

'Ndahoo'aah

2007 Report

by

Kim Brainard, Debra Farr,
& Douglas Hacker

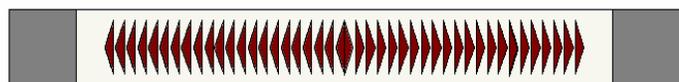
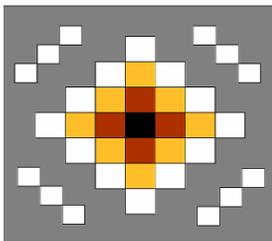
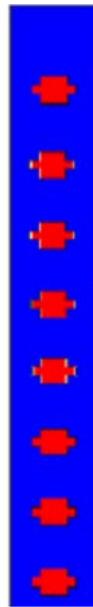
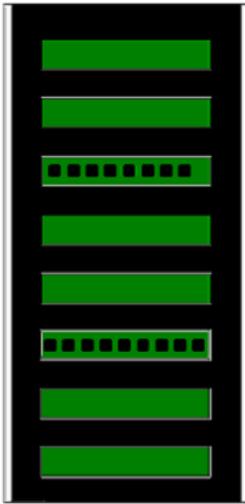
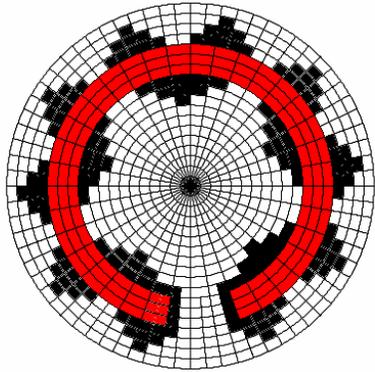
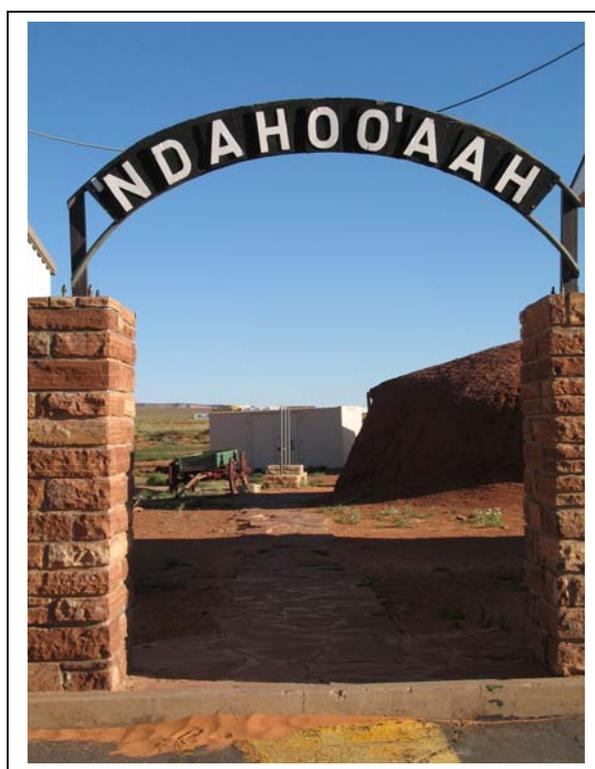


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Cover pictures are a representative sample of LOGO designs made by students from the 2007 'Ndahoo'aah program.

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Overview of the 2007 'Ndahoo'aah Program

'Ndahoo'aah translates roughly to “Re-learning/New Learning.” The 'Ndahoo'aah program seeks to explore educational objectives through a format that teaches, respects, and jointly develops both traditional and modern skills. Throughout 'Ndahoo'aah, every opportunity is given to build bridges between traditional and modern skills and between Navajo and Anglo cultures. The idea is to create an environment in which the traditional and the modern re-enforce each other rather than clash. The program is housed in Monument Valley High School, which is part of the San Juan School District in Utah. Although the program is housed in Utah, it is not uncommon to have students attend from parts of the Navajo Reservation in Arizona.

Students are provided numerous opportunities to explore the world of mathematics—more specifically, geometry—and its real-world applications and to explore computer programming using a graphics program called LOGO. Students also are provided hands-on experiences to learn traditional crafts, which



have been the inherent carriers of mathematics in the Navajo culture for many centuries. The students emerge with an enhanced knowledge of mathematics and computer programming, as well as an improved foundation for understanding their Navajo culture. Skills are developed

which lay the groundwork for future training and careers in a wide variety of areas—from systems analysis or graphic design to artistic crafts or cultural museum work.*

This year, the program took place during a three-week period and culminated in a graduation celebration that involved the Navajo Elders, mathematics instructors, students,



parents and friends of the students, and the program administrators. The students' traditional crafts and LOGO projects were displayed, and each student received a certificate of participation in the

program. The presentation of the certificates was followed by a traditional Navajo feast during which all of those who participated in the program had an opportunity to express thoughts about the program over a public address system. Many positive comments about the program were expressed by the Elders, teachers, administrators, and students during this festive culminating event.



Each day of the three-week period was broken into morning classes that were held from 9:00 to 11:15 and afternoon classes that were held from 12:00 to 2:00. Students attended either the LOGO section of the program in the morning and the crafts section in the afternoon or vice versa. There were three teachers and either two or three student



helpers facilitating each of the two LOGO sections. All sections had approximately the same number of students attending. The LOGO portion was held in the school's technology center, which was well equipped with

computers and well structured to accommodate class, group, or individual work.

* Paragraphs taken in part from the University of Utah, Mathematics Dept. URL: <http://www.math.utah.edu/~clemens/page2.html>.

In the crafts portion of the program, students could choose one of six crafts to learn (basketry, beadwork, rug weaving, cinch belt, sash, or silver smithing), and each of these was taught by a Tribal Elder in a separate room within the school. The school facility accommodated very well both the LOGO and craft portions of the program.



