Research Opportunities for Science Educators (ROSE)

Organizers

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Annual report for 2023 **Date: November 9, 2024**

Mission

The ROSE Program energizes and enhances science teaching in New Mexico by leveraging the research resources of the University of New Mexico (UNM) and the educational resources of the State of New Mexico Public Education Department (PED). The central activity is an authentic research experience in which teachers (ROSE Scholars) join ongoing projects for first-hand participation in discovery-based research. The embedded Scholars see firsthand "how science is done" and the interdependence of various disciplines and subfields while working with faculty and student researchers. Scholars are selected based on the underrepresented minority (URM) and economically challenged student populations of their schools and their own scientific interests and background. They return to their classrooms bringing new ideas, tools and enthusiasm to share with students. From this core experience, ROSE will assist Scholars statewide in building a community to share experiences and educational resources.

ROSE will

-improve the quality of science education in NM schools by refreshing knowledge and inspiring confidence in middle and high school teachers

-forge connections between UNM and schools by acquainting teachers with university resources and educating UNM faculty on issues facing the schools

-incorporate K-12 and higher education faculty into a collaborating community of STEM educators statewide.

ROSE Annual Report for 2023

Executive Summary

ROSE continues to provide high-quality research experiences to teachers from across New Mexico, improving their scientific knowledge and confidence while helping to build ties across the STEM education community.

The third summer of the ROSE program attracted over 50 applicants and brought 22 of these to UNM as Scholars (slight increase from 20 in summer 2022). Most (70%) of the Scholars teach at schools with over 70% minority enrollment, and most (>70%) teach at schools with over 90% economically challenged students; 80% of the Scholars teach at schools outside the Albuquerque metropolitan area. These Scholars worked with 15 faculty mentors- 6 from Chemistry and Chemical Biology (CCB), 4 from Biology and Earth Sciences, 4 from Chemical and Biological Engineering (CBE) and 1 from the College of Pharmacy. This mentor pool is slightly larger than in 2022 (12 mentors) and includes 6 first-time mentors from outside of CCB and 7 women.

The summer research session ran four weeks from Monday June 5 to Friday June 30. 2023; roughly 2/3 of the Scholars stayed in the UNM dormitories, moving in on June 4. Projects ranged from the computational (protein simulations, genetic diversity, Valles Caldera structure) to purely laboratory (anti-microbial properties of oligomers, catalyst testing, synthesis of iron complexes for photo-reactions) to organismal work (uranium uptake by wild min, rainbow trout development, Sevilleta fieldwork). As in 2022, Scholars presented their results to each other as posters which could be taken back to their classrooms for the academic year; in addition, tours were organized to allow Scholars to visit other labs and hear from other mentors about the longer-term research goals. Scholars also participated in panel discussions with UNM faculty and staff on college application and preparation and attended a workshop on molecular visualization software they can use for teaching.

Contact with Scholars continued during the academic year to variable degrees. A few classroom visits were arranged, and two virtual meetings of Scholars. In the follow-up survey in October 2023, all Scholars responded that ROSE had changed the way they teach, with new classroom activities and approaches and increased self-efficacy regarding teaching science concepts (67%) and practices (89%). One wrote “Participation in the ROSE program has significantly impacted my motivation as a science teacher. Thank you!”

ROSE organizers continued to pursue a stable funding model with the state of NM, requesting expansion funds from RPSP and presenting to the LESC in May; however, no additional funds were obtained. A proposal to formalize ROSE as a UNM program was submitted to the OVPR in August.

Priorities for the coming year include establishing a stable, ongoing funding model, improving Scholar recruiting and preparation procedures, expanding the pool of faculty mentors developing longer-term methods to evaluate program impact on teachers.

I. Background

ROSE began as pilot project in 2021 to provide statewide outreach to public schools and their science classes by embedding teachers into authentic research projects at UNM. With support from NM PED, eight science teachers from across New Mexico came to join ongoing research projects in UNM's department of Chemistry and Chemical Biology (CCB) for 4 weeks in summer. The number of applicants (40) and teacher responses (overwhelmingly positive) encouraged the UNM and PED to continue and expand the program.

In 2022, the program secured increased funding from the Math and Science Bureau of PED and from the HED RPSP program (categorical funds for Teacher Pipeline) which permitted an expansion to 20 teachers (Scholars), most of whom were housed in UNM dorms for the 5-week summer session. Thanks to an earlier start for publicity and construction of a ROSE website, the number of applicants increased to over 60. Faculty from departments outside CCB, Chemical and Biological Engineering, were recruited to mentor the Scholars. A more quantitative survey approach was used for assessment, and both Scholars and faculty mentors had very positive responses, the former group indicating that the ROSE experience was changing how they taught science during the school year.

The program continues to evolve in response to feedback from Scholars and other stakeholders, hoping to significantly benefit improve the STEM education ecosystem by improving the skills, confidence and enthusiasm of science teachers across New Mexico.

II. Publicity and website

The website (https://UNMROSE.unm.edu) served as the principal outward 'face' of the ROSE program through the recruitment period and the summer research session. Photos and PI research descriptions were updated as new items became available, and lists of Scholars were posted for 2021, 2022 and 2023. News stories ran on the departmental website before the summer research session and on the UNM news site after the summer session.

Advertising for the 2023 session began earlier than the previous year but used the same online mechanisms. A preliminary advertisement (informational, but no online application available) ran in PED's STEM Connect newsletter in October of 2022. The first advertisements containing the online application link ran on the NMSTA website in early February and in the February 20 issue of STEM Connect (text for all ads can be found in Appendix A). Also in early February, emails were sent to the 2021 and 2022 Scholars and to superintendents of all NM school districts (including charters).

Both the NMSTA website and STEM Connect newsletter are 'opt-in' channels which teachers must sign up for; we have not found a comprehensive email list for science teachers in NM. However, changes to the ad wording and earlier publicity resulted in fewer elementary teachers applying and fewer teachers declining Scholar acceptances due to prior commitments (relative to 2022). Geographic distribution of Scholars appears biased towards northern NM; it is not clear if this is related to publicity or to other factors. Brian Baca, a member of the LESC

and also an associate district superintendent from Valencia county, suggested that regional administrative centers might a good avenue for promoting ROSE to rural districts.

III. Scholar Recruitment and Selection

As noted above, online advertising and recruitment began in Fall 2022 and included direct emails, online advertising via PED STEM Connect and the NMSTA website and the ROSE website.

Managing the online application moved from PED to UNM. The application itself was slightly modified, and continued to request information on teacher preparation and experience. The application went 'live' on February 1, 2023, with a best consideration date of March 17 (end of the UNM Spring Break). Online advertising continued during this period.

We received 52 completed applications by the best consideration date (Appendix C). The organizing committee evaluated applicants based upon student demographics at their schools, geographic distribution, professional preparation, the ability of PIs to accommodate returning Scholars and short-answer questions about motivations. Demographic data obtained from the PED dashboard included percentages of Hispanic and Native American student populations, English language learners and economically challenged students. Professional preparation data included self-reported academic degrees, years taught and subjects currently/recently taught.

