

2018 Annual Report



College of Education

Raggio Research Center for STEM Education

What is the RRC?

The Raggio Research Center for STEM Education in the College of Education at the University of Nevada, Reno advances the theory and practice of science, technology, engineering and mathematics (STEM) education through collaborative research, development, instruction, dissemination, leadership and outreach.



Our Goals...

- * Conduct cutting-edge research on STEM education at the highest level on questions of state and national importance as applied to Nevada's needs.
- * Recruit and promote STEM education opportunities for all students at all levels in formal and informal educational settings.
- * Actively promote STEM education opportunities for traditionally underrepresented populations as specified by the Next Generation Science Standards as: Economically Disadvantaged, Race and Ethnicity, Students with Disabilities, English Language Learners, Girls/Women, Alternative Education, and Gifted and Talented Students.
- * Conduct professional development for better integrated STEM teaching PK-20.
- * Form interdisciplinary research teams of STEM content including university faculty, staff, graduate students, and undergraduate students together with teachers to develop, deliver, and assess/evaluate programs and activities.
- * Serve as an interdisciplinary education center to develop research-rich experiences for pre-service and in-service teachers to deepen and enhance STEM concepts and pedagogy.
- * Develop outreach activities and programs for students of all ages to support knowledge acquisition in the STEM disciplines.
- * Disseminate standards-based and scientifically supported research and information on STEM education.



Message from David T. Crowther, Ph.D., Executive Director

Welcome to the annual report for the Raggio Research Center (RRC) for Science, Technology, Engineering, and Mathematics (STEM) Education, housed in the College of Education at the University of Nevada, Reno. This report is an update on our current grants, projects, and collaborations, our dedicated staff, and offered services.

The Raggio Research Center for STEM Education has had a great year and we are happy to continue to see growth and change. We were sad to see Danny Sierra, our administrative assistant, leave our center to take a new position within the College of Science. Additionally, with the ending of the Northern Nevada English Language Initiative (NNELI), we say goodbye to Shawn Pennell. She continues within the College of Education in the Educational Leadership doctoral program. As we all know with change comes new opportunities, we are excited to have some new faces in our family. We welcome Catherine Pozarski-Connolly as a new Associate Director for the RRC and welcome our two new graduate students that are assisting Jenica Finnigan with our CBESS program.

During the 2018-2019 school year, the RRC managed \$5.7 million in funding spread across several projects. We engaged in an evaluation for the Governor's Office of Science, Innovation, and Technology (OSIT) and hope this is the start of a long and productive collaboration between the two entities. We have signed on as a founding partner in the Northern Nevada Science and Technology Festival (NNSTF) which is a week-long community event celebrating science and technology in our region.

Although there are many wonderful STEM related projects associated with the center we did say good-bye to a couple of very successful projects in 2018. The Northern Nevada English Language Initiative (NNELI) completed its final year. The research has been transformed into a program called STEM, Language, and Learning (SLL) which is currently under review by the Nevada Department of Education, so that it may be added to the recommended ESSA (Every Student Succeeds Act) programs. In addition to the SLL program, we have provided the Nevada Department of Education (NDE) with the application for both Engineering is Elementary (EiE) and Full Option Science Systems (FOSS) to become ESSA recommended program. Programs that receive NDE state approval may be used to obtain state grant funding. And we are currently under review to become an EiE training center able to provide EiE professional development to Nevada and the entire west coast.

Lastly, we say goodbye to the Northern Nevada Energy Efficiency Teacher Training Initiative (NNEETTI). This project on energy education resulted in saving participating districts money through the implementation of energy savings projects designed by students. Envirolution will continue to provide professional development for the project having received funding from TESLA's educational grants. We wish the program well and continued success at helping students understand the importance of energy conservation.

We are pleased at the progress of Community of Bilingual English-Spanish Speakers Exploring Issues in Health and Science (CBESS) funded by the National Institutes of Health (NIH) Science Education Partnership Award (SEPA). This 1.25-million-dollar grant has allowed us to solidify our new partnerships with the College of Medicine and the local community in preparing bilingual health workers in Nevada.

