

Connecting Academics, Indigenous Knowledge, and Commitment to Community: High School Students' Perceptions of a Community-Based Education

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This study examines Native American students' perceptions of one community-based education model (CBEM) involving four Pueblo communities of the southwest United States. I argue that community-based programs provide a means for achieving self-determination in education for Native communities and for returning to traditionally Indigenous educational approaches. Students' journals demonstrated evidence of the academic content they learned and their excitement for learning. The students also expressed the importance and relevance of what they learned to their own communities. By empowering Native people's knowledge and experiences as the basis of education, CBEM inspired students to commit to their communities' goals and interests.

Education for Native people in the United States initially served to assimilate Native children into Western culture. It is well known that particularly cruel methods were used in schools that served Native children to abolish their languages and cultural ties in order to promote assimilation (Adams, 1995; Lee, Kiyukanpi-Renville, Lone Hill, & Whirlwind-Soldier, 2002). Although the harsh treatment and punishment for expression of Native culture may have dissipated, the school largely continues to have this assimilationist effect (Deloria & Wildcat, 2001; Manuelito, 2003). Control of education did begin to fall back into Native hands in the late 1960s and early 1970s in the US, particularly with the passage of the Indian Education Act of 1972 and the Indian Self-Determination and Educational Assistance Act of 1975 (Lomawaima, 2000). Many Native Nations¹ have used the passage of these acts as an opportunity to reinforce, if not teach, Native values and cultural heritage such as language and custom through the school. Culturally responsive pedagogies are of concern to the First Nations of Canada as well (Agbo, 2004). Agbo argues that it is essential that First Nations' students receive not only culturally responsive education, but that the Euro-Canadian teachers also learn the necessary cultural tools for delivering and facilitating this type of education. For the most part, however, Native students today are served by public schools both on and off reservations, and their focus, curriculum, teaching, and learning stan-

dards are determined by mainstream non-Native institutions (Swisher & Tippeconic, 1999).

In trying to learn how education can embrace Native culture and people, one broad purpose of this study is to touch on the effect of community-based education in transforming and inspiring Native students' interest in their Native communities and their desire to commit to their community.² The successes of community-based education are apparent in the enthusiasm of students to pursue degrees or jobs that will directly (and indirectly) benefit their Native community. From an educational standpoint, it is important to determine the aspects of community-based education that influence and perpetuate students' interest and further commitment to serve their communities.

The specific purpose of this study is to demonstrate the effect of one community-based program on students' academic knowledge and the connections it fostered for the students to their current realities and home communities. This program is called the Community-Based Education Model (CBEM, 1997), and it is housed at a federal grant school for Native students in New Mexico. The purpose of CBEM is to motivate and improve achievement for students in math and science while also teaching them about tribal government and communication skills. The goals of the program as stated in its brochure and other quarterly reports to its funder, the Department of Energy, are to engage students and tribal communities in environmental issues of the communities. The approach attempts to stimulate student motivation and interest in math and science through an interdisciplinary focus of their application in Native governments and communities. The philosophy behind CBEM is that community-based education is the most relevant type of education for Native American students because it acknowledges and accesses students' home communities and knowledge. It makes learning more relevant because of its basis in real-life issues of the communities. The communities are considered equal partners in the program and become the decision-makers about topics or themes students learn about. CBEM hopes to motivate students in math and science through the relevance of the topics they study to their lives and through the field-based, hands-on approach to learning. This study showed the meaningfulness of community-based education and how students attribute importance, value, and meaning to their education as a result of their participation in this program. In addition, it showed the educational effect on students' achievement in academic content and the connections that students make between this knowledge and their communities' current realities and interests.

Challenges in Indigenous Education

Many Native peoples have maintained their cultural roots through the perpetuation of their language and the practice of traditional customs and cultural activities (Kawagley & Barnhardt, 2004). Yet at the same time, it is

also true that a large number of First Nations have lost their languages, and many more Nations are experiencing rapid language shift from their heritage language to English (Lee & McLaughlin, 2001; Sims, 2004; Crawford, 1995). In addition, cultural practices³ are not as widespread across the Native American population, which is rapidly becoming more urban (Fixico, 2000). For example, the 2000 census indicates that over 50% of the Native American population in the US lives in urban areas (US Census Bureau, 2000).

Despite the challenge of using schools to teach Native culture and values, many Native Nations use formal education in creative and alternative ways to promote their values and inspire future leaders of their communities. For example, several of those Nations include the 19 Pueblos of New Mexico who govern Mountain Indian High School (the school described in this study⁴), the 50 member Nations of the Council of Energy Resource Tribes who operate the Tribal Resource Institute in Business, Engineering, and Science (TRIBES), a summer college preparatory program (Lee, 2006), and a Canadian Native teacher education program that is guided by First Nations' educators and elders (McLeod, 2003). Self-determination in education, or the right to decide and teach Native children what Native people believe is important, is being exercised through mainstream schools and similar settings (Corson, 1999; Holm & Holm, 1995; McCarty & Watahomigie, 1998). Most probably this is happening because schools offer facilities and resources. However, the difficulty in using Western institutions to foster Native people's interests stems from the question: How can education and the school place have meaning for Native students who may feel disenfranchised from the very society formal education is trying to promote? Dozier Enos (2001) found that Pueblo students and their families struggled with how to include or reject school in their lives. She stated that Pueblo students may reject formal education as an institution of US culture, which is important in their identity formation, to reject that which is part of the dominant culture. On the other hand, Pueblo people are trying to find ways to include aspects of US culture without disrespecting their attachment to their Native communities. School complicates identity formation in this way.

