

**Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 114-C

Integrating Environmental Science Research in High School Education

Category: C. Environmental Education

Total Project Budget: \$ 445,000

Proposed Project Time Period for the Funding Requested: 3.5 years, September 2018 to August 2

Summary:

Working with researchers, 40 teachers statewide will integrate environmental research in their classrooms engaging students in scientific processes. Students will participate in ongoing scientific research and present at UofM

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Sponsoring Organization: U of MN

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Schematic of year activities and exponential growth of student learning from ongoing research

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %

PROJECT TITLE: Integrating Environmental Science Research in High School Education

I. PROJECT STATEMENT

The University of Minnesota have many researchers conducting ongoing research on diverse environmental topics, yet the perception of research is often disconnected from science and environmental studies. This is especially true as people (primarily students) think of science as a complete process from the past rather than ongoing. In school, teachers work to encourage students to think critically, but they tend to be isolated from much of the ongoing research or resources available at the University of Minnesota campuses, and UMN Research and Outreach Centers (ROCs) across the state. One reason for this is that many educators do not know researchers directly or the work that is ongoing statewide. This has created a culture where professors tend to expect incoming students to have specific knowledge, but high school teachers are not involved in this same conversation resulting in students lacking in knowledge, especially in science courses utilizing ongoing research. We propose to engage teachers and students in ongoing research providing diverse experiences that would bridge schools and students to research in their communities and statewide. High school teachers would work with research scientists to design experiments to setup at their schools. Students would be involved in experimental design and data collection, thus contributing to ongoing environmental research while learning about the process of research. We will also engage students in learning about the interaction of environmental sustainability and food security via the already established Minnesota Youth Institute hosted by the College of Food, Agricultural and Natural Resource Sciences (CFANS) at the University of Minnesota, which provides scholarships and opportunities for internships statewide to high school students. Lastly, teachers will participate in ongoing research during summer months.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Connecting teachers to researchers

Budget: \$48,000

We will invite 40 high school teachers (10 the first year; 15 each of the following two years) to network with environmental research scientists from across the state at a daylong colloquium. The high school teachers will learn about opportunities, and work with the scientists in designing experiments for their schools. In a pilot test of this kind of networking, we observed that once connected, teachers felt comfortable reaching out to the scientists for questions, and scientists guest-lectured at schools, benefitting both parties. We will rotate the location of this colloquium at different sites at different ROCs (Urban Research and Outreach Center in North Minneapolis for year one, North Central Research and Outreach Center at Grand Rapids for year two, and Southern Research and Outreach Center at Waseca for year three) sharing resources and potential for collaboration across the state.

Outcome	Completion Date
1. Networking event for high school teachers with environmental science researchers	October 2020

Activity 2: Setup of research projects at schools

Budget: \$81,000

Each of the high school teachers with their students will setup a research project at their schools that fits their school needs and aligns with their resources. Researchers will work with teachers to design projects where data from the schools can be accessible to all teachers, such that they can work on comparative environmental projects. Each teacher will be provided with a \$1000 supply budget, and we will have shared resources that they need not purchase. Researchers will also have the opportunity to visit the schools, either in person or via video conference, to create a connection with the students and to oversee project setup. Staff person supported by this budget will work closely with the teachers to support projects, data maintenance, and collaborations.

Outcome	Completion Date
1. Integrated environmental science research	June 2021
2. Scientist visits to schools	June 2021

Budget: \$43,000

Activity 3: Research Papers and MN Youth Institute

To complement the ongoing research and improve students' scientific writing, we will work with teachers to integrate the MN Youth Institute (MNYI) in their classes. MNYI engages high school students in researching

solutions to environmental sustainability and food security. This program provides scholarships, paid internship opportunities, and the potential to meet and learn from peers across the state. This proposal will provide some funds for localized environmental projects that students can conduct in their communities and internships, with support from the MNYI infrastructure.

Outcome	Completion Date
1. High school students writing about environmental sustainability for MNYI program	May 2021
2. High school students participating in environmental science internships	June 2021

Activity 4: Result presentation and start of next cohort

Budget: \$42,000

Complementing the fall colloquium, in late spring we will have a daylong colloquium where the high school teachers who setup research projects will present their projects and findings. We will invite scientists (other than those who have been involved), school district administrators from all the districts, as well as legislators, and members of the community. Lastly, we will invite high school teachers who would be starting this project the following academic year, in order for them to learn from these teachers.

Outcome	Completion Date
1. High school teachers presenting results and learning from peers across the state	June 2021

Activity 5: Summer research experience for teachers

Budget: \$231,000

In the summer, high school teachers who setup research projects will have the opportunity to conduct a four-week research experience at one of the research sites that we will collaborate with for this project. This can be one of the 11 research and outreach centers across the state or at one of the five campuses. This will provide teachers with experience in research, as they continue integrating environmental research in their teaching. We will also provide funding for up to three teachers per year to attend conferences where they can present their work.

