Engaging Students: Digital Storytelling in Information Systems Learning

Nathan R. Bromberg
Auckland University of Technology
New Zealand
nbromber@aut.ac.nz

Angsana A. Techatassanasoontorn
Auckland University of Technology
New Zealand
angsana@aut.ac.nz

Antonio Díaz Andrade
Auckland University of Technology
New Zealand
antonio.diaz@aut.ac.nz

Abstract

One of the general challenges in today's teaching and learning environment is identifying ways to create meaningful and engaging learning experiences that go beyond a traditional lecture. The discovery-learning paradigm has a potential to address this challenge by encouraging students to be active participants in their learning experience. In this paper, we report on our exploratory study of the use of digital storytelling to support discovery learning in an introductory information system (IS) course. Digital storytelling, in contrast to the traditional lecture format, encourages students to use computer-aided mixed media such as audio, video and images to construct and convey knowledge around a topic in the form of a story. The aim of the digital storytelling project was to encourage students to take ownership in their learning process by giving them the opportunity to design, create and present their own class materials. We discuss our findings on how digital storytelling facilitates learning of complex IS concepts. The results suggest that a careful pedagogical design around story planning, digital story production and reflection are important to achieve positive learning experience of students.

Keywords: Digital Storytelling, Discovery Learning, Information Systems.

1

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

Introduction

One of the general challenges in today's teaching and learning environment is identifying ways to create meaningful and engaging learning experiences that go beyond a traditional lecture. Teaching and learning activities in the field of information systems (IS) face unique challenges given the rapid contextual change in technology and industry practices and the need to develop core knowledge around complex concepts, such as enterprise architecture, information technology infrastructure and IS strategy (AIS, 2010).

A potential approach to improve student engagement and to create meaningful learning experience is *discovery learning*. Discovery learning is a constructivist education paradigm that puts more emphasis on students as active participants in their learning process (Bruner, 1966; Hermann, 1969), by which students construct knowledge through interaction with their environment, as well as other students. Discovery learning utilises students' ability for exploration, discovery and ingenuity, which are key to the constructivist education paradigm (Alfieri et al., 2011). Digital storytelling is well suited for discovery learning because it encourages students to use computer-aided mixed media such as audio, video and images to convey information to an audience in the form of a story (University of Houston, 2011). Research suggests that storytelling is a powerful method to help students understand complex and abstract topics (Bruner, 1990). In addition, digital storytelling facilitates student engagement, improves student involvement in their own learning experience, promotes deep learning and facilitates the discussion of topics presented in a story format (Barrett, 2006; Burmark, 2004; Gils, 2005).

This research explores the process of using digital storytelling in an introductory IS undergraduate course. In our teaching experience, we found some topics that are particularly difficult for students to grasp. Thus, we decided to supplement the lecture method with digital storytelling production as a medium to reinforce the learning of those allegedly diffi-cult topics within the curriculum. The goal of using digital storytelling as a learning strategy was to help students gain a better understanding of some of those particularly challenging and complex IS concepts. Generally speaking, concepts which cannot be represented by a single lexeme, such as *Supply Chain Management* or *Cloud Computing* compared to, say, *computer* can be considered complex (Murphy, 1988). For the purpose of this research, we defined complex concepts as those which require students to be able to analytically break them down into their individual components to understand and those which are "too abstract to grasp without practical examples" (AIS, 2010, p. 47). Digital storytelling would enable students, particularly those who had no previous experience with IS to learn through the process of developing digital stories and sharing these stories with the class. With this in mind, we designed an assignment with the aim to engage students in the learning process by giving them the opportunity to plan and direct a portion of the teaching activities.

The research questions we address are:

To what extent does digital storytelling facilitate learning of complex concepts?

How does digital storytelling contribute to the learning process?

The rest of the paper presents the literature on digital storytelling as an innovative learning method, the ways we used digital storytelling in our course and our findings. The paper concludes with research and practical contributions and future research opportunities.

Digital Storytelling as a Learning Strategy

Although the mode may differ significantly, all cultures throughout history have used storytelling as a means to pass on knowledge and customs that are important to the storyteller (Bell, 2002; McLellan, 2007). Storytelling, in addition to being an important method of communication (Bell, 2002; McLellan, 2007), allows individuals to rationalise and make sense of their experiences (Bell, 2002; Read

et al., 2009). These characteristics can make storytelling a useful tool for teaching (Bell, 2002), as students are able to construct contextualised knowledge around complex IS concepts through their stories and use stories to inform and engage their peers. Research suggests that storytelling is more effective at helping students develop critical thinking skills than conventional teaching methods (Ironside, 2006).

The idea of "digital storytelling" was first explored by Dana Atchley in the 1980s (McLellan, 2007) when information and communication technology (ICT) tools were in their infancy. Twenty years later, technology has evolved to a point where any individual with access to a computer and the Internet is able to create and share ideas with the world. YouTube video is a good example. This new way of sharing ideas opens the doorway for reinventing the way that we construct, communicate and share knowledge. In recent years, digital storytelling is being used by businesses as a method of advertising; however, it has deep roots within education (Dupain and Maguire, 2007; Royer and Richards, 2008) and other fields such as knowledge management (Brown and Duguid, 1991; Orr, 1990). The nature of storytelling, specifically the insight it gives into people's life experiences (Bell, 2002), has made it well suited for teaching and learning in disciplines such as social sciences and nursing (Ironside, 2006). However, the general acceptance of storytelling and the availability of new ICTs in homes and classrooms (Gazarian, 2010; Ohler, 2006) open the door for digital storytelling to be used as an interactive teaching tool (Crosling et al., 2009) in many disciplines.

