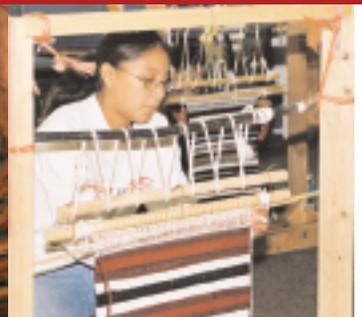


*2004
'Ndahoo'aaah
Program*



Analysis by Chris Roberts



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Philosophy of Lifelong Learning

'Ndahoo'aah represents a philosophy of lifelong learning, everchanging and ever being refined, and then shared with the next generation of learners. Educators would be well served to add the word *'Ndahoo'aah* to their vocabulary and personal philosophies. If *'Ndahoo'aah* is studied and understood, there is great potential for revolution in educational systems.

Students need unique and creative mathematical instruction, that at the end of the day leaves them with enthusiasm and interest in mathematics. Mathematics, in context and with real application, will provide the foundation for further growth and enthusiasm for all types of learning.

Effective Teaching Methods

Educational methods of progressivism philosophy were the most effective, when I provided students first with a set of problem solving techniques and methods, then introduced the goal concept in the context of a problem to be solved.

This method of helping students first to become literate problem solvers reduced confusion and frustration. In addition, this method provided for student engagement at an individual level. This was important because of the diverse spectrum of abilities and learning styles of the program participants. In a classroom that contained students ranging from fifth grade to eleventh grade, the importance of providing for learning diversity was best satisfied by this method.

The most ideal and successful lessons included preparing the students for a new concept by activating background knowledge and assessing student capabilities from student responses to the activation exercise. From this, the lesson could be adapted and crafted most effectively to be accessible to the majority of students.

Additionally, by letting the students know at the beginning of the day's lesson what they were expected to know at the end of the day's lesson, participants could organize more effectively the important information being presented to them.



Elisa (foreground) chose to study the ancient cultural art of weaving reeds. Chelsea Chief (left) was very shy. Initially this shyness was misinterpreted as oppositional behavior.



Chalsea Tallis (on right) shares a moment of humor with the elders and friends in the weaving studio.

When the goal concept was given context by activating prior knowledge and clearly stating specific learning expectations, the engagement level of the students was at its highest.

Incorporating a writing-to-learn activity at the conclusion of the lesson successfully stimulated students to think about and apply their new knowledge. While these writing-to-learn activities presented a significant level of student consternation and resistance, their benefit became evident in later days. In general, the negative response to the writing activities was principally a function of the students' lack of literacy skills.

Conversations with the school librarian and English instruction coordinator, Gary Rock, revealed that a lack of writing skill or skills was pervasive among the student population, and that collectively a significant number of students were reading and writing below grade level. He suggested our writing-to-learn activities were the type of activity infrequently used to challenge students through the course of their educational careers at Monument Valley High School.



Mariah nears completion of her ancient art basket.



Cynthia cuts out triangles as part of a geometry lesson.

Gary described an in-service program San Juan School District had recently implemented. This in-service was designed to encourage teachers to specifically incorporate writing activities in mathematics classrooms, as well as increasing instructor use of writing exercises in other disciplines and content areas. The effectiveness of the in-service is currently under evaluation.

Manipulative learning tools, and small group and individual projects were well received by the program participants. Tangrams, geo-boards, tracing paper, paper cutouts, and graphing tools were all useful and engaging devices in giving context to difficult geometrical concepts. Group creation of concept webs on poster board, partnered activities, and peer-mentoring interaction were effective activities that helped students access relatedness, both socially and in practical application.

Technology as a classroom tool was the most popular method of instruction for the students. The computer component of the sessions dominated the lesson time. The focus of the University of Utah's participation in the program was primarily related to instruction in the use of the software program *Logo Terrapin*. All of the participants completing the program mastered the novice commands of *Logo*, and many went on to master intermediate programming commands, as well. However, *Logo* by itself did not prove to be an effective device to stimulate students' mathematical problem solving strategies. *Logo* did prove to generate greater student interest in mathematics and computer sciences. This enthusiasm will benefit the participants in their educational careers and play an important factor in motivating their future interest, particularly in mathematics.

