

Stories of Mathematics: Case Study of One Aboriginal Student

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Traditional Grounding

Bazylak (2002) shared the following,

In order to understand the world, the Creator gave us language and legends shared by elders. The stories shared by elders and storytellers provide perspective to all that happens on Mother Earth. In the Plains Cree culture, Weesageechak is a mythical character who manipulates human beings and other characters causing chaos in their lives. Faced with Weesageechak's folly that ends in roadblocks, we are urged to find a way to return to a balanced and harmonious existence. Weesageechak attempts to trick us while playing the fool and then helps us to fix our lives. The lessons of Weesageechak provide a traditional opportunity to understand the plight of Aboriginal students in the educational system and to return to balance using the traditional teachings of the medicine wheel. (p. 1).

Weesageechak's challenge to mathematics educators is to bring balance and harmony to Aboriginal education while remaining within the present day structures of education systems. We share the story of Weesageechak as we, the authors of this paper, are of Aboriginal descent and have backgrounds in secondary mathematics or science teaching. It is these contexts that

frame our work.

Context of our Work

The Federation of Saskatchewan Indian Nations (1997) project that by 2015, 20% of the population of Saskatchewan will be of Aboriginal¹ descent (as cited in Thomas, 2005). This means that there will be a rise in the number of Aboriginal students within the education systems. At the same time, the Federation of Saskatchewan Indian Nations (1997) also estimated that approximately 60% of Aboriginal students do not complete high school (Melnechenko & Horsman, 1998, p. 2 – 3). The issue of high drop out rates is not limited to Saskatchewan or to Canada however (Brady, 1996), and we believe that educators and researchers should begin to focus on the successes of Aboriginal students (Bazylak, 2002). All teachers, including high school mathematics and science teachers should develop an understanding of the factors that contribute to the success of Aboriginal students in their programs.

Saskatchewan Education, the ministry responsible for curriculum development, also have as their policy that all school subjects should include the incorporation of Aboriginal content and perspectives. This policy, in existence since 1995, has had little significance in helping to improve the performance of Aboriginal students in mathematics.

There is also a need for Aboriginal secondary school teachers in Canada. One of the recommendations found in the Minister of the Department of Indian Affairs and Northern Development's National Working Group on Education's final report is that "post-secondary institutions and teacher education programs adopt multiple strategies to increase substantially the number of Aboriginal secondary school teachers..." (2002, p. 43). An increase in the number of Aboriginal secondary school teachers requires that these individuals have completed high school.

¹ In Canada, the term Aboriginal peoples refer collectively to status Indian, non-status Indian, Métis, and Inuit people (Wotherspoon & Satzewich, 2000, p.xv).

In addition, the report also identifies the importance of developing culturally relevant curricula, pedagogy and resources that would address the identified weaknesses in mathematics and science. Not only is there a shortage of Aboriginal secondary school teachers, there are also identified weaknesses in mathematics and science. This would imply that there is a severe shortage of Aboriginal secondary school mathematics and science teachers. In order to increase the number of Aboriginal secondary school teachers, and particularly secondary school mathematics and science teachers, individuals must be successful in high school mathematics and science programs. What factors contribute to their success in high school mathematics and science? What might we learn from the voices of Aboriginal secondary students about their experiences in secondary school mathematics and science programs? How might learnings from Aboriginal students inform practices in secondary mathematics and science classrooms?

This paper will focus on our conversations, about mathematics, with one of the Aboriginal youth from an urban environment in a small city² in Canada. The data that frames this paper comes from a larger research study where we talked with Aboriginal youth who saw themselves as successful in mathematics, those who saw themselves as successful in science, practicing mathematics teachers, practicing science teachers, secondary mathematics preservice teachers and secondary science preservice teachers. The research questions that framed this larger study were:

1. What are the factors which contribute to the success of Aboriginal students in high school mathematics and science?
2. How can factors contributing to the success of Aboriginal students in high school mathematics and science assist educators in restructuring their environment and practice to meet the needs of all students?

² The small city in this context has a population of approximately 225 000.

The Larger Study

The purpose of the larger study was to identify factors that contribute to the success of Aboriginal students in high school mathematics and science, from a students' perspective. We also explored the ways in which high school mathematics and science teachers might restructure their environments practices to contribute to Aboriginal students' success within these two subject areas.

