Section 4. Developing a Mentoring Program of Undergraduate Research.

This section discusses how to start developing a mentoring plan. It contains specific tools and resource links designed to implement a mentored undergraduate research program.

Developing a mentoring plan takes serious dedication and foresight. To begin, the mentor needs to ask the following questions:

- What are your goals for the mentee?

- What are your expectations?

- How and when will you interact with your mentee?

- If there are going to be regular meetings, when, and where will they be held?

- Are students expected to read and present regularly?

- How will the mentee be evaluated?

Mentoring involves the investment of emotional and physical investment time. It involves finding out about how many hours per week you have available for facilitating the learning of the mentee. This must be discussed with your department and other colleagues. It would be important to have a list of topics, projects or ideas to bounce off of others, and to liaise with department or school committees. If workshops on mentoring are available, it is imperative for potential faculty mentors to attend them.

Qualifications for Becoming a Faculty Mentor

Certain criteria should be in place for those faculty members who want to be mentors. Potential mentors should possess a terminal degree in the appropriate discipline, and have ongoing research or demonstrated research capability of high academic quality. The academic department chair or dean should recommend them. In addition, potential mentors should demonstrate interest in working City Tech students.

Ideally, qualified faculty members who seek to be mentors can inspire the student researcher to reach new academic heights and goals. The mentor provides opportunities for the student researcher to develop valuable research skills, and treats the student as a full-time member of a research team. The mentor needs to provide a safe environment for the student to develop academically and socially, and keep he student "on track." Invested mentors may develop their own criteria for choosing a mentor - mentee pairing or similar mentoring relationship form. In addition, qualified mentors have the time to commit to the relationship, and may appoint a "proxy" mentor if they cannot fulfill their duties or are going to be away for an extended period of time.

A qualified faculty member who seeks to be a mentor should be involved in the application process of identifying a mentor and a mentee, aid in the strategic pairing of mentors and mentees, help establish mutual and programmatic goals, participate in providing measurable outcomes, provide direct benefits to the mentee, school and community, know that mentoring engagements will last 9-12 months, and participate in expert training and support. The mentor must also be adept at assessing prospective mentee's skill sets and degree of interest, and designing research projects that effective, realistic, and feasible across the disciplines.

How to begin the mentoring partnership or relationship with a mentee can be daunting, especially for the novice mentor. In fact, any mentor may initially feel overwhelmed by having to think of feasible, good, and realistic research projects. It may be somewhat scary to go about planning individual projects for mentees based on individual experience, knowledge, or skills. A novice mentor may incorrectly forge ahead, meeting with colleagues, discussing specific projects, without giving proper thought to project feasibility, and time frame. Before having an abstract or information on the proposed project available for potential mentees, or even allowing students time to think of a project and their proposed involvement, mentors must dedicate time to developing the mentoring partnership agreement.

Developing an Agreement

A mentoring partnership agreement looks like a learning contract that is consistent with sound learning principles and practices of adult learning. The contract must consider the following:

- Objectives

- Evidence of accomplishment of objectives

- Learning resources and strategies

- Criteria

- The means for validating the learning (Knowles, 1980).

Successful mentoring partnership agreements establish boundaries and contain expectations (Galbraith, 1991). A mentoring agreement established without conversation between mentor and mentee is a missed opportunity for goals, commitment, and expectations clarification, connection, and arriving at agreements. The entire agreement must be revisited throughout the relationship. Think about Case Study 4.1 when considering establishing a mentoring agreement.

Case Study 4.1 A Tale of Two Students

At the beginning of the semester, Professor Grasso announced in his physics class that he was looking for students to mentor in a research project. He stated that the required background was knowledge in differential equations. After interviewing students and asking them specifically about their mathematical background, he chose David and Michael, both of whom were enthusiastic and confident and had taken a large number of mathematics courses, including differential equations.

However, after several weeks into the project, it became clear to Professor Grasso that David was having a hard time applying his mathematics knowledge to the types of open-ended problems that one tends to encounter in research. Michael, on the other hand, was catching on immediately. When exam time came around, this distinction was ever more apparent; Michael's exam was neat, well organized and perfectly correct, whereas David's exam was messy and full of errors. While David had an insatiable scientific curiosity and enjoyed discussing esoteric concepts, Professor Grasso assumed that David lacked the basic skill set required for the task at hand. Moreover, David was holding Michael back.

After much deliberation, Professor Smith decided to continue the project with both students for the remainder of the semester. This enabled the project to reach a natural stopping point with the mentoring program poster session, thereby providing a sense of completion and minimizing hurt feelings. During this time, Professor Grasso discovered that David was the first person in his family to attend college. While David was extremely enthusiastic, he had no idea what he wanted to do after graduation and was lacking guidance. It was clear that what would benefit David more than a research project was someone to advise him on career options.

At the end of the semester, Professor Grasso encouraged David to continue strengthening his basic skills and told him that he would always be around to discuss everything from physics to career options. During the following semester, he continued to have conversations with David about his potential career goals and how to achieve them, and introduced David to graduate students who could play the role of "academic big brothers." At the same time, Professor Grasso continued to do more technical research with Michael, which led to published papers.

Both David and Michael are now in Bachelor's programs for physics and plan to continue on to Ph.D. programs. They still stay in touch with Professor Grasso and continue to use him as a source of guidance.

Reflection: How differently do you think it would have been for both students had Professor Grasso decided to sit with them and set specific mentoring goals, objectives and timelines? What would have been learned if this had been done, and revisited throughout the relationship? How did Professor Grasso identify and solve the differences between mentees while managing the feelings of both David and Michael?

How to Find a Mentee?

What do we need to do to find a mentee? What is the application process of finding a mentee? We must have certain requirements of the mentee, given each research endeavor has specific requirements. Those students with more academic experience, or past opportunities at scholarship may be better suited to being involved in more complicated research endeavors. Regardless, all potential mentees need to experience first-hand discussions about course prerequisites, and prerequisite follow-ups. Students may have the first part of a course but may need to take the second part, such that the research outcome goals be in line with the students educational goals. There needs to be a formal application process, which includes specific forms, personal interviews, and collection and review of resumes. Mentors must expect that students with some interest in an area of research may be more productive in terms of research project undertakings and outcomes.

The process of finding appropriately suited mentees may occur through advertisement or the use of specific student-focused forums. For example, classroom discussions can be an avenue for recruiting, as may using snowball techniques, colleagues, and distributing flyers. A research mixer may also work.

The next section of the Handbook contains tools for inputs, processes, and outcomes, including individual and process checklists and evaluations, program surveys, and web-based evaluations. *The Mentoring Program of Undergraduate Research* Web Site link is provided for knowledge dissemination and promotion. In addition, external links to international, local, and national mentoring activities, specifically those focused on faculty member-mentee research, are included.