This school influence is shared in Canada, where a similar history of colonization and assimilation policies have negatively effected Aboriginal students' experiences in the Western-based school systems and "Indian Residential Schools" (Ball, 2004, p. 457). To address the disconnect between schooling and Aboriginal peoples and cultures, a group of Aboriginal elders, educators, and scholars compiled a lengthy resource book of strategies and guidelines to help classroom teachers better understand and serve their Aboriginal students.

The Relevance of Community-Based Education for Indigenous Education

Formal education through community-based education can have meaning for Native students in important ways for Native communities. For Native students to develop a sense of meaning in their education requires that education have relevance to their lives. It must also validate their life experiences and community knowledge. For example, like the resource book mentioned above, the strategies identified by Hampton and Roy (2002) for creating a more positive learning environment for First Nations students involved this type of validation by inclusion of First Nations content and culturally appropriate teaching styles. Although not community-based, the strategies entailed creating educational experiences that were more relevant to the students' heritage and life experiences. Community-based education resonates with these goals in education and represents what is meant by Indigenous education as explained by Cajete (1994), a Native scholar and educator. He stated that because the highest goal of Indigenous education was to "help each person find life and realize a completeness in their life, the exploration to different approaches to learning was encouraged." Community-based education uses various approaches to learning and attempts to aid students in finding meaning to their education, thus helping them to find life.

Related to this philosophy articulated by Cajete (1994), community-based education is an example of education visualized by Dewey (1915) and Friere (1970). Dewey visualized education as a process for learning through experience in settings that are a part of a child's natural habitat. Similarly, Freire discussed self-awareness and control over one's own education as a means to empower and activate an individual's sense of learning. These ideas from Dewey and Freire are both related to the importance of establishing relevance between educational content and children's lives. How educational relevance and linkages to home and community have been established for Native children has been through community-based education (May, 1999). Community-based education is rooted in community involvement and decision-making. Corson (1999) describes community-based education as beginning with people and their immediate reality. It allows community members "to become meaningfully involved in shaping their own futures through the school and other agencies in their community." Decision-making about education and children is placed back in the hands of the community, instead of remote officials who do not share the culture of the community and might not care much about it. For many Native American communities, this community-based approach to education is ideal because of the potential to direct the education of their children.

Spindler (1987) predicted in his essay on cultural transmission that non-Western cultures would create their own models of education that are more appropriate and relevant to their needs because of the difficulties

formal education has created for culture to be transmitted. Educational systems are agents of modernization, and the curricular content is alien to existing home cultures. Native people are recognizing these limitations of the Western educational system (Kawagley & Barnhardt, 2004).

Thus the need to adapt the educational process to facilitate cultural transmission becomes apparent. For Native communities, the importance of education reaches farther than simply a mastery of academic content and critical thinking skills. In essence, Indigenous education relates to learning about oneself and how one shapes the community and is interconnected with his or her local environment. Cajete (2000) explains that a primary purpose of Indigenous education is "to help the individual become a complete man or woman." This extends to one's responsibility to his or her community. For Native people to continue to exercise their inherent sovereign rights, there is a need with each generation to inspire Native children to protect, serve, and contribute toward Native communities' social, cultural, and political interests (Calhoon & Annett, 2003; Calhoon, Wildcat, Annett, Pierotti, & Griswold, 2003).

Community-based education is one adaptation to formal schooling with this objective for many Native communities. In a sense, community-based education provides the "free spaces" as discussed by Fine, Weis, Centrie, and Roberts (2000) for Native students to flourish and develop a sense of agency in shaping their future, especially as it pertains to community goals. These free spaces are places that are nurturing and safe for one to express oneself without pressures and misrepresentation from the outside world. For Native people, community-based education offers a place to embrace, nurture, celebrate, and teach Native values, culture, and language. In fact most of the community-based educational programs in Native communities as written about by May (1999) have focused on Native language maintenance and revitalization because of the strong threat of language loss. Many of these programs have also applied the work of Sims (2004), Director of the Linguistic Institute for Native Americans, and another authority on heritage language issues, Fishman (1991). Fishman outlined several strategies for language planning at the local level, and he stresses the need for community involvement and organization in the process. It has been precisely in these sorts of educational settings where Native students have found meaning and have thrived. For example, several community-based language education programs that exist on the Navajo Nation have been influential in improving Native language fluency while also raising academic achievement levels (Holm & Holm, 1995; McCarty, 1993; McCarty & Watahomigie, 1998).

In Canada community-based education has taken the form of land-based alternative education for Indigenous youth. It provides a way to "better reflect the local values, traditional knowledge, mixed economies, and the employment opportunities that exist in rural Canada" (Fur In-

stitute of Canada, 2004). It has also occurred through community-based partnerships between First Nations and higher educational institutions in Canada through the use of a "generative curriculum model" (Ball, 2004, p. 459). In this model and through their partnership, Indigenous knowledge, teaching, and learning practices along with Western theories are incorporated into the educational approach to transform educational experiences for First Nations learners.