On a personal note, I greatly appreciate the support of the RRC staff as I complete my final year in the presidential chain for the National Science Teachers Association (NSTA). This appointment has taken time away from the center and I would like to recognize our staff who have had to work many more hours to keep the center in top notch performance. The success of any center is a reflection of the hard work of the many people that make its success.

CBESS: Community of Bilingual English-Spanish Speakers Exploring Issues in Health and Science



Nevada's first SEPA grant comes to the RRC!

UNIVERSITY OF NEVADA, RENO

CBESS

COMMUNITY OF BILINGUAL
ENGLISH-SPANISH SPEAKERS

College of Education | Raggio Research Center for STEM Education
School of Medicine | Community Health Sciences

The CBESS program is a five-year, multi-collaborative, multi-disciplinary initiative funded by the National Institutes of Health on September 1st, 2017. It is a Science Education Partnership Award (SEPA), a highly prestigious and competitive award that aims to increase linguistic diversity in STEM and health care fields. The College of Education is partnering with the School of Medicine (SOM) to create a pipeline between bilingual K-12 students and higher education to foster a Community of Practice of STEM healthcare professionals and Spanish-English speakers.

"Our healthcare workforce should reflect the diversity of our community. We have an incredible opportunity with this project to empower SEB students to see their bilingualism as an asset in STEM-healthcare fields."

-Jenica Finnegan, Project Coordinator

For K-12 participants (Student Researchers), the program will include bilingually-supported career exploration, an intensive residential summer research experience, year-round near-peer mentoring from UNR students, and community outreach and dissemination experiences. Our Student Researchers will also have an opportunity to apply for research internship opportunities in the UNR School of Medicine.

Another component of the CBESS program is the training of Leadership Trainees (LT) to assist, guide and mentor the Student Researchers. LTs will be trained by UNR faculty in mentoring skills, inquiry-based science instruction as well as the knowledge to help position the Student Researchers as insiders into STEM fields. This project seeks to encourage bilingual students to pursue higher education and participate in science and health workforces.



NNEETTI: Northern Nevada Energy Efficiency Teacher Training Initiative

The Northern Nevada Energy Efficiency Teacher Training Initiative (NNEETTI) program is intended to train grade 7-12 teachers in innovative energy efficiency technology content, which will allow them to engage students in authentic data access, manipulation, and analysis. Teachers and students alike will be able to research energy phenomena in order to create energy saving solutions for their schools.

Teachers and students from the Washoe County School District, Carson City School District, and Pyramid Lake Junior/Senior High School will be participants in this program. The NNEETTI program is dedicated to providing over 80 hours of technology and content-rich professional development for 35 teachers in these partner schools. Participants will be involved in a 40-hour summer workshop with six monthly professional development sessions and individualized technology problem solving meetings. Teachers completing this course will receive a stipend or three graduate credits from the University of Nevada, Reno.

NNEETTI-partner engineers and scientists will interact with students to help them discover energy conservation methods through data analysis. There will be a wide range of curricular elements that students will learn from such as inquiry/discovery activities, data use in mobile environments, working with scientists and engineers, and communication with decisions makers, allowing for different modes of instruction and learning. This will be a dynamic learning experience that will introduce students to innovative technologies and STEM experiences, helping point students towards careers within this field.

Funding is provided by the Nevada Department of Education Math/Science Partnership Grant.



NNELI: Northern Nevada English Learning Initiative



The Northern Nevada English Learning Initiative (NNELI) is a National Professional Development Grant program fully funded by the Office of English Language Acquisition of the United States Department of Education. NNELI was funded in 2012 with a total grant award of \$1,935,167 and wrapped up its final reports in 2018. NNELI's purpose was to improve instruction to English learners (ELs) by providing professional development opportunities for pre-service and classroom teachers as well as paraprofessionals in northern Nevada. In 2018, Shawn Pennell completed her reports and dissemination.

