Supporting Indigenous students to explore the field of robotics

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Introduction

This paper is about the need to support Indigenous students and school systems to have robotics programs in their school.

The focus on Science, Technology, Engineering and Math (STEM) are often associated with high performing schools, socioeconomics and academic achievement which are often a disadvantage for most Native American students and schools that serve Native American students. Often, Native Americans deal with a threefold challenge including poverty, living in rural communities, and being part of a racial group that has been marginalized and forced to assimilate into this country's education system that often does not align with the culture and values of indigenous communities. Students the live on federal lands, often called Reservations, deal with high unemployment statistics and a lack of jobs. Conversely, school districts can help expose students to explore jobs where students do not have to leave the Reservation to find a job in STEM related fields. Coders, programmers, IT personnel can work from home and monitor systems from anywhere in the world. STEM allows students to have a high paying job without leaving the reservation.

Context

As an educator working on the Fort Apache Indian Reservation in eastern Arizona, I serve as a district administrator for the Whiteriver Unified School District. I am the Director of Curriculum and Instruction and oversee professional development, curriculum, mentoring and assessment for teachers. I have also overseen the robotics program for the district for the past 5 years.

Whiteriver Unified School district has approximately 2500 students from PreK to 12th grade. The school district is 99% Native American, with most students identifying as White Mountain Apache. In addition, the school district serves the indigenous populations of Hopi, Navajo, and San Carlos Apache. I have worked for the school district in various positions since 1999. I started as an instructional assistant, advanced to a teacher, then an instructional coach, and finally a principal before my work as a district administrator. My parents moved to the White Mountain Apache reservation as missionaries in 1996. My family lived on the reservation for more than 20 years. Both passed away and are buried in the tribal cemetery. I am a Latina woman who grew up and attended school in Los Angeles, CA.

The research in this Leadership Practice Guide was conducted on the Fort Apache Indian Reservation, home of the White Mountain Apache tribe. The Western Apaches, also known as the White Mountain Apaches, is one of the tribes of Apache, who live primarily in New Mexico and Arizona. The Apache Tribe are among the few tribes living on their ancestral land because they invited the U.S. Calvary to set up a camp at Fort Apache and live there in peace with the tribal village (InterTribal Agency, 2011).

The Apaches first went to Carlisle boarding school in Pennsylvania. Then, in 1891, the first school began in one of the barracks at Fort Apache by Castleberry (Archaeology Southwest, 2024). Theodore Roosevelt is still open to this day in the original location. Whiteriver Elementary was the first school of the Whiteriver Unified School District, opening its doors in 1955 and then the high school shortly after that. There are two BIE schools on the reservation,

the other being K-8 John F Kennedy School in Cedar Creek. The reservation has three public school districts- Whiteriver Unified School District, McNary School, and Cibecue Community School. McNary is a K-8 school, while Whiteriver and Cibecue are K-12 districts.

Rationale

Most research and conversations about Native Americans focus on indigenous tribes as one homogenous group. The reality is that indigenous students comprise 566 unique recognized tribes (Gentry et al., 2014). As a result, an education system or educational program designed for one indigenous population may not be culturally responsive for another tribe. Education systems must recognize the unique characteristics of each tribe and make sure programs fit the needs of the students in each school district serving indigenous populations.

In this paper, we will discuss what districts can do to support STEM in their district. And particularly robotics. The majority of new positions in this country are STEM focused.

"In 2021, 24% or 36.8 million of the U.S. workforce worked in STEM occupations , of which more than half (52%) did not have a bachelor's degree and therefore were classified as the skilled technical workers or STW. About sixty-three percent of the STW worked in STEM middle-skill occupations, and 26% worked in Science and Engineering related occupations. Most of the workers with a bachelor's degree or higher (90%) worked in S&E or S&E-related occupations" (National Science Board, 2024).

As school districts we can choose to emphasize and support robotics to showcase STEM careers with our students. This Leadership Practice guide will focus on the needs of Native American students and a district's responsibility to help prepare students for a future that will be dominated by STEM. The reservation faces high unemployment. According to the Robotics Education and Competition Foundation (REC), there are 2.5 million unfilled jobs in STEM Fields (REC, 2025). This is an untapped area that we can open to our Native American students and help them to enter these fields by allowing them to be exposed to these fields.

In this paper, I will explore the main robotics programs in this country and how a district can participate in robotics. Because STEM is the fastest growing job area each year jobs are being created; therefore, school districts have to introduce our students to these fields and help them to gain the experience needed to determine if this is their future. Only by working in a culturally responsive way to introduce careers to our students can we truly meet the needs of our students and ensure they are prepared for their future.

Topic Summary

There are systemic barriers facing Native American students. In STEM fields Native Americans remain starkly underrepresented. According to the REC Foundation, only 0.4% of robotics engineers in the United States identify as Native American (REC Foundation, 2025). We need to help introduce our students to these fields and showcase how they can participate in advanced technology.