In conclusion, the most successful teaching strategies were those that provided for the participants need to feel competent, autonomous in the classroom, and a simultaneous need to feel *related* to their peers and



Alumni mentor, Ray, assisted the Elders with cinch belt weaving looms.



Tiffany chose to create an ancient art rug.

the subject matter. This need is deeply influenced by the expectations that each student brings to the 'Ndahoo'aah Program *Logo Terrapin* classroom. It is important to note the divergent expectations of the participants, administrators, and *Logo* instructors. In the future, a great deal could be gained by coordinating, through better communication, a set of common expectations for the program, and specifically the *Logo* instruction.

A discussion of student expectations follows in the *Program Difficulty* section.

Program Success

All of the participants completing the program were successful in learning the basic commands needed to use *Logo Terrapin*. This was evident by the students' completion of two exercise packets and the creation of a unique design represented in their ancient art project (rug, cinch belt, basket). Several participants mastered intermediate command programming skills exhibited in the complexity of their final design projects.

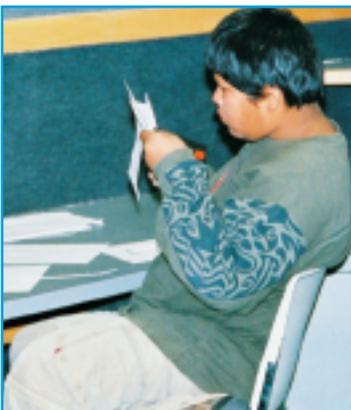
A significant number of participants concluded the program with a greater understanding of, and enthusiasm for, mathematics and computer science. Many of the participants' post-assessments revealed a positive change in attitude toward mathematics. Several students volunteered expressions of enthusiasm to one or both of the instructors.

Program Difficulty

● **Traditional classroom geometry lessons were not well received by the program participants.**

The program participants were not expecting geometry lessons—of any type. In fact, the participants expected, quite simply, to weave a rug, cinch belt, or basket—nothing more.

Most students did not know they would be expected to create a design for their woven ancient art craft or future craft using *Logo Terrapin*.



Students were unaware that instruction would be provided for the background geometrical principals necessary to use the *Logo Terrapin* computer program.

Students believed they were attending the program to learn

to weave. This can clearly be seen by examining the participants' responses to a mid-program questionnaire and the pre- and post-program assessments.

Participants chose to attend 'Ndahoo'-aah, not a required summer school program. A teacher would assume those attending a non-required program would be willing participants. I found out otherwise. It is unreasonable for a child who enrolls in what they expected to be a summer weaving program to be a willing participant in a program that included equal parts of math instruction. In



fact, the mathematics lessons we prepared resembled the summer school program their peers were *compelled* to attend to make up failed coursework.

During the final week of the program, participants were told by the school principal in order to take home their woven craft they would have to successfully complete the *Logo Terrapin* curriculum.

● ***Solution to program difficulty***

Leave the curriculum intact and make it clear to the students exactly what they will be expected to do as part of a program they are choosing to participate in.

Or...

Adapt the curriculum and with less-rigorous (not less-challenging) geometry lessons and emphasize activities and group work that ties the *Logo Terrapin* instruction with the weaving.

Classroom Learning Diversity and Student Abilities

It is untenable to expect a significant amount of mathematical learning to occur in a classroom shared by seven grade levels. It is not inconceivable, however, to expect *some* mathematical learning to occur, and more importantly, expect that all participants leave the program with a newfound enthusiasm for mathematics. New attitudes toward mathematics and learning is the true value of 'Ndahoo'aah.



Instructor Preparedness

For my short-term stay, I was insufficiently educated in the Navajo culture. As an instructor, I did not feel prepared for the objectives and expectations of the participants and administrators of the 'Ndahoo'aah Program.

With the interruption of the University of Utah's participation in the program over the last two years, and the University's new program administrator, it is understandable for the resulting lack of instructor preparedness. Clearly this year, the interruption was an impediment to a successful re-involvement with adequately prepared volunteer student teachers. Several years of continuous involvement will be necessary for the new University administrator to offer preparedness for and understanding of the Navajo culture, environment, and classroom.