Students pursued three goals in the LOGO portion of the program: (a) to learn basic geometry skills and concepts, (b) to learn the LOGO computer graphics program, and (c) to interface with the crafts portion of the program by drawing their crafts, using the acquired skills and concepts of geometry and the LOGO programming skills. For goal one, students learned the



properties and characteristics of a wide variety of polygons, the different types of triangles and angles, coordinate systems, congruent and similar triangles, ratios, and the Pythagorean Theorem. For goal two, students learned the basic commands of LOGO,

how to create procedures and embedded procedures, and how to draw a wide variety of geometric shapes. For goal three, students used what they had learned from the first and second goals to generate LOGO commands that would produce designs of their crafts. For example, a student learned the commands needed to produce the triangles and rectangles that were used to produce patterns in her cinch belt. All students produced a LOGO design of their crafts and a personal logo that represented their name or their personal identity (See Appendix A for all LOGO designs and personal logos). The three teachers worked cooperatively to make the activities planned for each of these goals enjoyable, engaging, and connected to the students' real

life experiences. At the same time, high standards, expectations, and academic rigor were maintained.

Twenty-one students attended the program this year, 11 females and 10 males. There was a great deal of diversity among them in terms of age and ability. The youngest student



was in third grade and the oldest was approximately 45 years of age, although the majority of



students were of high-school age. Some students showed strong mathematical, computer, and problem solving skills, but some had poorly developed skills in these areas. For a few of the students (mostly the adults), this was the first

opportunity they had to use a computer. Most of the students were enthusiastic participants in the LOGO portion of the program; however, there were approximately four students who were reluctant to participate and occasionally disruptive. Most students enter the program voluntarily; however, a few were coerced to enter by their parents. A safe assumption to make is that the few who were disruptive or non-participatory were those who were coerced to enter the program.

Cultural Context

While these [Navajo traditional] beliefs hold true for many of the older people, what about members of the younger generation who have not been raised in the same tradition? This is a difficult question to answer and a more difficult one to quantify. I have the impression that within a generation or two only a few select people will live by the [Navajo] teachings... many teachings do not find their way into an integrated system of values that can override the loud voice of technology and twentieth-century culture. This is in no way to suggest that Navajo culture is doomed, that the younger people will face failure and poverty, or that everyone belongs to a lost generation. There will always be a Navajo people, and for some time yet they will maintain distinct cultural practices; the direction and rate of change is the issue. As they achieve their social, economic, and political goals, many of the older values will be discarded for a different understanding of what empowers the world and what is important.

Sacred Lands Sacred View by Thomas McPherson (p. 4)

This quote from Thomas McPherson aptly encapsulates our impressions of the cultural milieu we experienced during our three weeks on the Navajo Reservation. There are definitely two cultures present, Navajo and Western. The manifestation of the two cultures in the individual person ranges widely across a spectrum, with exclusively Navajo on one extreme to almost exclusively Western on the other, and with nearly all variations across the spectrum present to some degree. As noted by McPherson, the variations in the presence of the two cultures coincided directly with the age of the

individual. The Elders were definitely on the Navajo end of the spectrum. These individuals were in their 60's or 70's, the women wore traditional clothing with traditional jewelry and had their hair styled in traditional ways, most spoke Diné exclusively and had little or no



understanding of English. The younger students were on the Western end of the spectrum. They ranged from 9-to-17 years of age, wore Western dress—mostly jeans, sneakers, duckbill

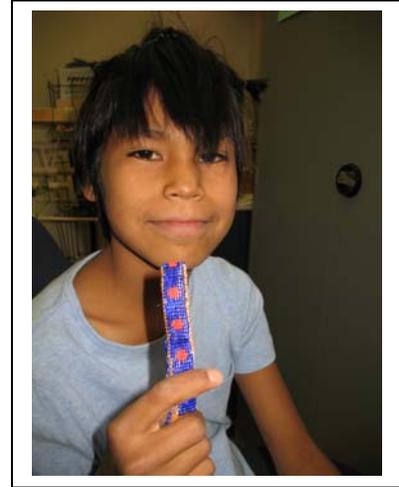


caps, T-shirts with pop culture figures imprinted on them, several had i-pods or MP3 players, all of them were thoroughly familiar with pop culture, most spoke English exclusively, which suggested that they

perhaps had little understanding of Diné or choose not to use it. In the middle of the spectrum were the Navajo teachers in the school. They were in their 20's-to-40's, wore Western dress, had good knowledge of both cultures, and many of them were fluent in both Diné and English.

This description of the Navajo is not to imply that there is an absence of Navajo culture in any of the people we encountered. The spectrum of people was a Navajo spectrum, and as

McPherson states, “There will always be a Navajo people.” The Navajo Culture and Western Culture that is filled with technology and pop sub-cultures are melding, and where they are melding the most rapidly is with the younger people. The Navajo will likely always retain a unique sense of themselves, and they will maintain distinct cultural practices. The rate of change that McPherson states is at issue seems to be very much on a generational basis. One can only wonder about the extent of the melding of the two cultures when the younger Navajo people have grown and have their own children in high school.



Our roles as teachers were definitely impacted by the cultural differences between the students and us. Classroom dynamics, student-student and student-teacher interactions, engagement, motivation, discipline, responsiveness, and attentiveness all had a distinctive cast to them. Overall, we found the students to be respectful, cooperative, bright with a wide range of skills and abilities, and many of them showed great artistic creativity. Initially, most of them were very hesitant to interact with us, but we believe this was due more to the fact that we were total strangers to them than to cultural differences. This hesitancy did not last long, and by the end of the first week had lessened considerably. This was more true for the younger students than for the older ones, who continued a lessened but nonetheless still present reserved attitude toward us throughout the three weeks. With prodding, students opened up to us and demonstrated to us that their reserved attitudes were not due to a lack of knowledge or skill, but were more a cultural characteristic.

At no time did we feel that the reserved attitude was intended to be unfriendly or hostile. For the most part, the student-teacher relationships that developed over the three weeks were

very friendly. Once again, this was likely more true for the younger students than for the older ones. Many of the students, young and old, openly shared aspects of their personal lives with us, and enjoyed joking with us. There were only a few students who maintained a separateness from us and made few attempts to be open with us. These behaviors seemed to be restricted to the few students who had been forced to attend the program.

When asking questions, we often had considerable wait times before a response was given. However, with patience and persistence in our asking, students would eventually venture a response that showed they were attentive to what was being presented or discussed. We found that the best strategy to follow was to be explicit and directive in our questioning and patient in waiting for a response.

Engaging in classroom competitions was not at all a problem, with student teams highly motivated to offer a correct response. Curiously, however, if a person or a team did not know the correct response, the other teams often offered help to them so that they could get the correct response. This was a refreshing blend of competition tempered by cooperativeness.

