Learning mathematics and Ojibwe culture through video games
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Native culture is a perfect example of where video games imitate life. Enormously popular immersive games, such as World of Warcraft, have players select an avatar with certain powers and characteristics. Centuries before massively multiplayer online games, the Ojibwe had the bear clan, the deer clan, the marten clan, or social categorization assigned through animal totems that depicted the characteristics and attributes of the members of each clan. Parallels between the international best-selling Halo and Native history are evident at surface level. The game evokes a need to strategize against invading aliens who possess more advanced technology. At its core, when playing Halo, you are fighting for survival against an attacking race that seeks to commit genocide on your society. Epic games have a storyline in which players overcome great obstacles to secure a better future for their people, often traversing great distances in the process. A thousand years ago, with no technology, before horses had been brought to America, the Ojibwe people walked halfway across the continent.

These remarkable histories provide the storyline arc for a series of games created by 7 Generation Games. Drawing on Native culture and values of the Ojibwe and Metis, the games seek to bridge gaming and education through technology and culture.

In Fish Lake, Ojibwe history and culture is taught in the context of a 3-D virtual world. Real life math problems challenge players to compute whether the fishing really is getting worse or where is the fairest place for hunters from two camps to meet.

In Forgotten Trail, two modern-day descendants retrace the steps of their Ojibwe and Metis ancestors to prove that they are more than just ordinary small-town kids. Sam and Angie are out to prove that their future is determined by their own abilities and not by other people's expectations.

The games were born out of what seemed to be a catch-22 when it came to teaching Native youth about their culture. In short, analysis of 2011 National Indian Education Study data found an increase in time spent teaching cultural content translated into lower performance on standardized testing subjects like math and language arts (De Mars & Longie 2011). The finding was logical as there is a finite number of classroom hours and any increase in time for one subject has to be taken out of time dedicated toward other subjects. At the same time, a significant body of research has demonstrated the value and effectiveness of culturally responsive education for Native American students (Demmert & Towner 2003). The solution was to create a (virtual) world where math and culture could exist in context, not conflict.

Federally funded by a Small Business Innovation and Research award from the U.S. Department of Agriculture's Rural and Economic Development arm (De Mars 2015), granted to develop "Computer-Assisted Mathematics Instruction in a Cultural Context," the project "address(es) the problem of low mathematics achievement of American Indian children in rural persistent poverty counties." With a commitment to accuracy and inclusive development, games were created with tribal member input and collaboration at all levels from conception through commercial release and iteration.

From the outset, the video games sought to combine what had previously been viewed by many to be diverging domains – bridging learning mathematics and social studies; as well as teaching of traditional Native culture through the use of cutting-edge technology. However, that concept of bridging worlds with seemingly opposed values and ideals is long rooted in the Metis culture.

Metis Identity and Depiction

The Metis people are born out of a mix of indigenous and European ancestry through which a unique, multicultural culture emerged. Originating from the intermarriage of Anishinaabe women and European trappers, a literal translation of the French word meaning "mixed," the Metis "were a people 'in-between." (p. 58, Devine, 2011.) The Metis bridged two worlds, with children often raised largely among their mothers' tribal communities but introduced to growing Eurocentric influences through their fathers' language, religion and professional dealings. The Metis played an important part in the American trapping trade of 17th through 19th centuries. It is an oversimplification of their vital role in the fur trade to say their impact was due to an ability to serve as translators. Because of their bicultural upbringing, the Metis possessed a unique understanding of both Native and European cultures and customs that enabled them to avoid or resolve cultural misunderstandings and bridge differences. Over generations, Metis identity would emerge as its own distinct culture (Andersen 2014).

However, depictions of Metis people or culture is virtually invisible in popular culture and media. In a landscape where representations of any form of Native culture are infrequent -- and even when Native culture is represented, that depiction is often inaccurate, playing into stereotypes or peripheral roles -- portrayals of biracial or bicultural Native characters are all but non-existent. This runs contrary to the fact that the 2010 U.S. Census found 44 percent of Native Americans identify as mixed race.

Moreover, on the rare occasion when such bicultural characters are presented, they are overwhelmingly depicted in American fiction, not as a people "in-between" but as "one must choose between being White or Indian: a Mixed-blood identity typically does not exist." (p. 70, Hubner, 1995.) Of course, mixed-blood identity certainly does exist; and for many, the challenges of existing "in-between" two worlds is a reality. It is the balance between two cultures that often have different, yet not necessarily conflicting values. For many growing up in tribal communities, there is a strong emphasis on culture, traditional values, family (the definition of which is far more fluid and extended than the American view structured around a nuclear family) and nature/environment. On the other side is the Western-influenced views that emphasize the modern educational system and apply a more rigid categorization to almost every element of society from culture to economy to religion.

