

Delivering Information Literacy Skills Through Game-Based Learning

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Introduction

Millennial students are students who have grown up in an ICT-rich environment with TV, video games and computers are 'digital natives'. They have never known anything else. It is a natural environment for them. They think and learn differently from 'digital immigrants', their elders. Their teachers are often digital immigrants, who did not grow up in an ICT-rich environment and have had to learn to use information and communication technologies (ICT). The digital immigrant remembers a world without cell-phones and personal computers. These millennial students enjoy the fun of learning through interactive games and spend a lot of time doing that. The time is ripe to consider an interactive information literacy game.

Information Literacy Defined

Information literacy is not digital literacy, it *builds* on digital literacy, goes beyond information access, and involves information in all forms. Information literacy involves skills in critical thinking, evaluation, and the application of information. It is about students knowing how to learn. Developing and improving information literacy is an active process with life-long benefits involving accessing, evaluating and using information efficiently, effectively, creatively, and accurately.

According to the American Library Association (1989), an information literate person is able to recognise when information is needed and has the ability to locate, evaluate, and use effectively the needed information. This view is reflected in the *Australian and New Zealand Information Literacy Framework: principles, standards and good practice* published by the Australia & New Zealand Institute for Information Literacy (ANZIIL) in 2004. The ANZIIL Standard (CAUL, 2004) defines information literacy as the understanding, and set of abilities, enabling students to 'recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information'.

These definitions fit with one that emerged from a UNESCO meeting of information literacy experts that claims: "Information Literacy encompasses knowledge of one's information concerns and needs, and the ability to identify, locate, evaluate, organize and effectively create, use and communicate information to address issues or problems at hand; it is a prerequisite for participating effectively in the Information Society, and is part of the basic human right of life long learning" (US National Commission on Library and Information Science, 2003).

Impact of ICT and Library Anxiety on Information Literacy

Libraries are changing, both physically and in all that a library encompasses; collections, access, and services. They now include a large selection of online resources and web-based services. But the transformation has not gone far enough yet and students still often avoid using libraries. Instead, they rely on inappropriate web sources rather than library-provided academic resources. Their multimedia projects look great but very often don't have substance, and show lack of understanding on issues such as privacy and copyright.

ICT are rapidly changing the way we think and work. Information comes thicker and faster, in all its variety. Information overload (Anderson & de Palma, 2005) is getting worse by the minute. Tracking information down on the Internet and databases takes information literacy skill. Many students overestimate their information literacy skills and need to improve them (Lorenzen, 2003; Perrett, 2004; Sormunen & Pennamen, 2004). Students often think the World Wide Web can meet all their information needs (Spence, 2004; Oblinger, 2004) and when they do get around to going to the library, they are unsure how to find needed information. They get overcome with anxiety because they don't know how to find it and feel too embarrassed to ask for help.

A strong link has been found between 'library anxiety' and information literacy. The Information Literacy Process Model of Library Anxiety (Onwuegbuzie, et al., 2004:70-80) describes how library anxiety interferes with information literacy on three distinct levels: input, processes and output. It recognises the major role that library anxiety plays in the process of locating, evaluating and presenting or using information resources. The Model recognises library anxiety as similar to the anxiety felt by learners of a foreign language. Students may have high levels of computer literacy, but they avoid the library to avoid exposing their perceived ignorance. 75%-85% of students develop library anxiety and as a result are 2.5 times less likely to use a library (Onwuegbuzie, et al., 2004:55).

'Digital Natives' and Their Learning Style

Since the 1980s a new breed of student has evolved: the 'digital native'. The digital native has been reared in what has become known as the Net-generation (Net-gen) or Digital Generation (D-gen). These students think and learn differently from their parents and elders. They are 'plugged in', engaged in the 'powered up' digital world, always connected by the Internet, email, their mobile telephone, and instant messaging. Wired for sound, text and graphics, they speak another language and inhabit another world from those that have studied before them (Prensky, 2001; Oblinger, 2004).

'Digital immigrants, who didn't grow up in this digital world of computer games and home computers, don't speak the same language and often experience difficulties teaching this new breed of student. They regard digital natives as having short attention spans and lacking interest in learning. However, this is not necessarily the case. Instead, the digital native sees the world, and learns best, through game-based behaviour instead of the traditional methods (Prensky, 2001). Through their use of computer games, digital natives have learnt how to evaluate a range of information, make decisions, see what happens, and take the next action according the result of the previous decision, at what Prensky terms "twitch speed". How digital natives find and interpret data, and publish their results through game forums parallels information literacy skills.