These programs are defined as community-based because they access community resources. They are not solely rooted in the school or in using school resources. Students interact and learn from community resources in a variety of ways and through community-developed methods such as the model demonstrated in this study. In the following sections, I share details from the teacher research that I conducted to examine CBEM for its effectiveness in teaching students academic content and for making connections to community through community resources.

Inside CBEM

The philosophy underlying CBEM (1997) at Mountain Indian High School (MIHS) was to affect learning in a meaningful way that responded not only to students' educational achievement and experiences, but also to the partnering Pueblo communities' needs and interests. Leading to "sustainable higher levels of academic performance, motivation, and interest in learning about, and contributing to, [students'] home communities is central to the approach" (p. 1). MIHS recognized that many of the students' communities had environmental concerns that were tied to social, economic, and cultural traditions that affected and influenced the quality of life in those communities for generations. They asserted that involving students with community members in exploring and investigating these issues would be more interesting for students than traditional core curriculum and would result in outcomes that benefited both the students and the communities. To enable this approach, students had immediate and in-depth interaction with community members and environmental issues that affected the communities over the course of an academic year. Thus the community sites became the learning environments through the involvement of community members as partners and mentors and resulted in lasting benefits for both students and communities.

Students who enrolled to participate in CBEM primarily did so to fulfill their science and language arts requirements. There were no academic standards a student needed to meet to enter the program, and thus their choice to participate was more a consequence of scheduling convenience. As the students across the school learned more about the program, those who were attracted to the idea of weekly field trips and use of technology also chose to participate.

Participating students attended CBEM every afternoon of the school week in which their community work was integrated with their classroom-based work. Their classroom work and academic credit were based on an interdisciplinary curriculum in which MIHS students took four courses in environmental science, tribal government, math modeling, and communications. The courses were taught by three teachers using interdisciplinary methods. The core of the program was the community visits the students took each week with one of the four Pueblos that participated in the program and worked with CBEM students and staff throughout the year. Once a week a group of students visited their assigned Pueblo and worked directly with the environmental departments there. The department administrators along with the Pueblo leadership identified themes of study related to their own work and concerns in the Pueblo for the students to learn about. The teachers then designed curriculum around these themes. The school developed the specifics of the curriculum organized around these thematic issues so that the field experiences and classroom learning supported and complemented one another. For example, in one community, the leadership and people were concerned with the effects of the Cerro Grande fire on their community. This fire affected much of Los Alamos, New Mexico in May 2000, and it reached the Pueblo's tribal land. The Pueblo asked the CBEM students to help with determining the effect of this fire on their natural environment with particular attention to contamination from Los Alamos National Labs, where nuclear technology is used and toxic substances are produced. Curriculum was developed around this theme so that students could learn about and perform such tasks as taking water samples to determine the water quality, testing air quality, and taking soil samples to test for contamination from spring run-off. In addition, the students learned about the social and cultural effects of the fire on the Pueblo and the associated legal rights of the Pueblo in rehabilitating their tribal land.

Technology was heavily incorporated into both field experiences and classroom-based learning. Students learned how to use such equipment as geographic positioning satellite systems and associated mapping software programs. They communicated their findings in writing and orally using word-processing and PowerPoint presentations on the computer. Students enjoyed the use of this technology, and it motivated their learning. In turn the Pueblos benefited from what the students produced using such state-of-the-art equipment. The Pueblos often do not have such technology to study these issues of concern, and as a result of the students' work can present highly organized and sophisticated information to their tribal members and the general public. The relationship between the students, CBEM staff, and the communities was reciprocal, each educating one another and becoming a resource for the others.

Throughout the school year of the study, all students participating in CBEM kept a journal on their thoughts about their field and classroom experiences. We encouraged the students to be honest and to feel free to discuss whatever was pertinent to them about the CBEM program. We also told them that we would not be reading the entries until the end of the school year in an effort to make them more comfortable with being honest in their writing. Students generally wrote about what took place during their community visits and classroom activities. They also wrote about presentations they had given or conferences they had attended. Students' voices are significant for learning about educational effectiveness, particularly when the students may feel disenfranchised or disconnected from the pedagogy and curriculum (Loutzenheiser, 2002). These journals provided rare and meaningful insight into the students' perceptions of the program.

Methodology

Based on this unique approach to education, the goal of this study was to determine students' perceptions of CBEM and the knowledge and connections they developed from their experiences in CBEM. More specifically, the research questions that motivated this study consisted of: *Are students motivated by and achieving academically due to the CBEM approach? Are students making connections between the community issues and the curriculum, and do they perceive what they learn as relevant to their lives?*

I conducted the study when I was a teacher in the program. I was the Tribal Government and Communications teacher. I am also Navajo and a woman, which is important for understanding my own position in conducting the research and in my relationships with students. My conversations with the students outside class often centered around our shared experiences and diverse opinions about being Native.