Assimilationist vs. Culturally Responsive Education

The Indian boarding school era, which began in the late 1800s and continued well into the 20th century, is a somber reminder of how radically these two worlds diverged. As Pember (2007) writes, "[Boarding schools] indoctrinated Indians to believe that abandoning their traditional ways for a life of servitude was the best they could hope for." There was no teaching of traditional culture or tribal history. In fact, to the contrary, schools actively worked to eradicate Indian culture (Lopez, Vasquez & Schram, 2013). While a new wave of Native

American boarding schools has replaced that dark chapter of American history, most contemporary academic curriculums are still not fully integrated within the Native communities and cultures – and an understandable wariness of the "white man's" educational systems still exists. The continued shortcomings and outright failures of a number of Bureau of Indian Affairs schools serve to further reinforce these feelings. (Pember 2007.)

Exacerbated by social factors, the result of this separation of culture and education has had an overwhelmingly negative impact on every conceivable student outcome, including graduation rates, academic achievement, self-esteem and participation/performance in competitive sports. For example, while U.S. math performance is already dismal – with only 26 percent of high school graduates meeting math proficiency standards – Native students fare considerably worse, with only 12 percent of Indian youth possessing the numeracy skills deemed necessary for workplace and postsecondary success (U.S. Department of Education, 2016).

The 2011 National Indian Education Study further assessed the state of U.S. education of American Indian and Alaskan Native (AIAN) students. It was from analyzing the data of this study that 7 Generation Games was born (De Mars & Longie 2011). As above mentioned, the study showed incorporation of culture into the curriculum, allowing less time for other areas, was related to a negative impact on already low standardized test scores. "I won't accept that my grandchildren either understand math or know their culture," said Dr. Erich Longie, a long-time educator, elder for the Spirit Lake Dakota and at the time tribal school board president. Out of that conversation came the early seeds of 7 Generation Games, as a way to integrate tribal history with contextual math through adventure games set in a virtual world. Cultural experts were recruited from each tribal nation represented in the games to create, approve and narrate the cultural content.

This approach -- marrying culture, education and technology -- is feasible in no small part due to a pedagogical shift that has taken place in many communities, emphasizing the importance and value of incorporating culture within authentic educational settings and integrating Native history into the curriculum. This includes both teaching of tribal history as well as adopting culturally responsive schooling, the latter of which stands in stark contrast to the assimilationist approach long employed toward Native students (Lopez, Vasquez & Schram 2013). However, the implementation of these changes, even when legally mandated, is a slow process. Montana is often recognized for its "Indian Education for All" program, which requires Native history be taught across all schools as part of state constitutional. Yet, it took more than three decades until any significant amount of funding was directed toward the initiative to enable any effective form of implementation (Carjuza, Jetty, Munson & Veltkamp, 2010).

While efforts are ongoing in North and South Dakota to improve the depth and breadth of content covered as it related to Native American history (MacPherson, 2014), it is only recently that cultural teachings and history were incorporated in any form into the educational system at many tribal schools. Previously, any teaching of culture was passed down in the home. Within many tribal communities, it was up to the family to teach what they could about their tribal history and language, but that knowledge varied widely. In some homes, Native language was spoken daily, but in many more families it was all but phased out, existing in bits and pieces of dialogue, single words here or there. Both within the tribal community and the educational system, English was the primary language taught and used. At school, there was no

teaching about tribal values, way of life or history. This move toward culturally responsive and inclusive education as well as the emergence of technology has marked a shift, although Native communities, especially those in rural areas still face the greater obstacles in accessing technology and reliable network infrastructures as a result of the digital divide.

Technology Access

Many tribal communities are lacking in access to up-to-date hardware and software and high-speed internet access. However, inroads are being made. Reservation classroom technology is far more accessible than it was even a decade ago, presenting students with far greater options and learning opportunities than previous generations. Still, most reservation lands -- and therefore the schools situated on them -- are on the "have nots" side of the digital divide (De Mars 2010). 7 Generation Games built Fish Lake and Forgotten Trail with an understanding of the technical challenges. Usability testing conducted on tribal lands has resulted in the creation of games that meet the student educational needs, resonate culturally and work with a district's hardware, software and network.

Why video games?

Video games are a form of media that cut across virtually all social and economic demographics when it comes to youths in this country. A Pew Research study (2008) found that 97 percent of youth, aged 12-17, play video games, accounting for 99 percent of boys and 94 percent of girls. In short, video games provide a way to reach students where they already are.