This study found that when given instruction, paraprofessionals actively apply principles from second language acquisition (SLA) theory and individual differences in SLA; use teaching and learning strategies intended for use with ELLs when instructed how to do so; are motivated by creating lesson plans, which causes them to engage in a higher order of thought and instructional planning; and enjoy using inquiry-based science as a means of motivating students. Data analysis on paraprofessional coursework reveals that participants increased knowledge significantly for the SLA, IDSLA, and inquiry-based science modules over all four years. Other significant gains were made in technology, professionalism, classroom management, cultural competence, World-Class Instructional Design and Assessment (WIDA), instructional strategies (GLAD/SIOP) and reading strategies to help students access the Common Core State Standards.

Project ReCharge



Project ReCharge is a hands-on inquiry and project-based Science, Technology, Engineering and Math (STEM) curriculum and training program that provides students, teachers, and staff with the knowledge, training, and technology to transform the way school energy savings are achieved. In 2014, the University of Nevada, Reno's Raggio Research Center for STEM Education partnered with Envirolution, a nonprofit energy education provider, and the Washoe County School District to secure a \$1.2 million National Science Foundation Innovative Technology Experiences for Students and Teachers (I-TEST) Grant.

The project strategy involved implementing research-based energy efficiency curriculum in 8th grade mathematics and science classes, as well as high school environmental science and Career and Technical Education (CTE) classes. Teachers attended professional development workshops, which integrated energy and technology into their core curriculum, and hands-on inquiry science methods to create authentic STEM experiences for their students. Project ReCharge outreach included 47 teachers and over 4,500 middle and high school students from mostly rural, economically disadvantaged, and racially diverse communities.

Led by a highly-qualified team of researchers, students discovered how building systems and appliances consume energy in their schools. Student groups used tablet computers to interact with real-time data: identifying and tracking major electrical loads in their school buildings. Using this data, student groups submitted proposals with energy conservation opportunities. Students, teachers, Envirolution staff, building control services engineers, and school district facility collaborated to implement these recommendations. These student-driven projects are now saving the school district every year over \$44,000 while reducing the district's carbon footprint by 352,000 pounds of CO₂.

The Raggio Research Center received the Golden Pinecone Award (2016) from Green Nevada for Project ReCharge, recognizing it as an outstanding program that has been successful in saving Washoe County School District thousands of dollars by implementing energy-saving proposals submitted by the students.

RRC Evaluations

OSIT K-5 STEM Grant Evaluation: The RRC provided the Governor’s Office of Science, Innovation, and Technology (OSIT) and the STEM Advisory Council with an evaluation of their K-5 STEM Education Program Grant (K-5 STEM). K-5 STEM grant was announced in November 2017. “The purpose of the program was to increase the prevalence of evidence-based, high-quality formal and informal STEM practices and programs within Nevada’s elementary schools.” (OSIT, 2017) The funding came in two forms; 1) a classroom award for up to \$1,500 and 2) a program award for up to \$20,000. K-5 STEM had four over-arching goals that guide its purpose. The goals focused on supporting equitable access to quality of STEM programs in elementary schools to prepare students for STEM careers in the New Nevada.

Goal 1: To increase the prevalence of evidence-based, high-quality formal and informal STEM practices and programs in Nevada’s elementary schools.

Goal 2: To increase the use of hands-on, evidence-based, experiential STEM learning in Grades K-5.

Goal 3: To increase the percentage of elementary schools that teach science three-plus hours per week.

Goal 4: To increase interest in, awareness of, and achievement in the subjects of science, technology, engineering, and mathematics in grades K-5, particularly amongst demographic groups that are traditionally underrepresented in STEM. (OSIT, 2017)

K-5 STEM provided funding to districts, schools, and classroom teachers. This 2018 evaluation found increases in student interest in STEM subjects in both K-2 and 3-5, student awareness of engineering as a useful skill at the 3-5 level, and student content knowledge. The evaluation did not find evidence that teacher self-efficacy increased or that every barrier to STEM implementation was removed; however, teachers expressed that there were changes to their classroom culture, including amounts of time spent teaching STEM, student engagement, student collaboration and discussion, problem solving skills, and overall excitement about engaging in STEM. The RRC’s findings assisted the OSIT in making recommendations that will be presented to the 2019 state legislature. These recommendations include increasing K-5 STEM funding.

