THE ANCESTOR PROJECT: ABORIGINAL COMPUTER EDUCATION THROUGH STORYTELLING

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ABSTRACT

The goal of the ANCESTOR program is to use digital storytelling as a means of promoting an interest in technology careers for Aboriginal learners, as well as increasing cultural literacy. A curriculum was developed and first tested with Aboriginal students at the LÁU,WELNEW Tribal School near Victoria, British Columbia, Canada. Based on feedback from both teachers and students, the curriculum was updated and then tested with non-Aboriginal students. Following more refinements, the curriculum was then delivered to Aboriginal learners using two different approaches. The first was a summer camp that took place within a First Nations community over three weeks, and the second was a special elective for grade 6 Aboriginal students at Shoreline Middle School in Victoria. The results from all these deliveries highlight student engagement, cooperation and imagination plus an increased interest in technology. However, in spite of a rich First Nations storytelling tradition, youth were unable to provide cultural perspective in their stories which demonstrates the lack of cultural transference. Next steps will include more emphasis on the integration of technology with the use of traditional language(s), as well as experiential components such as the inclusion of elders and time "on the land".

KEYWORDS

Indigenous, storytelling, literacy, culture, pedagogy, collaborative

1. INTRODUCTION

Within British Columbia, the Aboriginal population accounts for 4.4% of the general population, yet has a larger youth cohort than the general population; according to Census Canada (Statistics Canada, 2008), the Aboriginal youth population in British Columbia (15-24 years) will be at 54,000 by 2013. However, Aboriginal youth are marginalized in the education system and experience lower graduation rates from high school and fewer pursue higher education. To build educational participation and address colonizing attitudes many educational institutes in Canada are now actively looking to make curriculum relevant to Indigenous pedagogies and values. When asked what helped contribute to their success at the secondary and post-secondary level, Aboriginal learners confirmed that culturally relevant curricula, inclusion activities in and out of the classroom, and support systems (cultural and academic) enable an environment to succeed.

One form of Indigenous pedagogy being incorporated into mainstream curriculum is storytelling (Burk, 2000). An important outcome of storytelling is personal empowerment as youth incorporate traditional knowledge into their current learning environment rather than being passive recipients of knowledge. Telling or sharing a story gives value and significance to events in a student's life (Brown, 1995). The ANCESTOR (AborigiNal Computer Education through STORytelling) program incorporates storytelling to promote an interest in technology careers for Aboriginal youth and adult learners, as well as increasing cultural literacy. Courses and/or workshops with such a focus, along with lesson plans, encourage Aboriginal learners to build computer games or animated stories related to their culture and connections to the land and community. In an active learning environment, learners gain mathematical and computation skills, think creatively and reason systematically in a fun and collaborative way. By using Indigenous realities as a foundation to learning, the content becomes relevant to Aboriginal learners, thus creating a safe environment to build competencies.

Transferring the Aboriginal oral storytelling tradition to a digital expression has not been without controversy. Todd (1996) questioned whether Aboriginal world views could find a place in cyberspace. She argued that they are completely different ideologies. Hopkins (2006) stated that in the ten years since Todd expressed her views, that "Cyberspace has been occupied, transformed, appropriated, and reinvented by native people in ways similar to how we've always approached real space. Like video, digital technologies have become a medium for speaking and telling our stories."

There are many definitions for the term "digital storytelling". It can be as simple as "using digital media to tell stories", to the more detailed "At its core, a digital story is a narrative expressed in digital form for a variety of purposes, with applications ranging from education to personal expression, record keeping to movement promotion and everything in between." (Sussex, 2012). Barrett (2006) feels that digital storytelling facilitates the convergence of four, student-centered learning strategies: student engagement, reflection for deep learning, project based learning, and the effective integration of technology into instruction. Many of these strategies fit in with the skills deemed by the "21st Century Literacy Summit" (2005) as key elements to developing essential digital literacy skills for the future. The Literacy Summit report states that "Access to tools that empower expression in these new forms must be as ubiquitous as word processing software or spreadsheets. In schools, tools for creating new media should be available as early as possible, even in primary grades, and more advanced tools provided as students progress and gain facility using them." (p.14). The report encourages a community approach to literacy.