Video games provide the opportunity to apply concepts in simulated real-world settings. As Merrilea Mayo (2012) explains, "The rich environment of objects and activities within games gives information 'situated meaning': the other contextual elements support the information being conveyed."

Games, when done correctly, are also an effective educational tool that possess the ability to teach curriculum-related content and soft skills. Games reinforce and reward persistence, resilience in the face of failure and an appreciation for a gradual increasing level of difficulty (McGonigal, 2013) that are as applicable in the classroom setting as they are outside it. It is common to see a middle school-aged youth play a video game a dozen times to make incremental progress; this persistence does not usually apply to math equations. Integrating math problems as the problem-solving element within a video game transfers the motivations, intrinsic and extrinsic, that drive players toward finding solutions to the equations in order to progress within the game.

Video games are an ideal medium to merge problem-solving and narrative, making them a perfect choice when looking to teach math skills and cultural history.

Storyline

The continuous rollout of new technologies is constantly making what was previously considered "cutting-edge" seem dated when judged on graphics, aesthetics and gameplay. So what is a key factor in a game's ability to withstand the test of time? Storyline. This is especially true within the adventure game genre. As opposed to say puzzle or shooter games, adventure games center around a narrative that is essential in setting up the overall story arch which gives the necessary context and purpose for gameplay in order to engage players (Dickey, 2006). (It is

also important to note that many games draw from multiple genres, i.e. first-person shooter adventure games, like Doom, or trivia adventure games, like Where in the World is Carmen San Diego?)

The role of narrative within video games has long been heralded as equally, if not more, important to all other elements of game design and production. Good stories have the ability to capture the interest of players, engaging them to work to solve challenges (be it in the form of missions or contextually related math problems) and persevere in the face of in-game obstacles in an effort to continue through until the story's - i.e. the game's - end.

When it comes to educational games, narrative is severely lacking. Despite the hundreds, even thousands, of math games that exist, there are very few that have standards-aligned content created and vetted by credentialed educators, and even fewer with that content integrated as part of the game design (Malliarakis, Tomos, Shabalina, Mozelius & Balan, 2015). As Gunter (2008) writes, "There is a significant difference between simply representing educational content in a game or building a game like hangman or a one that replicates a popular quiz show and embedding content as an integral part of the game's fantasy context." (p. 513.)

Fish Lake and Forgotten Trail embed content as part of the virtual world as Gunter suggests. After all, history is at its core a rich library of stories and putting math in real-world context as challenges lends itself to the game format. Each game draws from the historical period and context surrounding the Ojibwe migration, a journey that spanned 500 years and 2,000 miles (Norrgard et al 2002).

Generally speaking, Anishinaabe and Western historical traditions agree that the people now occupying the Northwestern Great Lakes region have origins in more easterly parts of North America. The group of people today known interchangeably as Anishinaabe, Ojibwe and Chippewa – together with closely related groups like the Potawatomi and Ottawa/Odawa – migrated from an eastern land of salt water, most probably near the mouth of the St. Lawrence River. Assigning a precise date to the commencement or completion of their westward journey remains impossible and, in any case, the movement did not occur all at once. (Willow, 2012, p. 25).

There is no definite understanding as to why the Ojibwe migration occurred. Tribal history and oral tradition attributes it to the Seven Fires Prophecy. According to the Anishinaabe, the prophecy foretold of seven eras, or fires, that would ultimately lead to an eighth fire (an era of everlasting peace). The first three fires are closely tied with the people's movement during the Ojibwe migration, while the fourth warned of a coming light-conflicted races while the fifth and sixth foretold of eras of great suffering before culminating in the seventh fire that will ultimately decide the future of humanity (Commanda, 1997). Historians and archeologists have sought out more scientific causes for the mass migration, with some suggesting that an environmental shift in food availability might have been the cause, although such theories are speculative.

Fish Lake seeks to portray Ojibwe life, approximately 1,000 years ago, centuries before Europeans reached the Americas. As outlined in greater detail below, Fish Lake is intentionally both specific (the Ojibwe) and vague (a non-defined Plains location). The narrative in Fish Lake is based on the Ojibwe migration, a period of time during which the Ojibwe moved across the continent from the Canadian Maritimes to their present-day location in the Northern Midwest

plains (Peacock & Day, 2000). The narrative in Fish Lake revolves around daily life. The decision to focus on story through this context was influenced by Jose Gonzalez, a middle school teacher for Los Angeles Unified School District and member of 7 Generation Games educational team, who explained "History is not just about names and dates. History encompasses the way people lived, their everyday life, family structure, belief system, language, all elements of culture. There's so much more to history than 'On this day, this happened at this place.'" Fish Lake centers around the daily challenges the Ojibwe faced, from finding food to traveling distances to building wigwams -- and how math was applied in all of those contexts.