Education literature establishes that active learning yields the highest level of knowledge retention (Wiman and Meirhenry, 1969). Active learning is the process that "requires students to do meaningful learning activities and think about what they are doing" (Prince, 2004, p. 233). It involves a 'hands on' approach that can be supplemented by sharing the experience with others. Thus, we used digital storytelling as a learning strategy and asked students to construct knowledge by connecting IS concepts with real-world applications and share the recently acquired knowledge with the class, in the form of a story. As an active learning strategy, digital storytelling – compared with traditional lecture – is likely to yield higher knowledge retention for students who have limited or no practical experience with the topic. Digital storytelling also promotes higher-order learning outcomes, such as critical analysis and evaluation (Yang and Wu, 2012) through the process of selecting and developing learning materials. Students who have some practical experience with a particular concept (e.g., supply chain management) were encouraged to use their prior experience to develop their digital stories. We observed that those students who had practical experience with a specific topic felt more comfortable presenting it to their peers as we explain later on in the findings.

Digital storytelling is grounded on a student-centred learning approach. Therefore, it promotes and actively supports student involvement in their own learning process, which has been shown to produce effective learning outcomes (Dupain and Maguire, 2007). Quality of learning experience is positively related to student engagement and can help reduce student attrition (Crosling et al., 2009). Research also finds that the appealing nature of an interactive learning approach is beneficial for improving retention amongst minority groups (Crosling et al., 2009) and supporting non-native English speakers (Bell, 2002). Other benefits of digital storytelling are increased confidence for public speaking (Ohler, 2006) and enhanced creativity (Banaszewski, 2002). In the IS discipline, storytelling was found to support student learning in an introductory database management course (Ramiller, 2003).

Previous Research

Previous studies examine the use of digital storytelling in the classroom. Some of these studies, which are relevant to this research, are summarised in Table 1.

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

Table 1 – Summary of Previous Research			
Author	**Key Findings**	**Topics**	**Learners**
Bell (2002)	• Beneficial to both learners and educators • Helpful for new migrants and non-English speakers	English as a second language	Non-English speaking migrants
Di Blas, et al. (2009)	• Digital storytelling promotes positive learning outcomes • Efficacy of digital storytelling depends on the quality of educators and their ability to engage the class • Setting clear guidelines, providing support to students are important • Technology and tools should not hinder creativity	Learner-chosen topics	School-aged children and teenagers
Dupain and Maguire (2007)	• Digital storytelling promotes a better understanding of concepts • Digital storytelling encourages learners to take ownership of their learning	Health studies	College students
Gazarian (2010)	• Digital storytelling helps learners develop technological skills • Technology must be easily accessible	Health studies	Senior college students
Gils (2005)	• Digital storytelling needs to complement learning strategies • An overemphasis of an entertainment aspect of digital storytelling at the cost of learning should be avoided	Multi-disciplinary	From school new entrants to college students
Hung et al. (2012)	• Technology can promote learners' interest and engagement • Team-based projects can foster positive learning outcomes	Science	Elementary school
Hurlburt and Voas (2011)	• Good digital stories should process data into an art form to engage and stimulate others	Information technology	Review of extant literature
McLellan (2007)	• Digital storytelling is a powerful tool for learning and teaching • Storytelling engages the audience into participation	Multi-disciplinary	Students in higher education
Robin (2008)	• Digital storytelling requires learners to use various skills (e.g., information literacy skills, technological skills and communication skills) to develop stories	Multi-disciplinary	School-aged children and teenagers
Sadik (2008)	• Digital storytelling encourages learners to organise their existing knowledge on a topic and further develop their ideas • Low availability of technology may discourage learners from engaging in digital storytelling development	English, science, mathematics, social studies	School-aged children and teenagers
Valkanova and Watts (2007)	• Digital story creation process is useful for self-reflection • Digital storytelling builds skills and competencies for creative styles and communication methods	Science	Primary school children
Wang and Zhan (2010)	• Learners who are not digital natives may lack the digital acuity to construct high-quality stories	Computing, education, Chinese	Undergraduate and graduate students
Yang and Wu (2012)	• Digital storytelling enhances critical thinking and problem analysis skills • Digital storytelling motivates learning	English as a second language	Senior high school students

Although digital storytelling has only become possible with the widespread availability of information technology, storytelling dates back more than 6,000 years to the time of cave-dwellers (Hurlburt and Voas, 2011). Despite the modern decline in print media, storytelling remains crucial to help us "to make sense of an increasingly digitized world

4

flooded with nonstop data" (Hurlburt and Voas, 2011, p. 5). The purpose of digital storytelling is not to present the data in its current sterilised form. Instead, it requires storytellers to interpret data and put them into an art form to engage and stimulate others. Though digital storytelling has traditionally been the domain for media and communications courses, it is valuable across a large range of topics which require learners to convey information (McLellan, 2007).

Studies have looked at the role of digital storytelling in teaching and learning, its benefits and challenges. For example, Bell (2002) found that digital storytelling is beneficial to both learners and educators. Some studies found that digital storytelling supplements traditional lecturing styles (Di Blas et al., 2009) by enabling learners to develop a better understanding of concepts (Dupain and Maguire, 2007).

Furthermore, digital storytelling can help to enhance critical thinking and problem analysis skills, which in turn helps learners to interpret and construct language arguments (Yang and Wu, 2012). The development of these wide-ranging skills, such as problem solving, creativity (Hung et al., 2012), critical thinking (Yang and Wu, 2012) and self-reflection (Valkanova and Watts, 2007), is one of the greatest strengths of digital storytelling. The use of digital storytelling requires learners to develop digital, technological and information literacy skills and (Gazarian, 2010) an ability to communicate visually and in a way that will be universally understandable (Robin, 2008). In the process of story development, learners need to organise their existing knowledge on a topic or concept and help them develop their ideas further (Sadik, 2008).