McKeough et al., (2008) note that "There is substantial evidence that Aboriginal youth face serious challenges in schooling, in general, and in literacy development, specifically." (p.148). They emphasize the need to design early literacy programs that engage Aboriginal children. Since 1998, First Nation communities in British Columbia have participated in the Headstart Program, which builds literacy and cultural competencies of young First Nations children both on and off reserves. Other initiatives such as "Success By 6" (http://www.successby6bc.ca/) are also addressing engagement and comfort with literacy for both toddlers and their parents. Connections to community, storytelling, culturally appropriate learning opportunities, and collaborative life-long learning are hallmarks of these programs. The ANCESTOR program seeks to extend this literacy into the realm of technology.

The basic problems faced by Aboriginal youth in Canada are not unique. Similar issues are experienced by Indigenous peoples around the globe. For example in Africa, colonization policies have resulted in the submergence of cultural diversity through the exclusion of most African traditions from education (Woolman, 2001). Fleming and Southwell (2005) note that the dropout rate for Aboriginal students in the Australian education system is very high, and one of the key factors is the alienation of students within a white, Eurocentric school curriculum. Similarly, native Hawaiians are over represented in special education and underrepresented in higher education, which may be the result of the students' school experiences being different from their experiences in their home communities (Yamauchi, 2003). The premise of mono-cultural education is failing many Indigenous populations across the globe. It has only been in the past two decades that Indigenous communities and scholars have begun to deconstruct colonization policies and practices in mainstream education.

The adoption of culturally relevant curricula has proved to be of value in many different countries. For example, using culturally relevant "entry points", researchers found that they could make computer science more relevant to students in the Kidugala Secondary School in Tanzania (Duveskog et al, 2003). Richards (2004) found that integrating IT education in the context of cross-cultural dialogue and interaction in Asian educational contexts have formed the basis for effective change. The use of technology in the Hawaiian Language Immersion Program (HLIP) has generally been recognized as a success, yet there remains concerns about the "... balance of technology (ʻenehana) and traditional Hawaiian knowledge (ʻike kuʻuna)" (Yong & Hoffman, 2013, p.1331). This balance guides the development of curricula, as it is not only about designing content and learning opportunities. A culturally relevant curriculum includes the holistic learning needs of the learner, how the community supports the learner, and accommodates the relationship to place and culture.

2. DESIGNING THE CURRICULUM

Carnegie Mellon University's "Alice" is a 3D programming environment that allows learners to create animations for telling a story, or developing an interactive game.

Alice itself was developed as a teaching tool for introductory computing, and is freely available to download from the Alice website (http://www.alice.org). Alice is used by approximately 10 percent of U.S. colleges and universities, as well as in many high schools around the world (WebWire, 2007). Alice has also been used successfully to incorporate cultural perspectives into the teaching of programming by the University of Hawai'i at Hilo (Edwards et al., 2007). The library of 3D assets is dynamic and can be adapted to reflect culture and place, an added benefit for adapting the programming to different learning constructs.

For Aboriginal youth, Alice has an additional advantage in that the programming environment is expressed in terms of a "world", which provides an effective parallel to an Indigenous world view. Traditional cultural expressions through storytelling and transference of history (Young-In, 2008) are done in a protected and respected manner to ensure relevance of place to peoples. It is this detail to creating an effective, interconnected world that matches the logic of the Alice environment. Thus, Alice was selected as the learning environment for the ANCESTOR program. The challenge was to connect the Alice world with an Indigenous world view, while still maintaining an effective pedagogical approach and retaining cultural expressions in a protected manner. An important component of the ANCESTOR program is ensuring that stories told within communities stays in communities. The inclusion of cultural stories within the core curriculum was approved to be shared as an educational tool.

A team consisting of Camosun College faculty from Computer Science and from Aboriginal Education and Community Connections, plus two Computer Science students built a test curriculum. Three distinct curricula were created, each spanning a different time frame. These curricula included a one-day workshop called "Alice is fun!", which was designed to encourage learners to create a fun, simple animation. A one-week workshop and a semester-long course were also developed. The curriculum was largely derived from the extensive online resources available for teaching Alice. In all cases, the curriculum examples had an Indigenous focus, using examples that are culturally relevant, respectful of traditions and knowledge, and appropriate to share.

