STEAM Education:

Accessibility, Availability & Equity in Northern New Mexico

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Meet The Team

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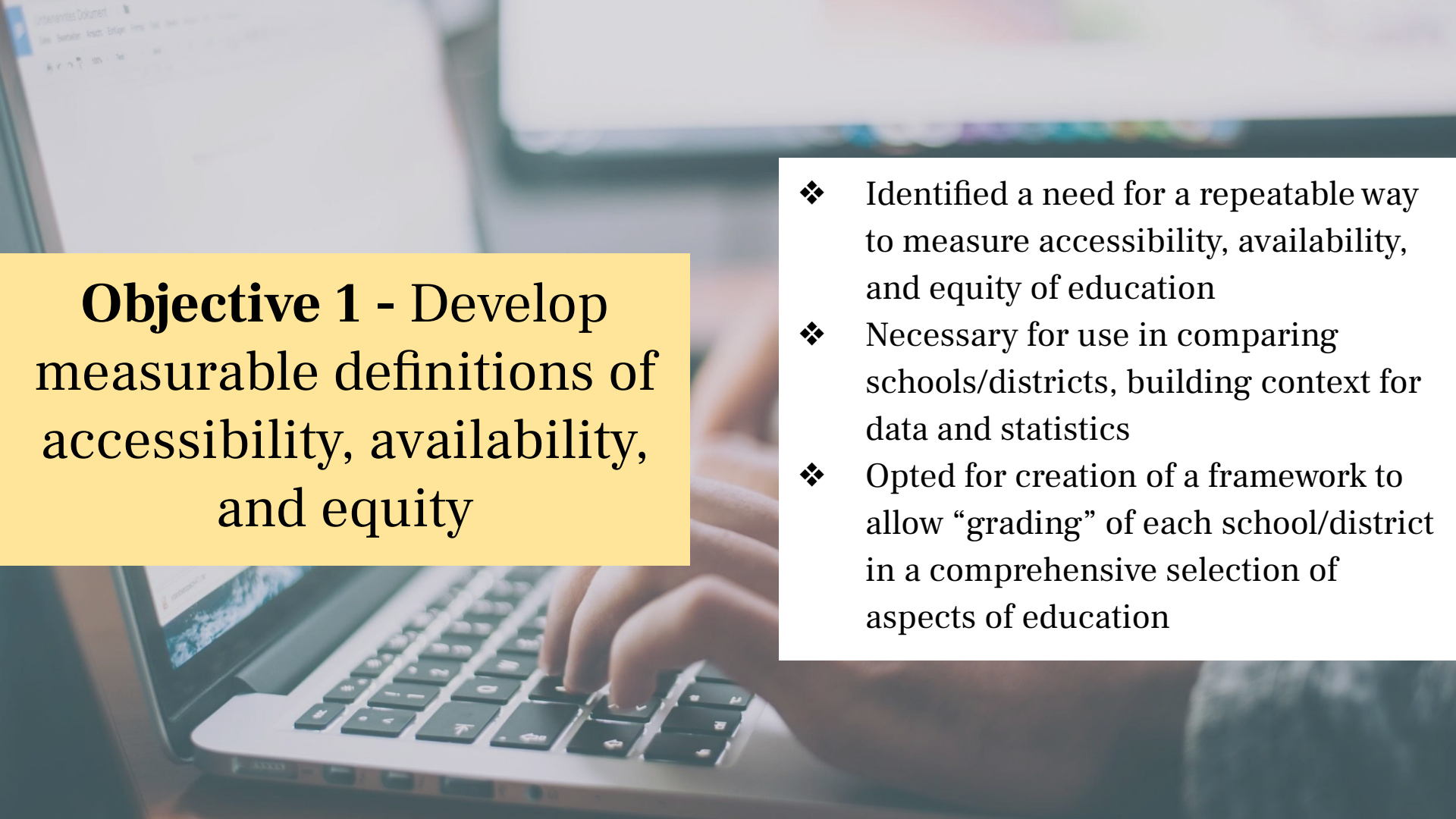
WPI