Forgotten Trail interprets history and culture through a modern-day lens as two teen characters of Ojibwe and Metis descent retrace the Ojibwe migration, learning about their history and displaying the cultural values that have transcended time. Determined to be "more than ordinary," Sam and Angie set out from their hometown along the Minnesota-North Dakota border en route to the U.S.-Canadian border outside of Maine, following the route their ancestors took to arrive on the shores of Lake Superior centuries before. Forgotten Trail interweaves history, geography and the role of Native American and multicultural identity in society. The characters work to devise methods of transportation, calculate distance and earn money as part of the in-game problem-solving.

Perspective

All narrative revolves around a point of view. While history may be idealistically portrayed as neutral, the reality is bias - unintentional and intentional - exists in historical documentation and research. This is especially true of the histories of colonized/conquered peoples whose histories were often erased or corrupted in the recording of them (McCullagh, 2000). From the game series' conception, a conscious decision was made that 7 Generation Games games would reflect the Native American perspective. The indigenous viewpoint is virtually non-existent in mainstream education, and 7 Generation Games felt it essential to tell the stories of both pre-Columbian and modern-day Native Americans through their voices and perspectives.

In order to do this effectively, 7 Generation Games works with tribal communities to draw from and accurately depict their histories, employing tribally enrolled members to serve as cultural consultants, engaged at every step in the game design process. Cultural consultants play an instrumental role in working with 7 Generation Games creative team to conceptualize, create and vet all elements related to tribal culture. These elements include storyline, artwork, mini-games, Easter eggs, music, language elements and more. For the development of Fish Lake and Forgotten Trail, 7 Generation Games core culture team was based on the Turtle Mountain Reservation, located on primarily in north central North Dakota, just along the U.S.-Canadian border. The home of the Turtle Mountain Ojibwe, the community also has strong ties to many who also identify as Metis as part of a multicultural heritage. Generations of marriages have created extended families that with lineages that cross tribes, especially from other area tribes descended from the Anishinaabe peoples, most notably within the Turtle Mountain area being the Ojibwe, Salteaux (both of which have been grouped in Western-centric histories under the singular "Chippewa") and Cree.

Unintentional bias often extends beyond historical textbooks and into the classroom. Even with the increased awareness of the importance in including culture, lessons are still often

being taught by non-Native educators, many of whom were educated under an assimilationist system and who carry with them their own conscious and unconscious biases (Carjuza, Jetty, Munson & Veltkamp, 2010). Technology allows for the removal of this bias. Instead of a non-Native classroom educator lecturing on Native curriculum, 7 Generation Games enlists Native educators and tribal elders in the creation of all game cultural content to help develop and review any elements related to their tribe. The information is presented through a game format, in many times, in tribal members' literal voices.

Character Depiction

In part to negate the often mainstream media depiction of Native Americans as one homogenous Indian people as opposed to hundreds of unique tribes with their own histories (Peacock & Day 2000), values and cultures, 7 Generation Games set out to make clear that the characters and cultures portrayed in each game reflected a certain culture, or in the case of Forgotten Trail, multiple cultures.

Appearance

In order to create characters that effectively and accurately reflect a population, it is necessary to model characters on members of that population. For Fish Lake character appearances were based primarily on 19th century images from the Library of Congress (researched on-site in Washington, D.C.) and the Minnesota Historical Society (accessed via its online images collection). Archival research was conducted using a variety of search terms (i.e. Chippewa, Ojibwe) and spellings (i.e. Ojibwe, Ojibwa, Ojibway). Characters were based not on a single photograph, but as an artistic composition of multiple individuals. This is illustrated in Figures 1.1 and 1.2.

Figure 1.1   **Figure 1.2**


Figure 1.1 Fish Lake Female Character. Left: "Ojibwe Woman" (1885). Center: Anookwesens. Generation Games 2D Artwork (Flores 2015). Right: 7 Generation Games 3D Female Avatar (Taylor 2015). Figure 1.2 Fish Lake Male Character. Top: "Full Blood Chippewa Man" (1918). Bottom: "Male Character 1." 7 Generation Games Artwork (Flores 2015).