However, the efficacy of digital storytelling hinges on the quality of the educators and their ability to engage the class rather than the quality of the students (Di Blas et al., 2009). The educators need to set clear guidelines and provide support for students to create innovative stories. Digital storytelling should be integrated into the curriculum to complement other learning strategies (Gils,

2005). In addition, consideration should be given to ensure that the technology is easily accessible (Gazarian, 2010) and does not hinder creativity (Di Blas et al., 2009). A potential risk that can undermine learning is that the experience of constructing the digital story overwhelms the concepts actually being taught. It is important that "the entertainment aspect of the system does not supersede the educational aspect" (Gils, 2005, p. 6). To be beneficial, the learning framework of digital storytelling needs to be interesting to ensure that learners are engaged at the early stages of the project (Hung et al., 2012). Research findings suggest that digital storytelling, if used appropriately, can yield a number of strong learning outcomes, such as increased learner engagement, knowledge retention, motivation and digital literacy (Di Blas et al., 2009).

Although previous research has primarily focused on evaluating the efficacy of digital storytelling over traditional teaching methods, we take a more cautious approach. Our research seeks to understand how digital storytelling contributes to the student learning experience. Previous studies and their findings have been used to inform the design of our research, which is discussed in detail in the next section.

Digital Storytelling in an Introductory IS Class

One hundred and twenty (120) students enrolled in an introductory IS course at Auckland University of Technology in New Zealand during the 2011-2012 academic year were required to develop digital stories. The course is required for both an IS major and an IS minor, and optional for general education electives. In our university context, students come from a diverse range of cultural backgrounds. In 2010, 13% of all students enrolled were international students (AUT, 2011a) from 85 different countries (AUT, 2011b). Four topics that students could choose to develop their digital stories on were: Mobile and Networks, Supply Chain Management, Customer Relationship Management, and Enterprise Resource Planning.

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

These topics were chosen because they were, according to our experience and the literature on IS education (Boudreau, 2003), the ones that are particularly challenging for students to understand.

Team-Based Learning

In their introductory IS course, Kreie et al. (2007) found a large rate of student attrition and low participation when they used traditional teaching methods. After introducing team-based formative assessment as a key component in the course, they found that the student dropout rate decreased significantly with a noticeable improvement in class participation. They assert that the social support provided by the collaborative nature of teamwork enables students to gain a better grasp on complex IS concepts. In the case of digital storytelling, a group project can be useful to provide students with a more diverse range of perspectives on their chosen topic than they would have individually (Read et al., 2009). Additionally, group projects enable students to create more advanced digital stories, with deeper background research, which may otherwise be difficult to achieve if working individually. However, our previous experience with group projects in the classroom had highlighted potential issues with a team-based approach. For example, unless teams are well monitored and supported, contribution of individual team members varies with their interest in the project and their other time commitments. As such, we adopted three principles as suggested by Kreie et al. (2007) to guide a successful team-based learning process: using frequent individual assessment to hold each team member accountable for their learning; keeping assignments as interactive as the curriculum allowed; and providing quick and comprehensive feedback to each team regularly. Although teams were self-selected into groups of four (with 32 groups in all), students were encouraged to group with students of varying skills and different knowledge domains to their own. To assist them in assessing their own computing knowledge, and that of their peers, they were given individual surveys, which enabled them to identify strengths and weaknesses in their basic knowledge and experience. Table 2 gives a breakdown of the number of groups that selected each of the four topics. Notably, there was a natural trend for groups to select topics for which they had previous practical experience, or they felt most comfortable with.
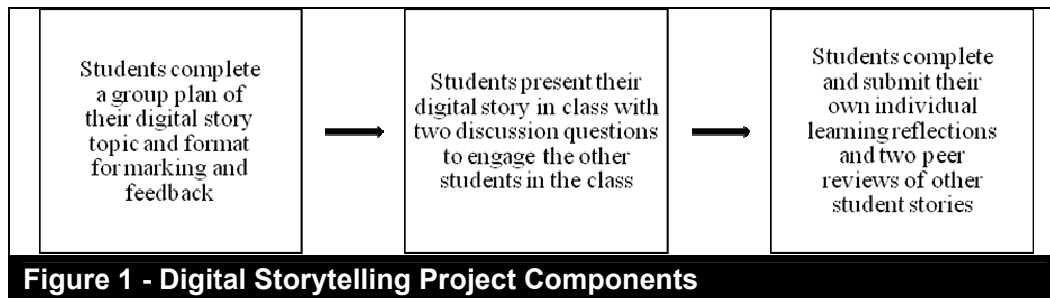
Table 2 – Group Topics Breakdown					
Topics	**Mobile and Networks**	**Supply Chain Management**	**Customer Relationship Management**	**Enterprise Resource Planning**	**Total**
Number of Groups	16	8	8	0	32

Project Activities

The digital storytelling project was broken down into three components; *a digital storytelling plan*, *a digital story presentation*, and *self-reflection and peer feedback* (see Figure 1). Students submitted a project plan outlining the story plot that connects a chosen IS concept with practice and the production plan. The plans enabled us to provide feedback early on to ensure that the students were on track for completing the assignment. The digital story presentation required student teams to show their digital stories and to pose two discussion questions to encourage other students in class to engage in the learning process. Individual reflections allowed students to think about their digital story creation experience and the stories produced by their peers in order to evaluate their learning benefits and challenges. The value of using self-reflection to student learning has been widely reported by academics and practitioners (Haigh, 2008; Smith, 2002; Tagawa and Imanaka, 2010; Warhurst, 2008; Yancey, 1998). In addition, each student also had the opportunity to offer feedback as peer reviews to two other student teams.