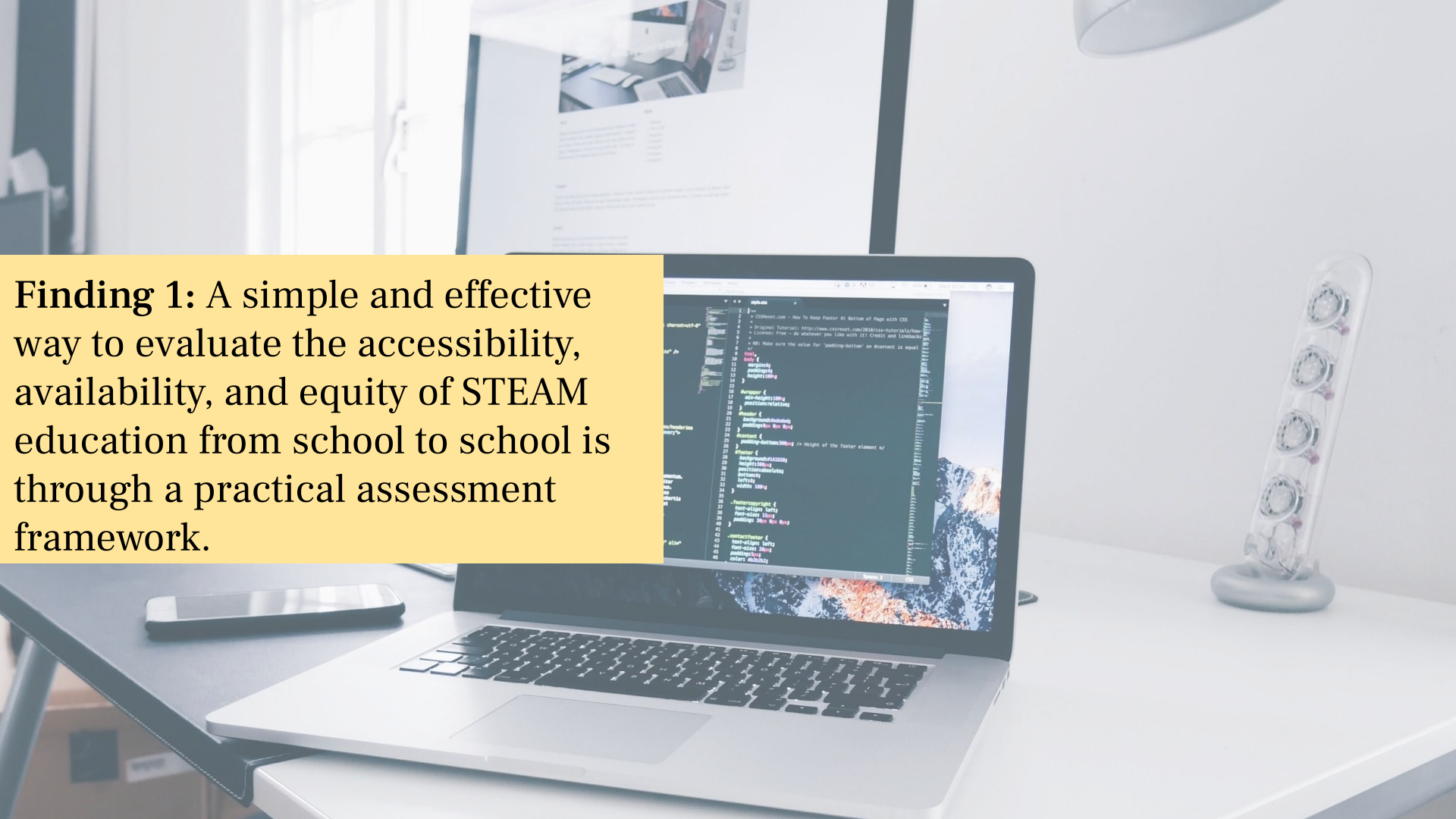
Project Goal

The goal of this project was to assist the Northern New Mexico STEAM Coalition in the procurement and analysis of STEAM education data in order to create a baseline picture and understanding of STEAM education, accessibility, availability, and equity among rural and non-rural schools in northern New Mexico.



Objective 1 - Develop measurable definitions of accessibility, availability, and equity

- Identified a need for a repeatable way to measure accessibility, availability, and equity of education
- Necessary for use in comparing schools/districts, building context for data and statistics
- Opted for creation of a framework to allow “grading” of each school/district in a comprehensive selection of aspects of education



Finding 1: A simple and effective way to evaluate the accessibility, availability, and equity of STEAM education from school to school is through a practical assessment framework.

Accessibility, Availability, & Equity Framework

Components:

- Integration of Social and Cultural Awareness
- Accessibility for Students of Diverse Backgrounds
- Access to Technology for Students and Educators
- Considerations in Accessibility of Technology
- Quality of Student and Educator Technology
- Accessibility to Varied STEAM Curriculum and Course Selections
- Availability of Teaching Support
- Student and Educator Access to Course Materials
- Access to Educators
- Diversity of Educators
- Instruction by Qualified Educators
- **Higher Education:** Post-Secondary Degree Pathways
- **COVID-19:** Adaptations for Distance Learning
- **COVID-19:** Availability and Integration of Learning Support

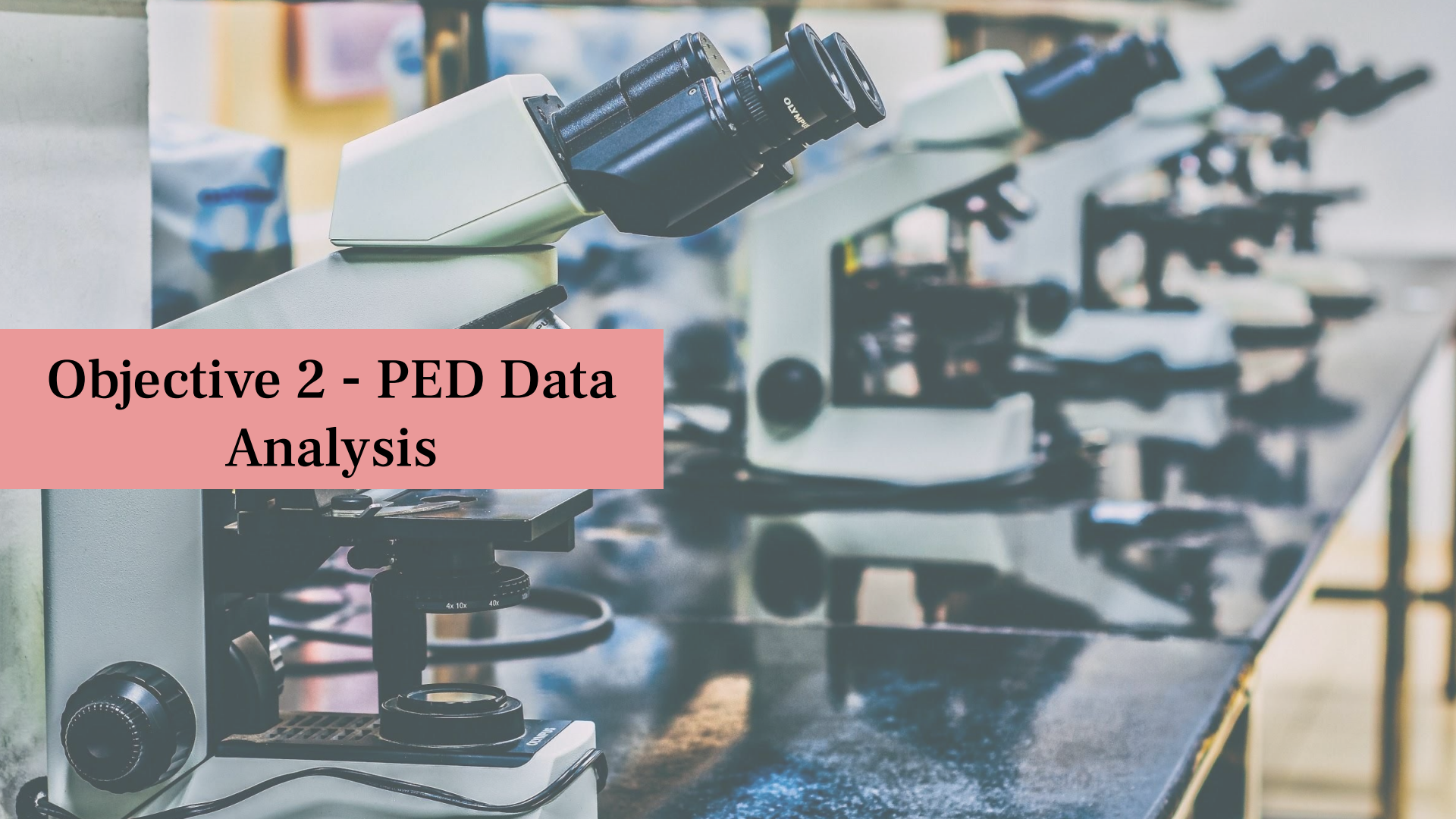
STEAM Learning Accessibility, Availability, & Equity Component	**Description**	**Excellent** (above average)	**Good** (average)	**Poor** (below average)