Recognizing the fact that early photographs of Native peoples, even those in "traditional dress" or "traditional settings," are portrayed through the lens of non-Native photographers with explicit and implicit bias, including at times in a conscious effort to portray Indians in Western European styles (Copway 1850), cultural experts were consulted on character clothing,

jewelry and hair. Examples of cultural team input and feedback included ensuring that the beadwork in the characters' clothing was reflective of traditional Ojibwe beadwork, which frequently draws from nature and flowers; requesting the lengthening of the female characters' dresses, which were initially deemed too short than would have actually been worn (Figure 2); and scrubbing earrings from the men as Ojibwe men did not wear earrings. 7 Generation Games' first game, Spirit Lake, had portrayed Dakota culture where men did wear earrings and initial artwork for Fish Lake had shown Ojibwe men with earrings as well. These are just a few of the many corrections, enhancements and improvements the culture team brings to each game project with its members understanding of the larger picture as well as more nuanced details.

Figure 2

Initial Skirt Length

Revised Skirt Length (Based on cultural team feedback.)
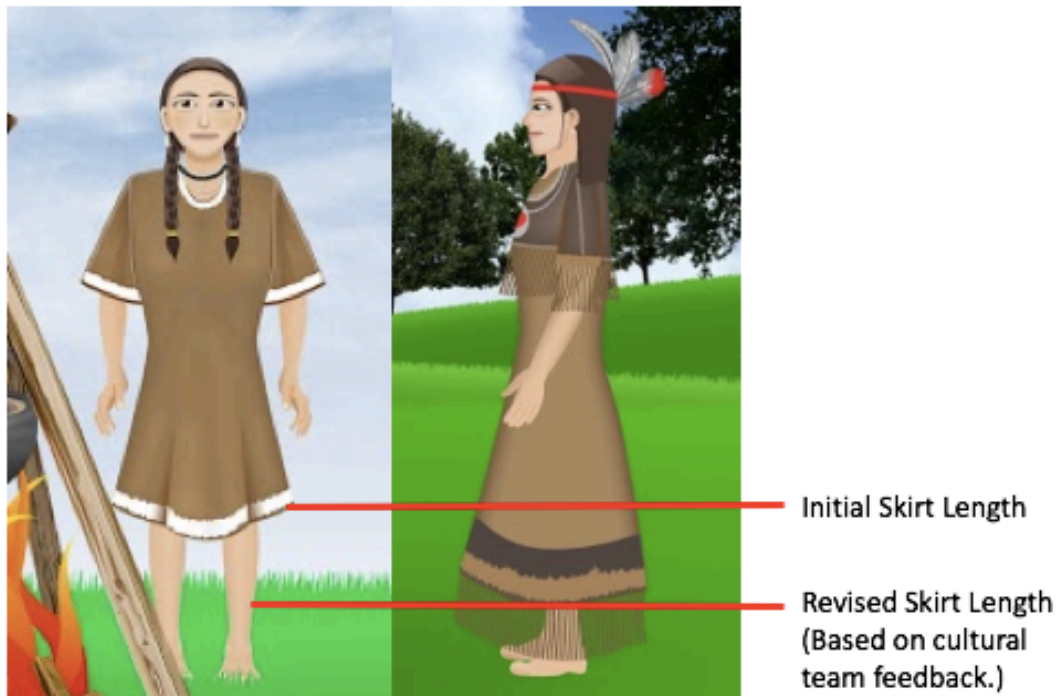
Forgotten Trail is set in the present era, although with occasionally visual depictions of the past as characters discuss their ancestral history. Flashback characters were again based on archival imagery retrieved on-site and via the web from leading preservation and research institutions. This included early Ojibwe representations as well as Mi'kmaq depictions when the protagonists reach the end of their journey near the Canadian Maritimes. The depiction of all other game characters are either composite images or based on single individuals (with their knowledge/consent). Both protagonists are composite characters. Like many American Indian youths today, neither Sam nor Angie is 100 percent Native American. Angie is Ojibwe, Metis and white, while Sam is Ojibwe, Metis, Cree and Hispanic. In order to create characters reflective of these diverse backgrounds, each character is an artist's composite of multiple teens, including Native, mixed and non-Native individuals. Similarly, secondary characters like the protagonists' family members and characters they encounter on their journey are based on people who come from the cultures and communities they portray.

It wasn't enough to make the characters simply look Ojibwe and/or Metis. Truly effective video game characters multi-dimensional. The goal was to create characters that looked, sounded and acted like the cultures they were representing.

