

# MENTORING UNDERGRADUATE RESEARCHERS

*Prepared for the Southeast Alliance for Graduate  
Education and the Professoriate (SEAGEP)*

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# WORKSHOP OBJECTIVES

- Provide background on mentoring and your academic future
- Equip you with some good practices and tools for mentoring
- Provide selected reading and resources for further development
- Get your feedback on this workshop

# What is a mentor?

In Greek mythology (The Odyssey), Mentor was a man who befriended and advised Telemachus, the son of Odysseus. The goddess Athena would assume Mentor's form when she visited Telemachus.

A mentor is an experienced guide, trustworthy advisor, a personal champion, a constructive critic, a motivator, a listener. A mentor wants the protégé to succeed!

A mentor may also be a role model, but these are not the same concept.

# Today's participants

- Graduate students, including SEAGEP fellows, who are helping faculty in the mentoring undergraduate researchers.
- Undergraduate REU students who are the protégé s.

*Introductions....*

# Outline

- The Educational Landscape
- Expectations
- Dimensions of Mentoring
- Effective Mentoring: Setting Goals
- More Effective Mentoring Strategies
- Career Advancement through Effective Mentoring

# The Educational Landscape

- “.. Undergraduate research (is) the pedagogy for the 21<sup>st</sup> century...”
- Prime benefits of undergraduate research
  - (1) acquiring disciplinary or interdisciplinary methodology;
  - (2) setting out a concrete investigative problem
  - (3) carrying out an actual project
  - (4) sharing a new scholar's discoveries

*Dotterer, in New Directions for Teaching and Learning, no. 90, Summer 2002. p. 81.*

# The Educational Landscape

“... learning is based on discovery of new knowledge guided by advising, as well as transmission of existing knowledge and values...” (Boyer Commission, 1998; Gonzalez, in Science, vol. 293, 31 Aug 2003, p. 1624)

“...the distinct mission of the research university is to introduce students to research, to inspire in them a passion for discovery...” (Gonzalez, in Science, vol. 293, 31 Aug 2003, p. 1624)

# The Educational Landscape

“It is clear that the academic community regards the involvement of undergraduate student majors in meaningful research... with faculty members as one of the most powerful instructional tools.” (Report on the National Science Foundation disciplinary workshops on undergraduate education, NSF, 1989)

# The Educational Landscape

The next generations of professors will enter institutions where mentoring of undergraduate researchers is considered an integral part of being an educator!

# Exercise 1: Reflect on your expectations

- Graduate student mentors: What do you expect out of your undergraduate student protégé and his/her project?
- Undergraduate students: What do you expect out of your REU project, and your mentor?

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# Perspectives from other studies

- Undergrad research experiences are characterized by: mentorship; originality; acceptability, and dissemination.
- Assumptions: interaction between student and faculty that is focused on student *learning*; expectation of a *meaningful* contribution; use of *current* procedures and methods of inquiry; culmination in a *tangible product*.

(Kardash, in J. Ed. Psych., 2000, 92(1) 191-201. Also Hakin, in CUR Quarterly, 1998, vol 18, 189-192.

# Perspectives from other studies

- Most frequently stated expectation: “ability to do science”
  - Understand research problem, pose questions about it
  - Determine the data needed, and collect it
  - Develop abilities to think independently, creatively
  - Acquire attitudes & skills of scientists
  - Become adept in the lab or in the field

# Perspectives from other studies

- Other expectations
  - A relationship with their faculty mentor
  - Respect
  - Real work, not busy work
  - New friends & social interactions
  - Succeeding in a new organization, setting, laboratory

## Exercise 2: The Dimensions of Mentoring

In what professional, technical, and personal dimensions do you feel a need for mentoring? Where do you need experienced help?