By the end of the three weeks, the three of us were aware of cultural differences between the students and us, but for the most part we were teaching adolescent children much like adolescent children anywhere. The commonalities shared across children of this age period seemed to far outweigh any cultural differences. As teachers, we learned to appreciate the differences and the commonalities and used both to improve our instruction.

Analysis of the Program

Our analysis of the 'Ndahoo'aah program is based on two main sources: our own impressions and observations as teachers in the program and a student survey that students completed at the beginning and end of the summer program. We will focus our analysis on several specific questions that have been part of 'Ndahoo'aah reports in previous years.

What teaching style worked best with the kids?

Overall, the one teaching style that was consistently more effective than others was direct, explicit instruction. Directly asking questions or assigning responsibilities to a specific student and waiting for a response from that student resulted in greater participation. Wait time was typically long, but eventually responses were elicited.

Several kinds of teaching strategies seemed to work fairly well. These included: jigsaw, partners, small group, large group, competitive learning games, one-on-one, and using hands-on activities (e.g., tangrams,



tessellations, polygon monsters, and LOGO programming). We also found that putting time parameters on assignments was more effective than keeping them open-ended. For example, “You will have 15 minutes to complete this assignment” usually ended up with completed assignments within that time frame.

What did not work?

Open questions addressed to the general class usually did not end up in a response from anyone. More often than not, students would simply defer to one another to respond, in which case no one responded. Longer lectures (i.e., longer than 15-to-20 minutes) often left students bored and unresponsive, and activities that could not be readily recognized as relating to their LOGO art project were seen by some students as irrelevant. The more that learning activities could be tied to the LOGO portion of the program the better the activities were received.

Did you feel properly trained?

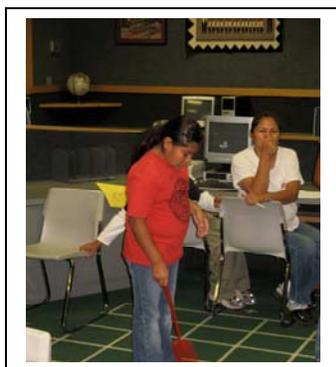
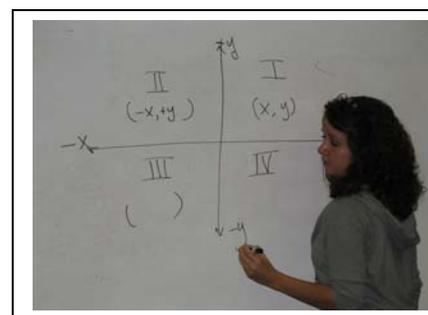
In general, we all felt trained and ready for the program. There were two aspects of the program for which we could have been better versed. We did not have a good understanding of how the two portions of the program were to be integrated. Was the LOGO portion of the

program only to mimic the designs already created in the crafts portion, or were students to use the LOGO portion to help create their designs? The answer to this was the former, but this was not obvious until the end of the first week. Also, we needed to have a better understanding of the timeline for the crafts portion of the program. By the time students had gained proficiency with the LOGO programming, their designs had already been created. More discussions among all the leaders of the program prior to the start of the program would have helped to alleviate these difficulties.

Finally, we were somewhat uncertain about the overall purpose of our portion of the program. “Making math fun” turned out to insufficient direction for us. Making math fun for a fourth grader is much different from making math fun for a tenth grader or for a student who absolutely hates math.

What was successful?

Tying instruction to the students’ lives and seeing how the content of lessons was connected to broader contexts within and beyond the classroom were more successful. Also, having the students more physically involved in learning activities was also



more successful. For example, when we taught students the principles of a coordinate system, we first instructed them as a group and then created a large coordinate system on the floor and had them walk across the grid to find specific coordinates on it.

This activity was helpful as an introduction to learning the

coordinate system embedded in the LOGO program.

How were interactions between you and the students and faculty/staff?

For the most part interactions with students were cordial and respectful. Some students (usually the younger ones) were eager to interact with us and were regularly cooperative with our instructions. The older students were more reserved in their interactions with us. They often required frequent prodding, and occasionally did not respond. As mentioned previously, for some students, there was a long delay time on the students' part. The overall impression was that this delay time was required for them to process our questions or statements on different levels to figure out our intent or purpose for asking a question or for making a statement. Alternatively, perhaps they were simply shy in giving their responses. However, this delay time did noticeably shorten over the three weeks. Another noticeable pattern in the students' interactions with us was a near absence for the need of common cordialities. For example, saying hi or good-bye, or asking how they were doing today were met with very short responses, often only enough to acknowledge that we had said something.

Our interactions with faculty and staff at the school were very good. Professionally, everyone at the school was helpful and provided whatever assistance we needed when we needed it. On a personal level, everyone we met was very receptive and genial (e.g., asking us to dinner, taking us sightseeing, or providing us training in their art works). The interactions with the principal of the school were particularly helpful. There was not a single request that we made of her that went unanswered.

What do we definitely need to keep doing the way we're doing it?

Quite simply, with a few minor changes, the 'Ndahoo'aah program needs to be continued. The emphasis on LOGO and geometry were well received by most of the students, and the integration of the math and crafts portions of the program needs to be continued, with perhaps even more integration of the two. The relationship between Monument Valley High School and

the University of Utah seems to be highly appreciated and valued. Our impression was that the high school would certainly enjoy continuing the current relationship and expand upon it if possible.

How does the program need to evolve over the next 5 years?

There are many successful elements of the program that should remain in place and need only minor refinements if any at all. The majority of the students felt very good about what they had accomplished in both the crafts and math portions of the program. Areas in which the program could evolve over the next 5 years would be to add components that deal with more basic math instruction for many of the high school students. Thorough reviews of adding, subtracting, multiplying, and dividing would be helpful, and greater exposure to basic mathematical concepts (e.g., ratios, balancing equations, working with variables) also would be beneficial.

With the addition of adults to the program this year, another area that could evolve would be to expand the basic mathematics instruction to adult education. Some of the adults' skills also were in need of strengthening. Offering a basic math course for adults would be heartily received by the community.

What advice would you give to next year's teachers?

The best advice we could give to next year's teachers would be to make sure they read this report and consider the various recommendations we have provided.

How was this experience for you personally?

