

APPENDIX 8: PRINCETON UNIVERSITY/CENTER FOR COMPLEX MATERIALS PROFILE

I. Description

Institution: Princeton University

PI: Richard Register

Co-PIs: none

Title: Princeton Center for Complex Materials

Proposal: 0213706

Program Officer: Thomas Rieker

Education Outreach Director: Daniel Steinberg

II. Education Activities within the University

Science and Engineering Expo

Description of activities

More than 1000 middle school students come to Princeton University to experience science and engineering with faculty members and students who perform cutting edge research. PCCM entirely organizes the engineering venue, which had nearly 40 tables of hands-on demonstrations and activities as well as an auditorium show representing about 50% of the entire Expo. The Science and Engineering Expo (SEE Princeton) has been a tremendous success in reaching 1000's of middle school students at an age where studies show they tend to lose interest in science. This event allows PCCM faculty members and graduate students to showcase their science research in a format in which middle school students can interact with the scientists and explore for themselves the world of engineering and materials research.

Program staff and expertise

Director – Pedagogy expert, scientist, recruiter and coach for demonstrators

Assistant – Handles administrative tasks and logistical issues

Goals and objectives

To inspire students at a critical point in their educational careers to appreciate science and possibly pursue careers in a scientific field

Target audience (educational levels, number of students at each level, etc.)

1000 NJ middle school (grades 6-8) students/year

Princeton University Materials Academy

Description of activities

Princeton University Materials Academy (P.U.M.A.) is a summer program for high school students that specifically targets students from underserved communities and young women. Students spend one to two weeks learning about materials science innovations from leading scientists in an intensive course in 2 sessions each summer. P.U.M.A. is the only program on campus that is strictly science oriented. This intensive program targets truly underprivileged, disadvantaged high school students – the especially those who have a good chance of success with the right encouragement – to give them a full immersion in science.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach

Assistant – Experience in Education Outreach

Lead teacher – High school teacher experienced in managing classroom

Goals and objectives

Supplement high school science courses; expose students to current scientific research and university professors' expertise; inspire students to pursue science in their college careers and beyond

Target audience (educational levels, number of students at each level, etc.)

High school students, especially underrepresented minorities from Trenton, Princeton, and Lawrenceville, NJ, 45 students/year

Current activities

Anticipated outcomes and/or deliverables (student awareness, curriculum materials, classroom demonstrations, etc.)

Nano S&E content focus

Materials Mini-Camp for Teachers

Description of activities

PCCM also has several Teacher Training/Education Programs in which k-12 teachers work directly with Princeton researchers to enhance the science content of their school-year courses. The *Materials Mini-Camp for Teachers* is a new initiative in our teacher training programs. In partnership with ASM International and Rutgers University, PCCM conducts a one-week course in materials science to help integrate the field with existing science and math curricula of New Jersey schools. With these programs, PCCM is teaching cutting edge science and directly involving faculty and teachers so that teachers understand what research and science at Princeton University is about. With this experience, they can relay knowledge and enthusiasm to their students.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach

Assistant – Handles administrative tasks and logistical issues

Lead teachers – ASM trained in Materials Mini-Camp curriculum

Goals and objectives

To provide specific tools and activities for teachers to introduce and integrate materials science into their curricula as well as enthuse teachers about science

Target audience (grade levels, number of students at each level, school districts, etc.)

30 NJ, PA, and NY high school teachers/year

Research Experience for Undergraduates

Description of activities

More than 30 undergraduate students are given the opportunity to perform actual research in materials science and engineering that compliments the ongoing research projects of Princeton Center for Complex Materials scientists. With the experience in the labs, short courses and lectures, the students are able to explore topics in materials science and engineering in a hands-on way that better prepares them for careers in science and technology.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach
Assistant – Handles administrative tasks and logistical issues

Goals and objectives

To provide college students from smaller schools or those without research facilities with the opportunity to perform research in sophisticated labs alongside acclaimed scientists

Target audience (grade levels, number of students at each level, school districts, etc.)

30 undergraduate students/year from all over the country

Research Experience for Teachers

Description of activities

Like the REU program, the Research Experience for Teachers program provides research experience in Princeton labs with Princeton scientists, but it has a more specific objective. The RET program is designed to allow three middle school and high school teachers to enrich their science curriculums at the schools where they teach. This experience does not only benefit the teachers. Their new enthusiasm and knowledge is passed to their students and fellow teachers. These teachers can use what they've learned to engage their students and provide insight on teaching and teamwork for other struggling teachers in all subject areas.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach
Assistant – Handles administrative tasks and logistical issues

Goals and objectives

To provide high school teachers with the opportunity to perform research in sophisticated labs alongside acclaimed scientists. To provide real world science experience to teachers that can be applied in their curriculum.

Target audience (grade levels, number of students at each level, school districts, etc.)

2-3 NJ and PA high school/middle school teachers/year

IV. Education Activities Outside the University

Science Center Collaborations; Liberty Science Center

Description of activities

PCCM has worked with the Liberty Science Center in a collaboration to supplement the Strange Matter Exhibit. The Strange Matter Exhibit is a traveling exhibit to introduce the topic of Materials Science to children and families. Liberty Science Center was the exhibit's first stop in the United States, providing Princeton University with a rare opportunity to participate in an award-winning program that makes Materials Science fun and educational for children. The Liberty Science Center asked the help of PCCM faculty to give a good solid science base for the exhibit. Faculty and students of PCCM volunteered their time at the Liberty Science Center performing pre-arranged demonstrations related to materials science. This has resulted in a strong partnership between the Liberty Science Center and PCCM. More collaborations on materials science related activities are to come.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach

Assistant – Handles administrative tasks and logistical issues

Goals and objectives

To engage students and their families in materials science, a field new to many of the general public.

Target audience (grade levels, number of students at each level, school districts, etc.)

Tens of thousands of people/year from the Tri-State area as well as tourists

Current activities

Anticipated outcomes and/or deliverables (student awareness, teacher professional development, curriculum materials, classroom demonstrations, etc.)

Nano S&E content focus

Nano S & E content consultants

Toll Gate Science Night and other school visits

Description of activities

Toll Gate Science Night is the largest of many school visit programs, which more than 100 parents and children attended. 3rd grade teacher Connie Cloonan, very active in elementary science education programs, collaborated with Princeton Center for Complex Materials (PCCM) Educational Outreach Director Dr. Daniel Steinberg to organize the program. The event is designed to introduce children to new concepts in science, engineering and materials science. Dr. Steinberg and Ms. Cloonan train teachers and parents to teach kids principles of science and to perform demonstrations of those principles. Toll Gate students of all grades learned about density, light refraction, acoustics, photosensitivity, and many other topics in science. Often professors such as Paul Chaikin or graduate students will visit schools to conduct hands-on demonstrations for students.

Program staff and expertise

Director – Pedagogy expert, scientist, experience in Education Outreach

Assistant – Handles administrative tasks and logistical issues

Goals and objectives

To engage students and their families in science and provide students with the opportunity to ask real scientists their questions.

Target audience (grade levels, number of students at each level, school districts, etc.)

Hundreds of students and parents/year in NJ

Current activities

Anticipated outcomes and/or deliverables (student awareness, teacher professional development, curriculum materials, classroom demonstrations, etc.)

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