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

| Students complete a group plan of their digital story topic and format for marking and feedback | → | Students present their digital story in class with two discussion questions to engage the other students in the class | → | Students complete and submit their own individual learning reflections and two peer reviews of other student stories |

Figure 1 - Digital Storytelling Project Components

Having surveyed students on their experiences with creating digital media and the technology they had at their disposal, we discovered that although most were savvy with digital media consumption (e.g., watching videos on YouTube), few had direct experience of creating ones. Only 4% of students regularly uploaded videos, whereas 85% reported that they had one or fewer experiences with creating video content. The feedback from the surveys seemed to indicate a general apprehension of using such technologies without further support. Although it is suggested that the technology behind digital stories should be secondary to their message (Banaszewski, 2002; Kajder et al., 2005), it is important to have some technological support and creative direction to ensure that the narrative and images of the story are well aligned (Leng, 2010). For this reason, we opted for the popular media site, YouTube, to give a brief tutorial on digital media creation and upload. Students who conscientiously objected to using social media for their coursework were given the option to present their video directly from the computer. However, we did not have any students who expressed concerns regarding sharing their videos on YouTube. Instead, students made favourable comments on the usefulness of the optional tutorial for their project – e.g., "[the]

tutorial was helpful for students not very proficient with video editing" and "[it] provided us the necessary tools to utilise in the project".

Data Collection

At the end of the course, students were given a self-reflection questionnaire. The self-reflection questionnaire has four five-point author-developed Likert-scale questions that ask students to evaluate on a scale of 1 (not well at all/not valuable at all) to 5 (very well/very valuable) regarding team work, learning experience and the perceived success of their digital storytelling. In addition to the four five-point Likert scale questions, there is one open-ended question that asks students to discuss their overall experience of the project. Similarly, the peer feedback questionnaire has four five-point Likert-scale questions that ask students to evaluate on a scale of 1 (disagree) to 5 (agree) regarding their perceptions about other digital storytelling presentations and one open-ended question that asks students to discuss specifics of what they like and offer suggestions for improvement. Table 3 presents the descriptive statistics and summary responses from the self-reflection questionnaire (responses from the open-ended question are not included here).

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

No.	Reflection Question	No. of responses	Mean	S.D.
Table 3 – Self-reflection Question Descriptive Statistics				
1	As a group, how well do you feel you were able to work together to complete this project?	120	3.95	0.99
2	How well do you believe that you have learnt about your chosen topic from this project?	120	4.18	0.79
3	Based on the class discussion, to what degree do you feel that your project was an overall success at teaching your chosen topic to the class?	120	3.67	1.02
4	To what extent do you believe that the digital storytelling project is valuable to your learning experience in this course?	119	4.08	0.86

Table 4 gives an overview of the student grades, which are broken down into five components: digital story plan, video production, presentation, reflection and feedback. The grades for the plan, video production and presentation were calculated based on the whole group's work. The self-reflection and feedback grades were individually graded for each student and were awarded for submitting their feedback and reflections, rather than the inherent quality of the submission.

	Plan	Video	Presentation	Reflection	Feedback	Total
Table 4 - Grade Descriptive Statistics						
Total Points	20.0	60.0	10.0	5.0	5.0	100.0
Mean	17.67	45.92	8.33	4.83	4.35	80.467
S.D.	2.55	12.92	2.29	0.71	1.53	14.97

We use responses from self-reflections and peer feedback questionnaires and student grades to evaluate students' learning through digital storytelling, as we explain in the next section.

Data Analysis

We performed correlational analysis between responses from the four five-point Likert questions of the self-reflection questionnaire and student grades to establish evidence of the value of digital storytelling for student learning. We also used a thematic approach to analyse qualitative data collected from self-reflection and peer feedback open-ended questions. The overall goal of the analysis – both correlational and thematic – is to elucidate elements of digital storytelling that are important to student learning process.

Correlational Analysis: Digital Storytelling and Learning

The correlation analysis between responses from the self-reflection questionnaire and student grades reveal some interesting results. We report only the statistically significant results here. A statistically significant correlation was found between the students' self-reported quality of learning experience (Question 2 in Table 3) and their overall digital story grades ($f=7.099, df=3, p=0.000$). The correlation between self-reported quality of learning experience was particularly pronounced on both the video grade ($f=6.521, df=3, p=0.000$) and presentation grade ($f=11.151, df=3, p=0.000$) components. This evidence indicates that students who underperformed on the video production and presentation stages of their project perceived a more negative learning experience than those who performed well. We also found a statisti-

cally significant correlation between the students' self-reported teaching effectiveness of their deliveries to the class (Question 3 in Table 3) and their presentation grades ($f=7.244$, $df=4$, $p=0.000$). This result suggests that student's perceived and actual presentation skills are important for students' learning through digital storytelling.

Next, we performed correlation analysis among self-reflection responses on quality of teamwork, perceived learning, perceived success of digital storytelling project, and perceived value of digital storytelling as shown in

Table 5. The correlations indicate that there is a connection between student's ability to work as a team (Question 1) and their perceived learning experience in a team-based digital storytelling project (Question 2). Also, a connection is shown to exist between the perceived learning value (Question 4) and their perceived success at presentation (Question 3). The strongest correlation is shown between students' own learning experience (Question 2) and the perceived value of their stories to their peers (Question 3).

Table 5 - Correlations between self-reflection questionnaire responses (n=120)		Question 2	Question 3	Question 4
Question 1	Pearson Correlation	.348	.319	.206
	Sig. (2-tailed)	.000	.000	.024
Question 2	Pearson Correlation		.401	.370
	Sig. (2-tailed)		.000	.000
Question 3	Pearson Correlation			.282
	Sig. (2-tailed)			.002
Note: For question 4, n=119.				

