hands of the students, switching their role from player to maker. We ran a series of workshops, entitled SCOOT Camp, to test and refine these node templates and storyboards into a series of simple online interfaces. These interfaces formed a simple step-by-step game design process that enabled users to instantly design, publish and access their own learning games on mobile devices.

4. SCOOT Camp: Node Templates and On-Line SMS Puzzle Maker Interface



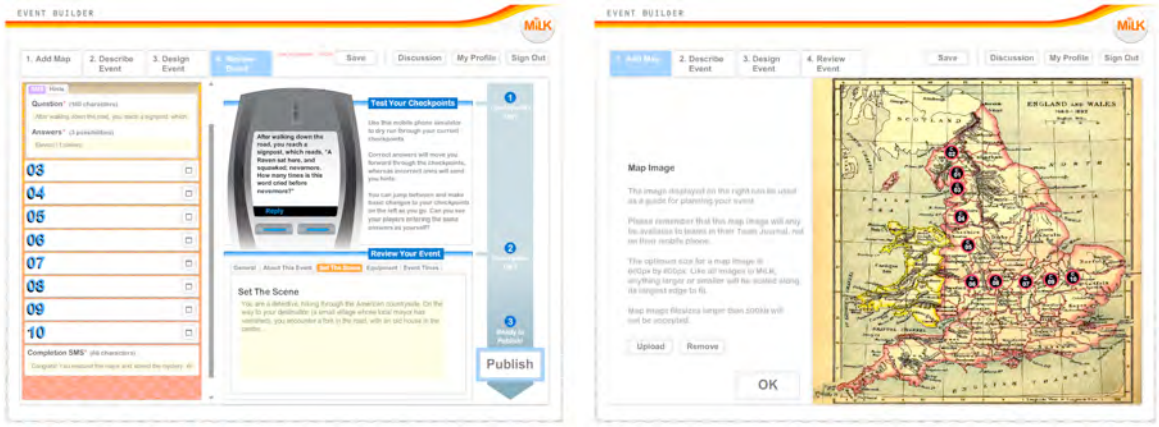
This project became the basis of two game authoring tools, MiLK the Mobile Learning Kit and Cipher Cities. MiLK was developed specifically for use in schools while Cipher Cities became an open public version akin to Facebook, Youtube and Flickr. The next section illustrates how MiLK was developed to simulate our design process, specifically for learning environments.

Project 3: MILK. The Mobile Learning Kit for Students

The MiLK interface consists of a simple step-by-step game builder that supports an iterative design process of collecting, composing, evaluating, and refining data into learning games. In addition to this game builder, the MiLK interface includes a number of components including student profiles, discussion forums, game review

functions, message logs, map annotation tools and photo uploads (see Figure 3.). These components essential to support maximised learning through critical analysis, opportunities for collaboration, and individual and group reflection. MiLK facilitates not only the process of designing games but also playing games made by one another.

3. MiLK Interface



4. STUDENTS AS PARTNERS IN THEIR OWN LEARNING

MiLK has been used in a number of schools across Australia and in New York, USA by students ranging from primary through to tertiary levels. We have conducted a range of user trials in which students created MiLK events for each other to play, in some instances these trials were conducted on school grounds and others were at other sites including the Adelaide Botanic Gardens and the Cairns City Centre. These user trials were conducted to collect data regarding the effectiveness of the MiLK interface and the learning processes it supports. The data collection methods employed for these user trials were participant observation and semi-structured interviews. In conducting these user trials, not only were we able to identify opportunities for fixes and improvements to the MiLK interface, we were also able to observe the learning process the students were engaging in while designing MiLK events and their methods for refining the data they collected.