Curiosity and creative thinking, attributes that help locate, find, and evaluate information, are at the heart of information literacy (Arp & Woodard, 2004). Learners need inquiring minds. Placing emphasis on a questioning approach to learning presents an opportunity for re-evaluating the way information literacy skills are taught and learnt. In the past, teaching information literacy has focused on transferring skills to locate information, rather than the inquiry and learning processes of students who want to think about, and use, information.

Digital games appeal as a teaching and learning environment. They attract and engage players, fit with theories of learning styles and experiential learning (Kolb, 1984; Moallem, 2003; Howard et al., 2004), and suit the different kinds of intelligences (Gardner, 1993) that allow people to identify and resolve problems. For example, people may use verbal, logical, visual, auditory, musical, and kinaesthetic or other kinds of perception and understanding in games.

The emerging millennial learning style of digital natives involves ‘mediated immersion’ in multimedia and digital games, active and experiential learning with opportunities for reflection, non-linear situated learning, and having their individual learning needs and preferences met online (Dede, 2005). Digital natives expect, and thrive, on a more interactive learning environment than previous generations.

Problem–Solving and Active Knowledge Construction

Constructivist pedagogical frameworks embrace inquiry and discovery-based, learner-centred approaches in which learning is an active process rather than passive (Windschitl, 2002). In constructivist learning environments students build on their prior knowledge and experience, discover, construct, practice and test new knowledge. It then becomes embedded, transforming their knowledge, skills and behaviour, enabling them to apply it to a new situation.

Learning from experience, getting feedback, and revising thinking, is a critical part of any learning process. The cycle of interactions, reflections and feedback in games fits with Laurillard’s (1993) conversational model. The depth of learning achieved through games fits with theories of deep and surface learning (Marton, 1984).

In problem-based learning, students make decisions and take actions to overcome a set of problems to reach their goal. In the learning process they’ll investigate and evaluate information and make decisions to reach their goal. Problem-based learning promotes critical thinking and expertise through the use of realistic situations or problems (Spence, 2004).

Games, as problem or inquiry based learning, are similar to the Socratic method of inquiry, and should be a ‘third paradigm’ alongside theoretical and empirical approaches to teaching and learning (Marinelli & Pausch, 2004). The constructivist learning processes employed relate more to thinking and reasoning than just information gathering (Okan, 2003). The information gathering, processing and construction in a game are influenced by both internal and external factors.

The process of accessing, evaluating and using information resembles what gamers do to figure out how to win games. Perhaps the single most important thing about a good game is

decision-making - frequent decision-making - and the speed of making decisions. Being forced to make those decisions increases the learning enormously. This ties in very well with the basic areas of information literacy, where a number of important decisions need to be made.

Tutorials, exercises, and guides can easily be incorporated in courses, and some libraries are already doing this in class work and assignments (Wartho, 2004). Games are also being developed to teach these skills; for example, TILT, the Texas Information Literacy Tutorial (<http://tilt.lib.utsystem.edu/>), developed by The University of Texas at Austin libraries, is an early example. There are also simulations such as Environmental Detectives (<http://cms.mit.edu/games/education/Handheld/Intro.htm>) that can incorporate information-seeking skills into the game, reinforcing millennial students' interest in figuring things out and working in groups (Lippincott, p 60).

Having Fun and Games Learning

People learn through play. Play is consistent with the constructivist idea of independent and motivated learners actively engaged in a safe learning environment, a 'microworld', being carried along by the flow of the activity and the fun of pitting their wits against the game to achieve a goal, and the learning experience transforming their knowledge (Rieber, 1996). An information literacy game would give students a safe environment for risk-taking, exploring and learning, like a "sandpit". Games can reduce learning anxiety and make the experience enjoyable. They encourage learners to reflect, take risks and go beyond what they already know, and develop mastery (Rickard & Oblinger, 2004).