One way school districts can expose and engage Native American students to the STEM fields is to compete in the Vex program. Vex is one of the three major robotics programs in this country. It has programs for students in elementary school up to the college level to allow them to participate in stem related fields including robotics, drones, and coding challenges.

As a proof of concept, the Whiteriver School District (WUSD) has hosted robotics in the district since 2016. In 2020, the district decided to start STEM programs and to take over control of the robotics programs from Apache Behavioral Health. This past year the district competed in Elementary Vex IQ, Middle School Vex IQ, Middle School Vex EDR, and High School Vex EDR with twenty teams total across the district. WUSD had one team attend Worlds and ten teams across grade levels participated in the state competition. Last year over 31,000 teams from 53 countries competed in Vex (vexrobotics, 2025). This past year the winner of the state competition was a team of students on a Native American reservation.

Currently, the Whiteriver Unified School District and Apache Behavioral Health host the largest tournament in Arizona every year. There have been seventy-four teams participating from across the Southwest United States. Teams competing required sat least 51% Native American participation rates. These tournaments have expanded each year and last year teams from Oklahoma, Arizona and New Mexico participated.

Implementation Plan

School systems have an opportunity to create a pipeline to increase students' awareness of STEM jobs and related fields. According to REC, “only 67% of Native American students attend schools offering computer science courses” (REC Foundation, 2025). School systems need to address these structural inequalities and make pathways to allow them to be introduced to pathways into computer science and robotics.

At Whiteriver Unified, we determined there was a need to enhance our STEM program by starting a robotics team over fifteen years ago. When beginning a program, schools have to determine if they are creating a program to learn robotics or if they are creating a program to compete in robotics. The three largest competition programs are Vex, Lego and First. There are other smaller organizations, but these are the largest. These competitions expose students to robotics skills like building and coding along with soft skills like communication, collaboration and time management. Ninety-five percent of participants in Vex have shown an increased interest in STEM subject areas and pursuing STEM related careers (Vex Education, 2025). In addition, robotics teaches students the inquiry method and they discover strategies by revisions to help their robot be successful.

Each of these robotics organizations have their own supplies, registration, rules, and challenges at a variety of levels. Students can get involved in robotics as early as kindergarten. It can be successfully implemented on a variety of levels and the skills the students learn will be focused on the level of challenge they choose to compete in. In the appendix is a chart about the major robotics programs in the United States.

Robotics teams can be facilitated in a K-12 classroom or a structured after school program. If a district or school is interested in starting a robotics program, first they need to gauge interest for both students and coaches or advisors. The district will need to present how robotics can help support students to have experience in coding, scientific iteration, the building process and teamwork and collaboration.

When choosing to start a robotics team it is important to find out what other teams are in your area or community. If you are going to compete you need to know where competitions are being held so you can participate. For most teams on reservations, they have to travel far to find other teams to compete with. This is why as a tribe we have started teams at ten different schools on the reservation. We are able to have tournaments on a monthly basis even if we do not have Phoenix teams join us.

Whiteriver USD got into Vex because of the opportunity that the Rec Foundation gave us to help start our teams in 2015. The district received a grant from the REC foundation to pay for the first robots program expenses. Today they are still helping teams to start. WUSD was able to begin having teams and made it to our first Worlds competition in 2018. Since then, the district has had elementary, middle school and high school make it Worlds. The robotics program has expanded, with the help of Apache Behavioral health, to schools outside the district so that we have more than forty teams representing the White Mountain Apache tribe from public schools and BIE schools across the reservation. Without the help and support from these outside organizations, we would not have been able to start this program, but now that it is successful, we are able to sustain it on our own.

Recruiting volunteers is an important area in the implementation plan. Robotics teams can be sustained through parent support but when the team sizes and participants increase there needs to be coaches, volunteers, coordinators even without hosting an event. Once you determine the need to host an event, you need to find referees, judges, event coordinators and many more volunteers.

Assessment

There are a variety of ways to assess the success of the program. The first way we assess our success is the number of teams that register and compete for the entire season of robotics. As a district, we emphasize to the families that when they choose to join robotics, they are making a commitment for the season. Competition begins in October for WUSD, but there are competitions that begin earlier and do not finish till May with Worlds. At Worlds, they announce the new competition, and the program starts all over again the following year. Registration with Vex is $200 a team, so it is important when the district sponsors a team that they are committed for the entire season. A point of caution and something learned from experience, WUSD would start as many teams as possible possible early in our development of our robotics program, however, many did not even compete in one event, so it is important that the teams are committed to robotics and compete in events.