However, when the students completed their journal entries, they knew they were writing to all three teachers in the program. The three of us spent much time with the students in the communities and in the classroom. Each of us developed unique relationships with the students based on our own teaching styles, personalities, and values. The fact that two of us were Native and one non-Native was only one aspect of our interactions with the students. McAlpine, Eriks-Brophy, and Crago (1996) emphasized how teachers' beliefs and identities are complex, and heritage alone does not adequately represent the diversity of teachers in Native schools. Our relationships with our students were enhanced by the amount of time we spent with them. We saw students every day of the week for three hours or more. Also, being away from the school culture during community visits, and especially while commuting, allowed us to come to know the students on a more personal level as they came to know our personal lives as well. Thus I feel this made it easier for the students to be open and honest in their journals.

The journals included in this study came from the 16 students involved in the program. All the students were Native American, mostly representing local Pueblo Nations and the Navajo Nation. There were eight girls and eight boys. Six students were sophomores, and 10 were seniors at MIHS.

To synthesize the journals, I read through each one thoroughly and tried to identify patterns of thought or ideas that each or several students addressed. I reread the journals twice more to confirm students' thoughts that I had identified and to check for topics I might have missed. I also asked the collaborating teachers and staff to confirm my categories of thought patterns and interpretations of students' comments. In addition, I worked with the students every day of the week for this school year, and so my analysis of their journals was improved by my daily interactions and my personal observations and conversations with them.

The students' journal entries reflect two critical areas in terms of establishing CBEM as an essential example of Indigenous education that succeeds in a traditional public school setting. The students demonstrated through their journal entries (a) the academic content that they learned, and (b) more important, the relevance and meaning of what they learned to their communities. For many this connection to their community stimulated their interest to continue in related fields for the benefit of their communities. In essence, CBEM provided meaningful education for the students, and their journals are testimony to this.

Students Reflecting on CBEM

Students frequently wrote about the academic content that they learned while participating in CBEM. The core of the program is math- and science-based. Consequently, many of the students' entries contain specific descriptions of mathematical and scientific knowledge. Before the year of this study, CBEM had already naturally emphasized an interdisciplinary approach to the topics of study selected by the communities. By working on environmental projects in the Pueblo communities, it was important and necessary that the teachers develop curriculum related to the projects that addressed the historical, political, cultural, and social issues involved in those projects. The addition of tribal government and communications courses during this particular school year made this emphasis much easier to achieve. Thus many of the journal entries reflected students' connections across disciplines from the curriculum. First I give examples of the scientific knowledge that the students demonstrated.

In writing about her experience in her assigned Pueblo, a senior student, April, accurately identified a wetlands area based on the type of plants that were growing in the area.

This week in CBEM class I went on two field trips. The first one was to (her assigned Pueblo⁵ on Tuesday.... We met with the people who were in charge of the environmental department at the pueblo. They took us to the wetlands they had. The first one was by the

river. It had water above the ground and some streams going through it. We saw a hawk there. The second wetland we went to was an isolated one. It didn't have water above the ground, but there were sedges and cattails, which are plants that classify the area as a wetland

April demonstrated content learning by appropriately connecting the classroom material on wetland characteristics with her observations during her community visit.

Similarly, a sophomore student named Marie consistently wrote about new and interesting content that she was learning from her experiences in CBEM. She also often demonstrated her learning by connecting academic content with her experiences in the field and with community members. For example, she described her decision to choose *water rights* as the topic for her individual research paper because of what she had learned from working with one Pueblo's environmental department, through interviewing the elderly in that Pueblo, and from her earlier research on water rights where she had learned about an important legal case regarding Indian water rights called the Winters Doctrine.

I don't know what to write for my research paper. Maybe I should write about water rights. That's the closest thing to interesting for me anyways. I don't know much about it. Right now I know that there are a bunch of people up stream [from her assigned Pueblo] pumping up a lot of water. There isn't much water left for the Pueblo because that river looks like a leak. There must have been more water than that because the elderly said that they used to ice skate on the river. [In] the Winter's doctrine I think the Pueblo is supposed to get at least a certain amount of water. Well, that's all I know so I guess I have to do more research on it.

Her comments here are reflective not only of how her academic interests were stimulated and strengthened through her involvement in CBEM, but also of her achievement in applying the knowledge she had learned months earlier to the present situation. She recalled earlier information that she had learned from the elderly in her assigned Pueblo and from her research on a paper months before to analyze the current situation she was learning about with regard to the river of that Pueblo.

In the next entry, Tara, a senior, nicely demonstrated content learning through her use of technical vocabulary associated with equipment the class would be learning how to use. She explained the purpose of two types of data loggers when she said,

I also learned what a Portable Data Logging Spectrophotometer is, it is to test the water if it is clear and to see if the water has chemicals. The data log is to sample the water. The Geo Explorer II is to pinpoint and locate where you are. These are some of the materials we will be using.

It is important to note that the students were recalling what they learned and writing it in their journals one to several days after being presented with it in the classroom or experiencing it in the community. It was the experience in the community where the students were able to

apply their content knowledge that helped to reaffirm this knowledge, which they then recalled and described in these journal entries.