Accessibility, Availability, & Equity Framework

Sample Component:

Integration of Social and Cultural Awareness	*Accessible, available, and equitable STEAM education considers a variety of perspectives to build awareness of social, ethnic, and cultural sensitivities in order to foster awareness, sensitivity, and empathy in educational environments*	Lessons introduce multiple social and cultural perspectives in association with STEAM topics, projects, and relevant real-world applications. They also work to supplement the understanding of how to become an informed citizen.	Lessons may introduce some social and cultural perspectives in association with STEAM topics, projects, and real-world applications. Lessons attempt to supplement the understanding of how to become an informed citizen.	Lessons fail to introduce multiple social and cultural perspectives in association with STEAM topics, projects, and relevant real-world applications. Lessons do not supplement the understanding of how to become an informed citizen.

Full Framework



Objective 2 - PED Data Analysis

Course Offerings

Finding 2: Rural school districts generally offer less STEM courses than non-rural school districts, putting rural students at a disadvantage.

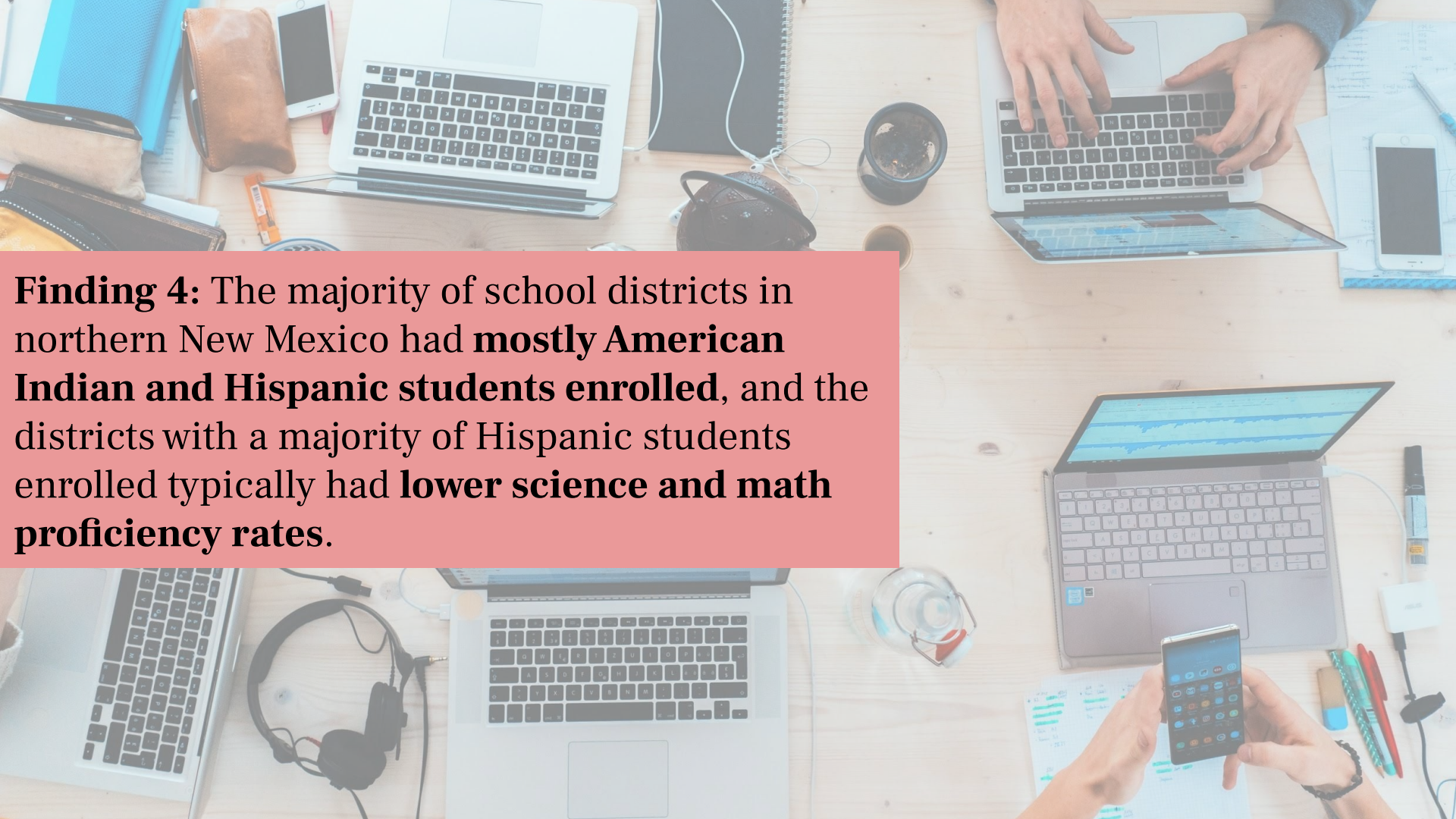
School District	Urbanity-Locale	High School(s)	Courses Offered
Bernalillo	Suburb - Large	Bernalillo High	24
Chama	Rural-Remote	Escalante Middle	17
Cuba	Rural-Remote	Cuba High	16
Dulce	Rural-Remote	Dulce High	8
Espanola	Rural-Fringe	Espanola Valley I	27
Jemez Mountain	Rural-Remote	Coronado High	11
Jemez Valley	Rural-Distant	Jemez Valley Hig	14
Last Vegas City	Town-Remote	Robertson High	26
Los Alamos	Town-Distant	Topper Freshmar	48
Mesa Vista	Rural-Remote	Mesa Vista High	11
Mora	Rural-Remote	Mora High	14
Pecos	Rural-Distant	Pecos High	16
Penasco	Rural-Remote	Penasco High	17
Pojoaque	Rural-Fringe	Pojoaque High	21
Questa	Rural-Remote	Questa High	17
Rio Rancho	Suburb-Large	Independence Hi	64
Santa Fe	City-Large	ACADEMY AT LA	55
Taos	Town-Remote	Taos High + Taos	32
Wagon Mound	Rural-Remote	Wagon Mound Hi	22
West Last Vegas	Town-Remote	West Las Vegas	24