3. REFINING THE CURRICULUM

The developed semester-long course material was first tested with grades 7 to 10 Aboriginal students at the LÁU,WELNEW Tribal School near Victoria, B.C. Canada. As reported by Weston and Biin (2011), at the end of this test at the Tribal School students were: (a) more comfortable in their use of computers, (b) more interested in learning about computer science and programming, and (c) more interested in their cultural stories. In fact this third result was one of the most positive outcomes from an Indigenous cultural perspective. Many of the students were exposed to storyboarding and how to tell an effective story. They would then take this tool and seek guidance from their cultural knowledge keepers. Was this done the right way? Would this tell the story in the right context? What if I incorporated this dialogue or interaction? For one student, he further developed his story to include the SENĆOŦEN language (his traditional language) as recorded dialogue. He incorporated male and female voices into his story, using new language learners, which demonstrated an innate balance of form and structure in Indigenous world view.

In spite of all the positive outcomes, there were significant problems, particularly in the way the material was delivered. The curriculum was generally too advanced for the students, and more repetition was needed. The proposed solution was to develop a series of simple video tutorials that the students could replay as often as needed.

With the help of a second team of computer science students from Camosun College, a total of 17 video tutorials were developed and posted to YouTube (http://www.youtube.com/ancestorproject). All tutorials are less than 10 minutes in length, with many less than 5 minutes. All examples used in the video tutorials have an Indigenous theme and, in some cases, are presented as part of a larger creation story from the W̱SÁNEĆ peoples. The tutorials were built to progress from simple methods to more advanced methods, and were divided into beginner, intermediate and advanced levels.

This newly revised curriculum complete with the video tutorials was tested with non-Aboriginal high school students as part of an access to technology course given several times at Camosun College starting in 2011. Students taking this access course were self (or parent) selected based on their interest in technology. As a result, these students were very comfortable with technology and were what the 21st Century Literacy Summit report calls "digital natives." (2005, p.2).

Any issues these "technology savvy" students had with the curriculum were noted and immediately addressed. If these students were having problems, then it was likely that students from a broader background would have even more difficulty.

To emphasize the storytelling approach, a formal section on storyboarding was subsequently added to the curriculum. The use of storyboarding also follows the recommendation of numerous authors such as Porter (2006) who states, "Teachers need to be diligent about requiring scripts and storyboards as a readiness ticket before using any technology. Scripts and storyboards ensure that the content is accurate and robust and demonstrate that media choices are effective and designed to support the message." (p.29). Drawing in part on the expertise of animation specialists from Emily Carr University (Vancouver, B.C., Canada), a new segment on scripting and storyboarding was added to the curriculum and set to precede any full scale animation.

The revised curriculum with storyboarding was then tested with Aboriginal students. The curriculum was first delivered in a summer camp for the Songhees First Nation in 2012. This was followed by a fall elective at Shoreline Middle School (both in Victoria, BC, Canada). The audience for the summer camp and elective was Aboriginal youth between the ages of 11 to 13 years of age, although some mature students also participated on occasion.

This revision to the curriculum supported a self-guided process for both the camp and elective participants in order to build comfort levels and gain digital literacy skills with the Alice programming environment. The offerings were then tailored to audience, time availability and resourcing needs.

The summer camp took place over three weeks (approximately 20 hours of instruction) with participants between of ages of 11 to 22 years. With one lead facilitator, the cohort was facilitated through a cultural storytelling exercise where oral narrative was interpreted into a 3-D animated sequence.

The fall elective at Shoreline Middle School ran for 7 weeks with one hour of instruction per week. Shoreline Middle School consists of about 300 students from grade six to grade eight with an Aboriginal population of about twenty-five percent. The Aboriginal community consists of students from two local reserves, and non-status and Métis students. An opportunity to have some students participate in this test was seen as a positive way of introducing digital storytelling to a small group of students as a pilot program.

The student group at Shoreline Middle School was introduced to a scripted story within Alice to determine interest in pursuing the elective through the remainder of their academic term. Once 'hooked' the selected group went on to learn simple programming methods and experiment with creating their own characters for an animated sequence. For this group the video tutorials were not utilized; instead the lesson was guided by one-on-one by facilitators and educational assistants.

4. LESSONS LEARNED

Each of the four testing scenarios contributed significantly to our knowledge regarding learning paradigms for Aboriginal students. The testing scenarios and outcomes are summarized in Table 1 below. Details regarding the curriculum and outcomes are given in following sections.