CBEM students collected large quantities of data and took samples from various rivers surrounding the communities. They wrote many times about their experience sampling and what they learned. Below are three entries from three separate students who wrote about this topic. In this first entry, Marie described what she learned in class about aquatic habitats before she did any sampling.

Earlier in class we learned about the aquatic habitats. We learned about how there is oxygen in the water. Two things make up water, which are nitrogen and oxygen. In water, there are different kinds of ways that oxygen can remain in the water for all kinds of living and non-living organisms who can call that place home. Oxygen can be produced in water because the plants give off oxygen because of the photosynthesis process it goes through. Also by the atmosphere because of the gravity that pulls air down into the water. Another way is the actual movement in the water. The bubbling and all the turbulence that goes on in the water increases dissolving action to happen within the water. A plant that gives off oxygen would be algae that grows on rocks.

Interestingly, Marie recalled this detail after a visit to a stream where the environmental science teacher explained this process to the students. He was able to enhance his instruction by referring to the bubbling water of the stream and the algae on the rocks. For Marie, the experience and demonstration during this field visit stimulated her learning to the point that she was able to recall precise details about aquatic habitats. I believe this was more effective learning for Marie than being presented with the material in a textbook.

In the next two entries, students described how they collected bug samples from the rivers to determine the quality of the water in the river. They described the process and purpose of the sampling, one with more precision than the other, but overall with the same content. Michelle, a student who claimed early in the year to be uninterested in science, wrote,

Well we went to Battleship Rock and we were doing a macro invertebrate sampling or something like that. Me and Angelo went in the water to do the work, to get the macro invertebrates from the river. It was all scary cuz the river was all-strong and those waders were like all floatable or something. It was pretty cool though. Well we got some bugs and we dumped them out on a tray to classify them into their groups. There were aquatic worms, stoneflies, case builders and other bugs (I don't know their names.) We classified them and determined if they were good for the quality of the river.

Lisa described the same activity at another river when she wrote,

Yesterday our group went out to the reservation to go and get bugs out of the little creek by an apple orchard. It was fun to do that because we got to see all the little different bugs that were in that creek.... After Tara got a couple bugs, me, Harold, and Nora dumped the bugs in one tray filled with water. After we did that then we separated all the bugs into little spaces according to their shape and how they looked. Then Tara went to go get bugs from under a place where it was shady to compare the bugs she got that were from out in the sun. Then we compared the bugs but we found the same types of bugs as before. I really enjoyed doing this project with the group.

Again, the experience in the community at the river collecting bugs stimulated their learning and improved their content knowledge related to insects and determining the health of rivers. Michelle demonstrated her learning a little further by her use of scientific terms and the names of the various insects.

Many of the students' journal entries also reflected the interdisciplinary nature of the program, which is important for representing how life experiences and community knowledge integrate various content areas and thus make that content more meaningful for the students. Students discussed how their coursework was linked to the community work and how specific topics fitted into broader contexts. Students also learned from their experiences in CBEM that the community people are resources who hold valuable knowledge about their community's environment. In using community people as resources, students validated the Indigenous knowledge and community experiences. For example, Marie wrote about how she had to ask the environment department in her assigned Pueblo for accurate information on the Pueblo that she could not find in her research back at school and at the local college library. She then explained how she learned about water rights and the various interdisciplinary issues surrounding water concerns in the Pueblo.

On Tuesday, my group went to (our assigned Pueblo). We asked (the staff) questions about the Pueblo that we couldn't find the answers over here. When we were finished with that we went down to the river. They took us to the east boundary of the river and told us about their water rights. They said their water is more polluted than it is up the river because more non-Indian people are up there and their septic tanks leak out to the river. They also talked about how they have less water because the people up the river drill wells and use up the water.

John also described well what he learned about a federally operated dam located on one of the Pueblos' land. In his description, he demonstrated his interdisciplinary and integrated learning when he alludes to the political issues and environmental consequences when describing the mechanical operations of running the gates of the dam.

The past few weeks we've been going to the [his assigned] Pueblo and the dam studying and learning more about the dam and the effects that the Pueblo people used to face like the seepage that messed up the farmlands. We also went to one of the drainage [canals] and it was the main one that goes down to the Rio Grande. [A Pueblo staff member] from the Pueblo was the one who took us there and showed us how they measure the flow of the drainage. They also showed us how the gates work that are under the dam. We went down the tower that is located at the dam. The tower is 20 stories high and went up to the sea level [5,480 ft.]. The walls of the tower is 20 ft. wide so no water can enter and the guy that operates or that is responsible for the water that flows out of the dam showed us how all three gates worked. There are two service gates and one emergency gate. We also learned about the history of the dam and when it was constructed and finished and also why it was constructed.

The students were not usually taking notes when visiting communities because they were actively engaged and doing hands-on work. The detail

John describes was based on his memory, suggesting the experience had a large effect on him.

The journal entries quoted above reflect what the students learned and experienced and their excitement for learning. More important for the objectives of CBEM and for the purposes of this study are the comments that demonstrated connections that students made between their coursework or fieldwork and the broader concerns of the community or of their own community. Exemplifying Freire's (1970) notion of the importance of empowering an individual's sense of learning, many journal entries showed how the students made connections between their coursework, community work, and real-life experiences. Their work in CBEM also sparked personal interests that they pursued in research papers or that they planned to pursue in college and employment. These entries offer a glimpse into the effect education can have for inspiring a students' desire to commit to their community. Significantly, this effect is created by drawing on students' current realities and community knowledge, while also accessing the knowledge of the participating Pueblo environmental department and community members.