Data for the larger study was collected through focus groups in the form of sharing circles (Bazylak, 2002). We invited Aboriginal students who felt successful in high school mathematics and science to engage in these focus groups, invited them to talk about why they feel successful in these subject areas and what factors they felt contributed to this success. We also had sharing circles with two groups of preservice teacher (enrolled in the secondary mathematics and science teacher education program) and two groups of practicing teachers (secondary mathematics and secondary science). We shared the themes from the Aboriginal students' sharing circles with the inservice and preservice teachers and asked them how they might use the themes to structure classroom environments and practices.

The students in the study were enrolled in high schools in a provincially-funded Catholic school division in a city in Western Canada. All of the inservice teachers who participated in the study taught in this school division (but did not necessarily teach the students involved in the study); the preservice teachers were enrolled in a teacher education program at the university in the city. Students were invited to participate in the study if they felt successful in mathematics or science³ and if they identified themselves as Aboriginal.

³ Although students were invited generally, we did not at first get any participants, however, school administrators and teachers eventually identified students who they know were Aboriginal and whom they perceived as successful in mathematics or science. We then contacted the students individually to invite them to participate in our research.

Introducing Brandon

In these introductory comments, we'd like to introduce you to Brandon, one of the students who participated in the sharing circle about mathematics. This was very important to the group; as one student articulately stated, "I think because as a society we put all Natives kind of like in the same box it sucks." In the larger study each of the students wrote about the way in which they would want to be introduced to readers of the research. We share Brandon's writings with you below.⁴

Brandon - I am currently in grade 12, graduating in 2006. I come from a family of 8. I live with my father, two sisters, and my brother. I am the second oldest of us all. I am planning on starting university in September. I am going to get my BA in Sociology then I'm going to go into law. I am planning on becoming a divorce lawyer. My reserve is a First Nation in the Northern part of the province. I was born in this city in April 1987. I moved to another province when I turned 9 then moved back here when I turned 18. When I was 16 I quit school for 2 years and work at an A & W. After 2 years I found out that you do need an education to do anything in the real world, that's when I moved here, where I became interested in the career of law. With a lot of help, especially Ms. Messier, I would not have even made it through my grade 10 & 11. Also my friends and family who kept pushing me to do better. Thank you all. (reconstructed field text, June 2006).

I've attended "about nine schools. Between like seven and eleven. I can think of nine for sure. When we grew up my mom was not really a home body person, she liked to go out and stuff and we ended up moving a lot and that was mainly in this city. Then she started university and got her Social Work degree. We then moved to another province; I went to three schools there till I quit. Then I came back to school. Yes, about nine different schools." (Interview, May 2006).

Theoretical Frames for this Study

From an Indigenous perspective, teaching, learning and education are all one word.

Williams (2008) shared some examples of this in a recent conference presentation,

For the West Coast Salish people the word means 'to be a whole human being' or 'to become a whole human being.' For the Navajo (Déne) people, the word means 'understanding interdependent compassionate relationships as they manifest life.' For the Poto (Tongan) the word means 'one who is clear or skillful, knowing what to do, where to do it, and doing it well.' (April, 2008)

⁴ We've reconstructed Brandon's writings, that is removed information specific to Brandon, in order to ensure his anonymity.

Cajete (1994) adopts cyclical notions to discuss the Indigenous stages of developmental learning. “Much of Indigenous education can be called ‘endogenous’ education; it revolves around a transformational process of learning by bringing forth illumination from one’s ego center” (p.208). The transformation of self is a process that is not characterized by peace of mind, tranquility, and harmony. Individuals search within themselves and their community to find a “new order and higher level of consciousness. Harmony is achieved through such a process, but it lasts for only a short time before it has to be revised as people and their circumstances change. This is the endogenous dynamic of Tribal education” (p.209).