Family Structure

In many Native American cultures, the Ojibwe among them, familial structure is more expansive and inclusive than the standardized American definition. While the predominant Western view of a family consists at its core as solely of parents and their children, with expanding levels of concentric circles defining more extended relations -- grandparents, aunts, great uncles, first cousins, second cousins, first cousins once removed, etc. Under this structure, relationships are generally considered less significant as one moves further outside the immediate family core. However, in Ojibwe culture, there is a less a defined division of family. Grandparents, aunts and uncles could be as involved in a child's upbringing as parents. Cousins could be raised as closely together as siblings. As such "an aunt" in name might technically be a first cousin once removed. The concept of second cousins, third cousins, first cousins twice removed and so on is virtually non-existent; cousins are simply cousins. This is reflected in both Fish Lake and Forgotten Trail. In Fish Lake, uncles, aunts, cousins and grandparents appear as often in the game as parents or siblings. Family as it is portrayed in the game revolves around family as a larger extended group. At the same time, Fish Lake also incorporates content about the Ojibwe clan system, under which families were organized within the tribe in part as a division of tribal responsibilities (Jacobson 2012). The clan system still exists within Ojibwe culture today.

Forgotten Trail integrates both the traditional Ojibwe view of family as well as the contemporary depictions of family, i.e. one which consists of married and divorced families, interracial/intercultural relationships. Forgotten Trail's protagonists, Sam and Angie, are cousins but were raised as closely as siblings. They visit their "Aunt Jean" who is genealogically their grandmother's cousin. At another stop, they visit their Uncle Don. Angie's father is not mentioned at all. With 34 percent of U.S. children being raised in a single family home (Livingston 2014), this is a reality of modern society -- and an even more common one for Native American children of whom 65.6 percent are born into single-parent homes (Martin 2010). At the halfway point of the game, Sam and Angie visit Sam's father, who lives outside of Detroit, nearly 1,000 miles from their home where the game starts. This conscious decision was made to reflect long distance parenting, which is commonplace in American society.

Interests

7 Generation Games cultural team identified activities that would have been part of the Ojibwe daily life including fishing and snaring rabbits. For comparison, these were very different activities than had been identified by the 7 Generation Games Dakota culture team who worked on the company's first game, Spirit Lake, where activities included hunting for buffalo and obtaining war ponies.

Early in the game design process students from the Turtle Mountain community were involved in providing feedback so that the games would reflect their culture as they view it. This feedback included adding activities that they themselves would do or that they had learned of being a part of their ancestors' lives. Student feedback included the integration of beadwork as a potential in-game activities and horseback riding as well as modern-day activities to be integrated in Forgotten Trail such as tractor racing.

Voices

Incorporating elements of Ojibwe language into character dialogue, when possible and within an understandable context even if one does not have a comprehension of the language, was done throughout Fish Lake. In both games, whenever possible, character voices are also voiced by members of the tribe. This did not go unnoticed during usability and efficacy testing involving an 896-student sample size. As noted in the researcher's observation of classroom gameplay:

At the point of building a wigwam, a character voiced by [a local tribal elder] instructs the player in the necessary steps. This resulted in a surprising spirited debate. "I know that voice!" shouted one of the children. "That's my grandmother!" "No, I think that's my grandma," another student said. Two other students in the class believed it was their grandmother's voice as well. A debate continued on until the teacher refocused the students on returning to gameplay. In discussions with [the elder] later, she confirmed she had one grandchild in the classroom, but not four. (De Mars, 2016.)

This reaction made clear the importance portraying the characters as authentically as possible. De Mars' observations supported prior researchers' (Hudiburg et al. 2015, McCarty & Lee 2014) findings that when Native students are presented with culturally related content, they are more engaged.

A surprising, but noteworthy secondary observation on this topic came from usability in non-Native communities where the games were also being tested. One parent relaying the experiences and feedback on the game from her child, who is not Indian and lives in a major urban East Coast city, noted to a researcher that her child "thought the voices were a little weird because no one actually speaks like that with that kind of accent." (Burns Ortiz, 2014). This further supports the research that Native characters' portrayal in mainstream culture is does not actually reflect American Indian culture in our country (Hubner 1995) even today and demonstrates a need to produce content in all forms of media that provides a more accurate representation.

Setting

Accurately portraying the setting is as important as the character portrayal. In this regard, every element of the scenes - from location to peripheral items/props - were held to the same cultural standards as character elements. Having Ojibwe characters, but, for example, having them live in squared log cabin structures instead of rounded wigwams is as much a disservice to the cultural portrayal as presenting characters in say modernized or European-influenced versions of traditional dress. Selecting and designing representative settings for each game, in terms of time period/era and location, was an integral part of the process.

In Fish Lake, there was a desire to create a virtual world that was not too geographically constrained by modern borders, similar to the way the Ojibwe experienced North America before European contact. The primary logic behind this decision was to reflect the history of the Ojibwe during the time of the migration as a semi-nomadic people spread over an expanse of the Great Plains, so the rivers could depict any of a dozen rivers or tributaries throughout the region. It enables to games to effectively and accurately portray tribal culture and life, in a way more inclusive way than a very specific location based might. The name Fish Lake was intentionally selected to be non-descript as there are a number of lakes that now go by the

name "Fish Lake" across the geographic area the Ojibwe inhabited during the time period during which Fish Lake is set (roughly 1000 CE).