Teaching in the 'Ndahoo'aah program was a huge learning experience for all three of us. Being exposed to the Navajo Culture on such a close basis was very informative and enjoyable. We felt accepted by the community and appreciated



for what we were doing. We all gained a wonderful appreciation of their culture, and even though there are differences between Navajo and Western Cultures, it was also nice to learn that there are many commonalities. Kids are kids. Too often we tend to focus on differences, but sometimes cultural differences are secondary to cultural similarities.

Recommendations

The recommendations that follow are not in strict priority order, but rather are loosely prioritized into three categories, with those of higher priority first and lower priority second and third. If implemented, some of the recommendations will require changes in only the mathematics portion of the program, and some will require a coordination of efforts between the mathematics portion and the crafts portion sponsored by Monument Valley High School.

Higher Priority

Lesson Planning

Because who will be attending the 'Ndahoo'aah program (and what their skills are) is not determined for at least the first several days of the program, planning of *specific* lessons prior to the program will likely not be useful. Developing a collection of *general* concepts to teach with a variety of materials and strategies to use in the instruction would likely be more helpful. A downside to this approach, however, is that to be more responsive to students, planning of specific lessons will need to be done on a daily basis. This past year, we spent about three-to-four hours planning for each day.

Change in Audience

If the goal of the mathematics portion of the program is truly to make math fun, then there may need to be a reconsideration of the population that is served. Some of the participating high school students showed very little interest or aptitude for math, and it is probably not too gross an assumption to make that these students have been turned off to math for several years.

A three-week program is likely going to have minimal impact on changing negative attitudes that have developed over years. Making math fun for these students will be a difficult task, and efforts to do so detract from those students who enjoy math. In contrast, many of the younger students showed great interest and aptitude for math, and found the program very engaging. The positive attitudes of these students were likely bolstered by the three week program.

Therefore, if the program is going to remain much the same as it has been, then students who enjoy math, regardless of their grade level, should be the targeted audience. Students who dislike math and attend the program only because their parents make them are only going to diminish the positive impact the program can have on others. Having a more age-diverse student population to serve will require greater and more flexible daily planning, but having more motivated students could do much to offset this additional work.

Integration of Crafts with Math and LOGO

This year we gave a fairly equal emphasis to geometry instruction and LOGO instruction. This changed a bit in favor of the LOGO instruction during the last week of the program so that students could complete their LOGO designs. Rather than having a “Math” portion and a “LOGO” portion of the daily class, placing greater focus on the LOGO portion and incorporating math instruction as a part of LOGO may be more beneficial in promoting both. According to our student survey, there was a great deal of interest in the LOGO programming, more so than in the geometry instruction. Therefore, shifting the emphasis more to LOGO would likely be well received by students.

There are numerous geometry concepts embedded within the LOGO programming. Focusing instruction on those concepts rather than other concepts that seem disconnected from LOGO could make the program seem more cohesive. In other words, the primary focus would be on LOGO with secondary focus on the geometry concepts used in LOGO.

The scope of the geometry focus could be expanded by having students create LOGO designs for all six of the craft projects. This year students created only a LOGO design for the craft they had chosen; therefore, the geometry concepts were restricted to that one design. However, if students created designs for all six projects (i.e., rug, sash, cinch, basket weaving, jewelry, and bead work), this would greatly expand the geometry concepts to which they would be exposed. For example, if a student selected cinch belt as his or her craft project, the principles of geometry they were exposed to through cinch belt were restricted to simple regular polygons, area, perimeter, and angles; however, if a student were required to create LOGO designs for all six projects, he or she also would be exposed to curves, circles, ellipses, irregular polygons, circumferences, secants, etc. Moreover, rather than being restricted to the one or two art projects, which is the current structure of the program, students could be exposed to all the 6 art forms, although they would only create projects concerning one or two of the six.

Pre-Training

Prior to starting the program (perhaps the week before), Elders, faculty, and staff need to meet to discuss the goals of the program, scheduling, how the math and craft portions can be better integrated, and any other topic that will help the program run more cohesively. For the first several days of the program, we had a fairly solid notion of what we were going to teach, but we were very uncertain about how the crafts portion of the program was going to be run and how we were going to integrate our curriculum with the crafts.

Medium Priority

Parental Participation

This year for the first time of the program, several parents attended the math portion of the program with their children. Our understanding was that some of the parents had an interest in the content of the program or that there had been a few discipline problems with some

students, in which case, the presence of the parents would help to alleviate those problems. In some cases, having an older audience was a great asset to the class. Their extended world knowledge and particularly their knowledge of Navajo Culture were welcomed additions to the daily instruction. Also, the added diversity to the classroom audience was an asset.

However, in most instances, the presence of parents had no impact on discipline problems. The students who did not want to attend simply did not want to be there regardless of parental presence. Students who did want to attend were great students and likely would have been great students also regardless of parental presence. In sum, if the intent is to have parents attend to curb discipline problems, the results were not encouraging. However, if parents want to attend to learn the content of the program, we would strongly welcome their presence.

Field Trips to Local Artisans

In addition to the participation of the local Elders, inviting artisans from the area who have established careers in the various art forms would be helpful to motivate the students. There are numerous resources throughout the area that could provide great educational opportunities and great sources of motivation for the students.

For example, the Twin Rocks trading post in Bluff has a wonderful collection of baskets and many other art forms. In our conversations with the owner, he expressed a good deal of interest in having students come to explore his collection and to share in his expertise. There are several other art centers/trading



posts—some of them owned and operated by Navajo—that could provide wonderful experiences for students. These local artisans could come to the school or perhaps field trips for the students out to the artisans would provide great experiences and an occasional diversion from the daily routines of the program.

Introductory Activities

Because the class rosters were in flux for the first few days of the program, we had a difficult time starting on a set curriculum and building on it. Four days passed before we had a permanent class roster in both our morning and afternoon sections. Perhaps this problem will be resolved next year, and sections will be set before the program begins, but as a precaution, teachers may want to start the first few days with ice-breaking activities that can be used independently from other subsequent activities. These ice-breaking activities could be a great way for students to break down the shyness and reticence that many initially showed. They also would be a good way for the students to become more comfortable with the teachers. Finally, imbedded within the ice-breaking activities could be some fun activities that would serve to assess students' knowledge and skills in geometry and LOGO.