Proficiency Rates

Finding 3: Universally poor proficiency rates in math and science in northern New Mexican schools suggest that STEM education is inadequate.

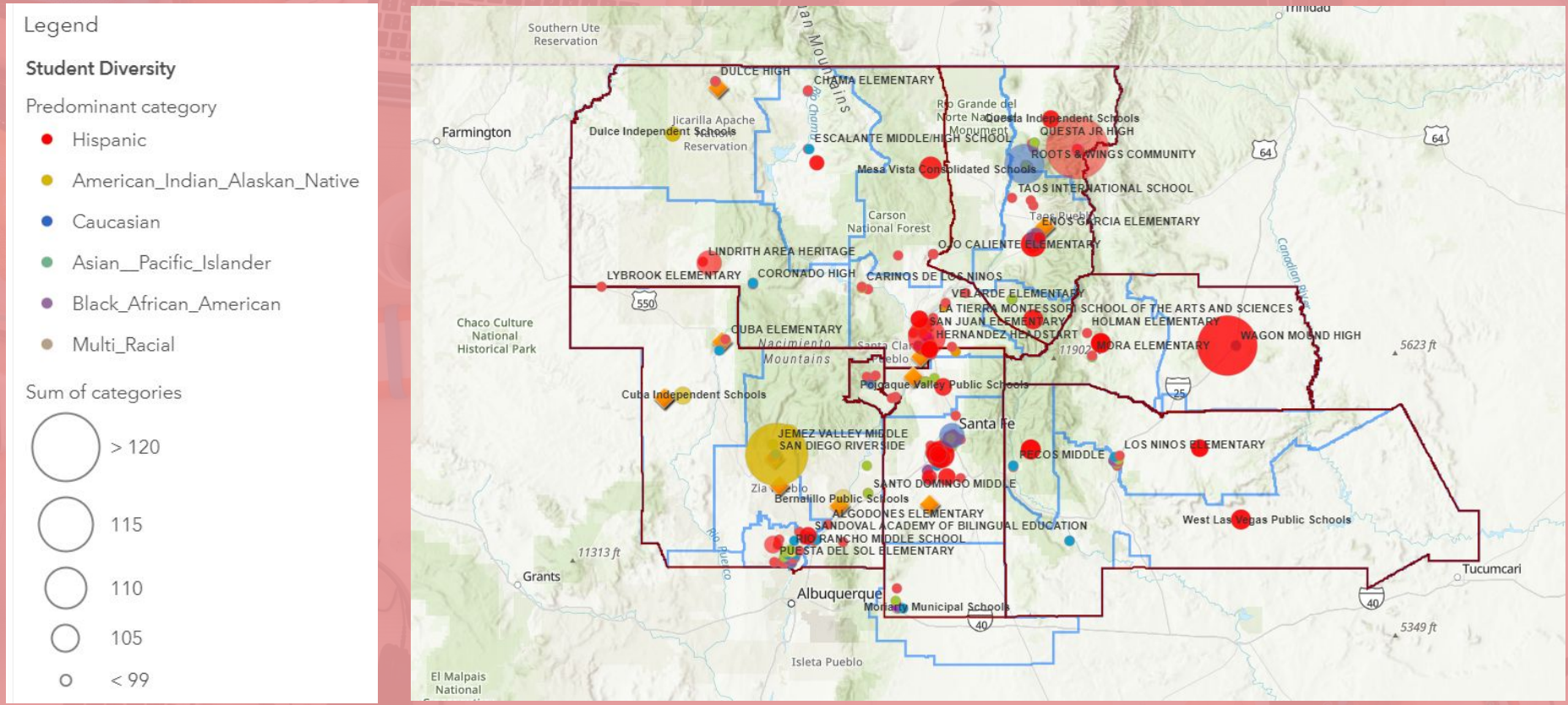
NM Average Math Proficiency: **20.1%**	NM Average Science Proficiency: **38.6%**
National Average Math Proficiency: 8th Grade | 12th Grade **33% 25%**	National Average Science Proficiency: NAEP Basic | NAEP Proficient **69% 34%**
NM Median Math Proficiency: **18%**	NM Median Science Proficiency: **37%**
NM Max Math Proficiency: **68%**	NM Max Science Proficiency: **91%**

Data retrieved from PED, NSF and NCES, 2018



Finding 4: The majority of school districts in northern New Mexico had **mostly American Indian and Hispanic students enrolled**, and the districts with a majority of Hispanic students enrolled typically had **lower science and math proficiency rates**.