The flora and fauna are reflective of locations that the Ojibwe inhabited during the later part of and following the completion of the Ojibwe migration. Research included drawing from historical, botanical and zoological literature to determine which plants and animals were native to the areas. Additionally, staff from 7 Generation Games traveled to sites in North Dakota, Minnesota and the Canadian Maritimes to record ambient sound and photograph foliage. These elements were give the games' audio engineers and art team to incorporate into the digital virtual world (Figure 3).

Figure 3

Left: Reference photography, Eastern North Dakota (7 Generation Games). Right: Woods Scene 2, 7 Generation Games Artwork (Flores 2015).

Setting a non-specific location was also done to avoid creating a game where the details became so microcosmic as to become exclusive. The goal of 7 Generation Games is to teach culture and math that is accessible to all students – regardless of racial, ethnic or economic background – however, that is not incompatible with creating games that are particularly resonant with a specific culture. The Ojibwe are subdivided into smaller bands, with more than 120 bands across the United States and Canada. While Fish Lake is set before the division and subdivision of many existing Ojibwe bands, the 7 Generation Games team recognized that a very place specific setting would lead some Native students to assume the game was only about the band of Ojibwe located in that limited geographic area. Not specifically labeling the location the game's setting is an effort to deter that thinking. That said, because the cultural team is based on the Turtle Mountain reservation, it is inevitable that certain elements may be

interpreted as band or geographically specific. For example, as with all languages spoken across a large region, there are certain accents associated with particular areas. Additionally, things like beadwork might vary slightly from band to band. Efforts were made to minimize these issues when possible, but not to an extent that they would dilute the cultural content to the game.

When it comes to the setting of Forgotten Trail, the 7 Generation Games design team took the exact opposite approach as the game is place-based. During a game design session with 7 Generation Games educational team, specific locations along the route taken by the Ojibwe during the Ojibwe migration were selected for levels (Figure 4). These locations are presented as stops along the protagonists' retracing of their ancestors' journey.

Figure 4

Forgotten Trail retraces the route taken by the Anishinaabe during the Ojibwe migration – traveling West to East. Each level of the game is tied to a specific city or geographic location along the journey.

Efforts were made to diversify the settings in order to create a diverse and inclusive gameplay experience. The route combines rural (i.e. small towns in Wisconsin and Maine) and urban settings (i.e. Detroit and Montreal); and each community is reflective of the people, architecture and landscapes that comprise it. This includes African American characters in Detroit, Hispanic characters in communities with large migrant and Latino farming populations, and Native characters in rural and urban settings. Moreover, the game encompasses not only the sites, but also the sounds, with the final version set to incorporate elements of five languages (Ojibwe, Cree, English, Spanish and French).

Style

No video game company wants to be associated with being predictable or boring. In order to prevent player apathy, 7 Generation Games' approach across its line of games is to create games that are dramatically different from each other in gameplay, storyline and artwork in order to maintain student engagement and keep players coming back (both to complete a single game and to play additional games). Many video game studios roll out one nearly identical game after another with minor substitutions, think TinyCo's line of "Tiny" games (Tiny Monsters, Tiny Castle, Tiny Zoo, Tiny Village, etc.) or King's Candy Crush follow up Candy Crush Soda or even Ubisoft's Assassin's Creed series where each game is stylistically similar and follows a similar format albeit in a different period of history. The goal in creating Fish Lake and Forgotten Trail was to create two completely different game experiences and depictions of Ojibwe culture. While Fish Lake is a 3D game (Figure 5.1), much of Forgotten Trail is in 2D (Figure 5.2, 5.3). Whereas Fish Lake is set almost a millennium ago, Forgotten Trail is set

in the present. Whereas Fish Lake features a single style in it's artwork and gameplay, Forgotten Trail draws from multiple styles and integrates them into a single multidimensional game. From game to game, in some cases even level to level, students don't know what to expect, which further engages them in the game with added motivation to advance to the next level in order to find out.

