# Signature Area of Excellence: Research as a Pedagogical Instrument

# Innovative and impactful teaching, research, and lifelong learning via the STEM Teaching, Research, and Inquiry-based Learning (TRAIL) Center

## INTELLECTUAL DESCRIPTION OF AREA OF RESEARCH:

We exist to elevate human potential through lifelong learning. We serve as a hub for interdisciplinary research experiences, learning enhancement and student engagement with the intellectual focus and theoretical framework of *research as a pedagogical tool for enhanced learning*. And we do this via research, teaching, advising, consulting, designing, implementing, and assessing high impact practices in science, technology, engineering, and mathematics (STEM) areas. We engage in collaborative research programs that range from wearable and educational technology, to pedagogical interventions such as course-based undergraduate research experiences and inquiry-based learning, all of which are empowered by our *purposeful* discipline-based education research. Our major strength is inclusion and our innovation is collaboration across disciplines, as this allows for differing perspectives and diverse teams that coalesce to solve key STEM-based learning challenges and opportunities thus leading to innovations with high impacts for our students, faculty, and community, that translates to workforce development, inventions, and professional development for Nebraska industry.

We have three strategic anchors to guide these areas of research for STEM learning empowerment:

1) Educational Innovation, 2) Self-sustaining Community Programs and Partnerships, and 3) Entrepreneurial Engagement with Stakeholders. Together, our anchors ensure that the STEM TRAIL Center will generate a wide variety of revenue streams and efficiently utilize resources the support to advance STEM practices and to have UNO become a true model on a national state.

**Why does the STEM TRAIL Center warrant Institutional Investment?**

Institutional investment establishes the infrastructure that enables us to meet the requirements of the grants and contracts that are supporting our work and that of our students. For example, grants specialists and support personnel are unallowable expenses from extramural awards. Additionally, truly transformative extramural programs require considerable investment pre-award (such as in the generation of preliminary data, mobilizing a leadership team and stakeholders, and in some cases grant writing). Our institutionally supported staff and infrastructure will provide a singular, consistent face for the programs, innovations, and products developed by and emanating from the Center.

**Summary**

We aim to infuse the traditional disciplines of science, technology, engineering, and mathematics (STEM) with that of the newer field of discipline based education research (DBER) to support a truly *university-wide, multi-disciplinary* network of collaborating scholars that are well-positioned to answer robust research questions, support innovative student learning, and collectively adapt to meet the state and the nation’s changing workforce needs. By using an interdisciplinary approach to questions in STEM, all faculty (regardless of discipline) are welcomed and encouraged to participate collaboratively with the Center. We aim to bring together interdisciplinary practices to provide an intentionally translated approach through experiential research and inquiry-based learning for all STEM students. This will maximize the potential of the entire spectrum of students, from the highest achievers to those who face challenges and struggles. The intended outcomes are: 1) Engage a diverse cohort of faculty in collaborative research that empowers life-long learners, 2) Be the place for DBER scholars and learners alike to study and learn the framework of research as a pedagogical instrument (from course-based undergraduate research experiences, to inquiry-based learning, to citizen science projects with active engagement in research, to hands-on projects that train and re-train the STEM workforce), and 3) Serve as a catalyst to identify and attract external funding for such shared innovations.

## METRICS FOR PROGRAM EVALUATION

To develop the Center, our leadership team held multiple quarterly off-site, facilitated retreats, to foster broad faculty engagement, establish clear communication, and ensure inclusion. These retreats also defined core metrics to determine the overall “successfulness” of the Center within 5-years of operation. These include:

Table 1. Metrics for Program Evaluation

|  |  |  |
| --- | --- | --- |
| Data Collected | When Collected | Analysis Method |
| **1.** **Student-Related Outcomes:** How are STEM students being directly impacted in recruitment, learning gains, retention and graduation?  |
| * California Critical Thinking Skills Test (CCTST)
* Changes in total # of majors in STEM disciplines
* Content-based assessments, via embedded questions for student learning gains
 | * Pre/post participation in key activities (e.g. pre/post participation in a course-based undergraduate research experience or professional development program);
* Gains/losses in enrollment over 1-5 year windows of time
* Focus groups for first year, 3rd year, and at graduation
 | Trend comparisons with other students related to baselines and targets. Descriptive statistics and frequencies from surveys and assessments. Qualitative gains, challenges, and future opportunities for improvement via focus groups. |
| **2.** **Faculty-related outcomes:** How has faculty mentoring influenced their ability to increase i) student learning outcomes/gains, ii) submit more successful manuscripts, and iii.) submit more successful grants? |
| * Retrospective Likert Ranking
* Pre/post Survey of Undergraduate Research Experiences (SURE III Survey) only for research, CURE, & internship participants as compared with non-participants
* Student participant and faculty surveys, interviews, and document analysis (student journals, training materials, and reflections in signature programs vs normalized, propensity score matched groups)
 | * Pre/post during first year, 3rd year, and at graduation annually
* SURE surveys will be pre/post research-based activity (e.g. pre-summer and post-summer experience or pre-CURE, post-CURE)
* *Ad hoc,* as part of signature programs
 | Coding of surveys and interviews, interpretation of retrieved writing, qualitative analysis, and descriptive statistics. Thematic analysis of interviews to determine emergent themes and insights. Paired t-tests on pre/post-test and survey data, along with repeated measures ANOVA analysis. |
| **3.** **Quality-related outcomes:** What are the signature UNO STEM programs (in teaching, research, and outreach), and their successes using mixed methods evaluation? |
| * Science major retention, persistence, and completion data, to include real-time monitoring using UNO-developed Pace Report tool
* Post-graduation data sources will be via surveys and interviews
 | * Real-time monitoring of student retention and persistence data using Pace Report post-graduation and faculty feedback
* Analysis of portfolio and meta-cognition data
* External site visits from evaluators
 | Trend comparisons of participants in Center vs. non-Center engaged participants (and, dosage-dependency for engagement with Center). Social Network Analysis for emergency nodes and actors. Descriptive statistics and frequencies from surveys. |

**These data will help us to formatively assess the following questions:**

* *What is the value added for STEM student recruitment, retention, success and graduation? What is the value added for all UNO students who take a STEM course?*
* *How far did we disseminate information? What evidence do we have at the regional, national level to ensure we are using best practices, etc.?*
* *How is the Center influencing (or not influencing) the support for faculty career development, networking, innovation, and creativity?*
* *How is the Center influencing faculty ability to be productive in their research and teaching areas? Are they working more effectively with students to enhance their learning?*
* *What is our bottom line return on investment for students, faculty, UNO and the State?*

## PEER AND ASPIRATIONAL INSTIUTIONS

To determine which organizations are fitting of delineation between **Aspirational** and **Peer**, we used a mixture of quantitative and qualitative methodologies. Briefly, for quantitative rankings by comparison, Furthermore, we utilized the [ranking databases](https://ncsesdata.nsf.gov/profiles/site?method=dsnotes) “Data Sources” provided by NSF. For qualitative data, we examined specific STEM Center-based, STEM-based, or active learning-based core programs of excellence for comparison and included those, respectively, in hyperlinks in the table below. The summary of our aspirational and peer institutions are represented in **Table 2.**

**Table 2. List of aspirational and peer institutions and learning centers to which the STEM TRAIL Center will gain guidance from, and compare with.**