Outcome	Completion Date
1. High school teachers conducting scientific research	August 2021
2. High school teachers presenting at scientific conferences, working on their professional development	August 2021

III. PROJECT STRATEGY

A. Project Team/Partners

Project Team/Partners: PI: Dr. Mohamed Yakub and co-PI Associate Dean Mike White, and we will collaborate with all the University of Minnesota Research and Outreach Centers across the state of Minnesota working with Associate Dean Greg Cuomo who oversees the ROCs.

B. Project Impact and Long-Term Strategy

The proposed project will integrate environmental science research in high schools across the state, providing students and teachers resources and understanding of ongoing research. Direct interaction between researchers and high school teachers will provide accurate and localized information to teachers and their students, and will provide teachers opportunities to learn from peers across the state, across school districts. The project will also provide high school teacher’s opportunities to engage in hands-on research, learning techniques they may be able to implement in their teaching. Lastly, this project will provide high school students access to scholarships, internships, and college counselors via the already established MN Youth Institute. This three-year project will set the stage for long-term viability via research grants from National Science Foundation and other agencies.

C. Timeline Requirements

We are requesting support for 36 months, from September 2018-August 2021. This support will provide 40 high school teachers from 40 different school districts opportunities to integrate research in their teaching and participate in research themselves. This project has the potential to change how students think of scientific research and environmental research, while connecting high schools with resources across the state of Minnesota.

2018 Detailed Project Budget

Project Title: *Integrated Environmental Science Research in High School Education*

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

Attach budget, in MS-EXCEL format, to your "2018 LCCMR Proposal Submission Form".

(1-page limit, single-sided, 10 pt. font minimum. Retain bold text and DELETE all instructions typed in italics. ADD OR DELETE ROWS AS NECESSARY. If budget item row is not applicable put "N/A" or delete it. All of "Other Funds" section must be filled out.)

IV. TOTAL ENRTF REQUEST BUDGET: 3 years

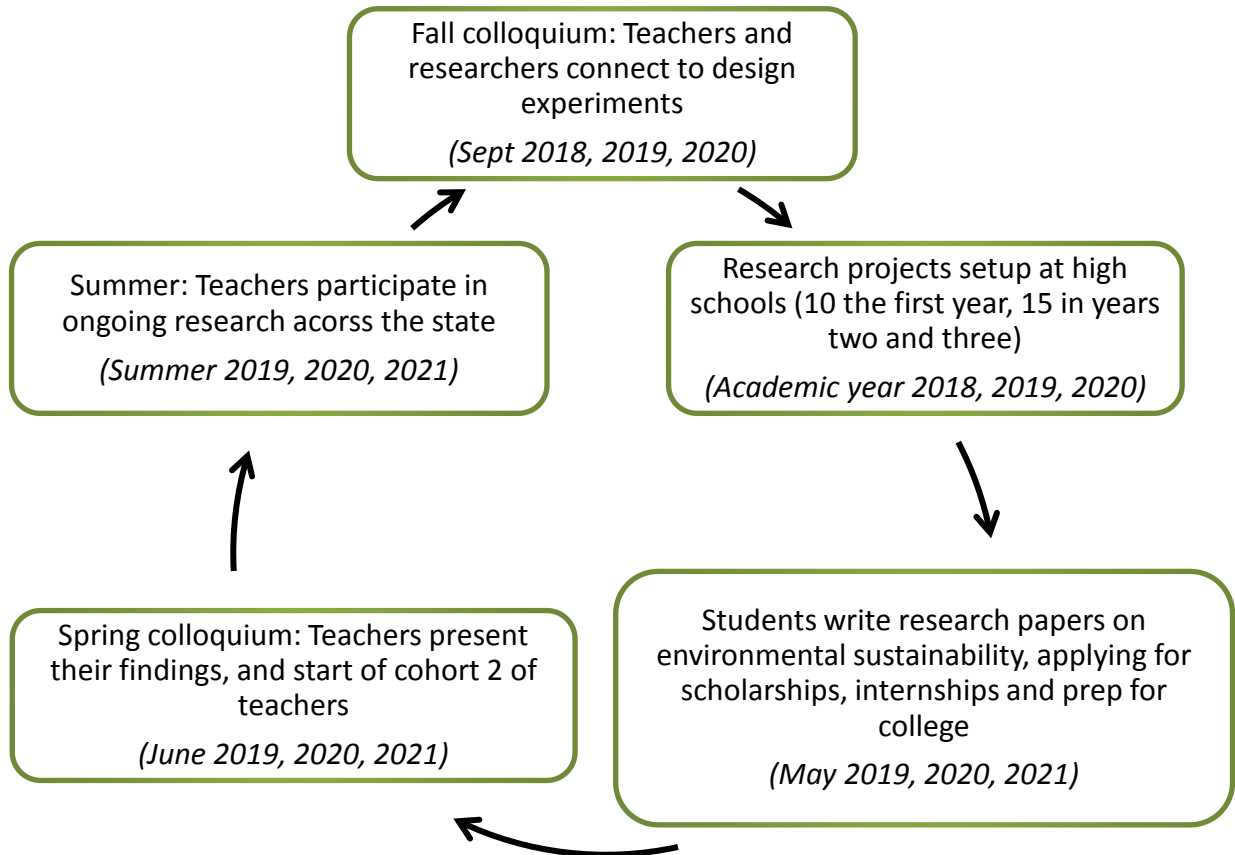
BUDGET ITEM (See "Guidance on Allowable Expenses", p. 13)	AMOUNT
Personnel:	
1 project Manager who will manage the relationships with all teachers and scientists, organizing events, and overseeing research setup (50% salary and 27.2% fringe rate) for three years	\$ 115,000
1 graduate student from STEM Education for one semester each year who will asses the results of this project identifying effectiveness of integrated research in high school teaching. This will be a student who has finished coursework and will be eligible for reduced tuition at the current rate of \$10,492.73 stipend and \$2834 fringe per semester	\$ 40,000
Teacher stipends for summer research for 1 month (estimating at \$60,000 per year, thus \$5000 per month) for 40 teachers	\$ 200,000
High school student internships (estimating 4 students at \$1000 per summer) for students who engage in MN Youth Institute	\$ 12,000
Professional/Technical/Service Contracts:	NA
Equipment/Tools/Supplies:	
\$1000 for supples for research setup for each of the 40 teachers (growth lights; soil for planting; media and containers for pollinator studies)	\$ 40,000
Shared supplies that teachers would have access to (tools for field work...wheelbarrows; hive setup materials; soil cores for soil testing)	\$ 10,000
Acquisition (Fee Title or Permanent Easements):	NA
Travel:	
Mileage for teachers and scientists to travel to colloquia sites across the state or the MN Youth Institute at the St. Paul campus of depending on where they are coming from, estimating \$1500 per year	\$ 5,000
High school teachers present at scientific conferences; estimate \$1000 per teacher for 4 teachers per year	\$ 12,000
Additional Budget Items:	
Substitute teacher cost (estimate \$100 per teacher for fall colloquia)	\$ 4,000
Handouts, materials, and food for fall colloquia (estimating breakfast and lunch for ~30-50 participants)	\$ 2,000
Handouts, materials, poster printing and food for summer colloquia (estimating breakfast and lunch for ~50-80 participants)	\$ 5,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 445,000