*Examples: Communications (how to understand the audience for my work)*

*Career paths (graduate school or industry?)*

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# Dimensions of Mentoring

- The “doing of science” in your field
- Formal communications (publishing, speaking)
- Informal communications (interacting, teaming, ...)
- Obtaining funding
- Networking, including job searching
- Career paths & major choices

# Dimensions of Mentoring

- Supervision: Quality, scientific and ethical standards, safety, ..
- Management: Time and resource management; prioritization of tasks
- Personal issues (e.g. balancing work & family life)
- Gender issues
- Minority issues
- Cultural issues

# Good Mentoring Practices

# Good Mentoring: Set Specific, Realistic Goals and Deliverables

- Many agencies manage by milestones
- Setting specific goals, deliverables, and promotes concrete activity
- Achieving modest, short term goals promotes sense of progress
- Frequent review of goals and timeline is a valuable reality check; allows for adjustments and re-focusing

# Setting Goals: Things to Consider

- Prior UG research experience?
- What is student's motivation; expectations?
- Student's plans after graduation?
- Coursework or other preparation? What does the student like? Where did student perform well?
- How much time is available?

# Setting Goals: Things to Consider

- One semester project, or several?
- What is the final validation... course credit, grade? If so, how will grade be determined? Are expectations clear?

(Adapted from slides prepared by J. Singer, Office of Undergraduate Research, Buffalo State College, March 11, 2005)

# The REU/RCS “Task Plan”

- Developed from the NSF “Research Communications Studio” project, 2002-present
- Originally for academic-term research projects over several semesters
- Format is flexible and adaptable
- “Deliverables” are focused on *communications activities*

# Communications Deliverables

- A graph, with an explanatory paragraph
- A table, with an explanatory paragraph
- An apparatus diagram, with written explanation
- A written experimental procedure
- A critical analysis of one or more papers
- A written statement of background and objectives

# Communications Deliverables

- Explanation of a theory, with figures, equations, etc
- A computer algorithm, with explanation
- One or two of these *quality* deliverables a week, collected into an edited paper, poster, or oral presentation, is excellent productivity for a summer!

# Suggestions for Use of the Task Plan

# Caveats!

- Much great science has occurred serendipitously, not according to a rigorous task plan
- Plans can and should be revised
- Some excellent research mentors are not planners
- Some students thrive in an unstructured environment

# Exercise 3: Testimonials

Take a few minutes to reflect on a good research/mentoring experience, and share with the group what worked best.

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# Other Tips for Effective Mentoring

- Interest & support
- Positive personality (humor, honesty, dedication, empathy, patience, objectivity, flexibility, ...)
- Knowledge and competence

Malachowski, in CUR Quarterly, December 1996, p. 91-93

# Other Tips for Effective Mentoring

- Set regular meeting times (shared calendars)
- Frequent early meetings
- Proper use of email and face-to-face meetings
- Clear expectations, esp. for graded courses
- Pick project that suits student interests

# Other Tips for Effective Mentoring

- Be careful about taking on a student project outside your area of expertise
- Never assume student understanding... probe, question, ask for their own words, etc
- Incorporate the UG into a team or group; promote learning among/across different experience levels.

# Other tips for effective mentoring

- Be responsive and timely
- Encourage dissemination: posters, papers, meetings, etc.
- At the end, focus on positive outcomes
- Remember, it is about *both* the research products and student learning

(Tips compiled by the Office of Undergraduate Research at Buffalo State College)

# Stages of Mentoring

- Initiation stage-mentor largely directing the student, providing the necessary background so that the student understands the significance of the problem. It also involves project planning and is a time when the faculty mentor and student build trust and set expectations. This stage includes frequent face-to-face meetings between student and mentor.

# Stages of Mentoring

- Cultivation stage- the mentor and student interactions are greater and more equal. The student starts taking 'ownership' of the project. The frequency of meetings will be less than the initiation stage, but are regular and at a frequency that ensures that the student and mentor are meeting to discuss progress, changing directions of the project, emerging ideas, etc.

# Stages of mentoring

- Transformation stage-the student requires less day-to-day guidance and the student is taking over running the project. The mentor provides feedback and advice. The student and mentor may begin to interact more like collaborators
- Separation stage-the student works even more independently and the mentor embraces more of the student's decisions. The mentor may be able to move on to other project(s) and work with other students.

Malachowski, in CUR Quarterly, December 1996, pp.1 91-93))

# Benefits of Being a Mentor

# Career Advancement

- Enhanced research quality and productivity
- Friendships and networks
- Improved teaching and research skills (due to explicit emphasis on mentoring)
- Proof of leadership & supervisory skills
- Getting on the leading edge of university education in the 21<sup>st</sup> century

Thanks, and Good Luck!