|  |  |  |
| --- | --- | --- |
| Aspirational Institutions | Rank | STEM Feature Program |
| Arizona State University | 201:R2 | [STEM Programs](https://science.asu.edu/stem) |
| California State University, San Bernardino | 311:M1 | [STEM Center](https://cns.csusb.edu/stem-center) |
| College of William and Mary | 177:R2 | [Active Learning Requirement](https://www.wm.edu/as/facultyresources/committees/educationalpolicy/coll-curriculum/active-learning/index.php) |
| Embry-Riddle Aeronautical University | 308:M2 | [STEM Education Center](https://prescott.erau.edu/about/stem-center) |
| Michigan State University | 32:R1 | [Create for STEM Institute](https://create4stem.msu.edu/) |
| Montana Tech of University of Montana | 309:M3 | [Undergraduate STEM Research](https://www.mtech.edu/research/student-research/) |
| North Dakota State | 130:R2 | [Growing up in STEM](https://www.ndsu.edu/cider/reu/) |
| Northern Arizona University | 201:R2 | [Center for Science Teaching & Learning](https://nau.edu/cstl/) |
| New Mexico State University | 148:R2 | [STEM Outreach Center](https://stem.nmsu.edu/) |
| Rutgers University, New Brunswick | 33:R1 | [Office of STEM Education](https://sasose.rutgers.edu/) |
| San Diego State University | 162:R2 | [STEM Education Program](https://education.sdsu.edu/stemed) |
| United States Military Academy | 306:BC A&S | [Center for Leadership and Diversity in STEM](https://westpoint.edu/centers-and-research/center-for-leadership-and-diversity-in-stem) |
| University of Washington | 5:R1 | [AccessSTEM](https://www.washington.edu/doit/programs/accessstem/overview) |
| Western Washington University | 310:M1 | [SMATE Center](https://cse.wwu.edu/smate) |
| **Aspirational Informal Education Centers of Excellence** |
| Exploratorium | [STEM Education Programs](https://www.exploratorium.edu/education) |
| Center for the Advancement of Informal Science Education (CAISE) | [Informal STEM Education Research](https://www.informalscience.org/research/what-does-informal-stem-education-research-look-like) |
| **Peer Institutions** |
| Bryn Mawr College | 321:BC A&S | [Adelante STEM College-Bound Program](https://www.brynmawr.edu/career-civic/civic-engagement/service-opportunities/adelante) |
| City University of New York, John Jay College Criminal Justice | 319:M1 | [STEM Research Academy](https://www.jjay.cuny.edu/stem-research-academy) |
| Claremont Graduate University | 322:R2 | [Claremont Graduate University](https://www.cgu.edu/) |
| Idaho State University | 274:R2 | [Rebecca Thorne-Ferrel Discovery Center](https://www.isu.edu/imnh/visitor-information/rebecca-thorne-ferrel-discovery-center/) |
| Langston University | 320:M3 | [Math and Science Academy](https://www.langston.edu/math-and-science-academy) |
| Rowan University | 312:R2 | [STEM Center](https://sites.rowan.edu/stemcenter/index.html) |
| Rutgers University, Newark | 246:R2 | [Rutgers University, Newark](https://www.newark.rutgers.edu/) |
| Tennessee Technological University | 316:R2 | [Millard Oakley STEM Center](https://www.tntech.edu/education/stem/index.php) |
| University of Missouri, Saint Louis | 318:R2 | [We Teach MO STEM](https://coe.umsl.edu/mycoe/index.cfm?event=p2_pe:viewTag&tag=weteachugrad) |
| **University of Nebraska at Omaha** | 317:R2 | [STEM TRAIL Center](https://www.unomaha.edu/academic-affairs/stem-trail-center/) |
| University of the Virgin Islands | 315:BC DF | [STEM Institute](https://www.uvi.edu/research/epscor/education/pipeline.aspx) |
| Xavier University of Louisiana | 314:M1 | [STEM Outreach](https://www.xula.edu/shelib-outreach) |

## FACULTY EXPERTISE

The faculty (and, non-faculty, to include staff, community members, business leaders, and other stakeholders) that are active members of the STEM TRAIL Center have a broad range of expertise. Additionally, UNO’s leadership of the Omaha STEM Ecosystem is housed within the STEM TRAIL Center, further emphasizing the direct connection with workforce development and driving innovation to meet workforce staffing needs, and client technology needs.

Even with this professional diversity, faculty self-identify their greatest strengths surrounding three key areas: i) Research (particularly in discipline-based education research/DBER, ii) Inquiry-based learning and high impact practices in teaching, and iii) Outreach experiences for wider dissemination of STEM content and inclusion of a broader community. Consequently, our STEM Leadership Team, overall numbering 72 participating faculty and staff have expertise truly spanning STEM content, but more importantly *they are already experts in selected perspectives on how to study the impacts of interventions on the learning gains for students at all levels,* as well as how to teach more effectively.

Importantly, this group of expert faculty has a proven track record in team building and project management derived from decades of funded research and community engagement (via social network analysis, strategic planning, and effectively mobilizing stakeholders). The team is also **outcome oriented**, thus making for a dynamic group that is well poised to accomplish this and subsequent ‘big ideas.’ Furthermore, this team is well positioned to serve as a supportive entity not only to groups on the UNO campus, but to the wider NU system, and to community STEM workforce partners outside of the university setting.