Thematic Analysis: Digital Storytelling and Learning

In this section, we report the results from thematic analysis to understand the underlying processes of student learning through digital storytelling. Thematic analysis "is a method for identifying, analysing and reporting patterns (themes) within... [the] data set in (rich) detail" (Braun and Clarke, 2006, p. 79). When conducting the thematic analysis, we applied the principle of the hermeneutical circle (Klein and Myers, 1999), by which we analysed the underlying concepts in the data, in relation to the whole. The concepts were then recomposed in order to produce a holistic understanding of the situation at hand. In total, 273 survey responses from the self-reflections and peer feedback (approximately 250 pages of text) from 120 students were analysed. Note that the number of survey responses is greater than the number of students because each student is required to

submit one self-reflection and two peer feedback questionnaires.

Discovering the Categories

From the inductive thematic analysis, we identified and coded 69 distinct concepts that are broadly classified into seven emergent categories. These categories relate to *planning, production*, *presentation*, *collaboration*, *content*, *assessment,* and *learning* processes of the digital storytelling.

Planning

The Planning category describes the process by which students map out their digital stories before starting the filming and production (see Table 6). For some students, planning was the single most important part of their assignment; for others, it was the single point of breakdown. Unlike collaboration (which was only assessed indirectly), students were required to submit a plan for their digital story so that the feedback could be used to improve the story focus and digital story produc-

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

tion plan. For many students, this component was difficult because digital storytelling is a novel experience and students have difficulty drawing on any of their prior classroom experiences. Also, some students struggled with coming to terms with the level of technical knowledge and skills required in digital story production. As mentioned earlier, the experience of student with digital production tools was fairly low (4% of the class), so a short workshop was held to introduce some basic concepts in video production. Whilst this was valued by a number of students, some responded that it was too abstract from the tools they eventually used, and that more advanced training would have been beneficial. This comment might suggest that we attached too much weight to the actual production factor of the video, which should be considered less important than the story itself (Banaszewski, 2002; Kajder et al., 2005). Another factor that was brought up frequently is the underestimation of the time required to complete the project, which led to poor time management. Like teamwork, proper planning is important to students' view of their own success.

Table 6 – Planning Category	
Concepts	**Illustrative Comments**
• solid planning is important • time management • lack of individual knowledge • lack of preparation • no experience of video editing • overestimated topic coverage • external factors affecting video recording • poor preparation for questions • fear of acting • difficulty in finding participants • personal problems • work commitments • poor video editing tools	• "had to set up a good plan for filming otherwise it will waste our time" • "our group had a serious schedule issue" • "the video was not as we were expecting for the lack of editing skills" • "we did not find a right person for our interview on that day" • "the weather hasn't quite agreed with us" • "Due to having a lot of other commitments, I believe I haven't put in the effort required to get excellent grades" • "Being all over the place this semester hasn't helped me at all"

Production

The Production category includes filming, editing and finalising the digital story which students later present to the class (see Table 7). Although it is arguable that production is perhaps the least important to the learning experience of the students (Banaszewski, 2002; Kajder et al., 2005), the quality of the final story is directly affected by production quality.

Students, particularly those who are more technically savvy, commented mainly on details such as choice of background music and transition timings. Some ethical issues identified by students and the teaching team are the relatively high level of third-party media use and the apparent lack of effort put into creating original materials.

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

Table 7 – Production Category	
Concepts	**Illustrative Comments**
• spelling errors • too much like a PowerPoint presentation • choice of background music • videos too short/long • quality of images/videos • not own work/copyright restrictions • slide transitioning too fast • lack of audio narrative • technical difficulties • audio quality • background music interfering with interview • advanced editing techniques	• "I also like the music that went with it" • "We used [a free audio editor]… and sometimes the sound [was] not good" • "The quality of the video is not really good" • "They did not involve any of their own production" • "The things that will need to be improved… would be… checking for spelling errors in the video" • "it was more like a power point presentation"

Presentation

The Presentation category describes the preparation for and in class discussion of students' digital stories, and includes the two open-ended discussion questions that students were asked to devise (see Table 8). Students raised a few issues on presentation. Some students reported that they were nervous to present in front of the class, or had little experience with class presentation. Some students found that those viewing the presentation were reluctant to participate in discussion. In some cases, presenters spoke too softly or were not engaged in the topic. This affected their overall view of the team's digital story, leading to a number of self-critical remarks in the reflections. The nervousness may stem from negative emotions surrounding a perceived "failure" at delivering the story, but nevertheless is an important issue to be considered for the future particularly on how instructors can help students achieve success with presentations and class engagement. Students were also apt at identifying weaknesses in some presentations such as, spelling errors or that the story was too reminiscent of a PowerPoint presentation. On the other hand, students praised some presentations on how well aspects of presentations complemented each other (audio, video and narrative).

Table 8 – Presentation Category	
Concepts	**Illustrative Comments**
• presenter difficult to understand • questions had already been asked • poor class participation • use of incentives for discussion • communication • lack of engagement • nervousness • class struggled with concepts and questions • sharing presentation responsibility	• "an excellent presenting method could help you more to deliver the idea to the students" • "try to engage or encourage participation through leading discussion" • "group did little to intrigue me into answering" • "talking too fast for me to understand what message they were trying to give to the audience" • "I could not hear anything from the speaker and I did not catch any of the explanations"

Collaboration

The Collaboration category is the work between team members, and most particularly the team cohesion and effectiveness at completing tasks (see Table 9). Very much linked to planning, collaboration is also essential to the process of making a digital story. Students had to be able to communicate effectively in order to collaborate on the project,

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

with many teams developing a leadership structure and task lists. Some interesting contrasts were present between team members in their reflections that showed very differing opinions on teamwork and leadership. For example, two students from the same team believed they were the leader, with wildly different views of each other. The most widely reported collaboration challenge was organising time to be able to meet as a team to plan

the project – e.g., "team members did not contribute their time for the success for this project". This challenge often led to students commenting that the pressure of team time management impacted their enjoyment and learning in the project – e.g., "my experience as a member of this group was not good", and "the overall experience of this particular project was not very satisfying".

