

Code Writers Initiative Pilot Program
Annual Report
December 1, 2017
(H.B. 2707, Sec. 40)

Funding:

On January 19, 2017, the Indian Education Advisory Council for the Arizona Department of Education voted to award the \$500,000 Code Writers grant to one entity: Science Foundation Arizona (SFA). The award check was received by SFA on April 11, 2017. The name of SFA's program is The Native American Code Writers Program (NACWP).

Sub-Awards:

Each NACWP partnering school was granted a sub-award of \$95,000 for a total of \$285,000 to cover teacher stipends and robotics and computer science (CS) equipment. During spring 2017, Linda Coyle, SFA Director of Education, worked extensively with school and district leaders to obtain approvals and processes to implement the program activities and new CS course offerings. Courses had to be developed, approved by the respective school boards, and included in course catalogs for the spring 2017 high school registration process.

Additional Funding:

Additional programmatic support came from industry partners GoDaddy, Amazon, Verizon, and Code.org. The funding was primarily used to offset the cost of teacher training. Code.org provided funding for research and evaluation on comprehensive CS training and circuit boards for each classroom.

Expenditures as of August 31, 2017:

Salaries and Benefits:	\$66,584.23
Direct Costs:	\$87,383.87
Sub-Awards:	<u>\$285,000.00</u>
Total	<u>\$438,968.10</u>

Goal:

The goal of the NACWP was to introduce computer code writing curriculum and deliver technology-focused education yearly to 100 Native American students in grades 9-12.

Program Participants:

The program targeted three Native American communities:

1. The Salt River Pima-Maricopa Indian Community (SRPMIC) and Salt River High School. The high school educates 350 students with 100% Native American students residing within the reservation.
2. The Fort McDowell Yavapai Nation (FMYN) and Fountain Hills High School in the Fountain Hills Unified School District. This is a traditional small-scale public school located adjacent to a tribal community. Students live on the reservation yet attend school off the reservation in a low-density (schools with less than 25% Native American enrollment) school district.
3. The Gila River Indian Community (GRIC) and Phoenix Union High School District. Gila Crossing School is a K-8 BIE school located on the Gila River Indian Reservation. The school feeds into the Phoenix Union High School District, with many students attending Cesar Chavez High School. Cesar

Chavez is a traditional large-scale public school located adjacent to a tribal community. Students live on the reservation yet attend school off the reservation in a high-density (schools with 25% or more Native American enrollment) school district.

Note: Due to the later than anticipated receipt of funds, SFA was unable to begin its program in fall 2016 as planned. As a result, a summer enrichment program was offered to students and spring and summer professional development trainings for teachers in 2017. The full course would be offered in fall 2017.

Professional Development:

Spring: Linda Coyle, in collaboration with Jill Jones, master CS teacher at Carl Hayden High School, provided a series of training to prepare teachers to teach introductory CS instructional units. Teachers also received an introduction to robotics using the Finch Robotic System.

Summer: Teachers were instructed in Code.org's CS Discoveries and Advanced Placement Computer Science Principles. The two week-long intensive workshops prepared the teachers to teach a full year of CS curriculum. The NACWP is prepared to offer the CS Discoveries course as a full year computer science course from fall 2017 to spring 2018.

Code.org:

The Code.org curriculum is a well-documented, validated curriculum with an introductory course for all students at the beginning level. The course is accessible online and needs no downloadable software. A major aim of the first course, CS Discoveries (CSD), is attracting students who might not think of themselves as "typical" candidates for computer science. CSD provides a comprehensive set of inquiry-based lessons while using a variety of tools and platforms. The course contains six units of instruction, including; 1) Problem-solving Computers and Logic, 2) The Internet, 3) Programming Interactive Games and Animations, 4) The Design Process, 5) Data and Society and 6) The Internet of Things.

Summer Enrichment:

Ms. Coyle implemented summer enrichment programs in CS and robotics, which provided the students with introductory exposure to the NACWP content and encouragement to register for the fall course at their high schools.

The NACWP offered CS instruction to expose incoming students to the CS curriculum, gaming and video design, and robotics.

At the end of the summer, staff from Fort McDowell hosted a Parent Engagement Night where students showcased their work. Parents, educators, and tribal council members, including President Bernadine Burnette, attended the event. The students presented their work via a slide show, an informational booth, and a short video movie depicting their coding experiences and their engagement with Finch Robotics.

Program Evaluation:

The purpose of the ¹evaluation was to gather and report on evaluative feedback from students and teachers participating in the summer 2017 NACWP. The research questions guiding evaluation were:

¹ The primary focus of the program, the code writing curriculum, did not begin until August 8th when most students reported to school for the 2017-18 school year. The grant requirements were to submit an annual report to the Arizona Department of Education by September 1, 2017, so the only data available was from the summer enrichment programs.

1. Based on grant-funded activities, to what extent are students engaged and interested in computer science?
2. To what extent are teachers prepared for and delivering effective computer science instruction?

Student surveys were used to address these questions. For teachers, one classroom observation, an end of semester survey, and document review of their course lessons and materials were conducted.