Student Diversity



2018-19 student enrollment data from the PED

Student Diversity

District	American Indian/ Alaskan Native	Hispanic	Caucasian	Math	Science
WAGON MOUND	<= 5	91	8	15	not enough students
LAS VEGAS CITY	<= 1	91	7	17	41
WEST LAS VEGAS	<= 1	89	10	11	34
TIERRA ENCANTADA CHARTER SCHOOL	<= 2	89	9	4	25
MCCURDY CHARTER SCHOOL	5	89	5	6	29
TAOS INTERNATIONAL SCHOOL	4	88	7	6	13
ESPANOLA	6	88	5	10	21
QUESTA	<= 1	83	14	7	23
PENASCO	12	83	5	10	47
CHAMA	5	82	11	7	24
MESA VISTA	<= 2	81	15	5	30
SANTA FE	2	80	16	18	33
SANDOVAL ACADEMY OF BILINGUAL EDUCATION	<= 2	80	13	26	31
POJOAQUE	15	78	6	11	34
TURQUOISE TRAIL CHARTER SCHOOL	2	71	24	37	60
TAOS	7	68	22	19	41
LA TIERRA MONTESSORI SCHOOL	10	67	18	23	43
MONTE DEL SOL CHARTER	<= 1	64	31	17	35
JEMEZ MOUNTAIN	29	59	11	14	24
THE MASTERS PROGRAM	<= 2	58	30	20	52
RIO RANCHO	4	56	31	32	55
NEW MEXICO CONNECTIONS ACADEMY	5	54	34	7	35

2018-19 enrollment data from the PED

Student Diversity

District	American Indian/ Alaskan Native	Hispanic	Caucasian	Math	Science
NM SCHOOL FOR ARTS	6	28	59	25	86
LOS ALAMOS	<=5	33	56	48	77
ROOTS AND WINGS COMMUNITY	8	33	55	12	not enough students
RED RIVER VALLEY CHARTER SCHOOL	<= 5	51	49	12	22
THE ASK ACADEMY	2	46	46	30	82
TAOS ACADEMY	3	46	46	40	70
TAOS INTEGRATED SCHOOL OF THE ARTS	9	43	45	30	68
NEW MEXICO CONNECTIONS ACADEMY	5	54	34	7	35
MONTE DEL SOL CHARTER	<= 1	64	31	17	35
RIO RANCHO	4	56	31	32	55
THE MASTERS PROGRAM	<= 2	58	30	20	52
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WEST LAS VEGAS	<= 1	89	10	11	34
TIERRA ENCANTADA CHARTER SCHOOL	<= 2	89	9	4	25

2018-19 enrollment data from the PED

Finding 5: For most of the school districts of northern New Mexico, the **diversity of educators was not comparable to the diversity of the students** meaning minority students are **underrepresented** in teachers of STEM education.

Educator Diversity

Legend

Diversity + Experience of Students and Educators - Educator Diversity by District

Predominant category

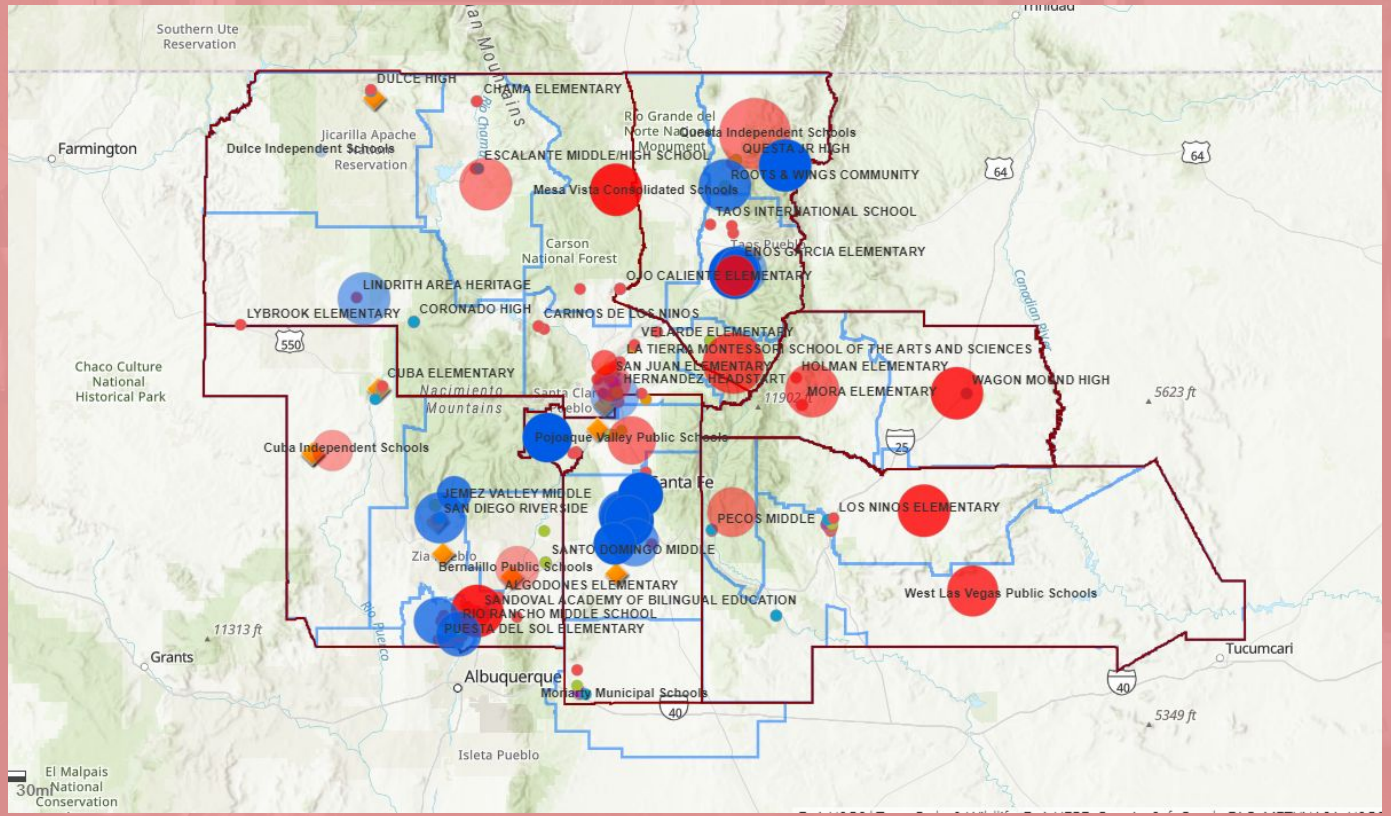
- Caucasian
- Hispanic
- American Indian/ Alaskan Native