Emails were sent March 27 to the first round of 20 accepted Scholars asking for a response by April 7; responses were overwhelmingly (90%) positive. A second round of 5 acceptances was sent out on April 7, who were asked to respond by April 14.

The accepted cohort of 23 teachers (Appendix D) represented schools from across the state, including Raton, Tierra Amarilla, Cuba, Shiprock, Rio Rancho, Lovington, Laguna Pueblo, Gallup, Albuquerque, Penasco, Pecos, Ruidoso. Las Cruces, Crownpoint, Bernalillo, Santa Fe and Aztec. Seven of the schools have a majority of Indigenous students, thirteen have a majority of Hispanic students and seventeen have a majority of economically disadvantaged students. Seven of these teachers were returning as ROSE Scholars for a second or third session.

IV. Summer Research and Cohort Activities

Accepted Scholars were matched with 15 UNM faculty mentors (Appendix E), who were encouraged to contact their mentees in May by email. (22 Scholars participated- one accepted Scholar withdrew in late May due to medical issues). Faculty mentors came principally from the College of Arts and Sciences (6 from Chemistry and Chemical Biology (CCB), 3 from Biology (Biol) and one from Earth and Planetary Sciences (E&PS)), although 4 faculty from Chemical and Biological Engineering (CBE) and one from the College of Pharmacy (CoP) participated. This mentor pool is slightly larger than in 2022 (12 mentors) and includes 6 first-time mentors from outside of CCB and 7 women.

The summer research session ran for 4 weeks from June 5 to June 30, one week less than in 2021. Out-of-town Scholars moved into the dormitory (de Vargas Hall) on the UNM campus on Sunday June 4. The first day (June 5) included program orientation, safety training and a

welcome reception in the SUB; new Scholars also met their mentors in person. Beginning June 6, Scholars joined ongoing research projects which were their principal occupation for the duration of the session. Research projects ranged from the computational sciences (protein modeling, geophysics, evolutionary theory) to laboratory synthesis to work with organisms. Specific projects and Scholar/mentor pairings are given in Appendix E.

To encourage interactions among the Scholars and to broaden their exposure to UNM faculty and activities, Scholars were asked to attend a series of activities. These cohort activities included weekly coffee breaks (Tuesdays) and lunches (Fridays) to promote social interactions and informal exchanges of knowledge. A more formal activity was scheduled each Friday afternoon:

a) a panel discussion with UNM staff who work with new student enrollment, student support and financial aid;

b) a software tutorial given by students from Prof. He's research group, showing the Scholars how to display complex molecules like proteins on laptop computers with the Chimera molecular visualization program;

c) tours of faculty research labs and facilities to allow Scholars to see and hear about research outside of their own projects.

The summer session concluded Friday, June 30, with poster presentations by the Scholars on their summer research (poster titles in Appendix E). Posters were displayed in the atrium of the UNM Science and Math Learning Center; Scholars were encouraged to take keep the posters afterwards for display in or near their classrooms. The session included a catered lunch and closing comments by the UNM organizers and by PED Deputy Secretary Amanda DeBell, and was attended by ~60 UNM students and faculty in addition to the Scholars and organizers.

V. Ongoing connections with Scholars

Following the research session, we attempted to maintain communications with the Scholars (2021, 2022 and 2023 cohorts) through periodic emails, Zoom meetings and class visits. Emails were sent regularly in the Fall semester, and less frequently in the Spring as ROSE shifted emphasis toward the 2024 summer research session. The emails typically centered on ROSE-related activities, but also mentioned other meetings and activities of organizations like the NMSTA and American Chemical Society. Readership as measured by opening the emails was high (>80%), but responses were much lower (~10%). Scholars were encouraged to arrange class Zoom visits by UNM faculty and students.

VI. Funding

The 2023 research session was supported by non-recurring PED and UNM funds and by in-kind organizational support from UNM. NM PED paid the 4-week stipends of 16 Scholars directly, $4,800 each for a total of $76,800. The additional 7 stipends and all on campus costs,

including housing, and graduate student stipends, were paid using HED RPSP and internal UNM funds.

ROSE continues to pursue Research and Public Service Program (RPSP) funding from the UNM HED. For FY23, ROSE received $100K through RPSP categorical funds for teacher pipeline activities. UNM approved and requested expansion funds for FY24 ($218K in addition to the $100K in categorical funds for a total of $318K requested), but this was not approved by the legislature (RPSP FY25 application form and presentation slides included here in Appendix F. Another expansion request will be submitted in 2024 for FY26.

At the invitation of Legislative Education Study Committee (LESC) Director Gwen Warniment, ROSE testified to that committee on May 15, 2023, at Bernalillo High School. Jeff Rack, Steve Cabaniss and Scholars Daniel Delgado (Cuba) and Margaret Romero (Arrowhead, Las Cruces) spoke to the committee about the purpose of ROSE and its activities to date (slides in Appendix F). Response by committee members was positive ("Glad to see you are doing good things for our teachers …") but non-committal. In subsequent conversations, individual members recommended working with PED (Sen. Harold Pope) and with regional administrative offices (Rep. Baca). In a follow-up meeting in July, Rack and Cabaniss met with Director Warniment and legislative staffers Sonny Liu and Connor Jorgensen to discuss budget possibilities. The staff felt that increased RPSP funding was unlikely and suggested working directly with districts.

VII. Organization

ROSE began in 2021 with an ad hoc group of CCB faculty (Rack, Cabaniss, Atlas) and no formal organization structure of recurring budget. After three successful summer research sessions, teacher participation expanded from 8 to 22 Scholars from across New Mexico and faculty participation expanded to 5 departments from 3 colleges. To ensure proper accountability at the university level, the organizing committee decided to make a formal proposal to establish operating parameters, including reporting line, dedicated spending account(s), and organizational structure.

A program proposal, "ROSE: Research Opportunities for Science Educators. Goals, Organization and Plan for Growth" was submitted to VPR Fisher on August 14 (see Appendix G for the full text). The proposal included a new Mission Statement, a theory of change, a brief historical introduction and a summary of operations. It proposed an organization structure based on a faculty executive committee, a program administrator and a director reporting to the OVPR. The proposal notes that for continued operation and growth, "Going forward, ROSE needs a core funding mechanism that will meet regular annual needs and provide for both year-to-year variation and planned growth. At present, two plausible mechanisms are HED RPSP and 'below the line' inclusion in the PED budget."

ROSE organizers subsequently discussed the proposal with the VPR, who indicated she would seek approval for this plan from Academic Affairs.

VIII. Assessment Process and outcomes

Program assessment consisted of a series of Scholar surveys during and after the summer session (summary report is attached as Appendix H). Results were summarized as:

1. The ROSE fellows overwhelmingly had positive things to say about their experiences with ROSE and with their lab groups. They would come back again.
2. For the majority of ROSE fellows, this was their first research lab experience
3. The average ROSE fellow has a level III teaching license, has 13 years of experience teaching STEM, and has a degree in Education.
4. This experience has impacted their ability to address the practices of science and engineering standards, the activities in their classroom and the amount of open ended inquiry with their students.