Other RRC Projects

SCIP (STEM Career Investigation Program): SCIP provides students with opportunities to observe research and career presentations by STEM professionals in a wide array of STEM disciplines and specializations. During its five years, students were introduced to marine biology and research conducted in Antarctica; the use of Functional Electrical Stimulus (FES) in helping the body relearn how to walk or pick up items; research being conducted at the UNR Biology Department on the side effects of Ephedra; and many more topics. Sessions included speakers from the College of Science at UNR, Tesla Motors, Renown Health, Washoe County Sheriff's Department, and the Nevada Advanced Autonomous Systems Innovation Center (NAASIC). Evaluation results have shown significantly increased interest in STEM fields as a result of students' participation in SCIP.

NERDS (Nevada Educators Really Doing Science): The NERDS program combines a focus on professional development in science teaching with research in science education. Participants in the program are educators from across the state of Nevada. Every NERDS course is designed to lead teachers, step by step, from "expert"-designed investigations to student-centered investigations through an active process of participation. The field experience portion of the course takes teachers away from familiar ecosystems near their hometown into unfamiliar territory where they must start their learning from scratch, similar to what their students experience every time a new concept is taught. Evaluation results indicate that participating teachers are more able and willing to use inquiry-based science in their classrooms.

RRC Grant Services

The Raggio Research Center also provides the following services:

- ◇ Grant Management Services (Administrative and Accounting)
- ◇ Evaluation Services
- ◇ Facility Rental and Event Space for up to 140 persons
- ◇ Professional Development
- ◇ Resource Center for Grant Participants, Partners, and Educators

To learn more about how the RRC can support your proposed research and/or outreach projects, please call 775-784-8288. For further information on how to join our list of donors and become a supporter of the RRC programs, please contact David T. Crowther, Executive Director: crowther@unr.edu.



Funded Projects	Collaborators	Raggio Amount	Total Amount
CBESS (Community of Bilingual English-Spanish Speakers) <i>a National Institute of Health grant and Science Education Partnership Awards.</i>	UNR School of Medicine (L) Raggio Research Center	1,250,405	1,250,405.00
EPSCoR grants - (Experimental Program to Stimulate Competitive Research) <i>through the National Science Foundation.</i> EPSCoR grants include: SCIP (STEM Career Investigation Program) NERDS (Nevada Educators Really Doing Science)	Raggio Research Center (L)	950,850	23,000,000
NNELI - (Northern Nevada English Learning Initiative) <i>a U.S. Department of Education grant.</i>	Raggio Research Center (L) Washoe County School District	1,935,167.00	1,935,167.00
Project ReCharge <i>Innovative Technology Experiences for Students and Teachers (ITEST) grant through the National Science Foundation</i>	Raggio Research Center (L) Envirolutions – LoadIQ	1,178,340.00	1,178,340.00
K-5 STEM Grant Evaluation <i>through the Governor’s Office of Science, Innovation and Technology (OSIT)</i>	Raggio Research Center (L) Carson, Churchill, Douglas, Lyon, Storey, Washoe Counties	15,870	15,870
NNEETI- (Northern Nevada Energy Efficiency Teacher Training Initiative) <i>a Nevada Department of Education grant</i>	Raggio Research Center (L) Envirolutions, (LoadIQ)	383,179	383,179

Total RRC Funding: \$5,713,811

*(L) denotes project lead organization

RRC Staff

Camille T. Stegman, Ph.D. Associate Director

Camille's educator experience spans a wide range of scope and scale. From her time in the smallest school district in Nevada to her representative role in a national science organization (of the most populated western state), Camille has worked in many levels of the K-12 education system. Her 20-year history with education includes positions as a science teacher, coordinator, and administrator. She holds two Master's degrees, one in Elementary Education and one in Educational Leadership. She completed her Ph.D. in Curriculum and Instruction focusing on STEM Education. She has completed and recently renewed her National Board Certification in Early Adolescent Science.