This first comment demonstrates well how CBEM had influenced Ron, a senior, to recognize the importance of technology. He also realized the uniqueness of the program in providing him with an opportunity that otherwise might not have been available. We asked the students to write a New Year's resolution at the beginning of the second semester, and his comments come from this resolution.

My new year's resolution for the CBEM class is to get all the skills I can get for the future use of the technology being used for many things out there in the world. I expect to get many things from the class, because almost everything in the world is now computerized. Learning the computers is an opportunity to me because at another school they wouldn't have a course like the course we have at the MIHS. I see my self succeeding in this class, getting most of the knowledge I need for the real world. For the communities, in the future I see my self helping the communities out with environmental or any other kind of issues. I will make all the effort to do all my work assigned to me, move on further ahead in the course.

He made a connection between what he learned and the usefulness of it after he finishes high school for his personal goals. He recognized the importance of technology in professional fields and how his skills with computers would help him succeed.

In the next comment, Lisa felt her work in CBEM helped her to contribute back to her community. She discussed what she learned, the work she would be doing in her assigned Pueblo, and how she was glad she could benefit the community.

On Tuesday, September 7, 1999 we went on a fieldtrip to [her assigned Pueblo]. We met five new people who are in charge of [the Pueblo's] environment. They take tests on the water making sure that it is safe for community to use. The Pueblo does have a problem with their water because a long time ago some waste leaked into the ground and now after

a few years all that waste has reached the Rio Grande river. This means that the river can be very hazardous to humans, animals, and naturally to the rest of the surrounding environment around that area. The Pueblo is taking charge by monitoring the waste by taking water samples and testing each carefully for any kinds of problems. I learned that I am going to be one of the members helping [the Pueblo] with their problems. I'm glad I am because it makes me feel good that I am giving back to my community.

Michelle made a similar comment about working in the communities, but she also acknowledged how the work in one community could be applied to the issues of concern in her own community. She said,

I am glad we will be working with the communities. I would like to have a better understanding and look at the problems from a more clear perspective. Because we all have very similar problems and with the knowledge that I gain I will use it in my community as well.

Students were assigned to their home communities when possible. For these students, it was an opportunity to learn more about their Pueblo than they realized, and thus become more interested in their Pueblo. During a field visit to the Museum of New Mexico's Photo Archives, Sara recognized environmental differences in her Pueblo, which made the activity worthwhile.

Last week Thursday, we went to the photo archives here in [town]. It was pretty cool ... Well, we went down there and looked at photos of how the pueblo looked back then. It was pretty amazing to see my pueblo because it was all clean. There was no trash lying around and everything was in its place. There has been a lot of changes that has gone through my pueblo. Upon the people, too. There's more housing, roads, people, and cars. Then, there was only stuff that the people needed and they were naturally there. Well, the pictures I saw interested me pretty great.

She made similar comments in another activity where the students interviewed several elderly people at her Pueblo's senior citizens' center.

We went to [her assigned Pueblo] at like 10:30 a.m., don't know what time we arrived there. Well, we went to the elderly center by the civic center. Me and Michelle sat by them and we talked while we ate. After we finished eating, we introduced ourselves and then we started out with the project for that day. It was to interview them. To add more knowledge in what I already know about my pueblo. Well, we started interviewing, I interviewed 2 men. I only know one of their names, not his English name but his Indian name and that is "thon-hon'-wa-ge." And the other man's name, I don't know. I forgot to ask. (DUH!) But anyways, the experience of it was cool. I never talked about any environmental issues with someone from my pueblo and that I didn't know of. And especially had to make them understand what I was asking, or that I had to speak clearly just to make them understand the question I am asking. It was pretty cool though and they did know some stuff. They both had the same views and they thought very alike.

In this activity she learned that the experience of doing an interview is challenging and even more demanding when translation is required. She had to translate the questions from English into her Native language, and then translate back into English to write down the responses. During this process, she also learned more about her Pueblo with regard to the environment because she said she had never talked with anyone from her

Pueblo about environmental issues. This experience interviewing the Elders is a good example of how CBEM Indigenizes education by providing intergenerational learning opportunities.

Another student, Angelo, who also participated in these interviews, learned that he could relate what he learned to his own Pueblo. He said,

It was very nice to talk to an older person and ask them how their childhood was cause when I asked them, they got all excited and then they started to remember all those memories they had gone thru when they were growing up. I learned something from them and can relate to myself and my pueblo. It felt very good to see them smiling and talking on the old days.

In addition to learning information that the students related to their own Pueblos, they recognized how their coursework and fieldwork often filled a community need. They acknowledged that their work was important and relevant to the community's projects, and in turn they enjoyed their work because it was fulfilling and played an important role. John commented on this connection between CBEM work and community need.