Sum of categories

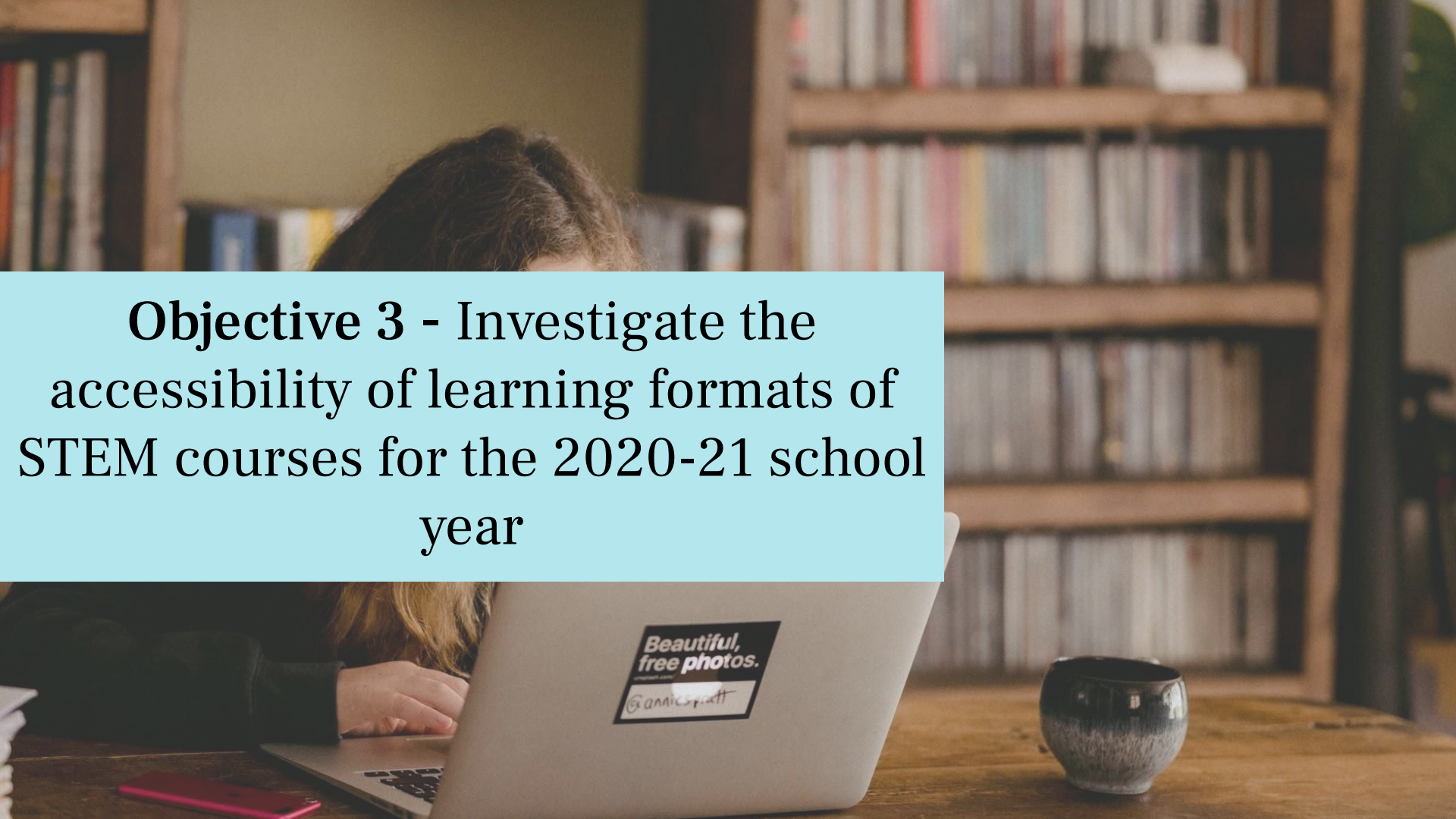
- > 113
- 105
- 90
- 80
- < 72

Strength of predominance

- > 90
- < 34



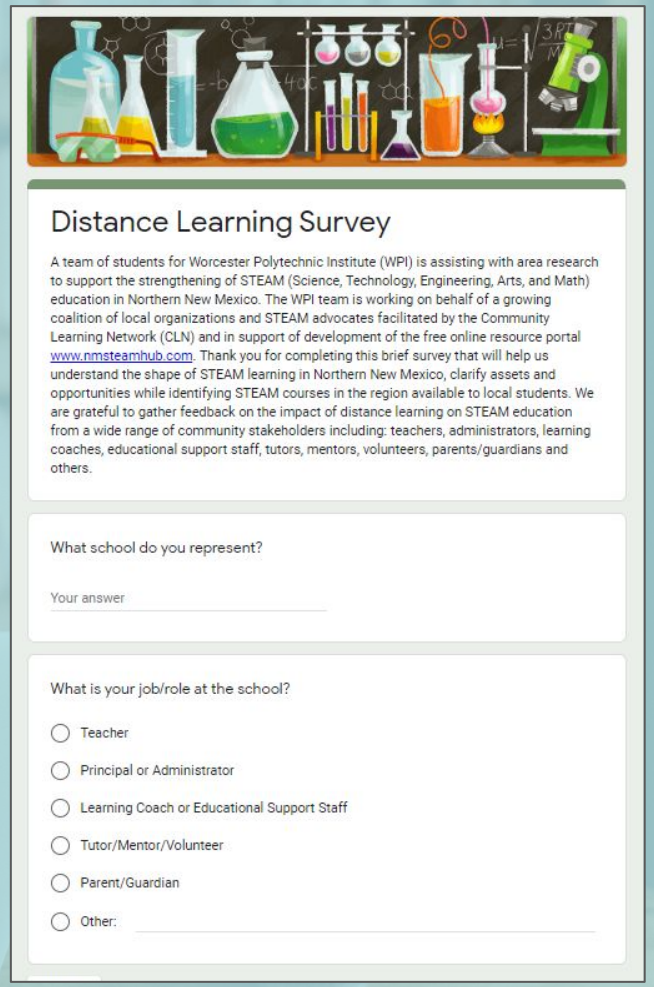
2018-19 educator diversity data from the PED