3. Students designing MiLK games at the Adelaide Botanic Gardens

When designing MiLK events the most of the students appeared to be highly engaged and motivated to learn including those students who were referred to by their teachers as ‘reluctant learners’. One ‘reluctant learner’ who has Asperger’s Disorder reflected, “I think it is a really fun way to learn. When you first start doing it you just think it is really fun, but afterwards you realise you learn a fair bit…MiLK Rocks”. We were surprised by how little the students spoke about the technology they were using to design and play the games. We expected that using a mobile device would be novel and exciting for the students. While at first they were excited to be able to use mobiles they soon forgot about the technology and were engaged in the subject matter of their games. Rather than being motivated by the technology they were using, it appeared that the students were highly engaged and motivated because they were given increased independence and control over their own learning and were given

the opportunity to design a learning game for their fellow students. The students knew they were free to explore the topic of their game (Australian Poetry or the Economic Garden of the Botanic Gardens for example), and there were not set right or wrong answers. The students had significant control over what they were learning and what their game would teach their fellow classmates. The students seemed motivated by this increased independence and responsibility for each other's learning, describing it as an 'adrenalin rush' to have others play their game. This independence and significant shift from their normal learning experiences impelled the students to reflect on their own learning. During each of the user trials, the students displayed a heightened awareness their own learning and were often keen to discuss their learning with their teachers. One student asked of his teacher, "What do you think about this learning method with phones?" and another noted "We're learning in a way that is more suited to our generation…this way we can have fun by going around and looking at the stuff in the real world.

The previous quote alludes to the situated and authentic nature of the learning the students engaged in while using MiLK. Due to the mobile aspect of MiLK learning games, the learning that occurs with MiLK offers opportunities to increase the relevance of learning by extending it beyond the traditional classroom and applying it in a real world setting. MiLK allows learning to be situated in its most relevant context, be that in the classroom, cultural sites, external institutions or everyday places. Situating learning in the real world creates opportunities to give students "the best and most authentic learning experiences" (Rudd, et. al., 2006: 06), ones that stimulate and engage students and make learning relevant to their everyday lives. During the MiLK user trials the students expressed how much the enjoyed "interacting with the environment". MiLK helps students to see everyday places as opportunities for learning.

As we experience when designing learning games and tools, the students had to learn a lot about their given topic or the location of their game as part of their design process. One year 10 student recognised this process commenting, "Building the game you have to look for things you want to add into it and you kinda look for stuff, even if you don't put it in it, it still registers in your head and you remember it…We take in a lot more". Throughout the design process the students engaged in a significant amount of valuable and incidental learning. When refining the information they had gathered for their games down to the 10% that was to be transferred to the player of their game, the students engaged in a complex process of high-order thinking and critical analysis. As the Education Officer from the Adelaide Botanic Gardens noted, "They had control over the learning and were setting up structures for others to enquire and investigate". When discussing their processes learning with his students, one teacher commented, "It is that move from lower order thinking, just answering questions, recall and finding information, to actually understanding and interpreting it, and actually being able to synthesise. If you want to look at Blooms Taxonomy, you are going right up from a lower level up high really quickly and that is where we have always tried to get kids to move to, from the basic recall to thinking about it."

If we think about the students learning process in terms of our interaction design practice, we suggest that the students framed their design decisions by identifying the key values of their end users (their fellow classmates) and their client (their teacher or more broadly the school curriculum). The students, although largely unconsciously, were assessing the information they had gathered from an educational perspective. This process required the students to consider the learning requirements of their fellow classmates and to determine what information was educationally sound with regard to the Key Learning Areas of their subject be it for social science, physical education or science etc. Not only were the students highly engaged in the subject matter of their games, they were also critically engaging in the logic of learning.

The most significant finding we found from our observations and user trials was that MiLK not only successfully translated our design process but more importantly that the students recognised that MiLK was designed to encourage students to reflect on their own learning and that they had become partners in their own learning.