Figure 5.1

Figure 5.2

Figure 5.3

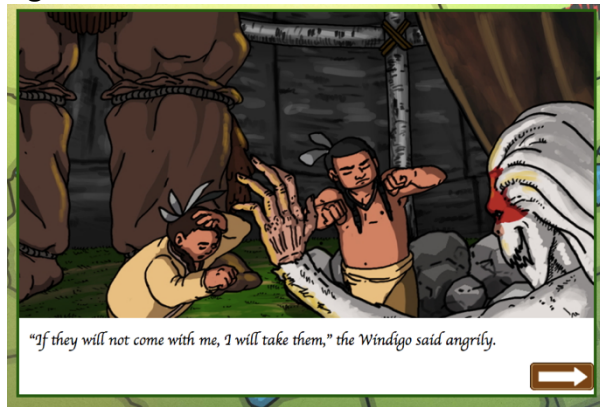*"If they will not come with me, I will take them," the Windigo said angrily.*

Figure 5.1 Fish Lake 3D Virtual World (2015). Figure 5.2: 2D level from Forgotten Trail. Figure 5.3: Graphic novel-theme level from Forgotten Trail. "A Giant's Gift." (Gladue 2016).

Broader Applications

In its very first grant funding proposal to create 7 Generation Games, the Julia Group (from which the game studio spun out) proposed making games specifically for Native

American students. The initial belief of the 7 Generation Games team was that each game would have to be customized to a specific tribe; that the engagement described when children were learning about culture (Hudiburg et al. 2015, McCarty & Lee 2014) only referred to learning about their own specific tribal culture. In order to meet this need, 7 Generation Games' first game, Spirit Lake, was designed on the back end so that all art and other cultural elements (i.e. sound, language, background) could be switched out and replaced with new cultural elements for each community where students would be playing the game. For example, files are named 'Girl 1' or 'Boy 2' or 'Audio 1' so that a folder could be created with those elements from the Dakota culture, but then switched out with a folder of those elements representing Ojibwe culture to create the exact same game but using different artwork, audio files, etc. However, this approach would also require an extensive creative lift for each game at an extensive cost versus creating a single game centered around a single culture.

Realization that the latter approach could be effective and engaging came when 7 Generation Games was contacted by a program serving Native American youth in the San Francisco Bay Area asking if the program could serve as a beta site for Spirit Lake. The games were supplied to the program, but in the first site contact, the lead researcher mentioned that the game centered around the Dakota while the site's students likely came from different backgrounds. "You don't get it," one of the educators informed her (De Mars, 2013). "These kids *never* see Native characters from any tribe in anything. Not in games. Not in their textbooks. Sure, the characters aren't from their tribe, but the fact that they're Native - just like them - that means something to the kids." Observations during usability testing and efficacy research collection for Spirit Lake, Fish Lake and Forgotten Trail reinforced this conclusion. Researchers and classroom staff observed that while students were more likely to point out specific elements of their own culture when they appeared in games, their level of engagement did not drop when they played games portraying other tribes (De Mars, 2013; De Mars, 2016).

The potential for 7 Generation Games to transcend beyond the Native American market was recognized when a school in the inner city of Los Angeles reached out to inquire about using the games for their students. While the school has a student body population that is over 95 percent minority, but no students identified as Native American. However, in conversations with educators, it was clear the school had the similar math performance issues -- less than 10 percent of students are meeting math standards -- and challenges faced by the Native American communities 7 Generation Games was working with already. What appealed to non-Native educators - in addition to the efficacy study results - was the Native American history element of the games (Ortiz 2014). The teachers viewed the cross curricular element as a bonus to the math content, and 7 Generation Games' efforts to vet and accurately depict the cultures portrayed gave the historical content additional credibility.

Conclusion

Mathematics achievement is a major concern across the educational system where students are failing to meet standards, and especially among Native American student populations where youths are even further behind. In these same communities, maintaining a cultural identity and preserving cultural history is also important. A finite amount of time in the classroom might lead one to believe that spending more time on one subject - be it math or culture - would come at the expense of another, but in creating educational video games that

integrate the two subjects, 7 Generation Games has shown that innovative technological approaches can make the coexistence of the two worlds possible. That is why it is fitting that the games depict and draw from Metis culture -- which demonstrated an ability to live between and bridge two worlds generations ago -- and the Ojibwe, a culture from which many Metis trace their lineage. Ensuring an accurate representation of the cultures was as essential as the technological and mathematical components of the game.

The purpose of this research article is to describe the history and design processes of Fish Lake and Forgotten Trail. However, a reader might also be asking oneself, "Do the games effectively teach mathematics?" The efficacy of these games is addressed in a separate article titled "The value of perseverance: Using Dakota culture to teach mathematics" (De Mars & Longie, in press).

Video games present an exciting media through which to educate people, tell stories and preserve culture. Through technology, game developers and historians have the opportunity to shape an interactive narrative in order to bring untold and underrepresented perspectives to the masses.

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