Lower Priority

Knowledge of Popular Culture

Cultural knowledge of the Navajo is definitely a must for teachers working in the program. Having a sensitivity to cultural differences is extremely important to show respect for the people with whom you are working and to be accepted by the students and community. However, as far as the students are concerned, their knowledge of popular Western culture is comparable to any teenager, and there is no need to restrict the scope or content of lessons based on presumed cultural differences.

High School Mentors

This past year and for several years in the past, college mentors have been hired to assist with the instruction of geometry and LOGO. Our experience this year was that the mentors were indispensable for the LOGO instruction. However, for the geometry instruction, they were not necessarily needed. This may have been due to the small student-to-teacher ratio (i.e., 12

students for 3 teachers) or to our lack of creativity in thinking of ways to use them. If our earlier recommendation to place greater emphasis on the LOGO programming is implemented, this likely would require greater use of the mentors.

Relatedly, rather than hiring college mentors, hiring seniors from the high school, particularly students who have gone through the program, may have more of an impact on the 'Ndahoo'aah students. If these older students appreciated the program and knew it firsthand, they could be great role models for the students. And, if the 'Ndahoo'aah students knew that they, too, could one day become mentors to the program, this could serve as a great incentive and motivator for them to participate.

Conclusions

Yet, Diné thrive on challenges and new experiences. In Diné philosophy, it is important for the health of the people to maintain traditions while adapting to changes in the physical world. Adhering to this belief makes Diné a truly bi-cultural society. The Navajo people lean on traditions during times of contemporary demands to help preserve their way of life. As a Navajo Nation leader once said, “We will be like a rock a river has to go around.”*

The history of the Navajo has shown that they are an adaptive people. We observed their adaptivity. They are adaptive as evidenced by the adoption of popular culture, an acknowledgement that mathematics and computer skills are important, that there is free access to information on the Internet, and that there is encouragement to leave the reservation and to return with skills that can be shared. We were outsiders to their community, but we felt accepted and supported by the faculty and staff of Monument Valley High School,



* Excerpt from the Park Guide for Canyon de Chelly, National Park Service, U.S. Department of the Interior.

and by members of the larger Navajo Community. Literally, everywhere we went we met someone who was willing to share his or her story of life on the reservation and the problems that are facing them as individuals and as a nation. As part of their adaptivity, perhaps their openness and receptiveness to us were ways for them to get their stories out to the larger world so that a common knowledge can be created between Navajo and Western Culture. With the creation of that common knowledge, greater opportunities will likely open for those on the Navajo Reservation. Whether they take those opportunities is a decision that many may not make, but at least some may see them as desirable opportunities that currently do not exist.

The importance of the 'Ndahoo'aah program is that it does develop both traditional and modern skills between Navajo and Western Cultures. The traditional and modern can re-enforce



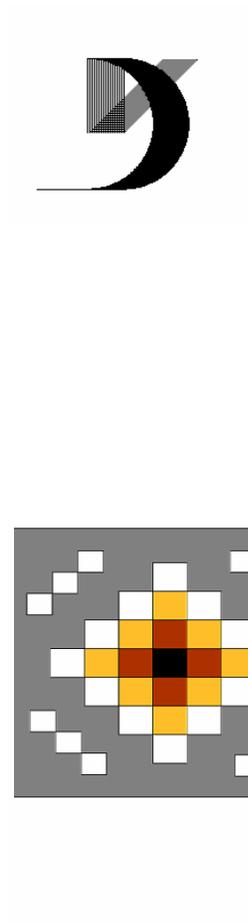
each other. This message was strongly affirmed in a Navajo Times article that covered this year's program (See Appendix B). As teachers in the program, we can only hope that what we shared with them was some of the best of what our Western Culture has to offer. We know that some

of the best of what the Navajo Culture has to offer was shared with us, and we are grateful for that. Having the opportunity as teachers to learn about the Navajo Culture and the Navajo as individuals is rationale enough for the 'Ndahoo'aah program.



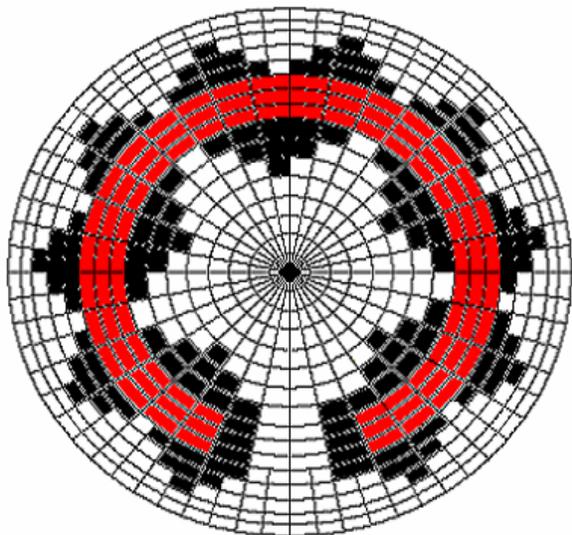
Appendix A

Students' Logo Drawings (top) with Personal Logo Design (bottom)

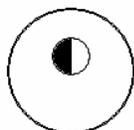


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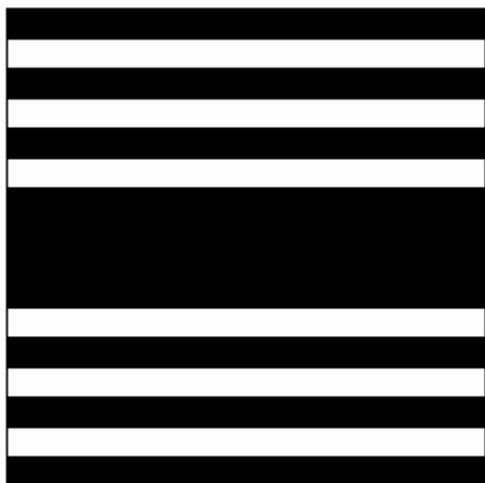
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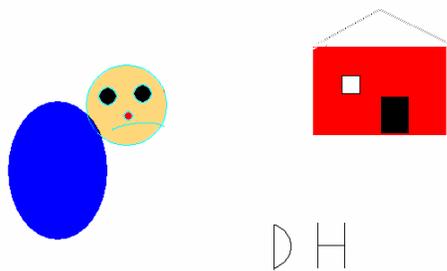
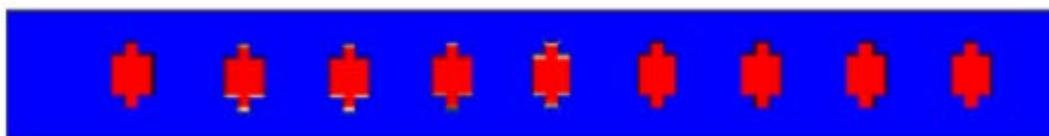
Crystal James