Objective 3 - Investigate the accessibility of learning formats of STEM courses for the 2020-21 school year

Distance Learning Survey

What type of learning format is your school currently utilizing for the 2020-21 school year?
Are all students issued devices such as a tablet or Chromebook that they may bring home to complete schoolwork?
Are all of the STEM courses that were taught prior to the pandemic continuing to be taught at your school this semester?
What is the structure of distance learning delivery and facilitation for STEM courses?
What platforms and learning management systems (LMS) are being used to support online distance learning? (i.e. Canvas, PowerSchool, Zoom, Google Hangouts, etc)
In your opinion, is the current work for STEM courses this semester (whether in person, online, or hybrid), comparable to the work that students would normally be doing in school in these courses? Why or why not?



Distance Learning Survey

A team of students for Worcester Polytechnic Institute (WPI) is assisting with area research to support the strengthening of STEAM (Science, Technology, Engineering, Arts, and Math) education in Northern New Mexico. The WPI team is working on behalf of a growing coalition of local organizations and STEAM advocates facilitated by the Community Learning Network (CLN) and in support of development of the free online resource portal www.nmsteamhub.com. Thank you for completing this brief survey that will help us understand the shape of STEAM learning in Northern New Mexico, clarify assets and opportunities while identifying STEAM courses in the region available to local students. We are grateful to gather feedback on the impact of distance learning on STEAM education from a wide range of community stakeholders including: teachers, administrators, learning coaches, educational support staff, tutors, mentors, volunteers, parents/guardians and others.

What school do you represent?

Your answer

What is your job/role at the school?

- ○ Teacher
- ○ Principal or Administrator
- ○ Learning Coach or Educational Support Staff
- ○ Tutor/Mentor/Volunteer
- ○ Parent/Guardian
- ○ Other:

Survey Response

Through this survey, we received...

29
Responses

from

16
Schools

across

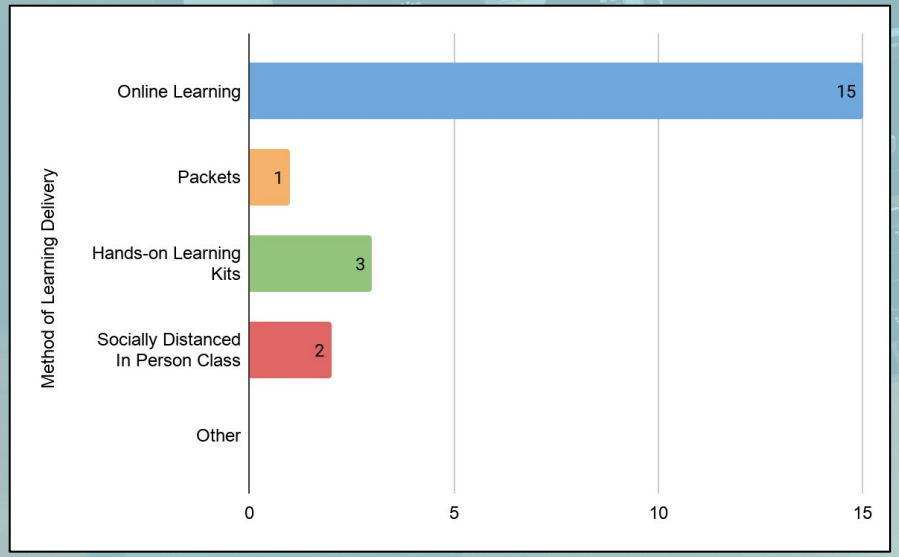
7
Counties

School	District	County
Amy Biehl Community School	Santa Fe	Santa Fe
Cielo Azul Elementary	Rio Rancho	Sandoval
Desert Sage Academy	Santa Fe	Santa Fe
Dulce Elementary	Dulce	Rio Arriba
Gonzales Community School	Santa Fe	Santa Fe
Los Alamos High School	Los Alamos	Los Alamos
Mandela International Magnet School	Santa Fe	Santa Fe
Memorial Middle School	Las Vegas	San Miguel
Pecos High School	Pecos	San Miguel
Pecos Middle School	Pecos	San Miguel
Robertson High School	Las Vegas	San Miguel
Taos High School	Taos	Taos
The Academy for Technology and the Classics	Santa Fe	Santa Fe
Turquoise Trail Charter School	Turquoise Trail Charter	Santa Fe
Vista Grande High School	Rio Rancho	Sandoval
Wagon Mound Public School	Wagon Mound	Mora

Finding #6: At least fourteen schools have chosen online learning for the 2020-21 school year and have reached a 1:1 ratio of student to learning device.

