

National Science Foundation 2017 Summer Research Experiences for Teachers (RET) Site

On

"Challenge-Based Learning and Engineering Design Process Enhanced Research Experiences for Middle and High School In-Service Teachers"

GOALS, EXPERIENCES PROVIDED, AND PERFORMANCE EXPECTATIONS

Goals of the RET Site are three fold:

- ▶ To educate, cultivate, and enrich science and math teachers' content delivery in their classrooms by exploring the engineering design-and-challenge instruction process and the critical research skills used by engineers to solve open-ended real-world problems.
- ▶ To improve 7-12 student science and math achievement and stimulate interest in STEM careers as a result of better instruction and curriculum delivered by participating teachers trained in engineering content and design-based instruction.
- ▶ To support participating teachers in becoming role models by applying their research experiences in their classrooms and communicating them effectively to their colleagues.

RET experiences include:

- ▶ Teachers completing a short, 1 week long course, *Engineering Foundations*, during Week 1.
- ▶ Two teachers working as a **team** on one project for six summer weeks (Weeks 2 to 7). An Area Coordinator (Faculty Mentor) and a Graduate Research Assistant (Graduate Student Mentor) will train the teachers on the research topic and guide each research team on daily basis.
- ▶ Teachers taking a series of professional development seminars and workshops taught by invited speakers and a team of ten highly experienced engineers and educators.
- ▶ Teacher receiving 40 contact hour continuing education credits for the summer RET experience.
- ▶ Teachers participating in four field trips.
- ▶ Teachers producing following deliverables at the end of the seven-week summer RET experience:
 - An individual curricular Unit which uses challenge based learning (CBL) and engineering design process (EDP) pedagogy to take back the RET experience to their classroom.
 - A team project report and PowerPoint presentation documenting: (1) the research project completed and (2) the classroom implementation curricular Units (two - one per teacher) developed.

- An individual teacher student audience poster. Since teachers are not expected to be proficient in poster creation, training and opportunities to create mini project posters are integrated in the *Engineering Foundations* course. A dedicated workshop of “Poster Making” will be also offered in which format requirements for posters to be created at the end of the Summer RET Site and after teaching the RET Unit.
- A short (≤ 3 minute) team (two teachers working on the same project) research video for other teachers. Since teachers are not expected to be proficient in video creation, training sessions are planned specifically for this purpose during the summer.
- A team summary report of the summer RET experience for submission to NSF.
- A team draft of a journal article.

Time and coaching support is provided for the production of the above deliverables during the seven-week summer RET program.

- ▶ Upon returning to the classroom, the teachers will be implementing their curricular Unit in at least one course taught by them during the next year and conduct assessment of student learning following project protocols.
- ▶ Each RET Teacher will be supporting a Choose Ohio First Scholarship Program (COFSP) Fellow (senior undergraduate engineering student) during the 2017-2018 Academic Year. The following timeline will be followed:
 - The COFSP Fellow will be recruited in September 2017.
 - Selected COFSP Fellows will participate in 4 hours of professional development on CBL and EDP teaching methods in September 2017.
 - During October 2017 to March 2018 the RET participant will host the COFSP Fellow assigned for 6 hours per week in the classrooms, with additional preparation time of 4 hours per week.
 - The COFSP Fellow will develop and implement an instructional Activity under the guidance of the RET Teacher based on a topic already being taught in the RET Teacher's classroom and in which the Fellow is able to incorporate his/her Senior Engineering Design Capstone Project topic.
 - The RET participant will be guiding the design of the pre- and post-test for this activity to evaluate impact on student learning due to its implementation.
- ▶ Reporting for two, school year Community of Practice reflection meetings (planned for January and mid-March of 2017-2018).
- ▶ After teaching the Unit, the teachers preparing one poster and Power Point for presentation at Final Culmination Event which is the 2nd Community of Practice in the early spring.
- ▶ Disseminating the RET results to other K-12 teachers through a dedicated website by each teacher contributing the curricular Unit implemented.
- ▶ Longitudinal Reviewing Support: The reviewing, critiquing, feedback and tracking progress of each teacher/team deliverable will be done by the RET Resource Person (RRP) using a

dedicated Wiki Site developed for the project. Since teachers are not expected to be proficient in creating and using Wiki, training sessions are planned specifically for this purpose during the summer.

- ▶ Teachers will receive following monetary benefits or equivalents:
 - A total stipend of \$6,000 per teacher, paid as follows:
 1. \$3,500 by the end of the summer seven-week RET program;
 2. \$1,000 (\$500/meeting) after reporting for the two school-year Community of Practice reflection meetings and submitting the reflection report for each;
 3. \$1,000 after submitting the completed Unit template, post-RET Unit poster, and video approved for web implementation; and
 4. \$500 after presentation at the *2017 STEM Conference* in the fall.
 - Note: The RET payments during the 2017-18 school year (total = \$2500) will be made in installments and will be linked to the required items listed above (deliverables #2, #3 and #4).
 - Laptop on loan until Post-RET implementation.
 - Supplies to conduct research projects during summer.
 - Parking fees to park at UC for the seven summer weeks of the RET Site.
 - \$200 support for Post RET classroom implementation
 - Additional Incentive Travel Funds are available for publication and presentation at a regional/national conference (other than the *2017 STEM Conference*).

RET performance expectations include:

1. You will participate for the full seven weeks (**June 12th – July 27th , 2017**) from 9:00 AM - 6:00 PM. The lunch break is 12:00 Noon – 1:00 PM daily. No exception will be made requiring full-time attendance during the seven-week RET Site, except under unforeseen circumstances occurring during the RET Site, which will be reviewed on case by case basis. The daily RET activities are typically planned as follows: 20 hours per week devoted to research and 20 hours per week devoted to professional development activities and production of project deliverables.
2. Other than holidays no exceptions will be made to the schedule (no absences).
3. You will receive the full summer stipend (\$3,500) at the end of the seven weeks. Missing any days will impact the amount of money that you receive.
4. You are expected to participate in Pre- and Post-RET implementation, including time during the 2017-2018 academic year.
5. Post-RET implementation includes: implementing the curricular Unit designed during the summer from the RET research experience; conducting and documenting results of pre- and post-Unit tests and any other assessments conducted; documenting the reflection on the Unit implementation and lessons learned; collecting student attitude evaluation data; revising the

videop created in summer; preparing a Unit poster for the *2017 STEM Conference*; preparing a short (≤ 3 minute) video showcasing their Unit highlights for other teachers; and submitting the approved Unit Template, poster and movie to be posted on the RET website. After the Unit is taught, the final Unit Template, poster and video will be again reviewed and approved by the RET Resource Person.

6. You will be required to come to two after school hour on campus (UC) Community of Practice reflection meetings (tentatively January and March 2018) the second of which is a Culmination event for both RET Teachers and the COFSP Fellows. At that time the RET Teachers will participate in a final Post-RET focus group meeting.
7. You will receive a laptop to keep only if you complete the full Post-RET requirements, otherwise the laptop will need to be returned. (Second year RET participants will not receive a laptop.)
8. You agree to come for an after school hour Orientation on campus (UC) sometime at the end of May 2017, to sign the contract and receive more information about the 2017 RET Site program. Attendance at this Orientation meeting is mandatory.
9. As mentioned earlier, the Post-RET payments (total = \$2,500) will be made in installments and will be linked to the items that are required as described earlier in item # 5 above (final Unit Template, poster and video – all approved by the RET Resource Person).