V. OTHER FUNDS (This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:	NA	
Other State \$ To Be Applied To Project During Project Period:	NA	Pending
In-kind Services To Be Applied To Project During Project Period:		
Co-PI Mohamed Yakub will contribute .01 FTE for the duration of the project	\$ 2,403	Pending
Unrecovered indirect costs @ 54% of modified total direct cost base of \$361,500	\$ 240,300	Pending
Past and Current ENRTF Appropriation:	NA	
Other Funding History:		
University of Minnesota Colloquium Grant as a pilot for Minneapolis teachers to integrate citizen science research in their classrooms/teaching (project is for the 2016/2017 academic year); funds received from Office of VicePresident for Research	\$ 12,000	

PROJECT TITLE: Integrating Environmental Science Research in High School Education

Proposed project schematic



Numbers of engagement (these will vary, and estimates are conservative)

Year 1: 10 teachers will engage ~60 students each in these projects = 600 students benefit

Year 2: 10 teachers continue to engage 600 students + 15 teachers engage 900 students = 1500 students benefit in year 2

Year 3: 25 teachers engage 1500 students + 15 new teachers engage 900 students = 2400 students benefit in year 3

Total: 4500 students engaged in hands-on immersive environmental science research, 40 schools across the state involved with at least 40 scientists researchers (likely more) sharing resources and knowledge

Project Title: Integrating Environmental Science Research in High School Education

Project Manager: Dr. Mohamed Yakub

Mohamed Yakub, PI on this proposal, completed his Ph.D in Plant Biological Sciences at the University of Minnesota. His research, focusing on responses of plants to urban environments, was setup at various high schools engaging students in ongoing research. He is the Science Outreach and Education Coordinator within College of Food, Agricultural and Natural Resource Sciences (CFANS) working closely with various faculty across departments and even colleges at the University of Minnesota. He works with high school teachers on various projects. Mohamed will oversee these projects, but will hire a project manager who will work closely with teachers and researchers, sharing information and overseeing project setup at schools. In order to assess the impact of this work, we will also support a graduate student to integrate this in their research and education.

Co-PI Dr. Mike White is the associate dean of students within CFANS, and will work to support Minnesota students in their path to college and success

Organization Description: University of Minnesota

The University of Minnesota is the land-grant University in the state, and supports 11 Research and Outreach Centers (ROCs) across the state. Associate Dean of CFANS Greg Cuomo oversees these ROCs and is supportive of this proposal engaging teachers in various communities across the state. CFANS within the University of Minnesota also houses the Landscape Arboretum and Bell Museum of Natural History, resources that will be leveraged for teachers to use in their learning and teaching.