Critically, our missing support is in the form of staffing needed to: coordinate amongst faculty and community contributors, organize student initiatives, support grant team mentoring, welcome external speakers and workshop leaders to our campus, and to serve as support staff to garner preliminary data and internal data (such as qualitative data for a unit or college). Similarly, in order to be recognized on the national stage, we must add a stronger media presence, with dedicated communication staff.

## INSTITUTIONAL PARTNERS

Our institutional partners range from a group of nearly 100 on the UNO campus. And, the **Omaha STEM Ecosystem** is a key *network hub* for the STEM workforce engagement component of the STEM TRAIL Center. We continue to expand our reach via our monthly STEM Leadership Team meeting, the new STEM TRAIL Center programming events (Fridays at noon), and via the demonstrated internally and externally facing projects in progress by this team. Finally, there are many community and regional partners that we seek to further expand in collaboration, these include the national Network of STEM Education Centers (NSEC), Metropolitan Community College, Central Community College, Iowa Western Community College, Doane University, Wesleyan, Collective for Youth, Urban Leagues, Big Brothers Big Sisters, Beyond School Bells, Gallup, OPPD, Union Pacific, Civic Nebraska, Fisk Planetarium—CU Boulder, the Metropolitan Omaha Education Consortium or ‘MOEC’, Omaha’s Henry Doorly Zoo and Aquarium, the Nebraska Department of Education, Nebraska Children and Families Foundation, and AIM Institute.

**Vb. Group Partnership Examples:**

* **Center for Faculty Excellence (CFE):** CFE has partnered with the STEM TRAIL Center to offer a coordinated STEM Learning Pedagogy Workshop. These professional development workshops offer hands-on experience for faculty to integrate best practices in pedagogy into their classrooms. For example, in our workshops on inquiry-based learning, the workshop itself is delivered using inquiry-based approaches. Instead of being a ‘one-size fits all,’ we’ve taken the approach of bringing in experts from STEM disciplines from UNO and external experts who have utilized best practices in pedagogy (ranging from “small teaching” to “active learning” to “performance-based feedback” in a timely way) so as to provide directed support for STEM faculty. This serves as an effective way to bring those interested in this topic together for networking, camaraderie, shared expertise and support via a professional learning community and give permission to fail, while steadily making progress toward bold successes. We recruit participants by offering professional development that focuses on smaller changes that faculty can make to best meet student needs. This collaboration has led to increased attendance at STEM events, expanded advertising of the events, and the opportunity to bring in experts from around the country to highlight the importance of effective pedagogical approaches within the undergraduate classroom.
* **UNO’s School of Communication (CFAM):** Partnerships that enhance Scientific Communication are important for the STEM TRAIL Center. Each day, STEM professionals are charged with engaging with the public to i) improve STEM literacy, ii) garner intellectual and monetary backing for their work, and iii) ensure that the needs of the community are heard in order to inform practices in STEM. Consequently, an affiliate faculty of the STEM TRAIL Center is the UNO School of Communication (SoC) within the College of Communication, Fine Arts and Media (CFAM). The SoC can play an important role for STEM in creating and hosting recognized SciComm speakers and experts to engage with the community via seminars or video broadcasts hosted by the TRAIL Center. The technology industry has long recognized that as important as STEM innovations are, their value is enhanced when the public understands the benefits. Science communication, in many forms, provides the stories that create links between innovation and the public’s understanding of it to build literacy and impact. The understanding of scientific breakthroughs is gained by putting those figures and statistics in context, via Science Cafes, seminars and the like. With the resources to hire the faculty member(s), including potentially an endowed Community Chair of Scientific Communication, the opportunity exists to link more directly with the Center.