Surveys were written, conducted and summarized by Prof. Carolyn Hushman, Professor of Educational Psychology and Associate Dean for Research in the College of Education and Human Sciences. Scholars were asked to complete 4 surveys in Qualtrics- a welcome survey at the start of the summer session (100% completion), a mid-point survey rwo weeks later (95% completion), an endpoint survey in July (75% completion) and a final survey in October (45% completion).

Classroom teaching impact of the ROSE experience is significant. Scholars teach over 100 students a year, on average (3,478 total students were taught by this year's ROSE scholars). All of the Scholars responding in October reported that they changed the way they teach due to their ROSE experience, including new examples, new activities and the use of open-ended inquiry. Most teachers reported an increase in self-efficacy regarding teaching science concepts (67%) and practices (89%). One Scholar wrote "It is a good experience for us to see the inner works of research. For us teachers, we are mainly confined to work in the classroom focused on … prescribed standards to follow. In research or scientific investigations, it is nice to know that it is fine if you do not get your expected results. Exploring other aspects of the study as new things unfold is interesting. Dwelling on the unknown opens up endless possibilities and in teaching we don't dwell on unknowns."

The ROSE experience also changed how teachers see themselves. Survey responses showed 22% increase in agreement with the statement "I am part of the STEM workforce in New Mexico". Most (87%) teachers agreed or strongly agreed that ROSE left them more motivated to teach science. One Scholar wrote that "Participation in the ROSE program has significantly impacted my motivation as a science teacher. Thank you!"

Survey feedback on program logistics was helpful, and included information on recruiting, teacher motivation, and preparation for the summer. Teachers learn of the ROSE program from administrators, other teachers, and PED communications; they apply in order to improve their science knowledge and personally experience research. Most (75%) teachers felt they had enough information about logistics and stipends before the start of the summer program, but at the midpoint, 67% of teachers reported they were overwhelmed by the research

and equipment in their lab (this decreased to 43% at the end of the session). Some teachers specifically requested more advance information on stipends, housing and parking.

Finally, ROSE is changing how Scholars interact with their students. One Scholar wrote that “Its been soooooo long since I have been a student, that this had the greatest impact on my classroom by reminding me what it is like to be a student and not know what you are doing. Not be the one in control. I’m thinking about everything from my directions to how safe my classroom is too ask a question or for help, as well as my activities.” Another concluded that “I now have a better understanding of some of the opportunities for my students who wish to go this route. I think I also have a better 'selling' idea for those students who are not sure which path to take and why STEM is a good path.”

Acknowledgements- ROSE organizers gratefully acknowledge financial support from the New Mexico Public Education Department, the NM Higher Education Department and UNM..

Appendix A. ROSE program advertising

A1. Text for NM STEM Connect, October 2022

Middle and high school science teachers- are you interested in learning more about what scientists do and what tools and skills they use in their research? ROSE brings science teachers to UNM for five weeks in the summer to join ongoing research projects.

Following a pilot project in 2021, summer of 2022 saw a significant expansion of ROSE to include 20 Scholars from schools across New Mexico, including Zuni Pueblo, Crown Point, Cuba, Raton, Clovis, Ruidoso, Las Cruces and Deming. Their research was conducted on projects lead by faculty PIs from Chemistry and Chemical Biology, Biology, Chemical and Biological Engineering and Civil, Construction and Environmental Engineering.

The program is funded by PED and UNM, and provides a stipend, on-campus housing for teachers from outside Albuquerque, and opportunities to meet and work with UNM faculty, staff, and students. More information is available on the website:

https://UNMROSE.unm.edu

We anticipate the 2023 session will begin the first week of June and run for 5 weeks; exact dates for the summer and for application will be posted by the end of January, 2023. If you have questions, please email one of these Chemistry and Chemical Biology faculty helping to organize the program:

Steve Cabaniss (cabaniss@unm.edu)

Jeff Rack (jrack@unm.edu)

Sherman Garver (wgarver@unm.edu)

A2. Text for NM STEM Connect sent Jan. 30, 2023

Research Opportunities for Science Educators (ROSE 2023)

Are you interested in performing cutting-edge research in state-of-the-art facilities? Would you like to learn the latest in the development of chemical theories? Would you like to know more about research opportunities at the University of New Mexico? UNM has partnered with the NM PED to create a program designed to bring science teachers to UNM for an intense four-week program working in an existing research group (Monday, June 5 to Friday, June 30). Participants of the program will receive a stipend of $1200.00 per week for five weeks. Housing will be provided on-campus for those that do not have local housing and all participants will receive a UNM parking pass. Applying is easy! We only need your name, your school, email address, and short answers to a few simple questions. [Apply here] To learn more about the individual research opportunities, please see the list of abstracts at our website (https://unmrose.unm.edu). This opportunity will allow you to participate in an active research project that seeks to answer important discipline-specific scientific questions. Prior experience in research is not a requirement to participate in this program. We have expanded the number of participating faculty from last year, and previous applicants and ROSE Scholars from are invited

to apply in 2023. We look forward to receiving your application. Please direct questions to unmrose@unm.edu. Full consideration will be given to applications received by March 17, 2023. We will begin to notify accepted scholars by March 31, 2023.

A3. Announcement for the NMSTA website sent Feb. 2, 2023

Research Opportunities for Science Educators (ROSE 2023)

Are you interested in performing cutting-edge research in state-of-the-art facilities? Would you like to learn the latest in the development of chemical theories? Would you like to know more about research opportunities at the University of New Mexico? UNM has partnered with the NM PED to create a program designed to bring science teachers to UNM for an intensive four-week program working in an existing research group (Monday, June 5 to Friday, June 30). Participants will receive a stipend of $1200.00 per week for four weeks. Housing will be provided on-campus for those that do not have local housing and all participants will receive a UNM parking pass.

Applying is easy! Our online application asks for your name, school, email address, and short answers to a few simple questions at https://www.surveymonkey.com/r/unmrose23

To learn more about the individual research opportunities, please see the list of abstracts at our website (https://unmrose.unm.edu). This opportunity will allow you to participate in an active research project that seeks to answer important discipline-specific scientific questions. Prior experience in research is not a requirement to participate in this program. We have expanded the number of participating faculty from last year, and previous applicants and ROSE Scholars are invited to apply in 2023. We look forward to receiving your application. Please direct questions to unmrose@unm.edu. Full consideration will be given to applications received by March 17, 2023. We will begin to notify accepted scholars by March 31, 2023.

A4. Emails sent to New Mexico school district superintendents Feb. 5, 2023

Dear Colleagues in education,

I am writing as part of a UNM faculty team (Profs. Jeff Rack, Susan Atlas, and Sherman Garver, all from Chemistry, and Cari Hushman, Associate Dean of Education and Human Sciences) to let you know about a summer research program for science teachers sponsored by the university and by NM PED.