Relationship permeates the notions of what it means to be educated in each of these three examples. As Donald (2008) suggests, “for many Indigenous peoples, an individual’s sense of self grows out of how he or she fits into the community. The community itself stands at the centre of a much larger whole, and the role of the individual is always to give back to the community” (p. 5). These ideas are consistent with the description provided by Weaver (2000), “Indigenous societies are *synecdochic* (part-to-whole) rather than the more Western conception that is *metonymic* (part-to-part)” (p. 227). Further, Little Bear (2000) describes the value of wholeness:

The value of wholeness speaks to the totality of creation, the group as opposed to the individual, the forest as opposed to the trees. It focuses on the value of the constant flux rather than on individual patterns...If a person is whole and balanced, then he or she is in a position to fulfill his or her responsibilities to the whole. (p. 79)

This notion of ‘wholeness’ is in contrast to the educational system that is in practice today. Senge (2002) describes that the educational system in practice today evolved from a European industrial factory model. In this factory model the focus was on a mass produced product and products that did not meet factory specifications were discarded. From a cultural

context, where does ‘becoming a whole human being’ as described by the West Coast Salish people, or learning about relationships manifesting in life as described by the D ene people ‘fit’ into the factory model? We also wonder, to what degree has mathematics education focused on the factory model...and how might the wholeness of Indigenous philosophies inform research and practices in mathematics education?

A second theoretical frame for the study was the power of voice. We believe that the students shared their experiences in an open and frank way and that, through their participation in this study that “the sort of voice one come to have as the result of one’s location – both as an individual and as a part of collectives” (Mohanty, 1993 as cited in James & Mannette, 2000, p. 87). Goodwill (2007) suggests that an Aboriginal person’s role in life is to ‘figure out who they are fixed up to be (cited in Doolittle and Glanfield, 2007). We might use the frame of identity-making to describe this process, that is to find one’s voice is a process of coming to know who you are, that is your identity, as a story to live by, a narrative term conceptualized by Connelly and Clandinin (2000). The notion of voice also supports the notion of one’s contribution to the ‘whole community.’ We would like to suggest that by inviting these youth to talk about their experiences in mathematics education that the community, as a whole, will come to learn. At the same time the individual will come to see their role in the ‘whole community.’

Given this notion of ‘wholeness,’ we’ve chosen to offer reflections on Brandon’s stories through the lens of the medicine wheel (Bazylak, 2002) or the sacred circle (Regnier, 1995). Cajete (1994) uses cyclical concepts to describe American Indian tribes ‘rightful orientation’ in the world, a contemporary pathway for ecological vision and the Indigenous stages of developmental learning. The foundations that Cajete (1994) describes are the foundations of the medicine wheel or the sacred circle. Cajete (1994) describes the learning path as beginning,

“with appropriate orientation, acknowledging relationships, setting intentions, seeking, creating, understanding, sharing, and then celebrating one’s vision with reference to a place of centering” (p.69).

Regnier (1995) suggests that the order of knowledge in the sacred circle proceeds from “revelation, to illumination, to introspection, and to wisdom. When the circle is completed in its wholeness, it begins again with certain continuity” (p. 412). We offer Brandon’s story and then share our interpretation of the revelation, illumination, introspection, and wisdom that he offers to our community of mathematics education.

Brandon’s Story of Mathematics – Revelation

Since I’m 18 now and I’m practically on my own, I get myself up in the mornings and get myself ready for school just, I don’t know I’ve never been actually told by anyone to go back to school, its just an idea that I had. I quit in Grade 10 for two years to go and work then, one day I woke up and I just like, I got to get back to school like this is not the life to have, like with a Grade 10. So I just had to go back to school. And I’ve kept myself in it ever since then. The only other person that’s helped me so far is Miss (Messier). She’s awesome, she’s like a teacher’s assistant or whatever at our school. She’s really like down to earth like, when I skip or whatever she’s the only one who actually comes up to me and asks, “Where were you? She’s really there. Whatever I do she always tries to make me excel in stuff. Like my average is currently around 80 or 90 per cent and she still wants me to do better than that. Like she’s really there to push me. And its kind of a big help considering like I’ve been wanting to quit for a while so, so. Yeah I don’t know, it’s myself and her.

I think I’m gifted with people. I think I am a very good people person. I don’t, I can get along with anybody, almost anybody. Like it doesn’t take much to strike up a conversation or whatever. Like ever since I was young, my first job was A&W and I dealt with people that whole time and every job that I have had so far is dealing with people and like just different situations. I have worked at clothing stores, I have worked at restaurants, movie stores, convenience stores, like all that. And I love meeting new people and different people and it is fun talking to people, like you hear everyone's different stories and it just, I like talking to people. Yeah.

