

‘Ndahoo’ah Program Report 2012

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OVERVIEW

Located on the Navajo reservation in Monument Valley, ‘Ndahoo’ah, which translates as “relearning” or “new learning,” is a three week program which blends an introduction to math and computer science with a strong emphasis on the Navajo language and culture. This year, the 50 or so students - who came from all over the reservation, many from New Mexico and Arizona - chose from a variety of traditional arts - including rug and basket weaving, silverwork, and traditional outfit making - while also utilizing Logo, a turtle-graphics program, and knowledge of basic geometry to design a digital representation of their traditional Navajo craft. The program culminated in a celebratory lunch, accompanied by a small dance performance by some of the younger students, wherein the students’ finished art projects were displayed alongside their Logo designs, and the teachers had the opportunity to share their thoughts on and experiences with the program.

ORGANIZATION AND LESSON PLANS

The students were divided into two groups: the students of one group started each day in their respective art classes, which were taught entirely in Navajo by community elders and craftsmen, while the other group started in the computer lab, learning basic geometry from University of Utah students and working on their Logo projects. After two hours, the students would switch. In the Logo lab, each day was organized such that, after receiving each of the two or three small daily lessons, which were often fortified with worksheets and other handouts, the students were given time to individually explore the topic at hand while the teachers surveyed the room to identify those individual students who might require additional assistance. While questions were strongly encouraged, many of the students were shy and, as such, constant observation was necessary to determine which students needed further attention. Developing a rapport with the students, often approaching them with small talk as opposed to direct questioning, was

useful in getting the students to feel at ease around the Logo teachers and, as the program progressed, more and more students felt comfortable asking questions on their own.

The first topics discussed were those most fundamental to computer and mathematics novices, with the aim of teaching one lesson regarding a basic math concept and two lessons regarding Logo syntax each day. As issues would sometimes arise that took precedence over the planned lessons, it was important to be constantly discussing the issues facing the students and to remain open to adjustments to the lesson plans. In fact, by the second and third week, the lessons taught were constructed primarily through exactly such discussions. Because of this, it would not have been practical to have a set three-week lesson plan before the program had begun.

By the middle of the second week, it became clear that many students were beginning to tire of Logo, and so they were given a chance to play with some math games - Star Structure, geoboards, and tangrams - as well as Logo pictionary. While many students were responsive to these activities, some did not perform well in the more lax environment.

Each day’s lesson plan was constructed shortly after the previous day’s class. This methodology was instrumental in the effort to cater to the students’ needs as they arose. Towards this end, these lesson plans were also tailored to be flexible, allowing for adjustments throughout the day. If students were being particularly self-motivated, more emphasis would be put on time for exploration, and less on the specific lectures. When students seemed lost, or needed more structure, the lessons were a tool to help motivate them.



The first lessons were meant to lead the students to feel more comfortable using Logo, whilst also giving them a mathematical foundation on which to start building their designs. Once the students understood basic Logo procedure, their focus was guided towards their designs. It was at this point that specific questions and issues began to drive our lesson plans. As seen below in the timeline, certain days had no prepared lesson plans at all, but rather were reserved simply for one-on-one time with the students and their questions. This approach was instrumental in accommodating the widely varying experience levels amongst the students.



Even after the students had been familiarized with Logo, however, some still did not feel ready to start their designs. To accommodate this, the students were provided with other avenues through which to start their planning. One option available to the students was to use graph paper to draw out the design first, which would facilitate the transfer to Logo through the use of a grid system. Another approach, aimed more towards the younger students, was to cut and glue together their design using construction paper. The benefit of this planning stage was twofold: first, it helped the teachers to understand the student's vision so as to better respond to their questions; second, it helped the students themselves organize their thoughts and ideas before trying to translate them into Logo commands.

During the third week it was agreed that, should a student finish their Logo design before they had finished their art project, that student would be allowed to spend more time with their craft, when they would otherwise be in the Logo lab. This was especially helpful to the students in basket-weaving and rug-weaving as these projects were time-consuming, and many students feared they might not finish. For the final two work days, students who were finished both their Logo design and their art project were provided with activities outside of the library, that they might not be a distraction to those students who were still working, while also helping motivate those who weren't yet done to finish.