The last time I went to the pueblo was when they told us that we had to GPS (Global Position System) the playground, the two baseball fields and the basketball courts for the governor to decide where to build the memorial gym for the pueblo's communities. That GPS will determine where the good place for the gym to be built. After [that], we took the GPS back to the office and [a staff member] downloaded [it] to the computer. That day was fun, we had a chance to go out and do the things required to do.

When John said he had fun because he did things that were required to do, he was referring to the immediate need of the Pueblo's environment office to have the three areas surveyed with the GPS in order to include the information in a proposal for funding a recreation center at one of those sites.

CBEM tried to emphasize the importance of protecting Native lands, resources, and people by having the students work directly on issues of concern and current environmental projects in the communities. One of the intentions was to influence the students to make personal choices to work toward the same goals of protection of their own lands, resources, and people. Marie made a decision that reflected this curriculum intention. When the class went to the local river to help replant trees, she decided to help cut down the exotic, invasive plants surrounding the area because that was the topic of her research paper.

Last Wednesday, we went to the (local) river to do some work down there. We met up with some people from Forest Guardians. We did three different things. We cut down some trees to the ground that were unwanted. We planted cottonwoods. You could either dig holes with a shovel for the big ones or use a machine to dig the holes. I chose to use a lopper to cut down the exotic trees. I figured since I've been writing all these reports and stuff on exotic plants that I might as well do something about them. So we cut down Russian Olives, Siberian Elms, and salt cedars.

As discussed above, Marie also chose a research topic that was of importance to the Pueblo community where she was assigned. In this paper, students were allowed to write on any topic of their choice. She considered possible topics that all related to her work in the Pueblo. She talked about her interest in writing about water rights because of the situation in this Pueblo. She eventually wrote about invasive and exotic plant species in New Mexico, which was another important issue addressed by the Pueblo's environment department. Then she took part in cutting down many of those exotic plants when we helped the rehabilitation project at the local river. Even further, she recently graduated with dual degrees, one in environmental science and another in Native American Studies from the University of New Mexico. Marie is a realization of the purpose of community-based education. She has expressed publicly the connection between her experience in CBEM and her life goals, which include plans for service to her own Native community.

Seven other students made similar choices to Marie's in their research papers. They chose topics that were of concern in their particular communities. One comment clearly exemplified this type of choice. When writing about the day's events, Ron said, "We also learned how to make notecards on the computer on issues we got to choose on our own. I choose alcohol abuse, because I think that is a serious issue on my pueblo."

Tara, who came from one of the participating Pueblos, commented, "The topic that I would like to write on is the dam. I think that would make a very interesting report." Tara had commented during her final presentation back to the Pueblo at the end of the school year that the most important things she had learned in CBEM were about the history, politics, and environmental consequences of the dam. This was an important statement because with all the technology and new content introduced over the year, the issue she found most worthwhile was one of great concern to her own Pueblo.

Finally, I end this section with an excerpt from a letter that David wrote at the end of the school year. This letter was addressed to prospective employers. He wrote a concise overview of the activities in which he had participated and the technology that he had learned in CBEM. He also stated his interest in pursuing a career in environmental science and forestry. This letter is important for showing not only the knowledge and skills he had achieved through CBEM, but more important, the interest he had gained in working in the environmental field and preserving the environment. Through CBEM he developed a connection between his coursework and fieldwork and his personal goals.

In this program we do such things as, test the groundwater and surface water in the communities, collar elk on pueblo lands for radiation testing, check the quality of the soils and air, collect microinvertebrates in streams and rivers to test the quality of the water, and also assist the environmental technicians with various tasks. In this program we also use advanced technology to make maps of various locations on the reservations, research

relevant information, and prepare Power Point presentations. Some of the programs we use in this class are GIS/Arcview, which is a computer program that is used to make out a map from downloaded data from the GPS, watersheds and sub-basins. We also use the Internet and different websites to write research papers on various topics given by the teacher. Finally, we use a program called Power Point to make slide shows for various presentations given to school officials, tribal officials, and elementary students about environmental issues and concerns. I am very interested in the environmental field and doing something to preserve the environment. If I become part of your program this summer, it would strongly prepare me for the environmental science and forestry career that I would like to pursue.

David also exemplified the purpose of community-based education because he was a student who started the program with poor grades and with lack of interest in school, from my observations. After he completed CBEM, he was motivated to seek summer employment related to the work he was doing in CBEM, and he expressed a desire to become more involved in their community's field projects and to learn at a more sophisticated level during the school year as well. David and the rest of his group took the initiative to request more involvement in their assigned Pueblo. He wrote a letter to the environment department of the Pueblo in which he first summarized the work that his group had accomplished in their Pueblo, and then made suggestions for further work in which his group would like to participate.

Some of the ideas that we came up with are; continue work on the plume; talk to the day school kids about how important it is to keep the pueblo clean; and take them out to pick up trash around the school area. The CBEM group could also help the ecologist with picking plants and taking pictures of animals around the pueblo area. Finally, we would like to take the place of one of the technicians for a day and experience what their responsibilities are.