This renewed participation should be seen as a great opportunity to the University Mathematics Department. It is poetic when one considers the literal meaning of the

Navajo word 'Ndahoo'aah—*new learning of the old learning, or relearning.*

'Ndahoo'aah represents a philosophy of lifelong learning, everchanging and ever being refined, and then shared with the next generation of learners. Educators would be well served to add the word 'Ndahoo'aah to their vocabulary and personal philosophies. If 'Ndahoo'aah is studied and understood, there is great potential for revolution in educational systems.

Consideration of Participant Needs

The students are seriously deficient in nearly every aspect of basic mathematical skill. Primarily, there is a pervasive lack of enthusiasm for mathematics. Enthusiasm for a subject fosters confidence; confidence in a subject lends to proficiency; and proficiency leads to success. Success in mathematics extends into success in all disciplines and content areas.



Interior of the program's hogan at Monument Valley High School

Students need unique and creative mathematical instruction, that at the end of the day leaves them with enthusiasm and interest in mathematics. Mathematics, in context and with real application, will provide the foundation for further growth and enthusiasm for all types of learning.

Mathematical proficiency begins with student enthusiasm for the subject. That is the key to overcoming the Navajo students heartbreaking lack of proficiency in mathematical operations, problem solving, and logical thinking.

Instructor and Student Interaction

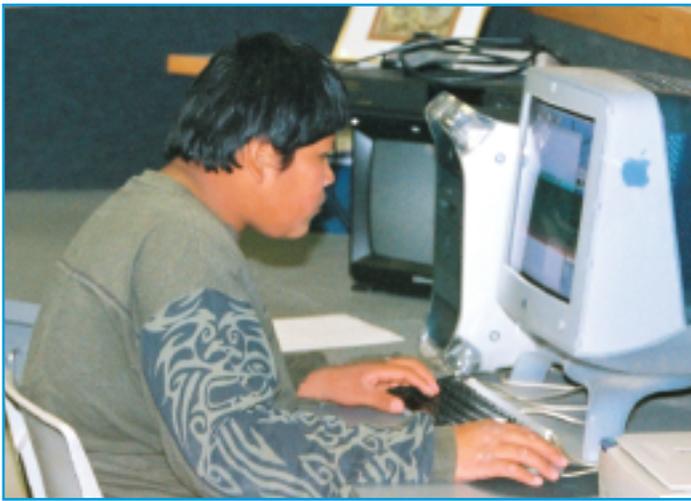
Initially, the relationship between student and instructor was distant. It was not unlike other early classroom environments where student and instructor are strangers at first. Some

of the students quickly overcame their apprehension to interact with the instructors, others were slow to relax and open up.

Early on cultural differences between the students and instructors were an impediment to easy interactions. I was empathetic to their feelings of alienation by remembering my early classroom experiences in the mid-60's as an immigrant to the United States. With empathy, I incorporated a daily social icebreaker activity, not always associated to mathematics or to the lesson plan.



Cinch belts completed in the program



Sylvester completes *Logo Terrapin* geometry exercises on an i-Mac in the tech center. Sylvester completed several designs for his ancient art—cinch belts. A component of horse saddle tack, Navajo artisans haven't woven cinch belts for decades. For the first time in the program's ten-year history, cinch belts were introduced as an ancient art opportunity.



Cordell waits at the printer for a copy of his *Logo Terrapin* generated design in the Monument Valley High School Tech Center, the principal classroom used by the 'Ndahoo'ah Program for mathematics instruction. Several participants were reticent to interact with classroom staff early on in the program.

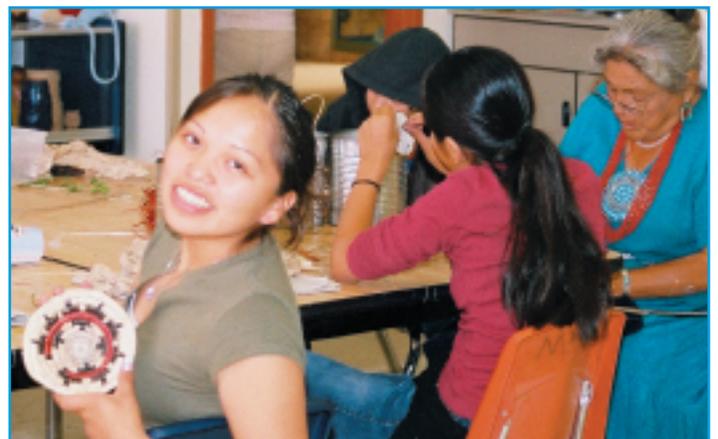
Additionally, I identified the students who seemed the most uncomfortable and spent some one-on-one time with them each day. My conversations with them were always unrelated to the day's lesson plan, usually something about the student's hobbies, family, where they were from, or what they wanted to do after high school. I responded with my answers to the same leading questions, and I recounted experiences of similar feelings of alienation as an immigrant young person.