ROSE (Research Opportunities for Science Educators) is intended to provide an intensive, on-campus research experience for chemistry and other science teachers. Information about the program and online application procedures (best consideration date March 17, 2023) can be found in the attached document and at our website:

https://unmrose.unm.edu/

The program has been announced by NMSTA and in the PED's STEM Connect bulletin, but one of our goals is to recruit teachers from smaller districts across the state and we are hoping that REC directors might be able to help reach this group.

Please pass this information on to middle and high school science teachers who might benefit from a 'hands-on' research experience. We are particularly interested in reaching newer and less experienced teachers who may not be 'plugged in' to professional development networks (although they should have taught for at least one year, and two or three would be preferable).

ROSE emphasizes outreach to schools with high URM enrollment and geographic diversity across the state. In summer 2022 we hosted 20 teachers from across New Mexico, ¾ of whom taught outside the Albuquerque metro area. ROSE does not require previous research experience and provides a weekly stipend and on-campus housing.

We are excited about bringing teachers into a research environment where they can experience 'what scientists do'. We appreciate your help in reaching out to teachers who can benefit from this program.

A5. Emails sent to Scholars from previous years on Feb 2, 2023

Greetings from UNM! I hope your Spring terms are off to a good start.

The ROSE application form is now online at https://www.surveymonkey.com/r/unmrose23

The form is similar to but slightly shorter than last year's, with a best consideration date of Friday March 17. Please spread the word among your friends and colleagues- we are hoping to add 5-10 new PIs to the program.

Appendix B. ROSE 2023 Timeline

Date	Activity
October, 2022	STEM Connect announcement of ROSE 2023
Feb 1-5	ROSE 2023 application goes online, advertisements run in STEM Connect, NMSTA, emails to superintendents
March 17	Best consideration date for applications
March 29	Sent PI Recruitment emails
March 27	First round of acceptances to applicants (response by April 7)
April 7	Second round of acceptances to applicants (response by April 14)
April 28	Scholars matched with PI mentors

Summer Research Session

Sunday, June 4	Scholars Residence Hall Move-In
Monday, June 5	Scholar Orientation, meeting w/PI, Welcome reception in SUB
Tuesday, June 6	Coffee Break
Friday, June 9	Lunch, UNM Panel discussion w/ D Garcia, J Villar
Tuesday, June 13	Coffee Break
Friday, June 16	Lunch, Molecular Visualization w/Chimera (tutorial)
Tuesday, June 20	Coffee Break
Friday, June 23	Lunch, tours of PI labs
Tuesday, June27	Coffee Break
Friday, June 30	Lunch, Poster presentations, Closing ceremony in SMLC

Appendix D. Summer 2023- 23 Accepted ROSE Scholars with School Demographics

ROSE Scholar	School	Location	Enroll	%Hisp	%Indig	%Black	%Asian	%Cauc	%Economic Challenged	% English learners
Amador, Janelle	BernCo Juvenile Det Center	Albuquerque	Data not available from PED dashboard							
Arenga, Tyza Faith P.	Raton HS	Raton	397	66	2	1	1	31	99	3
Casados, Carlos	Escalante MS/HS	Tierra Amarilla	155	82	3	2	2	14	93	14
Delgado, Daniel	Cuba Intendent Schools	Cuba	362	32	61	2	2	5	98	37
Denetclaw, Utahna	Tse Bit Ai MS	Shiprock	513	1	96	1	1	1	99	34
Felis, Ramsey Baltazar	Career Prep HS	Shiprock	203	3	94	2	2	2	98	24
Felty, Leah	V Sue Cleveland HS	Rio Rancho	2470	55	5	3	2	31	30	2
Hobbs, Violet	Lovington HS	Lovington	643	70	1	2	1	28	50	11
Maranan, Alexis	Laguna MS	Laguna	54	6	89	5	5	5	95	20
Martinez, Chrysler	Chief Manuelito MS	Gallup	602	13	82	1	1	3	99	26
Pavolko, Scott	Highland HS	Albuquerque	1151	68	7	9	3	9	99	33
Pena, Anelisia	Penasco MS/HS	Penasco	165	83	12	3	3	5	96	5
Phillippe, Venetia	Pecos MS	Pecos	160	93	2	2	2	6	98	9
Ramachandran, Vandhana	Ruidoso HS	Ruidoso	581	50	17	1	1	31	60	10
Romero, Maggie	Arrowhead Early College HS	Las Cruces	239	68	2	4	4	23	2	3
Roscoe, Rhonda	Eldorado HS	Albuquerque	1761	41	4	1	5	44	26	5
Tanedo, Petervon	Crownpoint HS	Crownpoint	282	2	98	2	2	2	98	36
Tangalin, Erley	Bernalillo HS	Bernalillo	833	51	42	1	1	7	99	20
Tembrevilla, Maan	Chief Manuelito MS	Gallup	602	13	82	1	1	3	99	26
Vigil, Adrienne	Santa Fe HS	Santa Fe	1594	75	3	1	2	18	52	13
White, Jennifer	Alma d'Arte Charter HS	Las Cruces	161	52	2	4	2	42	91	8
Workman, Aubri	Vista Nueva HS	Aztec	70	40	5	5	5	56	95	5
accepted, not attending due to health issues										
Valente, Aurelia	Santa Fe HS	Santa Fe	1594	75	3	1	2	18	52	13

ROSE Scholar	PI Host	Unit	Project Title (poster)
Amador, Janelle	Chi, Eva	CBE	How does oligo-phenylene ethynylene+ (OPE+) kill microbes
Arenga, Tyza Faith	Chi, Eva	CBE	How does oligo-phenylene ethynylene+ (OPE+) kill microbes
Casados, Carlos	Garver, Sherman	CCB	Natural History and Biochemical Genetics of Niemann-Pick C1 Disease in New Mexico
Delgado, Daniel	Atlas, Susan	CCB	Classical Molecular Dynamics Simulations of SARS-CoV-2 Spike Glycoprotein Variants
Denetclaw, Utahna	Whitten, David	CBE	Oligomers as antimicrobial Compounds
Felis, Ramsey Baltazar	Gulisija, Davorka	Biol	The effects of self-fertilization on the levels of genetic diversity in temporally changing environments
Felty, Leah	Chen, Dongchang	CCB	Probing the Universal Rules for Fast Li Ion Storage
Hobbs, Violet	Datye, Abhaya	CBE	Ionic Ni Surface Coating for Coke-Free Dry Reforming of Methane (DRM)
Maranan, Alexis	El-Hayek, Eliane	CoP	The bioaccumulation and toxicity of plastic waste and uranium in wild mint
Martinez, Chrysler	Salinas, Irene	Biol	Histology Of The Developing Rainbow Trout Nasal Cavity
Pavolko, Scott	El-Hayek, Eliane	CoP	The bioaccumulation and toxicity of plastic waste and uranium in wild mint
Pena, Anelisia	Garver, Sherman	CCB	Natural History and Biochemical Genetics of Niemann-Pick C1 Disease in New Mexico
Phillippe, Venetia	Rudgers, Jennifer	Biol	Sevilleta Long-Term Ecological Research
Ramachandran, Vandhana	Worthington, Lindsay	E&PS	Shallow Earth Structure in Valles Caldera: A case Study from Sulphur Springs
Romero, Maggie	Rack, Jeff	CCB	Iron Polypyridyl Complex for Solar Driven Reactions
Roscoe, Rhonda	Walker, Mark	CCB	Antibiotic Resistance Research
Tanedo, Petervon	He, Yi	CCB	AFDesign in Predicting the Structure of a Molecule Inhibitor of PICK1-PDZ
Tangalin, Erley	Chen, Dongchang	CCB	Reviving LiMnO2 cathode for lithium–ion batteries
Tembrevilla, Maan	Noureddine, Achraf	CBE	Effect of Nanoparticle Surface Topography on Red Blood Cell
Tyza Faith P. Arenga	Chi, Eva	CBE	How does oligo-phenylene ethynylene+ (OPE+) kill microbes
Vigil, Adrienne	Walker, Mark	CCB	Natural Products from Biosynthetic Pathways
White, Jennifer	He, Yi	CCB	Chimera in High School Biology
Workman, Aubri	Datye, Abhaya	CBE	Synthesis and Characterization of Copper Single Atom Catalysts for Ethanol Reformation