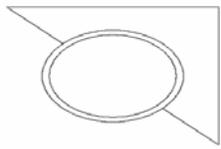
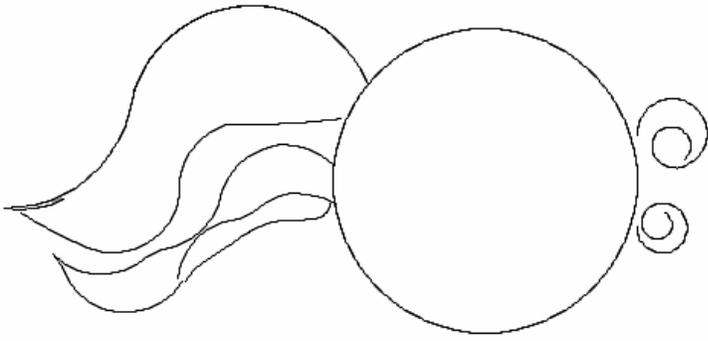
Danner June



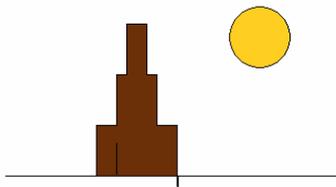
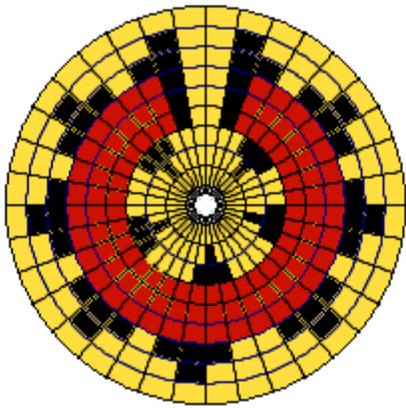
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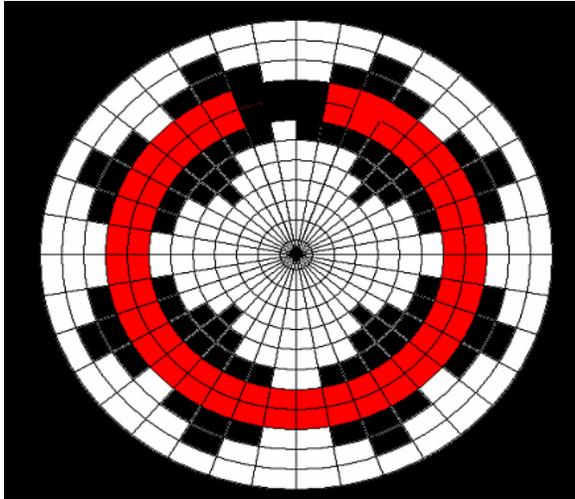
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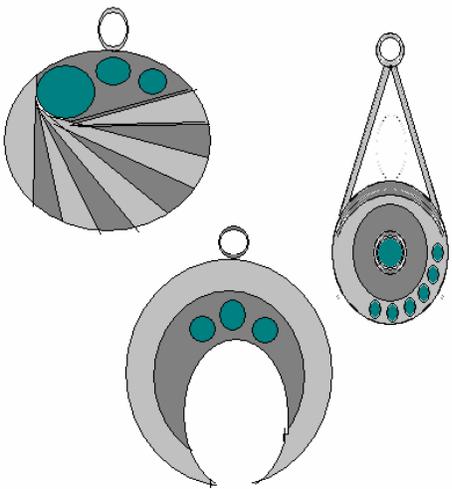
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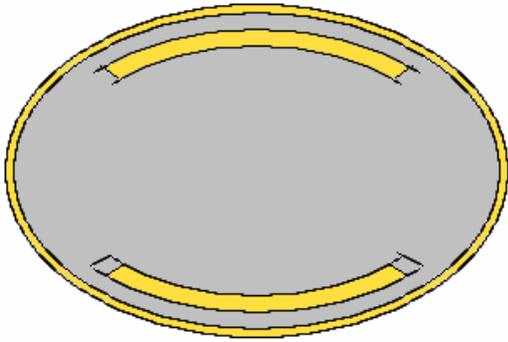
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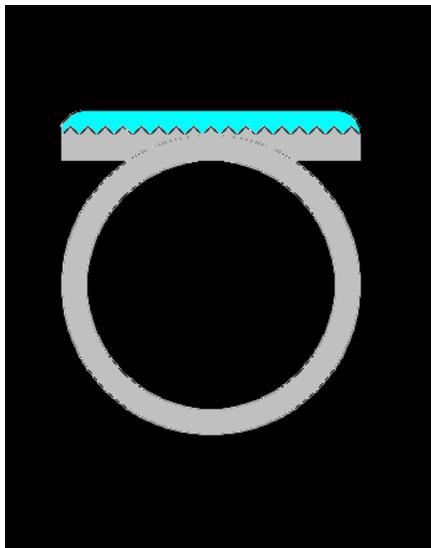
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Keifer Hanley



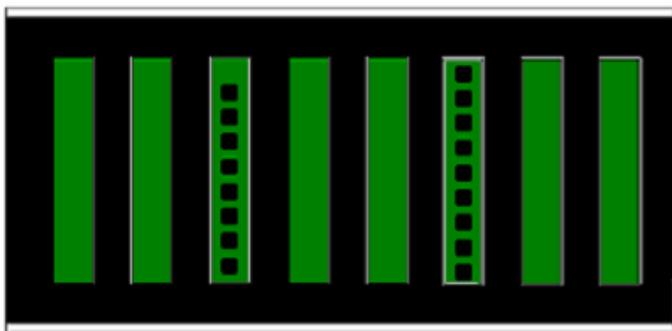
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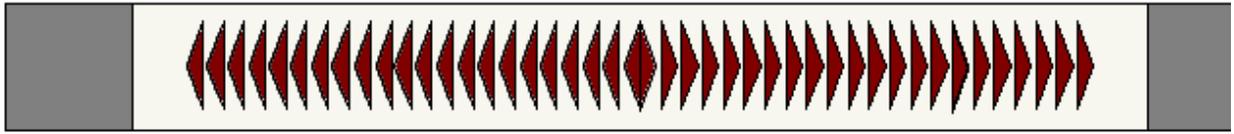
Kyle Fowler