TIMELINE

Week 1

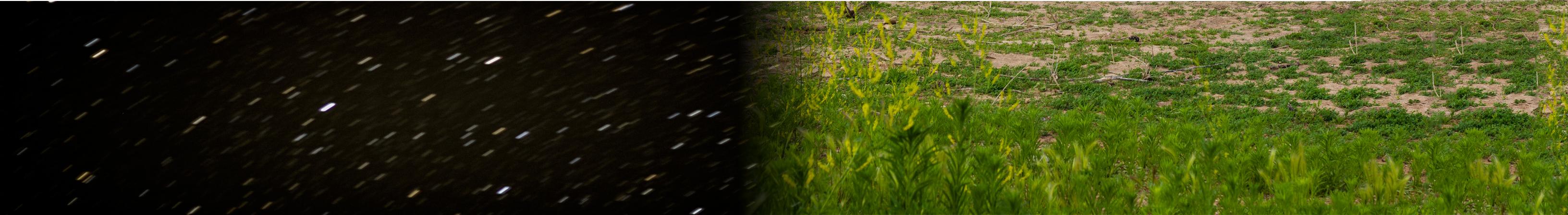
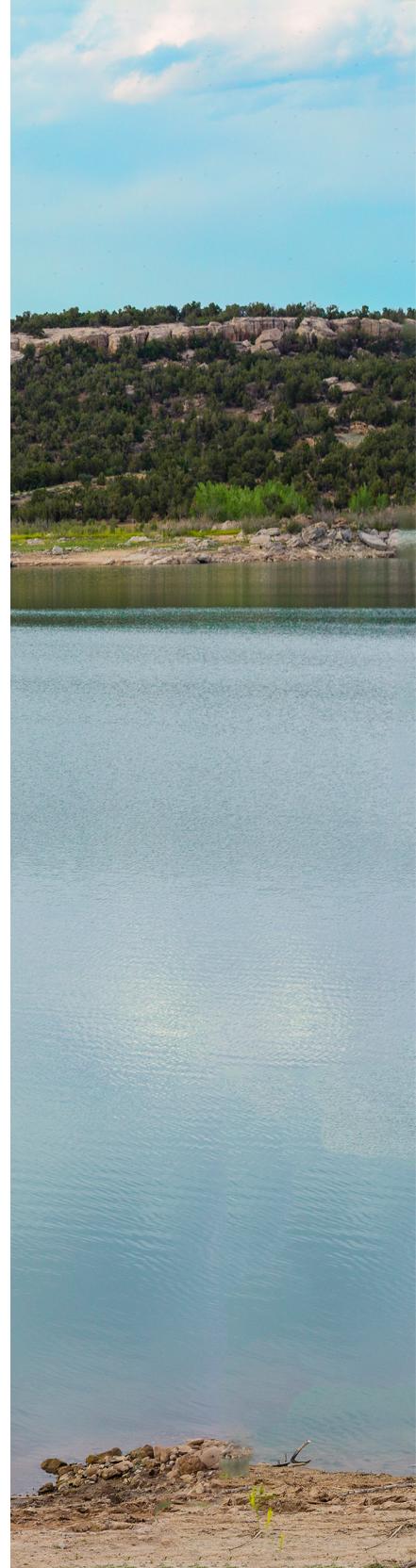
- **Monday:** Introductions and welcome assembly; basic Logo commands (fd, lt, rt, etc.)
- **Tuesday:** Angles and degrees, regular polygons; functions; saving Logo designs as bitmaps
- **Wednesday:** Coordinate system and the Pythagorean Theorem; saving functions and the editor; setting colors, pen width, etc.
- **Thursday:** Symmetries; ellipse, arc, and ellipsearc commands, more on degrees

Week 2

- **Monday:** Variables in functions; tiling of polygons
- **Tuesday:** Class was canceled due to a power outage, we made it up on Friday
- **Wednesday:** Review
- **Thursday:** Math games for the second half of class
- **Friday:** No specific lesson plans.

Week 3

- **Monday:** Basket weaving general design; rug weaving general design; more helpful Logo commands
- **Tuesday and Wednesday:** Helping individual students finish up, math games for students who were finished with their Logo designs.
- **Thursday:** Display of all students work, and celebratory lunch.





DIFFICULTIES

Perhaps the first issue that presented itself was in teaching to a group of varying ages. While much of the mathematics was new to the younger students, some of the high-school students were already familiar with the concepts and grew disinterested. Some of these older students finished their projects early but had very little interest in the math games that were aimed towards a younger crowd. While some of the adults were also already familiar with the concepts, they were more likely to experiment with Logo, usually to their own benefit. The issue of motivation also came to the fore when some students expressed on the class evaluation forms that they would rather spend time working on their craft than on their Logo project.

While every student completed a Logo design, it did not take every one of them until the last day to do so. In fact, some students finished towards the beginning of the second week. To keep them working with Logo, the students were encouraged to design their own signature or stamp, to be placed at the bottom of their designs when displayed. It was left to the students to decide how complicated a signature to make, and many students put a great deal of effort into them. Nonetheless, there were some students for whom a more structured and guided approach would have been more successful, both in keeping them interested and learning as well as simply keeping them occupied.



During the third week, those students who were finished with their Logo design participated in activities outside of the Logo lab, where they could play with tangrams, geoboards, and Star Structure. While this succeeded in helping those students who were not yet finished to focus on getting done, the students who were led out of the lab grew even more unruly. This was remedied to some extent

by more organized activities, such as Logo Pictionary or competitions to see who could build the tallest Star Structure towers, but perhaps a better approach might have been to have prepared math-related activities for those who had finished early.

SUCCESSES

Planning multiple short lessons for each day was very successful. Many of the students could not stay focused on the topic at hand for more than 15 minutes, and it was important that they be able to investigate the topic on their own after it was presented to them. Presenting multiple topics at once, and then expecting the students to use them all simultaneously, seemed unreasonable. It was necessary for them to see each idea at work on their own monitor to fully understand the concepts. Also, due to the varying ages and experience levels of the students, some students might have already been familiar with the topic being taught, while others would have been at a complete loss to understand it. Walking around and giving individual attention to each student was necessary to ensure that every student was making use of each lesson taught to them. In the end, each student had an art project and a Logo design to display, and all of them looked quite good. While some of the rug-weaving students were only a few inches away from completing their rugs, the majority of the silversmith students had finished three separate pieces of jewelry.



Insofar as its goal is to foster an interest in both Navajo tradition and modern technology, the program this year was an overwhelming success. The students showed great excitement about both their art projects and their Logo designs, and many took great joy in showing them off to friends and family. Each student seemed to have enjoyed the program and, what's more, began to understand that the traditional and the modern are never truly separate. Indeed, they are fundamentally reciprocal in their evolution, merging and blending in their combined contribution to everyday life.