Brandon’s Story of Mathematics – Illumination

Math, I think is a very big problem, for mostly everybody I think, I don't know,

it's a big problem for me. I really hate that class ... I don't hate it, its just, it's hard to understand some of the basic concepts of it. Math is like your little toe. You don't need it, you don't know why its there but you got to have it. I know I am successful and understanding it and being there every day to learn every new step that comes with the formula.

It seems like the whole world gets dark as soon as you go into your math class. I know I really dislike going to mathematics, I like all of my other classes. It seems like you go into some kind of depression when you walk into the class. It is so hard, you walk in knowing that, the teachers will do their best to help you, but you know that deep down that you're not going to learn it; I tell myself I want to learn it so bad, I want to get it down, but I know that won't be able to comprehend most of the stuff that I'm learning. When I actually do learn it, I find out it was so easy, and wonder how I could've not known that.

Brandon's Story of Mathematics – Revelation

My grade 9 or 10 teacher, in the other province, was very strict. You were not allowed to talk at all in her class while she was talking. If you started talking then she would scream at the top of her lungs; she was a big scary math teacher. I don't know how, but she would make you learn something. If you didn't know anything, by the end of the class you'd have. She did something like she'd turn it to something you'd understand. I don't know fractions, she'd turn fractions into money problems, something I understood. If someone really liked a certain sport then she would turn it into something about sports. She would make questions relate to people's everyday life, so it made math a lot easier. She was a pretty good teacher, especially when there were 40 of us in the class.

I like to deal with money a lot so if you were to change a fraction question around to, something to do with money or something, then it would be a lot easier for me to comprehend. And same thing with like slowing down on the assignments. It seems like my teacher this term really wants you to fail, he's pushing you to fail when he knows we can't handle the work that he's giving us. It seems like he really wants us to fail the class because he knows like, he tells us at the beginning, all the assignments have to be in, and if they're not then you don't get the credit. But then why give us an assignment everyday when he knows more than three-quarters of the class aren't going to hand in the assignment? It's like, it's just impossible like we all have the same problems in the same areas, and still he, he still focuses on those problems and he tries to fix everything but it still just the fact of getting an assignment everyday. Like, he should give us an assignment so that it could be (done) like two days later, or something, I have no idea. Just the assignment and day thing is a really big problem. I'm taking two English (study) classes right now, plus a social with my math. And just the two English classes alone are taking like two to three hours a day for homework. Then I have to do an extra three hours just for a math like, the homework that he gives us its like, intense homework. Like we do maybe five questions in class, then we still have another 20 to 30 questions to do at home with no help. And like it's hard with

help in the class. Last semester, we had a teacher assistant (TA), she taught us math better than our math teacher did. Our TA was better at the job than the teacher. The teacher would explain it, but then when the TA would come around. She helped you out a lot more because she, she just knows her math better than he does. She would go with a different approaches as how to get an answer to the question, and she did it a lot better. Like she'd actually sit there and like, even if it took all class to do one question, after you've done that question that would just make it a lot easier for all the other questions to be answered because then you just think back to that way. Instead of doing a question right his way and then struggling with all the other questions, I just found it easier when you relate stuff back to what I know.

Brandon's Story of Mathematics – Wisdom

If I could tell a room of math teachers about learning math I'd say, I like repetitiveness. I think repetitiveness is a great thing for school because it is like driving a car. They will tell you once. Like if you can tell someone put it in drive go down the right lane, stop at the light. You are not a professional driver the first time. You've got to practice and like practice makes perfect. Like with math you've got to keep doing the same questions over and over just to get it stuck in your head. Just like anything you do in life repetitiveness it gets it stuck in your head. It's like when you are watching a movie. You watch it and you know the movie or whatever, you know the basic outline of it and then after you have stopped it people ask you how was the movie and you are well it was good um, this on, whatever. But if you watch the movie over and over then you'll be like yeah, this one part was awesome, and then this happened. Like if you had to summarize it after one or after you have watched it your first time you will go blank. You will always say it was a good movie all and all but I can't remember what happened if you have to write a paper on it. But I can say if you watch a movie five times you would have a lot better, you have a lot longer response than just watching it once. So I think repetitiveness is really good and somehow when you do, when you start a new assignment in math the examples are always easy examples. Like you know how the first question is like $5a - 3$ and you do the example it is all based on those first questions and you go home and you get it. Then you get to question ten and it is like $5a - b + 2/6 - 5$, like. It's basically the same thing but it's not, it's with bigger numbers and more and yeah, so I would say if you are gonna do examples do examples of the hard questions.