Methods of STEM Education Delivery

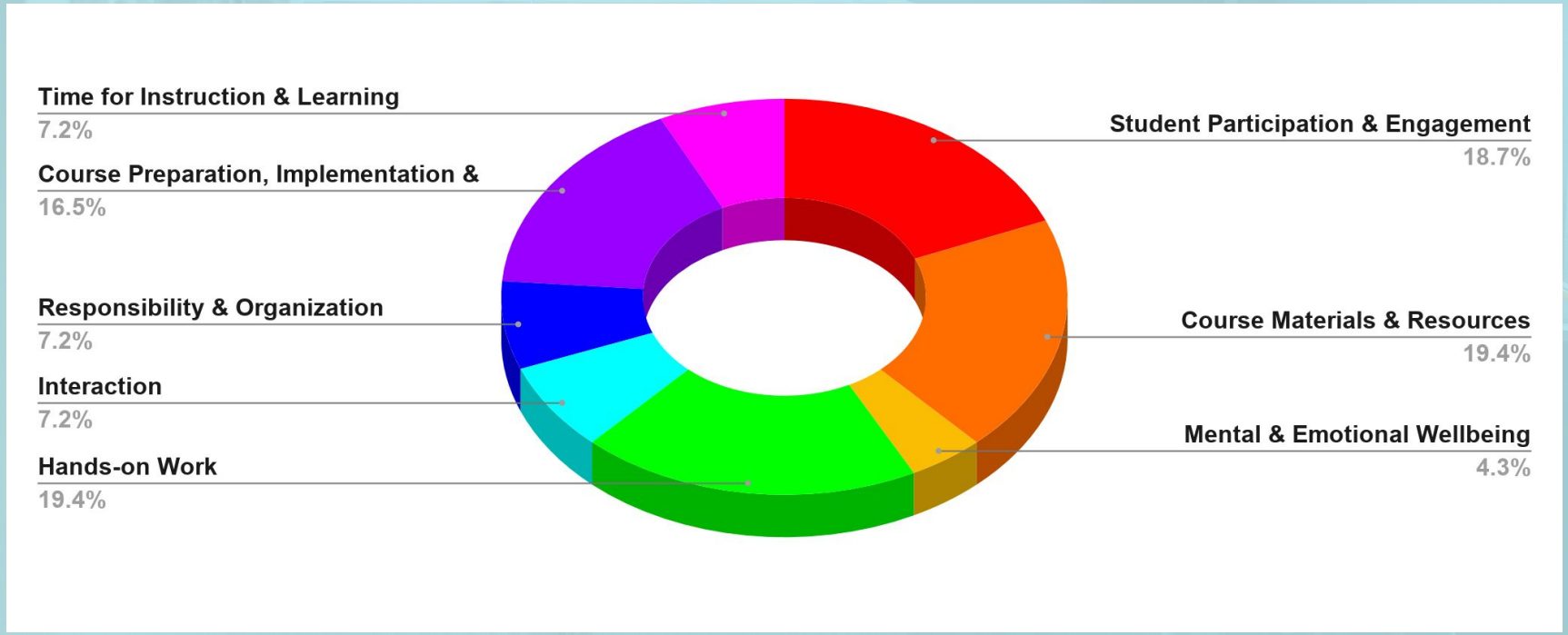
All **16** schools have reported providing their students with devices



Ranking	Platform/LMS Name	Frequency
1 (most common)	Canvas	12
2	Google Meets	11
3	Google Classroom & Powerschool	10
4	Class Dojo, Google Suite, Jamboard, Microsoft Teams, Office 365, Zoom	2
5 (least common)	Bright Thinker, Discovery Education, Edgenuity, Envision, Eureka, GoGuardian, Google, Google Hangouts, IXL, Kuta Software, Managebac, Math-aids, Nearpod, Open Access, Seesaw, Youtube	1

Finding 7: As many schools have turned to online or distance learning, educators are struggling to ensure students are engaged as they adapt to new methods of course delivery.

Thematic Analysis



Is the work comparable to that of previous years?

17% of Educators Answered **YES**

62% of Educators Answered **NO**

14% of Educators Answered **YES & NO**

7% of Educators **did not respond**

"Yes they are covering Next Gen standards but using household products"
- 5th Grade Teacher

"Yes, except for labs, because we can only do virtual labs or assign labs that could be done with kitchen equipment. And we have to give choices for labs in case some supplies aren't available for some students. The most difficult challenge is finding kitchen labs and ensuring equity by providing choice…"
- **High School Biology Teacher**

Challenges Educators & Students are Facing

“Without students using their cameras, I do not know if they are actually listening or taking notes.”
- Middle School Math Teacher

“I have a lot less instructional time, some of my students won't turn on their microphones and most won't turn on their cameras, decreased student participation and motivation.”
- High School Math & Science Teacher

“Students cannot physically manipulate materials such as protractors, blocks, 3d shapes, algebra tiles, etc”
- Middle School Math Teacher

“Screen exhaustion, overwhelmed/confused, limited platforms to ask for help, kinesthetic learners have nothing right now.”
- High School Science Teacher

Successes with Distance Learning

“Students are becoming more independent learners. They are taking more responsibility for their learning. Students are learning time management and organizational skills that they didn't need before.”
- High School Biology Teacher

“It's been easier to tie into a thematic lessons/cross curricular lessons. It's been easier to fit the lessons in because the kits we were using in person take way too much time to prepare and deliver.”
- 2nd Grade Teacher

“I am succeeding with making my teaching more student centered than ever and keeping better track of student data and more organized in my grading.”
- High School Math & Science Teacher

Recommendations

Recommendation #1: The Public Education Department (PED) & Northern New Mexico STEAM Coalition should apply the STEAM Education assessment framework across all schools within the northern counties

Recommendation #2: The Northern New Mexico STEAM Coalition, experts in STEAM Fields, K-12 educators, and students should work together to develop ways to provide students with innovative lessons in STEAM education.

Recommendation #3: The Northern New Mexico STEAM Coalition should continue to run the Distance Learning Survey we developed with improvements.

Recommendations

Recommendation #4: The Northern New Mexico STEAM Coalition should sponsor another team from WPI to conduct research similar to what we have accomplished with the Higher Education Department (HED) STEM education data.

Recommendation #5: The Northern New Mexico STEAM Coalition should sponsor another team from WPI to study informal education's impact on students' interest in STEAM in northern New Mexico and initiate the survey our team created.

Acknowledgements

- Our sponsor **Jennifer Case Nevarez** of the Community Learning Network for her enthusiasm in the improvement in STEAM education and sponsoring our project.
- Our faculty advisor **Seth Tuler** for his constant guidance and support throughout the entire semester.
- **John DiRuggiero** of the Community Learning Network for providing us with the skills to create maps on ArcGIS.
- **Kathy Chen** and **Donna Taylor** of the WPI STEM Education Center for their support in the development of our STEAM Education assessment framework.
- The **educators of northern New Mexico**, who provided our team with invaluable responses to our distance learning survey.
- **Worcester Polytechnic Institute** for continuing to provide students with the opportunity to make a difference abroad despite the challenges of the COVID-19 pandemic.

Want to see more about our project? Visit
https://sites.google.com/view/steam-education-in-nnm


Thank you!
Any Questions?