Camille feels that teachers should actively participate in analyzing their own practice, and student work, as well as engage in discussion about effective instruction with their peers. Using teacher learning communities, such as lesson study, can help teachers improve their practice by working together to design more effective lessons. This can lead to increased self-efficacy in science teaching, which can lead to more science being taught in classrooms. After all, teaching more science is the goal if Nevada is to become a leader in creating STEM professionals.

Her vision for the RRC is that the center serves Nevada communities, districts, and other stakeholders, both rural and urban, in developing and evaluating teacher professional learning that leads to improved student outcomes and interest in STEM professions.



Catherine Pozarski-Connolly, Ph.D.

Associate Director and Washoe County Based Field Faculty

Catherine has been an elementary teacher in Washoe County for eleven years. She received her Masters' Degree and Ph.D. from the University of Nevada, Reno both focusing in STEM education. Her research areas include current practices for STEM implementation at the elementary level, as well as curriculum design and program evaluation across the K-12 system. Her research and interest in STEM education has led her to preparing teachers to implement research-based STEM practices and evaluating the effectiveness of different STEM strategies. She is currently teaching at the University of Nevada, Reno in the Elementary Education Department as the Washoe County Field Based Faculty.



Jenica Finnegan

Project Coordinator, CBESS

Jenica joined the Raggio Research Center in 2017 as the Project Coordinator for the Community of Bilingual English Spanish Speakers (CBESS) program. CBESS is the first NIH-sponsored SEPA grant in the state of Nevada and encourages bilingual students to pursue careers in healthcare. As a proud first-generation student, Jenica understands the importance of exposing youth to opportunities and resources both in the community and around campus. She also serves on the Celebrating Science in Schools Subcommittee for the Northern Nevada Science and Technology Festival, a week-long celebration of STEM subjects in northern Nevada schools. Jenica received both of her degrees, a Bachelor's in Spanish and a Master's in TESOL (Teaching English to Speakers of Other Languages) from UNR and is thrilled to be working at her alma mater. Prior to relocating back to Reno, Jenica worked as an English teacher for two years in South Korea and four years at UCLA Extension's American Language Center. Jenica, her husband Ryan, and their dog Hazel love the mountains and going on outdoor adventures.

Brendi Gertsma

Grants Fiscal Manager

Brendi joined the Raggio Research Center in 2016, transferring from the UNR Foundation Accounting office. Her work at the RRC has enabled her to gain experience in grant fiscal management and she is the newly appointed College Grant Coordinator for the College of Education. Prior to university service, she worked in the healthcare industry for 13 years. Brendi successfully juggles work, family, youth coaching, and school. She is the proud mother of three wonderful children.



Sergio Trejo, Jr.
Graduate Assistant

My name is Sergio Trejo Jr . and I am one of the CBESS graduate assistants. I was born and raised in Las Vegas, Nevada. After obtaining my bachelor's degree in biology from UNLV in 2016, I decided to move to Reno and enroll in UNR's Masters in Public Health, which I will graduate from this May! After graduating, I will attend medical school starting this summer in the hopes of becoming a family medicine physician for rural and underserved communities. I am excited and honored to participate in the CBESS program and empower a future generations of healthcare professionals!



Noemi Gomez Martinez
Graduate Assistant



Noemi recently joined the Raggio Research Center as a graduate student for the Community of Bilingual English Spanish Speaker (CBESS) grant. She is very thrilled to be working with students and professionals all over northern Nevada. Noemi is a proud first generation Nevadan who received her Bachelor's degree in Business Management Administration and in Spanish from the University of Nevada, Reno in 2011. Currently, she is pursuing a master's degree in Social Work and is practicing her profession at Renown Medical Center. Noemi has been a mentor for the Dean's Future Scholars program for over 5 years, coordinated for the Washoe County School District 21st Century/Team Up program, and recruited for the University of Nevada, Reno. Noemi has also received the University of Nevada, Reno Community Service Spanish Award, volunteered for the Latino Research Center, participated in the Nevada Global Business program to New York, served as president and vice president for ADAVEN, and is a TRiO Scholar graduate.

Farewells

We wish **Shawn Pennell and Danny Sierra** the best as they move on to new and exciting opportunities.