Appendix F. RPSP application and slide presentations

The RPSP application spreadsheet and presentation slides for the FY25 RPSP program and the LESC presentation are attached as separate files:

Slides from the May 15 presentation to the Legislative Education Studies Committee:

ROSE slides for LESC May 23.pdf

Appendix G. ROSE organization (submitted to VPR Fisher on August 14, 2023)

ROSE: Research Opportunities for Science Educators

Goals, Organization and Plan for Growth

Mission

The ROSE Program energizes and enhances science teaching in New Mexico by leveraging the research resources of the University of New Mexico (UNM) and the educational resources of the State of New Mexico Public Education Department (PED). The central activity is an authentic research experience in which teachers (ROSE Scholars) join ongoing projects for first-hand participation in discovery-based research. The embedded Scholars see firsthand "how science is done" and the interdependence of various disciplines and subfields while working with faculty and student researchers. Scholars are selected based on the underrepresented minority (URM) and economically challenged student populations of their schools and their own scientific interests and background. They return to their classrooms bringing new ideas, tools and enthusiasm to share with students. From this core experience, ROSE will assist Scholars statewide in building a community to share experiences and educational resources.

ROSE will

-improve the quality of science education in NM schools by refreshing knowledge and inspiring confidence in middle and high school teachers

-forge connections between UNM and schools by acquainting teachers with university resources and educating UNM faculty on issues facing the schools

-incorporate K-12 and higher education faculty into a collaborating community of STEM educators statewide.

A. Theory Of Change

New Mexico typically ranks in the bottom decile of US states in quantitative educational outcomes like graduation rates and standardized test scores. In spite of the presence of three national laboratories and a high percentage of STEM Ph.D. recipients in the state, New Mexico recently ranked in the bottom quartile of all states for eighth grade science proficiency. In 2019 the NM PED considered only 1/3 of high school juniors to be proficient in science. Low achievement problems both overall and in STEM are particularly severe for URM and economically challenged students, as detailed in the Yazzie-Martinez decision. One factor in low student achievement is the high turnover rate for teachers, as teachers are the number one in-school influence on student achievement (Tao, Meng, Gao, & Yang, 2022).

New Mexico has persistently had the second highest teacher turnover rate in the country, estimated to be 23% (LEAP, 2021). High levels of teacher turnover negatively impacts student achievement, especially in rural, high-poverty districts and/or hard-to-fill STEM classes. Impact occurs through many mechanisms such as loss of institutional knowledge critical for supporting learning, decreased collegiality/trust among faculty, and changes in teacher quality related to experience (Amital & Van Houtte, 2022). Beyond the negative impact on students, teacher churn

costs the state over $6 million annually to recruit, train and support large numbers of new teachers and to staff empty classrooms with long-term substitute teachers. One of the top three reasons teachers cite for leaving the classroom is a lack of opportunity for meaningful professional growth and support (Carver-Thomas & Darling-Hammond, 2017).

The University of New Mexico is a high-research activity (R1) university with over 800 sponsored research projects. On the central campus, over 200 faculty and 1000 graduate students are engaged in STEM research ranging from fundamental quantum mechanics and particle physics to applications-oriented engineering and field ecology projects. The state of New Mexico has vested social and economic interests in using the research capabilities of UNM to improve STEM education statewide by providing authentic research experiences for STEM teachers. Working directly with science teachers, UNM can leverage the research resources of our R1 university to ensure all NM science teachers have access to a unique professional development experience which supports growth in content knowledge, inspires wonder and curiosity, and enhances their students' classroom experiences.

B. Program history 2021-2023

ROSE began in Spring 2021 following Prof. Jeff Rack's participation on an NSF review panel. New Mexico has an unusually high percentage of URM and economically challenged residents, and this is reflected in our student body. Nonetheless, Rack observed that relative to other flagship universities, UNM lacks large-scale transformational STEM outreach programs directed toward these groups at the PreK-14 level, instead employing a piecemeal approach which has varied over time. The formation of ROSE at UNM is a direct response to this observation.

The initial group of ROSE organizers (Profs. Rack, Cabaniss and Atlas) began conversations about a research experience for teachers (RET) type of program at UNM in Spring 2021. While seeking logistical support and endorsement from NM PED, they were offered partial funding for a pilot session using FY21 year-end funds. Several UNM units also offered financial or in-kind support (OVPR, Academic Affairs, CA&S, Dept. CCB) and a pilot program ran in June 2021for 4 weeks with 8 Scholars. Over 40 teachers had applied, and in spite of the pandemic the Scholar responses in a series of interviews were overwhelmingly positive, leading to a decision to repeat and expand the program in 2022.

The second round of the ROSE research session ran for 5 weeks in June-July 2022, and had ~60 applicants, 20 of whom participated as Scholars (all funded directly by PED). The faculty mentor pool expanded to include one biology and 4 SoE (School of Engineering) professors in addition to a core of 7 chemistry faculty. The inclusion of a software tutorial workshop as a cohort activity received enthusiastic reviews from the Scholars. Expanding the number of Scholars required that the assessment mechanism change from individual interviews to online surveys, and Prof. Cari Hushman from the department of Educational Psychology (in the College of Education and Human Sciences, CoEHS) joined the organizing group as the assessment specialist. Prof. Sherman Garver of CCB also joined the organizing team (now 5 people) after serving as a faculty mentor.

The 2023 version of ROSE benefitted from a $100,000 HED RPSP award which covered all on-campus expenses, but the PED contribution decreased from ~$120,000 (20 five week stipends) to ~$80,000 (13 five-week or 16 4-week stipends). The applicant pool shrank slightly,

which reflected an increased number of middle and high school (MS and HS) teachers and far fewer elementary teachers, but the number of well-qualified applicants increased from ~30 to ~40. The faculty PI group expanded to include more A&S faculty outside of CCB (3 Biology, 1 E&PS), 4 SoE faculty and one CoP faculty member. The summer session included 22 Scholars, 19 from outside of APS and many from rural schools in the northern tier of the state but only 3 from schools south of Socorro. Program assessment from summer 2023 is in progress (final survey in October 2023), but preliminary indications indicate a positive response by Scholars.