However, my immigrant background was not the key element in developing a relationship with these students. Any conscientious teacher could accomplish the same.

The social games, the one-on-one time, and sharing of like experiences, were very effective. At the end of the program, I had garnered a comfortable relationship with each participant. The time spent on making students feel comfortable in the classroom did not directly pro-

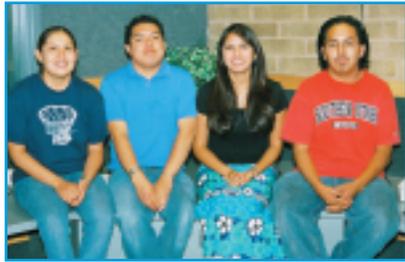
duce acquisition of mathematics or computer skills. However, without establishing this personal connection some students would have continued to distract themselves and classmates with oppositional behavior, thus disallowing *any* acquisition of learning.

Research suggests that diverse student populations do not feel safe in a classroom if the teacher is not perceived as understanding, concerned, accessible, and more like the



Loyette displays her ancient art-Basket in one of the Elders ad-hoc studio spaces. Elder Elsie Crank (far right) traveled with participants to pick reeds from the banks of the Colorado River near Moab, Utah. Elsie taught students to pick reeds only two or three days before weaving them into baskets so they might remain pliable and not become brittle. She also shared how to reconstitute dried reeds in clay pots of water.

student than different from them. This feeling of safety must be established before young minds can be open to learning, especially with culturally-, socioeconomically-, or disability-diverse student populations.



Instructor, Administration, and Staff Interaction

The relationship I had with the student mentors, program administrators, high school administration, and Navajo Elders was tremendously satisfying and beneficial to my personal growth as a lifelong learner.

The four alumni of Monument Valley High School, (*pictured above l-r*) Vanessa Bedonie, Raynard Cowboy, Melinda Dee, and Kenny Chee who served in the classroom as assistants and mentors, were a joy to be around. They proved to be a valuable resource, bringing enormous insight to the program, Navajo culture, and the young students.

Despite the language barrier, the Navajo Elders and I, never suffered any significant

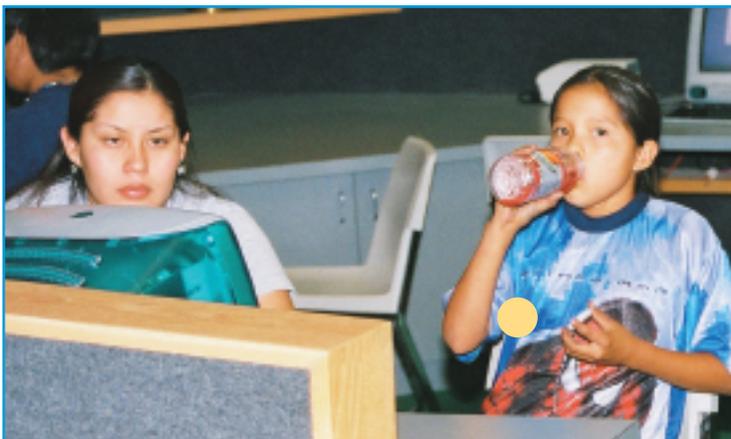
communication difficulties. The Elders were charming, respectful, very supportive, and helpful to all participants and staff.

There was something very special about these ladies. They possessed a quiet dignity that demanded the respect of the students, yet at the same time expressed love and concern for them.

The high school administration and program administrators were helpful and respectful of my needs and concerns. They made every resource available. Classrooms, computers, technologies, manipulatives, paper, pencils, markers, poster board, and every imaginable supply was available to me.