Table 1. Overview of the Approach for the Test Groups

Delivery Location	Timeframe	Cohort	Curriculum	Results Summary
1. LÁU,WELNEW Tribal School	Semester: 1 hour per week (2010-2011)	Computer science elective	• Lessons available online (Moodle). • No video tutorials.	• Students found the curriculum too advanced. • With only one hour/week students forgot previous material. • Needed more repetition.
2. Technology Access Program	3 hours per week for 3 weeks	Non-Aboriginal, selected	• Curriculum revised and video tutorial	• Video tutorials were successful, although some were too complex

				added.	and were revised.
	(4 repetitions during 2011-2013)	technology savvy students		• Lessons available online (Moodle).	• Students liked moving at their own pace.
3. Summer Camp	2.5 hours daily 3 days a week for 3 weeks (2012)	Voluntary sign-up		• Curriculum altered for time frame. • Additional video tutorials added. • A segment on storyboarding added.	• Video tutorials now at right level. • Storyboarding a difficult concept at the beginning. • Students worked well together and supported each other.
4. Middle School Elective	1 hour weekly for 7 weeks (2012)	Referred and selected		• One-on-one facilitation. • Storyboarding concept delayed. • Prizes used to encourage participation.	• One-on-one facilitation helped overcome the frustration factor. • Delay of storyboarding concept more successful. • Students very supportive of each other. • Students love prizes.

4.1 LÁU,WELNEW Tribal School

Many of the students at the LÁU,WELNEW Tribal School have only limited exposure to computers, and thus the curriculum had to find the right balance to accommodate disparate skill sets. Also, the one-hour per week class time meant the students forgot what they had learned the week before and had to review before continuing. Since the Alice environment is so rich, students would often get lost and thus frustrated. It was clear that more repetition was needed which led to the development of the online video tutorials.

Even though the students had some problems with the curriculum, the teacher commented that as soon as the students saw the gallery elements with the cultural 3D images, they were very excited and encouraged to try to create traditional stories. The teacher also noted that the students taking the elective showed significant improvements in the analytical skills. She was very impressed by how much better the students were performing in their other courses such as math.

4.2 Technology Access Program

The "technology savvy" Access students represented a distinct contrast to the Tribal School students. For one, these students were generally older; most were grade 12 students. For another, all were very comfortable with technology as evidenced by the wealth of smart phones and tablets that traveled with the students.

The Access students were quick to provide feedback on any part of the curriculum they felt did not meet their needs. As a result, topics and/or video tutorials that were too complex were quickly identified and corrected for the next offering. On the whole, the students were enthusiastic about the online video tutorials and lesson material. Students liked that they could proceed at their own pace through a lesson, replaying tutorials as needed. After a brief, introductory lecture at the start of each lesson, the instructor was then free to provide one-on-one help and encouragement.

4.3 Summer Camp

The summer camp had one lead facilitator, and the cohort was facilitated through a cultural storytelling exercise where oral narrative was interpreted into a 3-D animated sequence.

Once guided through a storytelling example, participants then spent their time between learning new programming with the self-guided tutorials available on a Moodle course site prepared for the camp and scripting their own one to two minute animation sequence with sounds and recorded dialogue. The facilitators provided problem-solving assistance when participants began building their animation sequences. At the end of the camp, participants screened their animations for all to see and were provided gifts for completing the camp.

The video tutorials proved of great value in the summer camp. Students who were more comfortable with technology could work ahead at their own pace. Those less comfortable could watch the tutorial as many times as needed. A key component to making the tutorials successful was to keep them short and simple. In addition, the tutorials are of value for distance delivery as well as basic support for teachers who are not familiar with the Alice programming environment.

An early segment of the summer camp was devoted to oral histories and storytelling. In this segment the oral tradition was reviewed and was then followed by a discussion of local, traditional stories. A series of books written by storytellers from the area were brought in and a traditional tale was shared with participants. They then had to identify a scene from within the story and create a storyboard sequence. Hand-drawn, the storyboard would show key camera angles, dialogue, and scene. It was difficult for youth to imagine sequences on their own, so the facilitator provided options for scenes and re-read certain sections of the story. After this exercise, participants debriefed and realized that listening to a story, building a character and creating a scene from the story required different skills. Participants then spent time creating their storylines and developing a storyboard to build their animation sequences. When programming became too advanced, the facilitator would build the sequence and then demonstrate back to the participant so he/she could incorporate into their story.