Going forward, principal challenges to the growth of the program are:

1. Acquiring ongoing core funding to cover administrative and Scholar costs;
2. Growing the pool of faculty mentors;
3. Recruiting more Scholars from southern and eastern NM

C. Timing and scope of operations

ROSE operates year-round; activities are centered around the on-campus research session during summer, but school and Scholar interactions, planning, assessment and reporting continue throughout the year.

A plausible annual calendar for the research activities:

Spring- prepare for summer by recruiting and selecting Scholars and PIs; Matching Scholars with PIs; planning specific Scholar activities during the session.

Summer- Scholars on campus for research session; Scholar and PI surveys.

Fall- from preceding summer- completion of research assessment surveys, writing assessment report, writing annual report; for following summer- confirming funding, setting session dates and reserving space in dormitories and meeting rooms.

Year-round activities include:

Online AY meetings to network with Scholars (3-6 times per year)

Monthly emails/newsletters to Scholars

Campus visits (remote and face-to-face, both directions)

Maintaining online resources- website, archives, repository for shared curricular resources

Program publicity/communications- meetings of NMSTA, PED groups, etc.

D. Partner organizations

Office of the VP for Research (OVPR)- has funded graduate student mentors; longer term interactions should emphasize increasing and stabilizing broader impact of funded research.

Academic Affairs (AA)- has funded on-campus housing; longer-term interactions should emphasize helping STEM-positive students transition to UNM, select majors and participate in undergraduate research.

Enrollment Management has particular interest in improved ties with high schools, school visits and in Scholars learning about the application, financial aid and student resources at UNM.

The College of Arts and Sciences and the School of Engineering are expected to provide most of the PI mentors for ROSE, and also most of the contacts with federal funding agencies and professional societies.

The College of Education and Human Sciences (CoEHS) could potentially provide some PI mentors and links to particular school systems, and is currently providing expertise in educational needs and processes, assessment and teacher development. Interactions with the Noyes teacher preparation program are also anticipated.

The College of Pharmacy has contributed one PI mentor so far, but could be a significant source of additional faculty mentors.

STEM-H Center emphasizes school science projects and 'extra-curricular' science, and has worked with Scholars interested in directing student research projects.

Off campus partners-

NM PED is the principal off-campus partner, and has provided most of the funding to date for Scholar stipends as well as organizational support (application process, payments) and contacts with teachers and other organizations.

New Mexico Science Teachers Association (NMSTA) is a volunteer organization for science teachers affiliated with PED; they provided Scholar honoraria in 2022 and are providing contacts and publicity state-wide.

Legislative Education Studies Committee (LESC)- has been a source of contacts and may contribute to structuring a funding bill through PED. We expect that both PED and LESC may wish to contribute and participate in ongoing program assessment.

ROSE will explore the possibility of additional partnerships. Some of these are ongoing conversations without concrete results (yet): the Coalition for Public Education (CPE), Sandia National Laboratory, Los Alamos National Laboratory Foundation, AFOSR at Kirtland AFB, the Bureau of Indian Education (BIE), NM Tech and NMSU.

E. Organizational structure

Director- The director is entrusted with overall supervision of the ROSE program, both daily operations and long-term success. The director is appointed to a four-year, renewable term by the VP for Research in consultation with the ROSE executive committee. The director is responsible for program finances and administration (hires and supervises the program administrator), appointing executive committee members, obtaining and maintaining funding, and reporting annually on program status to the Office of the VP for Research and to Academic Affairs.

Administrator- The program administrator will be responsible for handling routine correspondence with applicants, Scholars, and faculty PI's; maintaining and updating the ROSE program website and the shared curricular materials repository; organizing ROSE events (including space reservations, printed materials and catering); handling program purchases and stipend payments and keeping financial records; other duties as assigned by the Director**.**

Executive committee- This committee will be composed of four (or more) faculty representing all of the Schools and Colleges participating in ROSE. Members will be appointed by the Director in consultation with the committee, and will serve renewable 3 year terms on a staggered schedule so that at least one member is being replaced or renewed each year. The committee advises the Director, approves selections of Scholars and PIs, represents the program

within their respective units, assists in recruiting Scholars and PIs, and assists as needed with ROSE events. Four committee members will have specific portfolios of responsibility:

Archivist/webmaster- plans and oversees website design and content; program records and databases including information on Scholars, PIs and their research projects; shared curricular materials repository.

Assessment- obtaining feedback from Scholars, PIs and partner organizations; overseeing annual assessment report process; contact person for periodic external assessments.

PI mentor recruitment and relations- Publicizing ROSE throughout STEM research units on campus; recruiting and training PI mentors; communications with PI mentors

Scholar recruitment and relations- advertising and publicity throughout NM school systems; Scholar recruiting and application process; Scholar networking.

F. Resources

ROSE has received financial support from various UNM units (Academic Affairs, OVPR, CA&S, CCB), from the RPSP program of NM HED and Scholar stipends from NM PED. In FY 2023, these latter two provided all program funds: a $100,000 RPSP allocation for faculty and graduate student housing, catering, incidental on-campus expenditures and 6 Scholar stipends and direct payment of 16 School stipends by NM PED (~$80,000). This 2023 total expenditure of ~$180,000 does not reflect fully the time and effort for staff administrative work (donated by CCB) and faculty work (from various departments, mostly CCB).

Core (state of NM): Going forward, ROSE needs a core funding mechanism that will meet regular annual needs and provide for both year-to-year variation and planned growth. At present, two plausible mechanisms are HED RPSP and "below the line" inclusion in the PED budget. The former would place core funding on a renewable annual basis; while track records for renewal of RPSP funds are generally quite good, alleged abuse of the RPSP process has raised questions in the legislature about its format and even its continued use. The PED mechanism would require special legislative action, but one which has precedent and could provide multi-year funding. We are simultaneously pursuing both RPSP and PED mechanisms.

Specific-purpose: ROSE will also pursue at least two additional funding mechanisms external to the state budget, federal RET awards and private donations. NSF provides RET supplements to existing grants for centers and individuals; ROSE will encourage directors of existing centers in SoE and CA&S to request ~3 supplements each for summer 2024 (we hope for ~5 total stipends through this mechanism for summer 2024, increasing to ~10 over the next few years). We will also investigate the possibility of similar funding from other federal agencies including NIH, DoE and the department of Education. Private donations will be requested for short-term projects for specific purposes, including Scholar travel funds, curricular materials for hands-on classroom exercises, and materials for student projects to be supervised by Scholars.