5. SOME PEDAGOGICAL IMPLICATIONS

While the evidence of students learning while using MiLK presented above is encouraging in its own right, the significance of this learning becomes even more apparent when we consider the current education landscape. The internet and ever increasing internet connectivity on mobile devices provide unprecedented access to information. This almost instantaneous, 24/7 access to information has transformed our understandings of knowledge (Siemens, 2006) and called into question the what, how, when and when students should learn. In 2005 George Siemens wrote, "We can no longer personally experience and acquire the learning that we need to act. The capacity to form connections between sources of information, and thereby create useful information patterns, is required to learn in our knowledge economy" (2005:5). This comment has been reflected in the widespread call for new digital literacies that are integrated throughout the curriculum, the personalisation of learning, and a paradigm shift away from knowledge transferral of core subject matter towards an education model that compliments subject matter with the development of critical and independent learning skills (Jenkins, 2009, Rudd et. al, 2006, Williamson & Payton, 2009). We can see evidence of this paradigm shift in the United Kingdom's new secondary curriculum. This new curriculum includes a 'Personal Learning and Thinking Skills Framework'

that focuses on skills development and aims to promote independent enquirers, creative thinkers, reflective learners, team workers, self-managers and effective participants. Andrew Churches' 'Revised Blooms Taxonomy' or 'Blooms Digital Taxonomy' emphasises this need for personal thinking skills. Churches writes, "While much of the knowledge we teach may be obsolete within a few years, thinking skills once acquired will remain with our students for their entire lives" (2009).

In order to teach these new 'Personal Learning and Thinking Skills' new pedagogical theories and approaches to teaching and learning are required. The notion of 'personalised learning' has emerged as a prominent new approach to teaching and learning that prioritises personal learning and thinking. The notion of personalised learning places central importance on learning being meaningful to individual students and developing a learning culture of skilled enquiry and creativity. Rudd et al describe personalised learning as teaching practices that "account for different learning styles, needs and interests of individuals" and should "offer learners greater choice over what they learn, how they learn it, and even when and where they learn" (Rudd et. al, 2006: 5). Another central aspect of personalised learning is students' engagement in their own learning. This aspect of personalised learning is based on the opinion that "students can become motivated when they have control over their environment, set challenges for themselves and satisfy their curiosities" (Wishart cited in Sharples et. al., 2007: 62). In talking about their learning experiences and how they are made possible by a specific tool or their teacher's practice, students engage in their own learning and are in a better position to take pride in their developments and achievements. As the UK department for Children, Schools and Families indicates, the aim of personalising learning is "to enable pupils to understand themselves better as learners and so take greater control of and responsibility for their learning, transferring and applying a widening repertoire of learning approaches in different subjects and contexts" (http://www.standards.dfes.gov.uk/personalisedlearning/five/teachinglearning/ accessed December 5, 2007).

While we admit that 'personalised learning' as a verified and rigorous pedagogical theory is still in question, however we feel its aims reflect current ideals of what and how students should learn.

There are a number of clear parallels between the aims Personal Learning and Thinking Skills of the UK's secondary schools curriculum and personalised learning, and the learning that occurs when students build mobile learning games with MiLK. One of the most valuable characteristics of MiLK is the way it teaches processes and methods for gathering, refining, and creating knowledge and for transferring this knowledge between students. A student's ability to create connections between information and to draw out knowledge relevant to their current learning situation is critical. As noted earlier the skills to gather and create knowledge now exceed the importance of knowledge possession. When designing games with MiLK, students must identify information embedded within a site and engage in a process of critical analysis, synthesis and refinement, building upon their personal learning and thinking skills. Furthermore, throughout the process of designing MiLK games, students critically engage in the logic of learning. They actively set up structures for others to enquire and investigate and critically reflect on their own learning. All of the skills MiLK assists students to develop are essential in a society where we can no longer personally possess all of the knowledge we need to act, rather we must be able to seek it when necessary (Siemens, 2005).

6. CONCLUSION

Through successfully translating our process of designing mobile learning games into the MiLK interface we have developed a powerful learning tool for 21st Century learners. Using the 10% rule as an analytic tool for exploring the design process, this paper has revealed the complex learning involved in designing mobile learning games and has discussed the significance of this learning process in forming independent enquirers, creative thinkers, reflective learners, team workers, self-managers and effective participants.

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