Table 9 – Collaboration Category	
Concepts	**Illustrative Comments**
• reliability/participation of team members • leadership • team cohesion • communication • brainstorming • respect for other team members • team member availability times • share workload • overpowering/controlling leadership	• "my group made a list of what concepts should be retrieved and selected" • "it is critical that all members need to be present" • "I did not contribute as much as I should of towards this assignment" • "I feel this group member does not get involved enough… and thus hinder our assignment" • "Not communicating effectively also I believe have led our overall performance down"

Content

The Content category relates specifically to what was presented to the class through the digital story, rather than how it was presented (see Table 10). Students' learning and engagement hinge on content, which is a core aspect of the digital storytelling process. It is also the main focus of the grade evaluation whether or not the content is adequate to inform and engage other students. While few comments expressed the lack of focus some

stories had on IS and that some concepts were not properly explained, the general perception was that most of the stories were interesting and engaging. Along with production and presentation, the content component shaped the perception that other students had of the story. Most particularly, students reported to learn more from other teams' stories and experience than as a presenter when the content was perceived as valuable and engaging.

Table 10 – Content Category	
Concepts	**Illustrative Comments**
• went off topic • informative • use of humour • lack of focus on IS • lack of focus on business • lack of topic explanation • boring video • information overload in video • shallow/narrow focus • exciting/fun • use of real world examples	• "I have learnt a lot from our chosen topic Successful Supply Management" • "video is not boring and it makes audience want to participate" • "the future for better video making, they may add some [clear] explanation" • "the video went a little off topic" • "our video is more boring than others" • "In the end, the information in the digital presentation was lacking" • "their video did not seem to have sufficient information about the topic"

Assessment

The Assessment category describes the feedback on the assessment criteria and processes directly, such as the grades and weighting (see Table 11). Assessment was mentioned in the reflections, particularly among students who believed that the criteria were in some way unfair or unreasonable. Three concepts identified were that there was not enough direction on the exact requirements of the project, that the assignment was difficult to complete with the time pressure of other assignments, and that not enough points were allocated to it. Although this was certainly not the experience of many of the students, it suggests that those students who perceived the assessment as unfair had different degrees of satisfaction for the project. One student commented that the course assessment structure "is quite overwhelming... including exam and tests... this [course] has eight assessments... and all of them are equal or less than 10% each... I gain [sic] very limited knowledge doing digital storytelling". This comment confirms Craddock and Mathias's (2009) finding that time constraints cause frustration, leading students to place less value in class assessments. They also found that students receive greater value from formative assessments than summative assessments. This finding seems to be in conflict with the findings of Casem (2006), who suggests that a number of small summative assessments, such as quizzes, are useful to increase the knowledge retention of the students. Although measuring such effects is beyond the scope of this research, it does present a challenge of balancing assessments with time management in a course that utilises digital storytelling along with other class activities.

Table 11 – Assessment Category	
Concepts	**Illustrative Comments**
• not enough allocated marks • lack of direction • pressure of other assignments • considerable time with not enough reward	• "The digital storytelling is quite overwhelming… It takes time and effort to do them especially if people want to get good result." • "a bit more direction… could have been given" • "Including exam and tests… this course has eight assessments…equal or less than 10% each."

Learning

The final category, Learning, looks at the views students had on the learning process itself and how valuable they believed the project to be to this process (see Table 12). Students offered some suggestions on how to improve the project in the future. A common issue noted by some students were the technical difficulties that arose when trying to play their videos through YouTube in class. Nevertheless, students identified positive learning outcomes that are of particular interest to this project. For example, the use of practical examples enabled students to connect complex concepts with real-world examples. The freedom students had in content creation enabled them to control their own learning environment with visually engaging content. Additionally, the diversity of projects allowed students to practice other core skills such as teamwork, time management and critical enquiry. The comments given on the learning component indicate that the project adds value to the learning process, including the introduction of materials that links to a practical aspect of IS.

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

Table 12 – Learning Category	
Concepts	**Illustrative Comments**
• gain first-hand experience • understand topic better • more complete learning experience • rare experience to be a teacher • good teambuilding exercise • creativity • appropriately challenging • confidence building • in-depth research • use of real world examples • interview skills • time management	• "enhances learning from a more visual and fun aspect to students" • "take the initiative in our own learning" • "I will remember the process more than someone just being told about it" • "it gives us a feel on how to film, edit and present our final work" • "I like the way that the group uses real life example [sic] to demonstrate in the video" • "we did lots of research" • "I've never done anything like it before, so it was like learning to swim again"

Emergent Themes

The results from the thematic analysis reveal some insightful and encouraging findings. Firstly, drawing from the concepts identified by the students, we develop a model showing the seven different categories where knowledge acquisition takes place in the digital storytelling. Each of the categories – i.e., *collaboration, planning, content, production, presentation, learning* and *assessment* – is crucial to the success of a team-based digital storytelling activity and to the outcomes of the overall learning experience. Next, we discuss the importance and the interrelatedness of these components to students' learning.

The overall comments pertaining to the digital storytelling project experience seem to be positive, with a number of students indicating that they would be interested in doing similar assignments in the future. Some examples of positive comments are:

• "Overall I had a great experience using my creative side to finish this project and I feel our video came out very well in the end."

• "Digital storytelling gave us a good way to learn about our chosen topic in an interactive way, and I would like to do more assignments in this fashion in the future."

• "I feel this project is a very good component of the Business Information Systems [course] as it enhances learning from a more visual and fun aspect for students."

• "In the end, this was easily the best assignment ever."