G. Growth

Program growth is described here in terms of the number of Scholars participating in each summer session. This can be approximately converted into funding requirement by assuming ~$200,000 to cover UNM administrative and faculty costs plus ~$10,000 per Scholar

to cover the Scholar stipend, housing, research supplies and graduate student 'technical mentor' stipends. Thus, a program with 25 Scholars would require $200K + 25 x $10K = ~$450K annually, while doubling the number of Scholars to 50 would require ~$700K. Another way to look at program growth is the cumulative number of Scholars participating. Since some Scholars may participate for more than one summer (currently limited to a maximum of 3 summers), the cumulative number of Scholars will be less than the simple sum of annual totals. Based on the number of returning Scholars in 2023, it seems reasonable to assume that ~2/3 of each year's cohort will be new to the program, so the cumulative growth of a program with 40 Scholars each summer would be ~25 new Scholars per year.

Program growth is presently limited by two factors: PI recruitment and funding. The number of potential PIs on campus (all research-active STEM faculty) is large, and even accounting for competing needs, individual choices and personal preference it seems reasonable that UNM central campus could have 50+ faculty participate as PI mentors. The number of participating PIs has grown slowly (5 → 11 → 15), but could easily double over the next year or two as new units join in- and the deans of SoE, CoEHS and CoP have all expressed interest. Note also that some PIs have mentored 2 Scholars simultaneously, so the number of PIs can be less than the number of Scholars. Funding is much harder to predict, since it has depended upon one-time PED 'excess' funds which have no promise of future availability. The current RPSP line ($100K annually) does not cover all the staff and faculty effort required, so most of this has been provided as in-kind support by UNM. NSF RET supplements and programs are a plausible mechanism for funding 5-10 Scholars per year. While the number of PI mentors is a co-limiting factor at present, growth in the longer term appears to be limited principally by funding.

What is the optimal size of the ROSE program in terms of Scholars per year? New Mexico currently has 281 public high schools and a similar number of separate middle schools. A program which averaged 50 Scholars per summer for 10 years would have hosted ~300 individual teachers (allowing for some duplicate participation, as above). While a substantially larger program (~100 Scholars per year) would speed up the effects of the program, it is not clear how many teachers will apply nor whether the program operations which have worked for ~20 Scholars could be scaled to that level.

We propose a program goal of 40-60 ROSE Scholars per year, achieved by expanding in increments of ~10 Scholars per year. That is, 30 Scholars participating in Summer 2024, 40 in Summer 2025 and 50 in Summer 2026. The funding required is about $500K for 2024, $600K for 2025 and $700 for 2026. While it is reasonable to expect some portion (10-20%) of the Scholars to be funded using federal sources (i.e., NSF RET supplements and national lab outreach programs), the remaining funds will need come from state sources (HED RPSP, PED 'below-the-line' and UNM funds).

H. Evaluation and reporting

ROSE is intended to improve directly teacher preparedness, morale and retention; indirectly this should improve student learning and achievement. Since the effects on students may also have a longer incubation time, program assessment will primarily emphasize the Scholars, including:

Self-reported changes in confidence, enthusiasm and preparedness

Changes in classroom STEM curriculum and conduct related to the ROSE program
Changes in teacher retention statistics
Changes in teacher participation in extra-curricular STEM activities

ROSE will produce an annual report each December summarizing the year's events and incorporating an assessment report on the effectiveness of the summer research session. At a minimum, the report will be distributed to the deans of all participating colleges, the Provost and VPR and to NM PED. Following this distribution. the ROSE director will meet with the above stakeholders or their designates to receive feedback on the program and guidance for the coming year and beyond.

External review of the program will be conducted every five years beginning in the Fall of 2026. The review mechanism has not been decided, but it could be managed by the proposed UNM program assessment center, for which HED RPSP funding is currently being requested. If that mechanism is not available, two alternatives are i) an external contractor and ii) the Academic Program Review office in Academic Affairs. Results of this review will be presented to on-campus stake-holders, the NM PED and the Legislative Education Studies Committee.

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Appendix H. Survey Assessment Report

Welcome Survey: The welcome survey had 37 open (7) and closed (30) ended items. It focused on logistics and clerical matters, measuring aspects of identity, prior experiences, demographics, and current classroom environment. Participants completed the survey in the first three days with 100% completion.

Mid-point Survey: This survey had five questions-3 closed questions and 2 open-ended. The questions focused on satisfaction with experience, concerns, and how they thought this would impact their classrooms. It was sent at the start of the third week and had a 95% completion rate.

End-point Survey: This survey had 20 items with 12 of them being closed ended and 8 being open ended. The questions focused on logistics and clerical matters, thoughts on classroom impact. It was sent the last day of the program, followed by two email reminders at 2 and 3 weeks after the experience. There was a 75% response rate.

Final Survey: This survey had 25 questions with 15 closed items and 10 open questions. It focused on aspects of identity and changes made to their classroom practices. It was sent the first week in October (3 months after experience) with two email reminders at 2 and 3 weeks. There was a 45% response rate.

PI Survey: This survey had 10 items with 2 open questions and 8 closed items. It focused on experience with the ROSE scholar and impact on research environment. It was sent the first week in July with a follow up a week later. There was a 0% response rate.

All surveys were sent to participant provided emails and were administered with Qualtrics.

Summary:

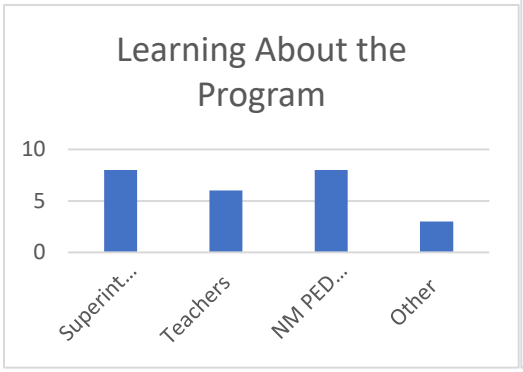
1. The ROSE fellows overwhelmingly had positive things to say about their experiences with ROSE and with their lab groups. They would come back again.
2. For the majority of ROSE fellows, this was their first research lab experience
3. The average ROSE fellow has a level III teaching license, has 13 years of experience teaching STEM, and has a degree in Education.
4. This experience has impacted their ability to address the practices of science and engineering standards, the activities in their classroom and the amount of open ended inquiry with their students.

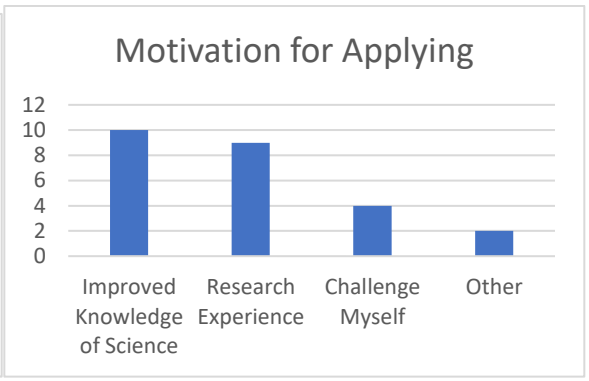
Logistics and Clerical Matters

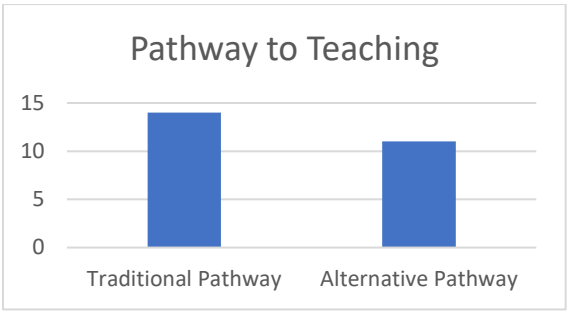
- Teachers learn about this program from administrators, other teachers, and PED communications
- The reasons for applying are mostly (68%) to improve their science knowledge followed closely by the desire to experience research
    - "….science changes so quickly, I don't have the opportunity to focus on my own learning on science and therefore what my students learn can be dated"
    - "In my teacher training, I never got to participate in REAL actual science research and this opportunity will help me close that gap."