The assessment measure used for students was based on the Computer Attitude Questionnaire (CAQ) from the University of North Texas' Institute for the Integration of Technology into Teaching and Learning (Knezek, G. and Christensen, R., 1995). The CAQ is a validated instrument that measures various student attitudes about computers and computer science. Additional demographic questions were added to prepare a description of participants (e.g., gender, grade, tribal affiliation).

The contracted external evaluator, Dr. Mary Aleta White, Ph.D., is a professional evaluator with over twenty years of experience. Her expertise is in evaluation design, mixed methods, and STEM education research. She conducts evaluation research on numerous funded projects and conducts independent research related to STEM education.

Participant Characteristics:

- Seventy-two percent (72%) of participants live on the reservation, 12% live off the reservation, and 15% reported living on and off the reservation for 6-12 months per year.
- Sixty-four percent (64%) were female and 36% were male.
- The majority were in grades 8 (44%) and 9 (20%).
- Over half of the summer participants (52%) reported that they did not have a computer at home and 40% reported not having the Internet at home.

Tribal Affiliation	Sum
Fort McDowell Yavapai Nation	6
Navajo	1
Navajo Apache	1
Navajo, Yavapai, and Apache.	1
Navajo/Lakota	1
O'odham	1
Pima	1
Pima Maricopa Tohono O'odham	1
Yavapai	7
Yavapai & Navajo	1
Yavapai and Hopi	2
Yavapai and Pima	1
Yavapai/Apache/Pima	1

Evaluation Results

1. To what extent are students engaged and interested in CS education or careers?

Student participants were asked why they signed up for the summer CS courses. For 20% of them a friend or teacher suggested it, another 20% said they were simply curious, and 16% stated they signed up because they like computing. Several students from the Fort McDowell program wrote that the class was mandatory and they felt as though they didn't have a choice but to take the class. In the "other reason" column one student wrote: "I wanted to finish my Robot and learn new computer stuff!" Another student said that attending summer school "made me think that it might be easier for next year since its gonna be my first year attending Salt River."

The student survey asked students to list their probable college major. Most students expressed an interest in non-STEM majors; however, 64% of students indicated an interest in post-secondary education.

Most students (68%) reported that they liked working on a computer and 88% stated they very much enjoy computer games. More than half (60%) realized that they would be able to get a good job by learning how to use a computer. Interestingly, a sizable percentage of students (84%) recognized the power of learning while using a computer. Students evinced very low scores on computer anxiety items (e.g., "I get a sinking feeling when I think of trying to use a computer"; Working with a computer makes me nervous").

When asked to rate their current knowledge about computers and technology, most students (56%) stated they had an average knowledge, while 35% felt as though they had a good or excellent knowledge of computers and technology. Only 8% reported not having current knowledge about computers and technology. In terms of skill sets, 24% felt as though they had excellent or very good skills, while 65% reported having average skills in computers and technology.

Many students (60%) said they were very or pretty much interested in computers and technology. Another 36% felt as though they had an average or neutral interest. The clear majority (92%) stated they enjoyed using computers and technology.

When asked if they were interested in pursuing a career in computers or technology, 32% agreed or strongly agreed, and 48% said maybe while 20% of the participants said they were not really interested in pursuing a career in computers or technology. The fall 2017 course is expected to deliver CS career information to students.

2. To what extent are participating teachers prepared for and delivering effective CS instruction?

To better understand the make-up of participating teachers, they were asked to share information about their background. One teacher had less than 5 years of teaching experience, one between 10 and 15 years, and the third had more than 16 years of experience. Two of the three teachers (66%) had a STEM undergraduate major and two also have a master's degree.

Teachers were asked to indicate how familiar they were with CS Discoveries and with Finch Robotics. The majority were not at all familiar or only slightly familiar. After the initial training by Jill Jones in May, two teachers felt "very prepared" and the third felt "prepared" for the summer enrichment courses. At the end of summer, most teachers stated they did an excellent or above average job of implementing the CS Discoveries lessons and the Finch Robotics activities over the summer.

Summary:

During the first four months of its pilot program, the NACWP delivered effective training and resources to the targeted teachers. The teachers felt prepared to deliver CS instruction to their students during the summer enrichment programs. Many of the students who completed the summer survey showed interest in the activities (e.g., robotics) and in the field of CS (careers). It is promising that most of students reported feeling confident in their skills and knowledge of computers and technology. These sets of students, if they chose to continue during the fall semester, are primed to expand their knowledge, interest, and skills. The teachers received additional training during the Code.org summer workshops, and are prepared to deliver the full CS Discoveries course beginning in fall 2017.

Evaluation data from the fall 2017 course will provide additional information on the program impact such as students' continued engagement, interest, course projects/artifacts, and course grades as well as on the teachers' level of preparation and course delivery. The report will be available in January 2018.

While the overall targeted number of 100 Native American students was not achieved, the 40 committed students in year one of the NACWP will be fully prepared to take the Advanced Placement Computer Science Principles course in year two in comparison to 2016 where only one Native American student in the state of Arizona took the exam.