Lionel James

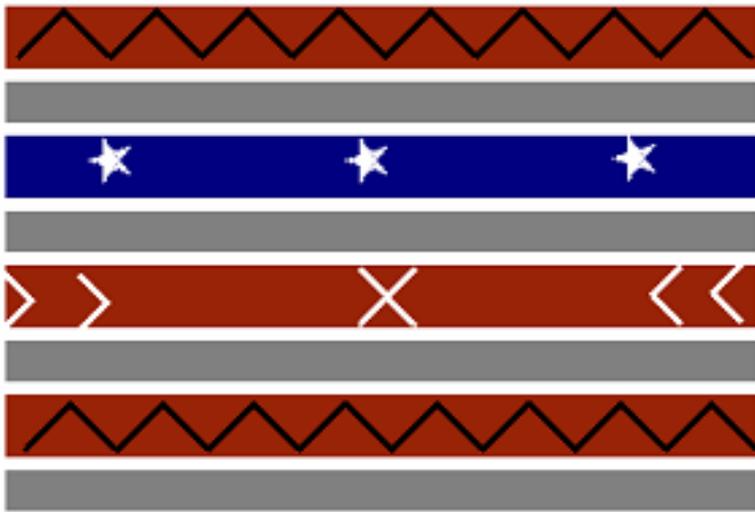


Lisa Robbins



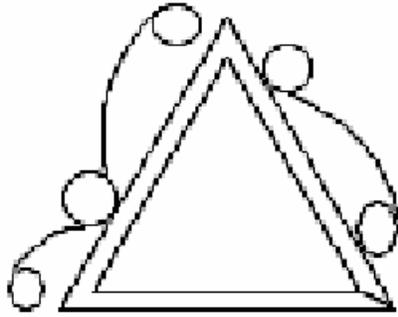
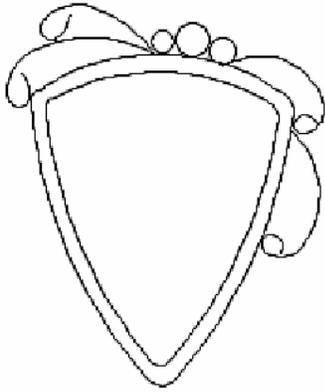
Cowboy

Lita Cowboy

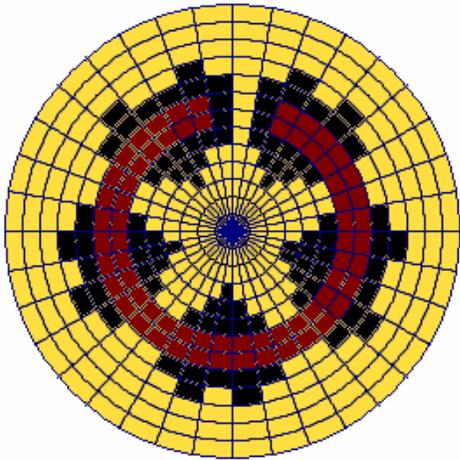


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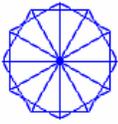
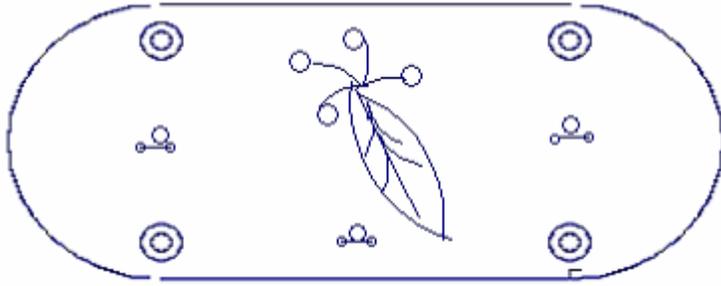
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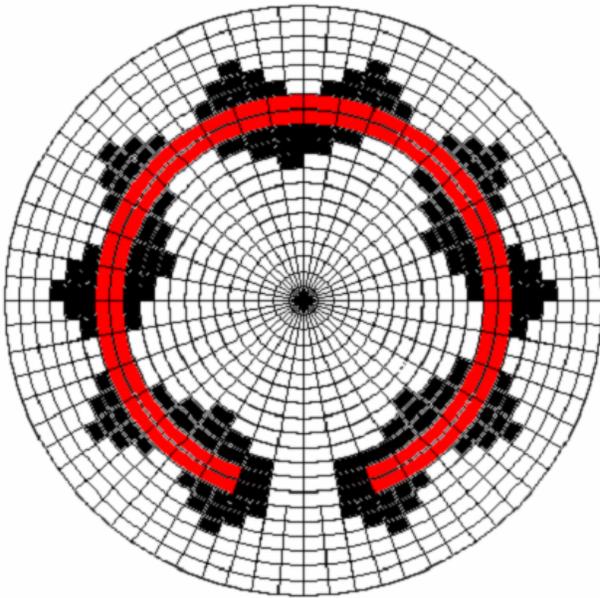
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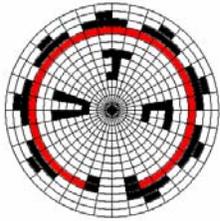
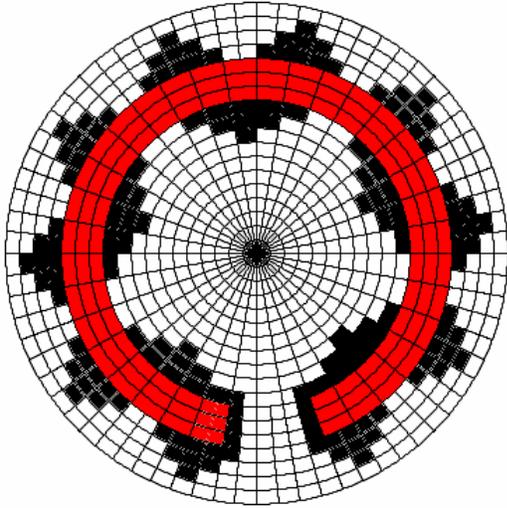
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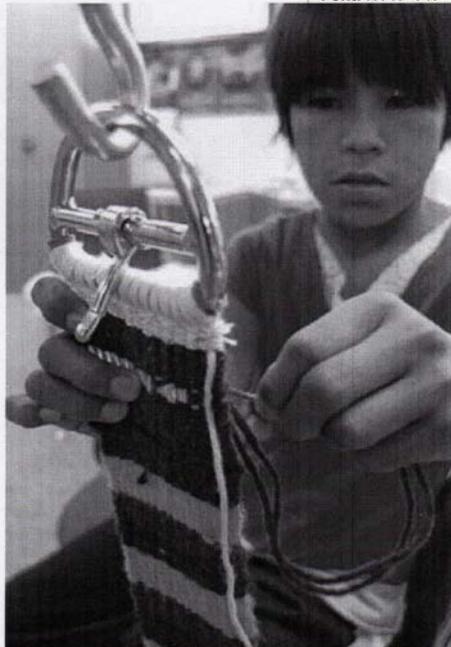
By Marley Shebala
Navajo Times

