RET 2012 – Pharmaceutical Engineering
Center for Pre-College Programs
Education Component – Expectations

Staff: Dr. Howard Kimmel
Dr. John Carpinelli
Ms. Levelle Burr-Alexander
Dr. Linda Hirsch

Overview:

An outcome of a teacher's participation in the research experience is two-fold. First, each teacher will be enriching his/her own knowledge-base as a STEM education professional by participating as an active member of a research team at NJIT in the area of pharmaceutical engineering. Second, the teacher will be synthesizing his/her research experience by integrating the acquired content knowledge and skills into a learning module for the high school students which supplements the school/district curriculum.

The learning objective for the teacher, from the educational component, is:

1. to **identify** (*comprehension cognitive level*) the research topic and **analyze** (*analysis cognitive level*) the skills/knowledge that will be necessary for their summer experience;
2. to **select** (*evaluation cognitive level*) the student-focused instructional module topic and **analyze** (*analysis cognitive level*) the skills/knowledge that will be developed for students to learn about an aspect of their summer experience;
3. to **prepare** (*synthesis cognitive level*) a project management plan that describes the tasks, outcomes, and timeline to be achieved in the summer research experience which includes the development of a student-focused instructional module (which is comprised of several lessons).
4. to **write** (*synthesis cognitive level*) a student-focused instructional module that consists of several lessons relating to an aspect of the research experience.

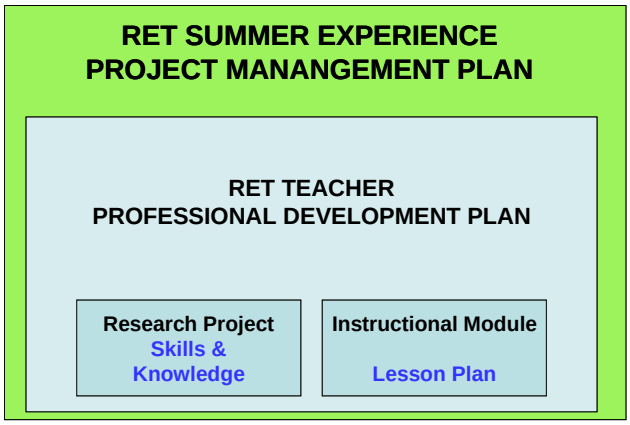
Topic 1 – Developing a Professional Development Growth Plan

Teachers will examine the connection between their professional development growth plans, as defined by the NJ Department of Education, and the summer research experience "management" plan; see diagram below. As a result, each teacher will prepare a management plan for the summer's research and the development of the instructional module. Planning the management of the summer research experience project should be described in the Professional Development Plan based on:

1. Identification of the ***skills and knowledge*** the ***RET teacher*** will acquire as an outcome of the ***research*** in pharmaceutical engineering during the summer; and

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889

2. Identification of the ***skills and knowledge*** the **students** of the RET teacher will acquire as an outcome of the implementation of the ***instructional module*** in pharmaceutical engineering during the upcoming academic year.



Topic 2 – Developing an Instructional Module

Teachers organize their thoughts on the instructional module by completing a "Module Development – Outcomes Matrix" which provides the topic, brief description, learning objectives, student-focused learning experience (instructional plan summary), and student assessment (assessment tools, i.e. student scientific notebook, and criterion for levels of mastery that will be used to students to demonstrate the acquired skills and knowledge). To assist in the iterative process of writing student-focused learning objectives that clearly articulate the cognitive behaviors, content, evidence of acquired knowledge, and criterion of mastery, the teachers will participate in reflective dialogue sessions regarding the development and refinement of learning objectives that are stated for any given module. The staff of the Center for Pre-College Programs at NJIT provides group and individual feedback for the refinement of the learning objectives and learning experiences for students throughout the summer experience. The teachers will revise the outcome matrix as they improve and/or clarify the elements summarized in the matrix. The outcomes matrix was introduced in the summer 2009 as a tool for teachers to organize their thoughts into well-defined student learning outcomes, learning experiences, and assessment strategies that would guide the further development of the instructional module. On the final day of the RET program, each teacher will present his/her research project accomplishments and challenges along with a revised version of the outcomes matrix. A draft of the complete instructional module will be submitted by each teacher as part of the 2012 fall workshop. By the 2012 fall workshop, the teachers are expected to implement the module, collect student work, assess the student work, and provide feedback to the students. Anonymous examples of student work will be assessed, archived, and submitted to the RET staff at NJIT along with a refined version of the instructional module. The submitted materials will be used as an indicator of the extent to which the RET project outcomes have been achieved for the teachers through the 2012 RET experience.

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889