In particular, a San Juan School District technology specialist, McNeil, spent hours each week supporting the program. Twelve-year veteran educator and school librarian, Gary Rock, (*pictured at right*) was especially supportive.

I couldn't have asked to work with a finer group of people.



Shalea, who will begin the 6th grade in the fall, takes a refreshing gulp of Gatorade, a favorite beverage at Monument Valley High School where temperatures soar into the 100's during the summer. Vanessa (left) was instrumental as a mentor in helping breakdown cultural barriers between the Native American and the Anglo world. Vanessa attends Southern Utah University in Cedar City, Utah. She spent one year at William Penn University in Oskaloosa, Iowa, on a volleyball scholarship but, withdrew because of loneliness as the only Native American enrolled at William Penn.



(left to right) The 'Ndahoo'aah Elders and Staff receiving Certificates of Appreciation. The Elders: Mary Gillis, Elsie Crank, Lena Atene, Lorita Adakai, Sandra Black, and Gladys Oliver. Foster Grandparent Volunteers: Mae Begay and Lorena Begay. Program Administrators: Esther Begay and Mary Lena Yellowman.

● **The student mentors were underused.**

● **Solution**

Prior to arriving in Monument Valley, I was unaware that mentors would be available to assist me. Had I known this, I would have prepared a program and curriculum guide for them.

The mentors and instructors should meet for 15 minutes prior to and after each day's session in discussion of goals and objectives for the day.

The mentors and instructors should meet for several short preparation sessions during the first three days of the program's orientation.

● **The goals and expectations of the program and high school administrators were not communicated.**

In the beginning, I was extended complete autonomy by the administrators for the application of the curriculum, without a complete set of expectations for the program. This could have been a tremendous empowering opportunity; except, without knowledge of administration's expectations, conflicts arose later undermining some the curriculum.

Specifically, the administrators excluded information concerning the Elders plan to use their own designs on the ancient art projects and the math curriculum would need to facilitate the students' duplication of the Elders' designs with the *Logo Terrapin* software. Unfortunately, I spent several days facilitating student-created designs with *Logo Terrapin* in preparation for the ancient art projects.



'Ndahoo'aah Staff (left to right): (back) Kenny, David (middle) Esther, Mary Lena, Vanessa, Melinda (front) Ray and VISTA Volunteer, Olivia, who created a film documentary of the 2004 'Ndahoo'aah Program as a living record.



'Ndahoo'aah Program Assistant Director and High School Office Manager, Esther Begay

Solution

The instructors and administrators should meet for several short sessions during the first three days of the program's orientation. During these meetings, the administrators should clearly outline their goals and objectives for the summer program. The instructors could then pose questions of clarification and offer the math curriculum goals and objectives as well. The outcome, would be a clear and cohesive understanding of the timeline and administration and instructor coordination for a successful program.

Future Participation

We need to keep participating in the program. As part of our participation, we should ensure the continuous and consistent administration by the University of Utah Department of Mathematics. This participation includes the concept of the Navajo idea of 'Ndahoo'aah and this type of rigorous review of methods and curriculum within the goals and objectives of the 'Ndahoo'aah Program.

This is a program that shouldn't go away. In fact, it should become a pilot program that could be extended to diverse populations throughout the United States.



Kenny passes near the 'Ndahoo'aah Program's traditional Hogan. Modern uses of the Hogan are typically ceremonial but, here used for the program's orientations and meetings. The Hogan is the traditional family home and spiritual center of Navajo Native Americans. In this photo, Kenny's friends have jokingly blocked the entrance to the Hogan by telling him, "Sorry, only Native Americans can enter." Kenny, who of course is Native American, has been active in preserving Navajo culture all of his life and is responsible for helping organize several Pow Wow celebrations each year in Monument Valley. Kenny attended the Tribe of Nations Pow Wow this Spring in Albuquerque, New Mexico, where every North American Native Tribe still in existence was represented.

Long-Term Participation

The University needs to explore new ideas in creating a trusting relationship with the Navajo students and the Navajo Nation.



The University should establish a greater presence at Monument Valley High School. A presence that projects a genuine and profound commitment

to the Navajo students and ensures the University is coming back year after year to invest in their young minds.