Shawn Pennell

Shawn Pennell worked with Raggio Center staff for twelve years- first as a graduate student on TITE-N (2006) and KEEP (2007)- then as a faculty member on Nevada Pathway Leadership Project (2009), Newton's Network (2010), NERDS (2011), and NNELI (2012-2018). Initially specializing in technology integration in secondary education, she transitioned into online/hybrid education, curriculum development, and professional development for adult educators. To enrich the NNELI program, Shawn led a team of stakeholders in creating a proposal called PARALLELS that sought to serve bilingual degree-holders interested in pursuing a teaching license through an alternative route to licensure program. The curriculum developed during NNELI has been modified and is still being used in Washoe County School District Department of Professional Learning for training paraeducators to work with English language learners.

Shawn is pursuing her doctorate through the Educational Leadership program in the College of Education at UNR to explore the potential of experiential education. She now works as the Director of Academic Affairs for Multnomah University.



Danny Sierra

Danny started in the Raggio Research Center in September 2017 and is enjoying his first job in higher education. Before joining the RRC, Danny was the Special Events Coordinator for Patagonia in Reno for three years, organizing in-store presentations, discussions, and film screenings that centered on environmental and scientific initiatives. Danny has a background in both journalism and sports management, most recently graduating with a Master's from Bowling Green State University. He lives in Reno with his husband and two dogs.

Dissemination

The following section outlines dissemination from the research projects previously described in this report.

Crowther, D.T., Royce, C. (2018). Engaging All Students in Science Using the NGSS and Phenomena. Teaching English to Speakers of Other Languages (TESOL) International Conference. Chicago, IL 3/26-3/30/2018.

Crowther, D.T., Royce, C., Brunsell, E., Price-Colley, K., Peterson, J., Mendez, F. (2018) District-Level Administrators? You Are the Fourth Dimension in Implementing 3-D Teaching and Learning. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018

Langus, T., Crowther, D.T., (2018) Exploring biodiversity in One Cubic Foot. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018.

McKenna, A., Evans, D., Blake, S., Crowther, D.T. (2018) Successful Classroom Strategies for Urban Science Educators. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018

Pennell, S. (2018) National Resource Center for Paraeducators (NRCP). Training for Paraprofessionals Working with ELLs is a Sound Investment for Everyone. Seattle, WA 4/27-4/29/2018

Pennell, S. (2018) National Association of Professional Development Schools (NAPDS). A New Breed of Paraprofessionals Working with English Language Learners. Jacksonville, FL 3/15-3/17/2018

Pennell, S. (2018) Conference on Academic Research in Education (CARE). The Northern Nevada English Learning Initiative (NNELI) Program for Paraprofessionals. Las Vegas, NV 2/26-2/27/2018

Pennell, S. (2018) Nevada State Science Teachers Association (NSSTA) Region 1 Science Conference. Paraprofessionals Can Do Science - So Let Them! Las Vegas, NV 2/10/2018

Pozarski-Connolly, C., Crowther, D.T., Robinson, T., Loftin, L. (2018) Exploring Insulators Through Engineering and Data Collection. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018

Pozarski-Connolly, C., Crowther, D.T. (2018) Project ReCharge: Results surrounding student achievement and interest in STEM. Association for Science Teacher Education (ASTE) National Conference Baltimore, MD.

Robinson, T., Pozarski-Connolly, C., Crowther, D.T. (2018) Using Robotics to Learn Programming – From the Simple to the More Complex. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018

Robinson, T., Pozarski-Connolly, C., Crowther, D.T. (2018) How High Did It Go? Using Math to Compute Rocket Apogee. National Science Teachers Association (NSTA) Atlanta, GA 3/15-3/18/2018

Stegman, C.T., Brolsma, A. (2018) Primary Students Can Do Science! National Science Teachers Association (NSTA) Reno, NV 10/11-10/13/2018

Stegman, C.T., Brolsma, A. (2018) Developing Primary Teachers' Abilities in 3-D Science Teaching and Learning. National Science Teachers Association (NSTA) Reno, NV 10/11-10/13/2018