A deeper analysis of the seven components of the digital storytelling process at a higher level of abstraction reveals four emergent, distinctive yet interrelated themes (see Figure 2): peer perceptions of stories, team planning and cohesion, perceived engagement and value, and perceived fairness of the assessment. These themes describe the perceptions that influence learning experiences of students for this project. Based on these emergent themes we advance four propositions.
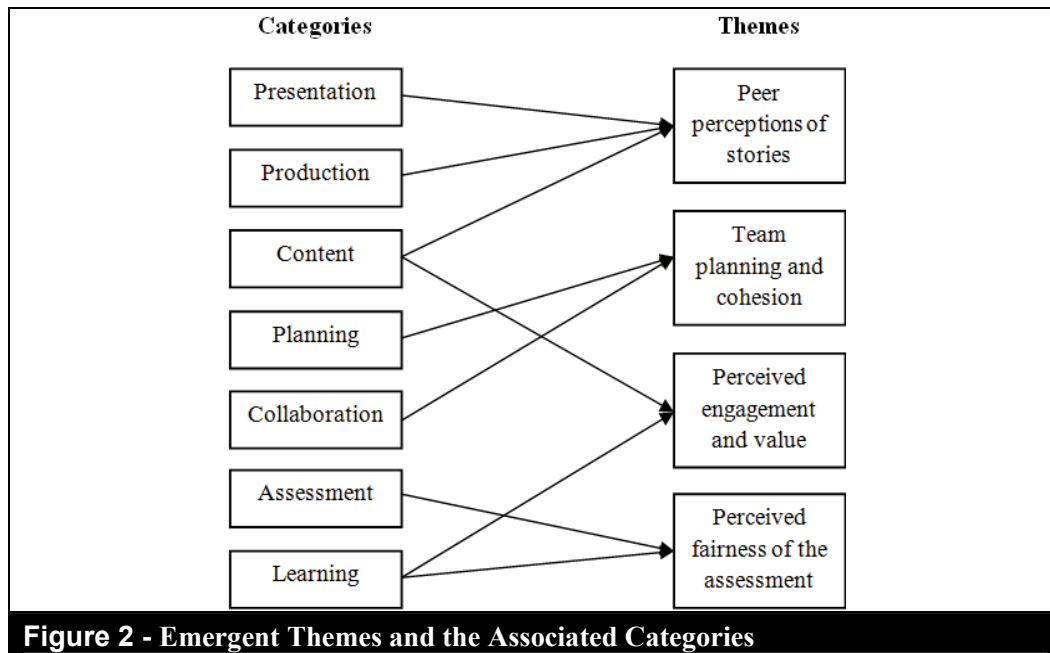
Figure 2 - Emergent Themes and the Associated Categories

Peer Perceptions of Stories

The categories of *presentation*, *production* and *content* were all reported by students to influence their perception of other students' stories. Creating interesting stories that both engage and inform the class is an art form (Hurlburt and Voas, 2011), which requires strong presentation, quality production and well considered content. Most particularly, issues of informative content, engaging presentations and clear productions were essential in conveying a quality learning material. For instance, videos that used practical examples, which is essential to digital storytelling (Di Blas et al., 2009), were not favoured highly by students if they were presented poorly, particularly if the video had issues with quality. As Wang and Zhan (2010) suggest, quality of digital content can be a challenging balance for students who are not familiar with the technology. Therefore, it is essential that the technology tools themselves do not hinder students' creativity (Di Blas et al., 2009). Similarly, videos that were well edited and entertaining were only seen to be valuable if content was also educational and informative (Gils, 2005). This leads to the following proposition:

Proposition 1: The quality of the content and delivery as well as the quality of the production influence peer perceptions of digital stories.

Team Planning and Cohesion

A team-based approach was used for this project as it has been shown to improve learning outcomes in digital storytelling assignments (Hung et al., 2012). Some students reported that they did not feel that they got the most out of the project, or that they believed the quality of the story suffered because of issues related to teamwork and planning. Although working in groups gave more time for the project (Read et al., 2009), it was noted by a number of students that proper planning was essential, and often hinged on being able to come together as a team during meetings. The evidence seems to indicate that student experiences with teamwork and planning have a greater influence on how successful they believe their digital stories to be. This was found by both Burdett and Hastie (2009) and Volet and Mansfield (2006) who suggest that negative perceptions of the teamwork in a group assignment lead to lower feelings of achievement. Regular feedback is important to the

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

success of team-based projects (Kreie et al., 2007). Similarly, guidelines were set at the beginning of the project (Di Blas et al., 2009) to allow students time to plan ahead of time (and the planning itself was graded). Drawing on the evidence in our data, we propose the following:

Proposition 2: Perception of students' own digital stories are affected by the effectiveness of the planning and cohesion of their team during digital story development.

Perceived Engagement and Value

A number of factors influence the value that students perceive from learning projects, such as the experience of the educator (Di Blas et al., 2009), entertainment value (Gils, 2005), creativity (Gils, 2005) and skill building (Robin, 2008). Our students reported that they gained most learning experience from creating their video's content and viewing content created by others. Most particularly, digital storytelling engaged students into further developing their information and technological competencies (Gazarian, 2010; Robin, 2008) whereby the use of and access to technology can promote interest in the project (Hung et al., 2012). It also helps students to focus their knowledge on the chosen topic and to identify areas for improvement (Sadik, 2008), which is then supported by self-reflection on learning at the conclusion of the project (Valkanova and Watts, 2007). Additionally, storytelling itself helps to engage the audience (McLellan, 2007), and creative representation of the content can be an effective tool for students to engage others with the concepts and information in their stories (Hurlburt and Voas, 2011). Content was perceived to be of a high quality if it was interesting, engaging, entertaining, focused and well explained. As observed by Fuhrman and Ladewig (2008), narratives that were both humorous and relevant to the topic were very effective at inspiring creativity in others. This leads to the following proposition:

Proposition 3: Students' learning experiences as learners and presenters are influenced by the perceived engagement and value of the story content.