A mentoring program should be established for Native American high school graduates to assist and participate in

'Ndahoo'aah. The University should expand its participation into recruitment, training, and development of these mentors so they can guide the program to best serve Navajo students in the study of mathematics.

Exploring methods that will expand the funding of the program should be pursued to meet these goals. A fully-funded program can begin a renaissance of mathematical learning among native cultures. History shows cultures that value and excel in the study of mathematics extend those values into progressive and self-sufficient societies. History also shows cultures that lack economic and natural resources find their only capital in knowledge. Mathematical knowledge can become the capital that impoverished native cultures use to improve the lives and opportunities of their people.

Advice for Future Instructors

Educate yourself in the culture of Native Americans and specifically, the Navajo Nation. Understand there exists a predisposed resentment of Anglos and familiarize yourself with strategies to help students overcome this.



The high school serves as an informal hay distribution center for Monument Valley residents.



Be prepared to work very hard at creating a genuine and trusting relationship with each student before expecting to impart any knowledge. Do not become frustrated with a lack of initial success in developing these relationships. Accept that student resistance to interaction is not a negative commentary on you or your capabilities. Centuries of indigenous distrust of Anglos cannot be overcome in one summer session.

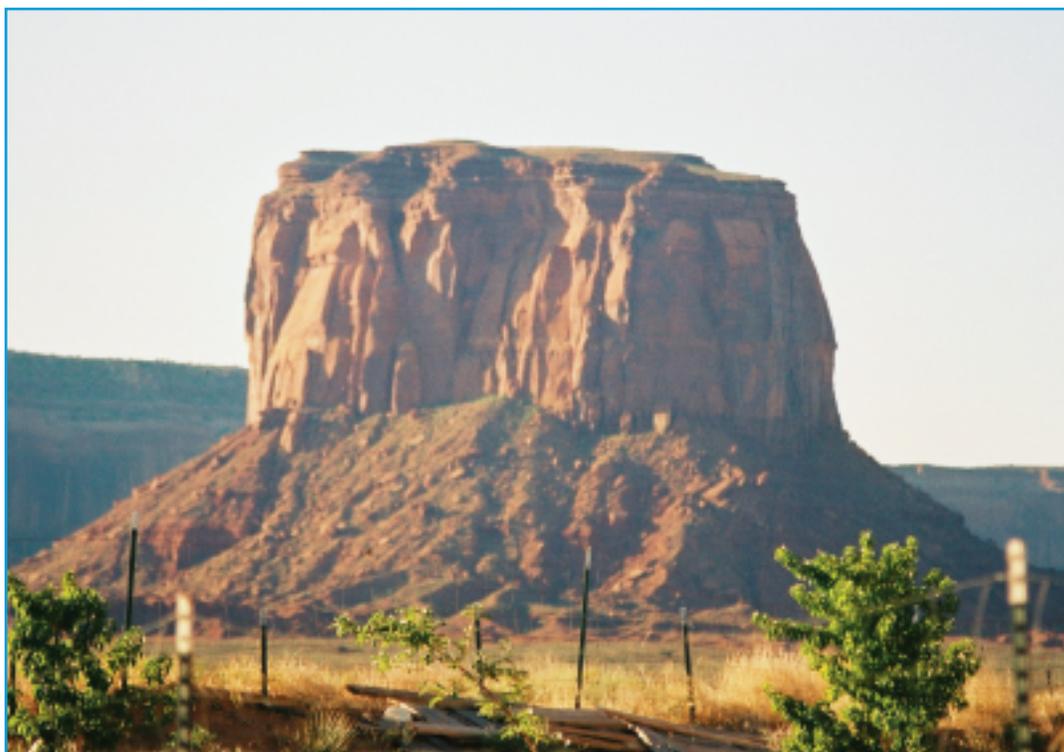
Don't go as a "do-gooder." Go, to create meaningful relationships and share something you love—mathematics. Go, to practice unique and creative methods and produce a classroom full of enthusiastic mathematics students. Get totally into it, but don't let this limited experience define your teaching abilities. Don't go as a "do-gooder," but do go to do good things.

Final Thoughts and Personal Comments

With the exception of a few "stones in the road," my time spent in Monument Valley was a positive life-changing experience. It strengthened my love of mathematics, validated my desire to be the best teacher I can be, and cemented my advocacy for society's underclass. I unconsciously, find myself scanning late-night television for classic Western films (like John Ford's, *She Wore a Yellow Ribbon*) in hopes of seeing familiar sights of Monument Valley.



