The Ten-Strand Systemic Mentoring Model
The Timbuktu Academy, Southern University and A&M College

Systemic mentoring entails a weaving of the following "overlapping" strands. *[The implementation of this model earned the Timbuktu Academy the 2002 US Presidential Award for Excellence in STEM mentoring]*

1. Financial support is provided to the scholars from *a variety of sources* – guidance, monitoring, and other components of systemic mentoring that guarantee the use of the resulting "time dividend" for studies, research, and related enrichment activities on a full time basis. The diversified funding base for the scholars include tuition scholarships (TOPS in Louisiana), the Federal Student Financial Aid, limited support from LS-LAMP, LASIGMA, and other scholarship and fellowship sources, including unit and institutional funds.

2. Communication skill enhancement - A host of listening, speaking, reading, writing and related activities are aimed at developing the mastery of the applicable language (English), a vehicle of thought. This activity entails vigorous exposure to technical communication as provided for in *"Writing for Success"* (1998, McGraw-Hill Companies, pp. 135-176 and pp. 212-215), beyond regular English course work.

3. Comprehensive, Scientific Advisement - The proper sequencing of courses is treated with the utmost care. Indeed, the internal rigidity (or taxonomic structure) of science, technology, engineering, mathematics (STEM) disciplines requires this approach. Empowering the learner is a central aim of mentoring. This empowerment includes grasping the power law of performance and its extension, the integrated law of human performance (ILP); and knowing a few time-tested facts and practices (first-time memory retention curve, the value of effective study groups, a problem solving paradigm, the difference between lacking a background material and not being "smart.")

4. Tutoring - Tutoring by faculty members and particularly by peers will continue to be available to the students or scholars who need it. (In fact, regular tutoring areas are often taken over by self-organized study groups!) Tutoring is for excellence, not for remediation; it is to address holes in a background and to reinforce known essentials; the need for it is not a sign of any lack of intrinsic smartness, so says the power law of human performance, but rather a wise recognition of the internal rigidity of STEM fields. Incidentally, tutoring by advanced scholars also promotes their communication skills and their sense of self-worth while they review materials (so says the ILP)!

5. Generic research activities - Rigorous literature searches are conducted by the scholars on several subjects. They master sophisticated search algorithms, electronic searches, and related iterations. The scientific literature is an unlimited source of research questions! Refereed literature is the standard for STEM disciplines. Discussions of the fine structures of the scientific method, critical thinking, and of creative thinking are part of this discourse.

6. Specific research project execution by the scholars of in our mentoring programs - Faculty members and researchers at federal and industrial laboratories serve as research supervisors and mentors during the summer. *According to the integrated law of human*

performance, research experiences should prepare for graduate studies and for productive research careers. Seeking summer research opportunities on-line, at conferences, and through visits to various laboratories and agencies is one requirement for a mentoring program. Assisting scholars to apply vigorously and professionally for these opportunities and maintaining adequate files on each scholar, partly for the purpose of writing substantial (as opposed to general and vague) recommendations, are some tasks for mentors to accomplish. On a given summer, 70-90% of our 60-100 undergraduate scholars engage in summer research. *Research and design infrastructure enhancement is for expanding on-campus opportunities for scholars.*

7. Development of a professional culture - Every scholar is exposed to discussions that explore the dimensions of *ethics in science.* Immersion in a professional culture demands regular reading of technical journals and appropriate magazines of professional societies, conference attendance, and collaboration with others. Current awareness needs no explanation in an era of information explosion. Professional practices and standards are set and seen in publications, *regular (weekly) seminars*, and at conferences. As for the need for and value of collaboration, we simply assert that not one individual has built or operated a nuclear submarine, an aircraft carrier, or a space shuttle alone!

8. Development of Computer and Technological Skills - The mastery of productivity tools, including word-processing, spreadsheets, database, graphics, other applications, and scientific programming (C++, FORTRAN, etc.) are needed. Electronic communication and productive surfing of the web are needed by the middle of the first semester. Advanced exposure has to include a programming language. (The need for these activities stems from practices in the environments to which the students are destined, i.e., graduate schools and the global, competitive market).

9. Monitoring –facilitated by the mentoring portfolios of scholars. Without this portfolio, a mentoring cannot be comprehensive or systemic as we know understand it. With monitoring, throughout the semester, potential problems are avoided before they become permanent Fs. Preventive measures include concentrated efforts, extra-tutoring, and the last resort, dropping a course. The former two steps are best when they are taken as early as possible. The latter step is not an available option past a certain date after mid-term! The monitoring of research participation and performance is critical for another reason: *the development or reinforcement of non-cognitive skills that undergird success (self-discipline, hard work, assiduity, working well with others, etc.).* Monitoring and evaluation are part of a professional environment, without them, who will know what a beautiful job a scholar has done!

10. Guidance to Graduate School - It begins in the freshman year (or earlier) and includes research experiences, conference attendance, *GRE preparation* starting the freshman year, and opportunities for financial support for graduate studies! Placement in graduate programs follows steps similar to those for summer placement. The number and the extent of the opportunities depend on the cumulative grade point average for the BS degree, the courses taken, research experiences and results, and the GRE score. In addition, graduate preparation will include an understanding of the non-academic factors that are critical to success in graduate school (study habits, self-discipline, hard work, etc.). Emphasis will be placed on the establishment of a seamless transition to graduate schools.