Perceived Fairness of the Assessment

Finally, a small number of students commented that they believed the workload or assessment criteria for the entire course was not feasible or that the amount of grades did not fairly reflect the amount of work that they put into the assignment. For most of these students, they remarked that this issue negatively impacted their experience with the project and felt that they did not get the full benefit of the experience. In order for students to fully engage with the project (Wise and DeMars, 2005), it is important that they perceive that the assessment outcome fairly reflects the work they put into the project (Jensen Delucchi et al., 1987; Resh, 2009), regardless of the learning outcomes. It is important for instructors to design an assessment structure that students perceive as fair and to reward the effort put in completing the assignments. Digital storytelling projects, in part should complement the course's learning strategies (Gils, 2005). This leads to the following proposition:

Proposition 4: Students' overall experience of the project is affected by the perceived fairness of the assessment.

Conclusion

The aim of the digital storytelling project was to engage students in their own personal learning process by giving them the opportunity to develop and present their own class materials. The balance of comments were largely positive, with many students commenting that they believed the project was worthwhile to their learning, was engaging and fun, and they would like to complete projects like this in the future. The thematic analysis revealed the underlying factors that contribute to the overall learning experiences of students. Despite the limited academic research on this emerging learning approach,

the existing literature on the topic maintain that the use of digital stories and self-reflected learning in classrooms yields a positive impact on student engagement and development (McLellan, 2007; Valkanova and Watts, 2007). The results suggest that a careful pedagogical design around story planning, digital story production and reflection are important to achieve positive learning experience. Even on the relatively small scale of this project, some suggestions and pitfalls have been identified that may be useful for other IS courses and beyond.

Implications for IS Education Research and Practice

In this paper, we have discussed our findings from the implementation of digital storytelling into an introductory IS course. Although the scope of the digital storytelling project was relatively small, these findings can make some contributions to research in the field of IS education. Firstly, although content is important to the quality of information being conveyed, students perceive stories that are well produced and well presented to be the most engaging and informative. Similarly, engagement is crucial for students to feel that the project is valuable to their learning. On the other hand, a lack of planning or insufficient time spent on team building can result in lower satisfaction from the digital storytelling project. Finally, students must feel that the assessment of the projects is fair and rewards students for their commitment to their stories. Future educators wishing to use digital storytelling as a teaching method should take these findings into consideration. We believe these findings support the usefulness of digital storytelling in contributing to and enhancing the student learning experience.

From a practical point of view, the emergent themes can be used as a guideline for others wishing to use digital storytelling in their courses. Firstly, although many students enjoyed the freedom to be creative without too many restrictions, some commented that more direction would be beneficial. For example, greater coverage of what is expected from their stories, and examples of what work

and what do not. Naturally, as this was the first time the project was run for this class, no direct examples were available until now. Also, some stories used a large amount of copyrighted materials, which suggests that explicit explanation and instruction need to be given to students regarding copyright and plagiarism issues associated with the use of digital media.

Secondly, some students were rather apprehensive about presenting and directing class discussion. One approach may be to set aside some class time to discuss useful strategies, or if resources permit, develop a workshop to cover these. Furthermore, more incentives may need to be given to the class to encourage participation, such as grades assigned to in-class discussion. Alternatively, social media, such as blogs could be used as a platform to present the stories. Thirdly, the most frequently reported issue that students faced when planning and producing their digital stories was poor cohesion within their teams. This is perhaps an inevitable problem with group assessments, as it is nearly impossible to police the inner workings of teams. However, one approach may be to get students to sign a group contract that requires teams to agree on team member conducts and responsibilities at the onset of the project.

Fourthly, the selection of the topics for student to pick from is an important consideration. Although we had given Enterprise Resource Planning as one of the potential topics, none of the student teams selected this topic. This may be because students believe that finding real-world case studies would have been too challenging for such a short project, which is in itself a corroboration of the complex nature of this concept. Finally, it is important to consider the overall weighting of the project in the grades. The number of allocated grades should be reflective of the amount of work required to complete the assignment (Jensen Delucchi et al., 1987; Resh, 2009), otherwise students may not fully apply themselves to the project (Wise and DeMars, 2005).

Engaging Students: Digital Storytelling in Information Systems Learning/Bromberg et al.

Future Research Avenues

Our findings indicate that the project was largely of benefit to the student learning. Each of the emergent themes – i.e., peer perceptions of stories, team planning and cohesion, perceived engagement and value and perceived fairness of the assessment – can be further investigated in future studies. For example, other researchers may consider using a mixed-method research design, such as adding a control group to rigorously assess the efficacy of digital storytelling by comparing it with other instructional strategies such as case study or lecture approaches. For the group to be subject to the digital storytelling production, the propositions we put forward could be translated into testable hypotheses. In addition, one-to-one interviews with students may provide useful data to contribute additional insights and to clarify any ambiguity in the data.

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About Authors

Nathan R. Bromberg is a postgraduate research student in the Faculty of Business and Law at Auckland University of Technology, New Zealand. His research interests include the use of new information and communication technologies (ICTs) for enabling social participation and convergence of shared ideas, particularly in the context of grassroots social movements and online communities.

Angsana A. Techatassanasoontorn is a Senior Lecturer of Business Information Systems in the Faculty of Business and Law at Auckland University of Technology, New Zealand. Her research interests include IT-enabled social innovations, IT use and quality of life, digital infrastructure, adoption and diffusion of technology, safe computing, and technology policy. Her research has been supported by grants from the Association for Computing Machinery, the Commonwealth Fund Foundation, Internet New Zealand, Microsoft, the National Science Foundation and Qualcomm. She won the prestigious United States National Science Foundation CAREER Award in March 2011 for her research on broadband telecommunication use and its consequences on human quality of life.

Antonio Díaz Andrade is a Senior Lecturer in Business Information Systems at Auckland University of Technology, New Zealand. He has a strong interest in the interplay between the social and the technical, especially in the area of information and communication technology for development.