Tiffany excelled in learning *Logo Terrapin* and developed a strong grasp of the many difficult concepts of geometry presented during classroom sessions. Tiffany wants to attend medical school after graduation and understands that mathematics will play an important role in her preparation to become a physician.





Traditional Navajo Spirit Lodge

Most of all, my life was changed by the young Navajo students I met. I came to love and respect them in my short stay, and I miss them already.

I miss tiny Shalea, in her favorite Spider Man tee-shirt that she loved so much it was worn almost every day. Sylvester, cranking at full volume, Hip Hop tunes on a school PC during breaktime. Mariah Taylor and Mariah Tallis interchanging their last names every morning during attendance. Chalsea, explaining she was tardy because she had to “load the cows on the truck for Blanding.” I miss Charles, glaring at me over the top of his computer screen when I asked him to get back on task and I miss Charles, smiling at me over the top of his computer screen when he found out he could complete his rug design using the “tee” command. I miss all the students, including those who didn’t stick it out. Even Mershanda, who more than once told me to “get lost!”

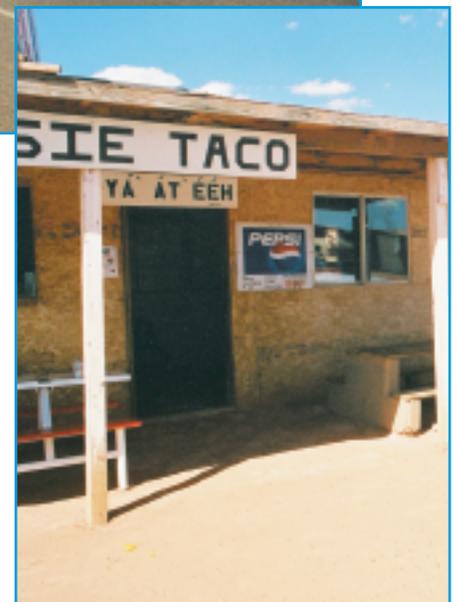
I’ve been changed negatively, as well, by observing the shockingly poor living conditions of Navajo families. Electricity and running water are unique amenities for many. Every time I made the drive to the post office, I observed a line of cars and trucks with the occupants waiting their turn for water at a public spring. An hour rarely passed in which there was no line, even in the middle of the night.

I also noticed dead car batteries everywhere. I came to find they were the favorite source for powering a single light bulb in the family Hogan, trailer, or shack.





Tourists stop for authentic Navajo food and jewelry on the road to the Tribal Park. Hidden from the tourists' view, behind the shacks, are dozens of discarded automobile batteries and piles of corrugated metal sheets and other building materials.



Monument Valley taco stand and jewelry store

I'm also left feeling alarmed. I can't understand how so many students have been left behind—reading and writing below grade level, testing in mathematics below grade level, and eating their only meal of the day in the school cafeteria.

The local living conditions, combined with the cultural isolation, were overwhelming to me at times. But, those moments never lasted long and I soon occupied my mind with free reading or in lesson preparation.

The scenery is both majestic and barren. I was in awe of the desert environment and the adaptive behaviors of all its creatures. The Navajo relationship with the environment mimics that of the wildlife, maximizing available resources in harmonious moderation.



The high school garden is the only irrigated land in the valley.



Rug artisans display their final projects at the awards ceremony on the last day of the program. Each student replicated an Elder design in *Logo Terrapin*.

The Navajo have used the full variety of desert resources; and when left to themselves have never overused any single resource. It is only when the Anglos introduce foreign industries, such as cattle, that the Navajo lose balance with nature by overgrazing. There is a simple beauty about their

lifestyle, and if not for destitute poverty, it would nearly be idyllic.

With the exception of a few “stones in the road,” my time spent in Monument Valley was a positive life-changing experience.

All in all, I'd go back in a heartbeat.

View of The Mittens from Monument Valley High School, a haunting juxtaposition of human poverty with scenic beauty. In the foreground: Navajo makeshift plywood shacks that serve as shops and cafes—locally called *The Strip Mall*.