CFAM has strong expertise in communication and has partnered with Omaha Athletics (Year 2019-2020) to complete a soft launch of the Maverick Digital Network. Therefore, the STEM TRAIL Center is partnering with CFAM as an affiliate to conduct market research on the utilization of such a platform for potential for recruitment of additional support mechanisms in Year 2021-2022 (2020-2021 would be to complete the market analysis). The Center could utilize the Maverick Digital Network platform as a way to more widely engage the public in STEM literacy and Science Communication. For example, the Maverick Digital Network could serve as the distribution vehicle for a statewide seminar on implementing inquiry-based learning in the undergraduate classroom. Or, to share information such as information about the science behind athletes’ performance as contextualized in a UNO hockey game. Furthermore, it could feature stories about STEM students’ innovative research or class projects. It could broadcast STEM lectures worldwide through its video stream. Perhaps most importantly, it can feature stories about STEM projects ongoing at UNO. As both a visual and audio medium, the Maverick Digital Network is an ideal place to show how innovations in visual, theater and music arts are incorporated into training and research for inquiry-based education and are a necessary component of STEM education. Importantly, this component as an affiliate of the STEM TRAIL Center also allows market research to determine demand, scalability, and cost, for opportunities grow for the pursuit of these activities in 2020-2021.

* **Libraries across NU and Open Educational Resources E.g. Pilot Project Highlight: UNL Open Educational Resources NU grant for the Development of Materials for Calculus:**

The STEM TRAIL Center is keenly interested in supporting student success via resource development, faculty professional development, and innovation. Consequently, the Center will serve as a referral entity to connect partners across NU with the UNO Library Open Educational Research Initiative. One such connection is already underway with a grant being prepared for a January 2020 submission, associated with the fact that students in Calculus purchase expensive texts largely for the access to practice problems. This expense can be potentially inhibitory for student advancement at the undergraduate level. Consequently, a team of UNO-UNL-UNK researchers are partnering on a $300,000 Collaborative Grant to support OER for Calculus by cross-sharing their materials, compiling them into a single resource, and evaluating their usefulness for reducing student costs. This project includes rigorous peer-review and an effectiveness study to determine impact upon the student. This project is an example of the affiliate partnership that the Center has with the Library and other proponents of OER across the system to contribute to the Completion Imperative and to remain student-centered, despite being an administrative (not academic) organizational unit.

* **Nebraska Business Development Center**

As evidenced via the State-wide Department of Labor Surveys and recent highlights in the World Herald, combined with progress reports from the Omaha Chamber of Commerce, Nebraska is facing a significant challenge in retaining talent in the state, recruiting the next generation of business leaders and innovators, and building small business locally. Consequently, we aim to partner with the NBDC (and across UNO Colleges) to serve as a 3rd party SBIR clearing house via the “*Entrepreneur in Residence”* model, wherein our student participants can serve as “a entrepreneur CEO” and bring ideas for university spin-off companies to further develop technologies that they co-create with faculty mentored research projects at UNO. This opportunity will add to the workforce and new businesses for the state, provide additional high wage jobs for our graduates, and serve as an internal review catalyst for faculty as they strive to compete on national stage for new ideas.

## EXTERNAL FUNDING

The STEM team has been proactive and successful in seeking external funding for various initiatives, and we continue to aggressively do so in an effort to expand support for programming, faculty development, student engagement, faculty research, and research opportunities for students. Consequently, the majority of our programming and institutional innovations will come in the form of extramural support mechanisms. With adequate administrative support for the Center, we have the opportunity to expand our applications to the entities described in **Table 4.** Importantly, members of our team already have experience in assembling interdisciplinary teams and obtaining funds in response to these RFPs, and the development of the Center actually allows us to apply more competitively across these platforms, as well as to compete for the larger, Center-style grants such as EPSCoR.

Table 4. Non-exhaustive extramural funding opportunities for the STEM TRAIL Center.

NIH= National Institutes of Health; NSF = National Science Foundation.