Another way we assess our success as a robotics organization is the number of teams that receive an invitation to the next level of competition. Last year we had eleven teams invited to the state invitational and one to Worlds. Matter of fact, the White Mountain Apache reservation won the elementary state IQ tournament. When competing at the state and Worlds competition Naive

American students have pride in their work and are proud of who they are and where they come from. WUSD has been able to represent the White Mountain Apache nation in the Walk of Nations on three separate occasions at Worlds and wear our traditional attire with pride.

Finally, the success of the program is often shown with the future of the students. When STEM related careers are open to students, the opportunity gives them the opportunity to have success for their future. Currently, WUSD is not yet able to judge the district in this aspect. The first Worlds team from Canyon Day Junior high just graduated. WUSD is tracking these students to see what their future holds. Long term success will tell how successful the WUSD Robotics Program is!

Conclusion

STEM opens a door of opportunity to students. STEM related careers are expected to increase by volumes in the coming years and districts have an opportunity to introduce Native American students to fields that allow them to be successful and many of them can be done from home. The lack of technology related jobs and education, particularly on the reservation, needs to be addressed and there are organizations out there that are more than willing to help. WUSD has partnered with Google, Amazon, Indigitize and many other organizations to help bring robotics to the Fort Apache Indian Reservation. We are proud of the work we have done and will continue to do in the future.

Resources

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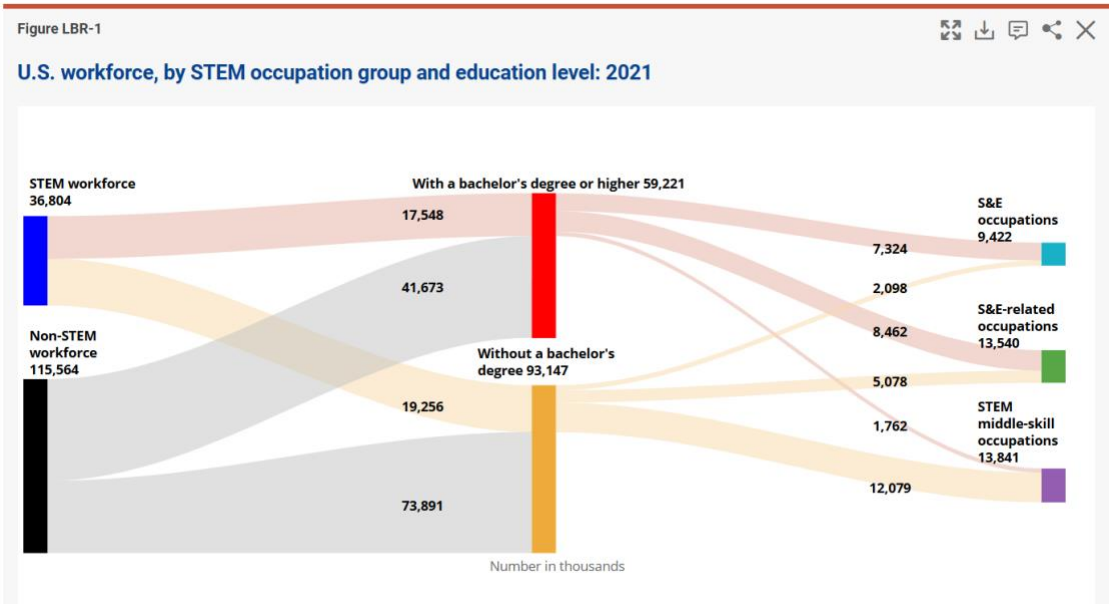
Appendix A.



Source(s):
Census Bureau, American Community Survey (ACS), 2021, 1-Year Public-Use File, data as of 25 October 2022.

Appendix B.

WHAT TYPE OF PROGRAM DO YOU WANT TO START?

	Lego	Vex	First
Levels of Program	K-1 First Lego League Discover 2-4th grade First Lego League Explore 4th-8th Grade First Lego League Challenge	Vex 123 PreK+ Vex Go Grade 3-5 Vex Aim Grade 4-12 Vex IQ Competition- Grade 4-8 Vex ExP Grade 8-12 Vex V5 Grade 9-University Vex CTE Grade 9-University Vex AR Grade 9-University	First tech challenge Grades 7-12 First Robotics Competition Grades 9-12
Registration Fees	First Lego League $200 a season First Lego League Explore $140 a season First Lego League Challenge $275 a season	$200 a team for the season	$6300 a season
Equipment Fees	Lego Education Steam Park $119.98 a set Lego Education Explore pack $329.95 Lego Spike Prime+ Expansion $556.90 a set	$699.99 for IQ team kit $1244.99 competition kit	Voucher for kit parts included- more can be purchased or manufactured.
Tournament Fees	$250-$300 an event	$60-150 an event	One regional and 2 district events
Training Cost	First Lego League $300 First Lego Explore/ First Lego challenge $600	Basic training free VexPD+ $999 a year	Free mentor training
Size of team	Up to 10 students	Up to 8 students	At least 10 students