Digital natives are known to embrace computer games with a passion and spend a great deal of time playing them as long as the game is motivating, engaging, and fun, and they can influence the outcome of it by and solving a problem (Oblinger, 2004; Rickard & Oblinger, 2004). Students will look forward to game-based learning when the experience is fun, the game is suitable, has defined learning outcomes, structured around a realistic story, has simple-to-explain rules, and is engaging enough to keep the players attracted and motivated (Kelly & Nanjiani 2005; Falstein, 2004).

There is no doubt that digital games can teach effectively (Bracey, 1999; Ellison & Mangis, 2004; Oblinger, 2004) and can provide learner-centred, self-paced just-in-time teaching, 24/7. Lesson content will be the same; however, engagement through game-based delivery will lead to effective learning, knowledge retention and transfer and prove more suitable to digital natives than traditional teaching methods (Rickard & Oblinger, 2004).

Games provide a good environment for learning. Players learn to play games without being taught. The learning that takes place in the game environment is actively self-constructed through response to events, reflection, decisions and actions, repeating the cycle until the objective is reached. It is "stealth learning". Players are so engaged in the game that they do not realise until later that they have actually learned something (Prensky, 2001:p 96).

With an information literacy game, students will be entertained, challenged, make decisions, weigh up information and strategies, and reach a desired outcome against known and unknown odds, effectively and efficiently achieving information literacy learning objectives. Games help the new breed of student to learn by doing, and through reflecting on the outcome of their decisions and actions. In short, the students are having fun in an

environment that they are comfortable with while learning a set of learning objectives that you have defined within a game.

The Design and Technical Imperatives of an Information Literacy Game

When developing a game that would act as a learning tool for the digital native, the designers have to strike a balance between aesthetics, game-play, and delivery. A popular misconception about digital natives is that for a game to be engaging, it must be of the highest quality aesthetic level. There is a misconception that the game must have millions of colours, the highest screen resolutions, and photographic quality graphics. In truth, the aesthetic values of a game go only skin deep. Once the digital native scratches the surface of such games, they will quickly become disengaged and lose interest.

What is important is not how the game looks on the surface, but how engaging the game is. A digital native will sit there for hours trying to build a mighty Roman city state, pitting his wits against the computer's and will learn much about ancient history, economics, time management, etc. It is the mechanics of the game that is engaging the digital native, not the quality of the graphics.

The mechanics of the game should be designed and outlined before a single graphic is drawn. The mechanics should be based upon a logical path that will lead the digital native to have a strong grasp of the learning objective at the end of their journey. Once this mechanism is thought out, then a virtual world of the computer can be laid over it.

Using this method of development, the delivery of such a game would be ideally positioned to be media neutral. By scaling up or down the hardware and software overhead of the user interface, a game that can accommodate a wide variety of delivery devices can be produced. For example, a version of the game can be delivered on a mobile phone, web page, or lower level computer with a minimal amount effort.

There are several development environments currently available at various levels of maturity that support such a development model. Macromedia Flash is such a development environment and perhaps the most mature of the options available. The underlying game intelligence can be written once stored as an object that can be called upon by other Flash applications. The overlying user interface can then be added later and scaled up or down depending upon the delivery mechanism. Flash supports a wide variety of delivery mechanisms through its stand-alone device plug-in. So, once the application is written, it is just a matter of copying the program to the device and the student is ready to go.

Another less mature and less supported development environment is Scalable Vector Graphics (SVG). SVG is a W3C recommended specification for using XML to describe graphical applications for display in web pages or other devices. While there have been several impressive proof of concepts, very few applications support this standard and the ones that do support these standards have their own ideas of how it should be implemented, leading to unpredictable results. However, this is a standard that lends itself well to Open Source initiatives, so it is conceivable that, in the not so distant future, applications will be introduced that support this standard.

It is Only a Matter of Time....

It is just a matter of time before an interactive information literacy game is developed that complies with ANZIIL and internationally accepted information literacy frameworks and appeals to students at any age. Such a game would go beyond how to locate and find information to the information literacy skills required for the application of information to meet a specific need (e.g., an assignment).

The envisaged game would provide a modular structure using a flexible delivery medium in which information can easily be tailored to a specific institution's needs depending on the skills or level of complexity required, and may be delivered on a variety of platforms. The game would lead students through the various stages of seeking and evaluating information sources, and students would be able to set their own particular learning path depending on what they need to know and, in the process, they would develop, and test, their knowledge and use their information literacy skills.

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