|  |  |  |
| --- | --- | --- |
| Federal | State | Donor/Local Foundation Support/Royalties for Intellectual Property Licenses |
| * NIH SEPA, $1.5M
* NIH SBIR/STTR, $300k-$2M
* NSF SBIR/STTR, $300k-$2M
* NSF Noyce, Tracks 1-4, $1-5M
* NSF S-STEM, Tracks 1-3, $1-5M
* NSF ITEST, $1-3M
* NSF IUSE, $150k-3M
* NSF AISL, $500k-$5M
* HHMI, $1-3M
* NSF EPSCoR, Tracks I & II, $2-20M
* NSF STEM+C, $1M
* NSF RET, $500k
* NSF REU, $500k
 | * Nebraska Children’s and Families Foundation
* Nebraska Department of Education
* Nebraska Cancer & Smoking Disease Research Program
* Nebraska Industry Partners (via Contract-based research)
* Nebraska Business Development Center (SBIR/STTR match)
* Google/Facebook/Local Tech
 | * The Sherwood Foundation
* The Peter Kiewit Foundation
* Prospective Donors
* Kendall-Hunt Publishers
* Charles S. Mott Foundation
* Carnegie Foundation for the Advancement of Teaching
* The Wallace Foundation
* The Gates Foundation
 |

By adding to our pre-award support staff (to include research technicians and PhD students, defined under Resources below, we will be more competitive in our applications to these entities. Importantly, **these grant and contract-funded projects do not allow for the support of any administrative staffing or infrastructure (in research, personnel, or physical facilities) and thus require foundational UNO support to be competitive.** And, it is also critical to note that STEM projects support staff and student workers that often go far beyond the boundaries of the STEM TRAIL Center, to include interns for UNO’s Youth Safety, UNO Teaching or Learning Assistants to support student achievement in courses, including post-docs and other staffing support for various courses across Colleges, and a University Communications Intern, amongst others.

## STUDENT OUTCOMES

As an institution, UNO tracks quantitative data for student engagement and retention, but we have a unique opportunity via the TRAIL Center to also collect qualitative data that serve as a way to better understand student needs. Consequently, the details of learning in real time student needs (and the impact of our programs) are defined in the Student Outcomes section in Table 1.

Since the STEM TRAIL Center is an administrative unit, not an academic unit, we serve to support individual units and colleges in their goals of student completion, enhance the recruitment of first time freshman, and provide *experiential learning* for students. Students in the cohort programs supervised by the Center include training as learning assistants that then serve as assistants for faculty. This directly supports units to enhance teaching and reduce administrative workload for faculty at no cost to the unit (e.g. NSF NoyceSCIENCE program). Furthermore, we’re actively recruiting first time freshmen via the Teacher-Researcher Partnership Program and the NSF S-STEM program, while supporting students via tuition remission and participation in experiential learning in field, wet-bench and community experiences.

## RESOURCES

We are in need of resources that broadly fall into 3 main categories: 1) Staffing, 2) Operating Costs, and 3) Physical Infrastructure. It’s imperative to point out that generally, **no extramurally funded grant allows for use for staff support, nor administrative/operational funds.** Therefore, we are able to provide programming and research support, but not administrative support of the Center’s operations.

**Executive Summary of Resource Needs**

**1) Staffing:**

* 2 Full-time Administrative Staff
* 2 Grant/post-award support staff
* 2 Research Technicians
* 2 PhD students
* A communications staff member or *ad hoc* consultant
* Faculty Leadership Workload (15% of workload/1 course/year reduction x core leaders, on rotation, x 4)

**2) Operating Costs:**

To include office supplies, to include technology (computers, projector and auditory support), building rental charges, and the annual external review of the Center and staff (360 review), $50,000

**3) Physical Infrastructure:**

We are seeking a major renovation of space (The Basement/Garden Level of Roskens Hall, estimated to be $4M for renovation, with up to $1.5-2M of demolition and abatement). Consequently, we request a **one-time** $50,000 for a pre-proposal for architectural planning and $1.5 million for the demolition component of the infrastructure.

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**Total Request in One-Time dollars:** $2,050,000 for renovations

**Total Request in Recurring, Hard-lined Positions:** Approximately $400,000/year x 5 years = $2M

*Description of Resource Needs, and Matching Support from UNO entities:*

Our critical staffing needs include:

1. *Staffing for 2 related to Administration of Center* (coordinators of Center day to day activities, managing the website and calendar, coordinating workshops, reservations, and generating consistent templates to be utilized across the Center to match UNO branding guidelines)
2. *Staffing for 2 STEM Grant Coordinators* (coordinators will handle the pre- and post-award budgeting, reconciliations, PAFs, PARS, maintain regulatory and compliance records, and other personnel paperwork for any faculty submitting grants or contracts via the Center).
3. *Staffing for 2 STEM Research Technicians* (these technicians with expertise in a discipline and in discipline-based education research will serve as floating support and consultants for UNO faculty interested in using the services of the Center. They can conduct professional development, advise on STEM DBER innovations and self-studies, and aid in data collection, collation, and writing to meet faculty professional goals).
4. *Support for 2 PhD students* (12-month support for tuition and salary for 2 PhD students in discipline-based education research is requested. These students will have a core mentor but will also serve to support different programs in their internal goals and as part of the student’s DBER PhD).
5. *Leadership support* (1 course buy-out/year for faculty leading key initiatives in the Center, such as seminar series and major cross-disciplinary initiatives for Units or Colleges that are only taking place at UNO, for which no extramural support mechanism exists).
6. *Dedicated Communications Staff Member* (a full-time position dedicated to the external face of the Center, to maintain compliance with all UNO Branding rules and regulations, and ensure constant communication with stakeholders).
7. *Renovation or Acquisition/rental of Physical Space* (Currently the Center is renting space from the UNO Alumni Association, as there are no other available offices for the existing 2 staff members; similarly, we are unable to access existing spaces due to current usage on campus to host some of our events, thus we have been hosting them off-site, e.g. Holland Performing Arts Center, in order to find space, but at an added expense for the Center for each event and severely limiting potential attendance due to the commute for faculty, students and partners).
8. *Operating Budget* (A general operating budget of $50k is requested to cover day to day costs such as printing needs, provide consulting for 360 reviews of the Center, to host consultants for external reviews of the Center, promotion of events via media outlets/advertising fees, technology acquisition, and other *ad hoc* needs)

We aim to grow and expand deliberately and sustainably as our bandwidth of faculty workload and RFPs allow. Our overall goal is to be an impactful, yet efficient and resource-minded Center. Consequently, the following identifies programming and research ventures currently supporting the Center: Sherwood Foundation, NIH SEPA, NSF S-STEM, Collective for Youth, NSF IUSE, Nebraska Children’s and Families Foundation, NSF NoyceScience, NSF NoyceMath, and the NSF BODYMODELS project. The contributions from these existing programs to Center activities total approximately $611,000/year. And, we are actively pursuing other revenue sources, as articulated in Table 4. Many of these are currently under their first review at this time, to include pending awards of $13.94 million, again with no budget for administrative staff or operation expenses of the Center. Moreover, the UNO Center for Faculty Excellence provides support for some of the Center’s speakers for the Pedagogy Seminar series up to $3,000/year as a shared resource. Finally, the Lead Dean (Dean Edick) is committed to assisting the Center in fundraising via the upcoming Capital Campaign, and the leadership team remain actively engaged with the Nebraska University Foundation to accomplish this and work closely with the Foundation team to explore opportunities.

**Takeaway Messaging on Our Audacious Goals:**

During our campus-level presentations on our future goals as a campus for supporting our students, our community and the state, we have been honored to be a part of conversations about having “Audacious Goals” that stretch us all to be the very best that we can be together for collective impacts. The STEM TRAIL Center is conceptualized within that context, by a **large and inclusive team of faculty that value stretching us to work together to be the best that we can be as a campus.** We believe that the STEM TRAIL Center represents such goals in that we are: 1) Laser focused on learning and scholarly outcomes, by using research as an inclusive learning pedagogy, 2) Building stronger university-community partnerships, through UNO led mechanisms such as the Omaha STEM Ecosystem, 3) Establishing life-long learning models and outcome guarantees by building data-driven initiatives focused on STEM student recruitment, retention, graduation and success, 4) Effectively blending high technology with high-touch learning by mechanisms such as partnering for open-education resources and with the Maverick Network, and 5) Dramatically rethinking the cost model to create true affordability by directly supporting students with externally-funded fellowships, learning opportunities, internships/externships opportunities, open educational resources, and most importantly effective learning opportunities at UNO. Thus, we know that the STEM TRAIL Center proposal described an “audacious” set of goals, as proposed by a passionate and increasingly expansive set of faculty and collaborators, but we are so proud to share that philosophy and to stretch together with so many wonderful colleagues at UNO, as together we can do great things for the many students, community members and wider STEM workforce that we serve.