MONUMENT VALLEY, Utah, June 28, 2007

Math, they say, is a universal language, and one way to learn it is entwined with an ancient Navajo art.

Recently students from Monument Valley High School and teachers from the University of Utah uncovered this relationship as they set about unlocking Logo, a computer math program, during summer

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(Times photo - Leigh T. Jimmie)

Demarie Hanley, 10, weaves wool to make a cinch in a summer cultural program at Monument Valley High School (Utah) in Monument Valley, Utah.

school.

Teaching assistant Kimberly Brainard, 23, of Pueblo, Colo., was amazed to see how Navajo weaving designs helped her students "see that math really does apply to real life." Brainard was helping University of Utah professor Douglas Hacker teach the basics of Logo to students and adults enrolled in 'ndahoo'aah, an annual three-week summer program that ended June 22 at the high school. The program is open to everyone in the community from 4th grade through adults.

'Ndahoo'aah means "relearning" or "to relearn" the Navajo way of life, explained Dorothy Bigman, a Navajo language and culture teacher at the school.

During the 'ndahoo'aah program, students learn to weave a rug, sash belt, saddle blanket, saddle cinch, or basket. Or they can learn how to make turquoise and silver jewelry or Plains beadwork.

Monument Valley Principal Pat Seltzer said the summer program began in 1992 when she accepted an offer from Herb Clemens, who was with the University of Utah's science program, to teach a computer math class with the aid of Navajo rug patterns.

Seltzer recalled Clemens explaining to her that he had made his offer to numerous schools across the reservation and none had accepted it.

She laughed as she said, "We never say 'no' so we started it."

Weaving tradition

Modern applications of math have always existed in Navajo tradition, though Brainard admitted that it was news to her. But she saw it reflected in the students' quick grasp of Logo, particularly that of Lita Cowboy, 12, of Promise Rock, Utah.

Maybe it's in the genes: Cowboy, dubbed this summer's "Logo whiz" by program staff, is the granddaughter of renowned weaver Sandra Black of Promise Rock.

Black is known for a three-dimensional rug weaving technique, a complex style that is rare among Navajo weavers, Bigman said. She also credits Black with reviving from near-extinction the art of weaving saddle cinches, which historically was done primarily by men.

Cowboy, too, wove a cinch during this summer's 'ndahoo'aah program and recently sold it for \$200, Bigman said.

Cowboy seemed surprised by all the attention last week and smiled shyly as she nervously bit on the left cuff of her black sweatshirt.

After a bit of gentle prodding, Cowboy explained that it was her second attempt at weaving a saddle cinch, and the first in which she had incorporated a design.

Then, seated at a computer, she talked about how much she liked math and the Logo program, in particular, swiftly typing in commands that called up her design on the computer screen.

Cowboy's shyness slipped away as she explained how she drew her design by hand on graph paper and then transferred it to the computer using Logo.

She also showed her design for a rug, which depicted the four sacred mountains framed at the top and bottom by a row of four arrowheads.

Cowboy, who is Tó Dích'í'nií (Bitter Water Clan), born for Tó 'Áhání (Near to Water Clan), designed each mountain with its appropriate color and directional orientation, as defined by Navajo tradition.

Brainard said Cowboy had previous experience with Logo and was familiar with geometry but had never used angles.

She said that Cowboy, who enters the sixth grade this fall, is excited because her newfound knowledge of angles has put her one step ahead of her class.

Teachers as learners

Teachers also became learners during the program, as Brainard, Hacker and a third Logo teacher enrolled in the Navajo basket weaving class.

Brainard laughed and said her hands hurt and her fingers cramped after her first day of basket weaving.

Bigman said Brainard, a lefty, has the "rare talent" of weaving a "left-handed" basket.

Debra Farr, a teacher from Tampa Bay, Fla., who helps teach the Logo classes, said her basket weaving experience taught her how "geometry was built into the Navajo woman's brain." She also learned the monetary and spiritual value of wedding baskets.

"The process is incredible," she said. "It takes days because it's so labor intensive. Sometimes you don't appreciate that until you do it yourself." Farr, 48, said the basket-weaving students learned how to collect sumac, tear it into splints, strip the bark, clean it and finally begin weaving a basket.

Basket as teacher

Mary Gillis, 67, has taught the basket weaving class for the summer program for the past 12 years.

Gillis, Deeshchii'nii (Start of the Red Streak People Clan), born for Nóóda'i Dine'é Táchii'nii (Ute People Division of the Red Running Into Water Clan), remembered with a mischievous smile the day her dad, a medicine man, brought home an "old, old" Navajo basket.

He told her to throw it away but she held onto to it and used it to teach herself how to weave a wedding basket, she said.

Gillis also remembers watching her paternal grandmother, who was Ute, weaving baskets.

"She never taught me," she mused. "Maybe I learned by looking at her." Bigman, who has become the driving force behind the summer program and the bridge between the bila'gáana world and the Navajo world, said the program is very fortunate to have the financial support of the university and Foster Grandparents of America.

The university pays the Logo instructors and FGA pays the weavers, basket makers and silversmiths, she noted. Bigman said this together with donations from other groups keeps the cost to \$25 per person. The fee is waived for Monument Valley High students.

Information: Dorothy Bigman, 435-678-1842.

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