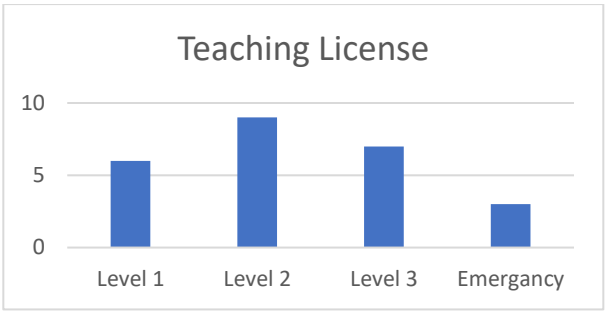
- "After two degrees and 10 years of teaching science, this is the first time I will actually be in a real science lab let alone getting to be involved with the actual research."

- 75% of teachers felt they had enough information about logistics and stipends before the start of the program.
- At the midpoint, 67% of teachers reported they were overwhelmed by the research and equipment in their lab, at the end 43% reported the same feeling.









Helpful:

- It was great to get the acceptance letters earlier this year.
- This experience was very helpful last year for me in developing science projects with my students in regular and stem classes.
- "I'm not comfortable sharing my thoughts in this format. We should be able to talk with someone directly and not these surveys."

Suggestions:

- It would be nice to have more details up front. Information about how and when the stipend gets paid would have been nice to have, especially since many people came in from outside of ABQ. Maybe some info on the dorm-style housing, or a basic outline of expectations for the program would be helpful too.
- Description/summary of projects available.
- Making ROSE part of the STEM Ecosystem would be great.
- Have more of the first week stuff (safety training) online before the program so that more time is spent doing the research
- Parking is a bit confusing, but I think I have a grasp on it now. I wish dining was not as expensive however.

- For the new PI's to have a better understanding of the program so they are better prepared for the teachers in their area. And for the admin. paperwork to be a little more clarified on how our names are used for access.
- I have really enjoyed this opportunity. I do wish we had more time (or at least I had more time) to spend on this project as four weeks are flying by extremely quickly and there is so much more I would like to see!

Experiences:

- 95% of teachers report having little to no prior research experience
- 60% of teachers report their teaching spaces/schools are not safe for the use of chemicals
- 59% of teachers report they have never received training in how to safely handle hazardous chemicals
- 80% of teachers report not using chemicals in their classroom (56% reported due to lack of safe space in school)
- 27% of teachers report a science fair or research challenge at their school
- 59% report have clubs geared towards STEM at their school
- 0% of teachers report having training in safety including handling equipment or chemicals in last 5 years
- On average, teachers in ROSE have been teaching for 13.4 years (range 1-20 years)
- 57% are Level 3 licensed teachers, 41% Level 2, 19% Level 1, 3% probation license
- 78% of teachers report a degree (BS or MA) in education, 12% report a degree in science or engineering (BS)
- 89% of teachers agree with the statement "The ROSE program is high quality professional development
- "The ROSE program has been absolutely educational and worth my time. Sure is better than the professional development I receive during the year!"

Identity Impacts

- 22% increase in agreement with the statement "I am part of the STEM workforce in New Mexico"
- 87% of teachers agreed or strongly agreed that ROSE left them more motivated to teach science
- 15% increase in agreement with the statement "Science is the best discipline to teach."
- "Participation in the ROSE program has significantly impacted my motivation as a science teacher. Thank you!"

Classroom Impacts:

- On average, teachers teach 101 students a year. Total students taught by ROSE scholars this year 3,478
- At the mid-point survey, 67% teachers mentioned they hadn't thought about the impact on their classroom until the survey actually asked them to.
- 67% of teachers report an increase in self-efficacy regarding teaching science concepts
- 89% of teachers report an increase in self-efficacy regarding teaching the practices of science and engineering

- 45% increase in teachers intending to support student projects focused on growing skills in the practices of science and engineering
- 32% increase in agreement with this statement, “research is an important part of teaching science.”
- 38% increase in teachers who report incorporating the practices of science and engineering in their lessons
- 100% of teachers report they have changed the way they teach due to their ROSE experience
    - Class activities (45%)
    - Examples in class (89%)
    - Feedback to students on their learning (23%)
    - Incorporating open ended inquiry projects/assignments (37%)
- “I often teach research as kinda a solo, flowchart kinda activity, but the reality is that research is a social endeavor of swirling activity. Our lab is more of a community doing different things but also working together, and I don’t think I think of research like that. I am thinking of changing my student research projects to small groups to reflect reality”.
- “I’ve already signed up to share what I learned from the software through a presentation or workshop at our science meetings with the other two science teachers in my district. We all teach middle school and high school classes, but I think it will work.”
- “What we are working on in my research group is FAR FARRR beyond the capabilities of my lab/school, but also my students. what my students WILL get from this is a presentation about my experience that will (hopefully) inspire them to pursue not only STEM, but also going outside their comfort zone. Learning is hard and we have to ok with not knowing and having questions. That is what they will get.”
- “Its been soooooo long since I have been a student, that this had the greatest impact on my classroom by reminding me what it is like to be a student and not know what you are doing. Not be the one in control. I’m thinking about everything from my directions to how safe my classroom is too ask a question or for help, as well as my activities. “
- “I now have a better understanding of some of the opportunities for my students who wish to go this route. I think I also have a better 'selling' idea for those students who are not sure which path to take and why STEM is a good path.”
- “It is a good experience for us to see the inner works of research. For us teachers, we are mainly confined to work in the classroom focused on a prescribed standards to follow. In research or scientific investigations, it is nice to know that it is fine if you do not get your expected results. Exploring other aspects of the study as new things unfold is interesting. Dwelling on the unknown opens up endless possibilities and in teaching we don’t dwell on unknowns.”
- “I hung my poster in my classroom and students, parents and other teachers ask me about it all the time. One parent was surprised at the high level science I took part in and it felt good.”
- “I made new friends that are also science teachers. It is great to have a group of teachers who know what it is like to be the only science teacher in a small district or school. We text at least once a week on text to bounce ideas off of each other. We also try activities out and talk through what worked or didn’t. I don’t feel as alone in trying to teach.”