The examples in the book always take the easiest questions and the teachers say, "it doesn't get any harder you are just doing the same kind of, you are using the same formula but with just more terms." And you are like, "how the hell do you add more terms in there?" I have told my teacher, "say if an assignment has fifty questions, then do number one, do 19, 20 do 30, 31 and then go 49, 50." And then that way I've got examples of every part of it where it progressively gets harder.

If you have a connection with your teacher then you will go to class. With some of my teachers I won't get to class. Like when I was doing my Social 30 now.

Like when I first started out, well I can't, well that's a good, I didn't get it at first and then I don't know I built a good relationship with my teacher and she started teaching me in ways that I learned. She learned that I like volleyball and all this other stuff and she started talking about that. Like if I couldn't get a question then we would take a break and start talking about something else or just go way off topic and we would go back on it and then I would get it and stuff. My mark go up to an 89 so I think that a good relationship with your teacher helps a lot. Compared to, like if I walk into a class with a teacher that I like; I would sit there and have enough respect for that teacher to try and learn and to keep quiet while they talk. When going to a class where you despise the teacher, you are just act like, I am going to be a prick today and just keep talking even though you are talking and not listen to you and I am going to make your life a living hell even though you get paid for it.

Conclusion

King, Walters, and Wells (2001) identify stories of success in the voices and experiences of first-, second- and third-generation urban Aboriginal people. Their stories of survival serve as inspiration for their children who fill our failing school systems. Cajete (1994) is another Indigenous educator who identifies the importance of Aboriginal peoples' voices being heard in education:

It is time for Indian people to define Indian education in their own voices and in their own terms. It is time for Indian people to enable themselves to explore and express the richness of their collective history in education. Education for Indian people has been, and continues to be, a grand story, a search for meaning, an essential food for the soul. (p. 28)

Placed in this context, the complexity and value of student voice in educational change is evident and invaluable. Cleary and Peacock (1998) discuss the importance of voice as a tool for encouraging success for Aboriginal students. "Students are also motivated when they feel the power in their own voices, the project tapped their inclination toward self-expression" (p.211). The power for change comes from within.

At the same time, Donald (2008), asks us, as a first step toward decolonization, to resist the temptation to frame Indigenousness in isolation and exclusionary ways; and suggests that "It

is possible to simultaneously promote Indigenousness while also recognizing that Indigenous and Eurowestern knowledge systems exist simultaneously—in context and in relation to each other—and that the quality and character of those relationships is unpredictable (Nakata, 2002)” (p. 6).

Brandon reminds us of this. When asked what he thought were the factors that contributed to the success of Aboriginal students in mathematics, he replied,

it’s kind of like detrimental to aboriginals saying like: Well why are you guys successful and why aren’t you guys successful? Or going up to like a non-aboriginal and saying: Well how come you guys are more successful or not more successful than aboriginals? Like, its the same thing, we’re both doing the same thing. It’s not like because we’re brown we’re going to get worse marks or because we dropped out the most it just depends on where you come from, who you grew up with and how the families are. It’s like you have like the typical like native family or whatever where there’s a lot of alcohol and everything and you get looked down upon if you’re trying to finish school or whatever. But than that could be the same thing with white trailer-trash or whatever like it just depends on where you live like, if you put a bunch of white people on a reserve of course they’re going to like go partying or whatever, and then you stick a bunch of natives in a city, same thing I guess. But like I don’t know, its just weird like, I think it shouldn’t be either aboriginal or non-aboriginal, its all just, I think it should be generalised as teenagers and what age groups, not depending on race because I don’t think race really has anything to do with it. Cause you have your really smart natives but then you have your really smart white people, and you have your typically dumb both I guess. I don’t know I don’t think it should be based on racial things.

What might the community of mathematics educators learn from Brandon’s story? In what way(s) might the community of mathematics educators begin to recognize that Indigenous and Eurowestern knowledge systems exist simultaneously? What practices in school would reflect this co-existence? These are the areas of future study.

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