4.4 Middle School Elective

The fall elective was given in 2012 at Shoreline Middle School. Unlike the Summer Camp, the video tutorials were not utilized during the class time for this group. Since this elective was a trial to see if the Aboriginal students would be interested in Alice, the elective was guided one-on-one by facilitators and educational assistants. Another major difference when compared with the Summer Camp was related to use of scripting and storyboarding. For the school elective, the scripting and storyboarding segment was removed. Based on our experience at the summer camp, it was likely the students would find that segment difficult especially in such a limited time frame. To keep the students engaged, they went straight to the computers, and worked with them from day one to build a basic animation skill set. Carefully prepared animated scenarios were presented to the students, and one of the facilitators would walk through the solution on a projected screen while the students followed along on their own computers. Depending on the confidence level of the student, he or she might start trying to move ahead on his or her own. The students were provided with extra motivation to complete the animated sequence through small prizes being awarded to the first three students who completed their animation.

The decision to not have the students in the middle school elective create a storyboard first seemed to work well. Walking them through an existing animated story at the beginning helped clarify the process. The students were then able to use this foundation, along with their imagination, to create new scenes and characters. As Keiran Egan states, " [I]magination is not some desirable but dispensable frill, but … is the heart of any truly educational experience; it is not something belong properly to the arts, but is central to all effective human thinking. … Stimulating the imagination is not an alternative educational activity to be argued for in competition with other claims; it is a prerequisite to making any activity educational (Egan, 1989, p.458).

Comparing the ease and speed at which the non-Aboriginal, "technology savvy" students in the Access course worked through the curriculum reveals more fundamental differences. Many Aboriginal students had never seen or used a flash drive. As a result, much of the first class was taken up with reviewing some basic computer skills. There were also literacy issues to consider when developing the curriculum. Care was required to not make the handouts too complex. Minimal text and the use of screen shots of the sequence and programming code ensured that we did not experience literacy barriers. Certainly some of the differences were a result of the age ranges involved, but as noted by the Canadian Council on Learning (2010), literacy levels of Aboriginal youth in BC are statistically lower than the general population.

Hence, our handout materials used different modalities of learning to ensure youth were engaged and did not become discouraged or frustrated into silence.

5. CONCLUSION

Citing numerous references and statistical results, one of the conclusions of the Canadian Council on Learning (2008) regarding literacy levels among Aboriginal Canadians is the need for schools to be more culturally inclusive of Aboriginal students and Aboriginal approaches to learning. They specifically state: "A number of studies have demonstrated that, in different cultures, different aspects of learning are emphasized and valued. For example, researchers have observed that many Aboriginal students prefer co-operative rather competitive learning, and that many learn through imitation, observation, and trial and error rather than direct instruction. Given that learning style factors can contribute to the alienation of Aboriginal students within classrooms, attending to these factors should contribute to more successful outcomes among Aboriginal students." (p.6).

The results of our curriculum trials fully support the conclusion of the Canadian Council on Learning. Students in the tribal school, summer camp as well as the middle school elective worked well together and were keen to share new skills with each other. Walking through initial examples with the students allowed them to build the confidence to move forward on their own. It was important to distinguish learning the tool (in this case Alice), from learning how to create a story. We found that the students first needed to see what the tool could do before they could see how it applied to a story. As we discovered in the summer camp, creating or listening to a story, then building a character and creating a scene from the story required different skills. This was borne out at the middle school. Although the students had seen many movies, and had heard and read stories, it was clear that starting with creating a storyboard and script was not going to work for this group of students. They first needed to build a comfort level with the computer and the animation tool, before they were ready to let their imaginations loose. The students also gained new perspectives from their classmates, which led them to push their skills to new levels.

Reviewing the results of our curriculum tests, we identified several areas upon which we can improve and expand. Our planned actions in these areas are as follows:

1. Incorporate more opportunities for Aboriginal students to work co-operatively and thus learn more through imitation and observation. One method of accomplishing this is to divide a traditional story among all members of the class. Each student, or team of students, would work on a segment of the story. The segments can then be assembled into a complete story at the end of the course.

2. Take the developed curriculum to a different, less urban First Nations community. All our work thus far has been with Southern Vancouver Island communities. It is important to explore how different worldviews and story traditions will fit with our current approach.

3. Explore using the basic curriculum to support a Language Arts program. The animation skills could be used in many ways such as retelling a legend while incorporating traditional language(s). The use of animation allows student to have a fun tool to express their learning..

4. Work with elders to bring more traditional stories to the students. Included as an activity in our planned summer camp in 2013 for the Songhees Nation, is a visit to a nearby transformation site with an elder. The elder will recount the tale in both English and Lkwungen (a traditional language). The students will then return to the classroom to create the animation in Alice. A variant of this approach has been successfully applied in Hawai'i (Edwards et al., 2007).

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