His interest in doing more advanced work was a delight to his teachers and was an indication that CBEM had had a tremendous effect on this student's excitement for learning and his goals, which demonstrate his commitment to community. The students' entries in this section are important for demonstrating that CBEM was a key factor in their academic achievement and motivations for future life plans. Many students were probably motivated to contribute to their communities before entering CBEM, whereas many perhaps had not thought about their life in this way. CBEM allowed them to contribute immediately to their communities through their work, and they observed the benefit of it. As a result, and as shown most succinctly in the entries by David, their motivations for continuing this type of beneficial and useful work for their communities stimulated their learning and achievement and their life goals.

Conclusion

The students' journals provided one valuable way to analyze the effectiveness of CBEM because the data came directly from the recipients of the program. The application of Indigenous philosophies of education was

apparent through students' perceptions of CBEM. The CBEM program, which is housed in a formal educational setting, was able to bring meaning and relevance to MIHS students' lives by drawing on their community's knowledge and their own personal experiences, which are important components of Indigenous education. Through collaboration with Pueblo community members, students became more motivated to achieve academically, and as a result increased their content knowledge related to environmental science, math, tribal government, and communication skills. I observed that they could articulately describe the specific environmental conditions in the Pueblos through scientific terms and language. They also demonstrated more confidence and improved skills in speaking, writing, and presenting their work over the course of the year. As they increased this knowledge, they made connections between this content and the Pueblo's current realities and situations. Even further, students were able to apply that knowledge to their own home communities. As the journal entries demonstrated, these connections the students drew to their lives provided them with inspiration to contribute back to their communities. Although the students never identified specifically how they might contribute, the idea and commitment to serve their communities was sparked by their experience in CBEM. Although some of these students may have had these inclinations to work for their communities before participating in CBEM, my observations as their teacher for the year is that CBEM showed them more specifically how they could contribute and the importance of contributing. Their commitment or motivation became more apparent across all the students in varying degrees but to all in increasing degrees. We can see in the current actions of some students how this commitment is playing out. As mentioned above, Marie, who became interested in water rights and invasive plant species in the Pueblo where she was assigned, has successfully pursued environmental science and Native American Studies bachelor's degrees. She has told me that she is interested in using her degree and expertise to benefit Native people and communities. Tara, who found the most important thing she learned in CBEM was about the history of the dam in her Pueblo, is now pursuing a college degree and plans to attend law school to study Native law and protection of Native rights. In addition, David expressed his desire to pursue a forestry career. Further investigation of CBEM alumni is necessary and would surely demonstrate similar life goals among the participants as a result of the effect of the program.

As an Indigenous approach to education for Native students, CBEM is an example of a community-based program that meets the needs and desires of the Native communities. Students' learning and work is rooted in the Pueblo communities where Pueblo knowledge, culture, and values are reinforced. At the same time, students learn mainstream skills in math, science, communications, and technology. The concerns or objectives of

the stakeholders in the education of these students (i.e., MIHS, Pueblos, government and business funders of CBEM) are met, and the students understand that the core of their education is rooted in Indigenous knowledge and experiences. Centering education on the concerns and realities of the Native communities is extremely important for Native education. It creates meaningful education for the students in ways that are significant for Native communities, and it does this through the use of formal educational systems and sites. CBEM is rooted in collaboration with community; it allows communities to become the decision-makers in the education of their children; and it meets objectives of mainstream subjects (math, science, language arts, and social studies). CBEM has demonstrated that formal education can be shaped to prioritize Native values and goals. CBEM is one example of a program located in a school that places community knowledge ahead of standards, and by doing this it goes above and beyond these standards in curriculum for environmental science, language arts, math, and social studies. Although state tests cannot measure this effect because they would not have indicators for community knowledge and the affective qualities of motivation and commitment, I argue that CBEM exceeds these content standards by applying and connecting the content that students learn with the current realities and conditions of their home communities. Their knowledge is not compartmentalized into subject areas, but is integrated and observed by the students through the examples in the communities. This goes beyond expectations of current content standards. It is promising that Native education through community-based education can now prioritize community concerns and issues through an effective model that allows Native people to direct the education of their children.

On a broader level, the students in this study demonstrated interest in further exploration of the topics they studied while in the program. Their oral and written expressions of furthering their education in related areas of study, which would then benefit their community, give some insight into the importance of community-based programs in influencing students to have life goals that are committed to their communities. Students who are passionate about serving their community's interests are vital for the future protection of Native people's inherent sovereignty and way of life. CBEM is one program that shows promise in leading Native students in this direction.

Notes

¹I use the terms *Nation* or *community* when possible as opposed to *tribe* or other similar terms. I use *Nation* to assert the sovereign status of Native Nations as the United Nations did when it standardized the use of the term *Nation* when referring to Indigenous peoples. I also use *community* when I wish to emphasize the social, cultural, and environmental sense of belonging among people in a particular Native community and not necessarily its political relationship with other Nations.

²Commitment to community can be represented in a person's life goals and endeavors, which they perceive as benefiting their community for a greater good and less for self-promotion.

³In referring to cultural practices in this context, I mean traditional activities and customs that were practiced before contact with Europeans.

⁴I use pseudonyms throughout this article students' names and the name of the school.

⁵Each student was assigned to a participating Pueblo to work with their environmental department on ongoing projects and studies. When possible the Pueblo students are assigned to their own community. I refer to these Pueblos and as the student's "assigned Pueblo."

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