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# Beyond the Classroom: Mentoring in the CIS Academic Community

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## ABSTRACT

*Elliot Soloway, noted author and teacher, recently observed in a presentation at ACM'97 in San Jose, that human interaction and nurturing are as much a part of the educational process as is the discipline knowledge. He went on to state that no use of technology can replace this human element. Although the classroom is the traditional instructional forum for issues such as professional ethics, responsibility to society, and the need for a life-long learning, a more individualized approach to learning is recognized as providing a higher degree of success [Parks 1990, Parks 1995]. How can educators provide a more individualized approach to learning without sacrificing classroom content? One answer is Mentoring. Several years ago, our university established a mentoring program for certain high-risk students. The School of Computer and Information Science (CIS) embraced the mentoring concept and extended it to involve CIS majors for in-class and out-of-class activities. In this paper we describe the mentoring process as it occurs in our CIS community.*

**INTRODUCTION** Many CIS curriculum documents [ACM 1991, DPMA 1991] outline a holistic approach to learning which results in a complete student. Graduates of CIS programs are expected to achieve a personal as well as a professional development. They are expected to possess sufficient professional skills and knowledge to gain initial employment, and they are expected to possess sufficient personal skills to work effectively in teams and to be productive members of society. They are expected to have a sense of personal as well as professional ethics and to understand their individual role as well as professional role in society. They are viewed by members of society as possessing valuable technical skills and problem solving abilities and, therefore, leadership roles gravitate towards them. How can we as faculty give more than curriculum instruction so that our students are prepared for these leadership roles? How can we get them to commit to a life-long learning approach to cope with new professional and community demands?

Academic environments are also often guilty of a passive learning style. This is often blamed on the vast knowledge base of facts that must be mastered; hence students must be told what they need to know. Bloom [1956] speaks of levels of learning. The very basic fact level only accomplishes level 1 in Bloom's taxonomy. Active learning results in higher levels of achievement [Doran 1996].

The curriculum clearly states topical content to cover. Recent work has considered depth of coverage in terms of Bloom's levels [Doran 1995]. Courses successfully introduce the necessary topics of problem solving, teamwork and life cycle issues; but practical experiences are often lacking [Doran 1993], [Daigle 1995, 1996]. Also lacking is a necessary component of human interaction and nurturing. Elliot Soloway stated this recently at ACM'97 held in San Jose. Technology plays a critical role in education today; however, without the human interaction between teacher and student, learning will fail.

Soloway states no use of technology can replace this human element. How can the educational experience be personalized? How can educators provide a more individualized approach to learning without sacrificing classroom content? One way to personalize education and to maintain the human element is through Mentoring.

**MENTORING** Mentoring is hardly a new concept. The word mentor comes from Greek mythology. Mentor was the trusted friend of Odysseus and the tutor of Telemachus, Odysseus' son. During the Trojan War, Odysseus entrusted the care of his household to Mentor. The word mentor now refers to a trusted advisor. [Grolier, 1996].

Mentoring within academia occurs both informally and formally. When you take that special student under your wing, looking out for their best interests, guiding them through the curriculum, and looking out for meaningful academic experiences for their development, you are mentoring in an informal way. Other examples of informal mentoring are advising professional organizations such as ACM and AITp, coaching a team for a programming contest, or organizing a faculty-student softball intramural team. There is no formal commitment to involvement but there is a desire to have greater involvement and a deeper understanding of people rather than the roles of student or faculty;

When you analyze a student's plan for next year's courses for relevance to the student's stated academic objectives, you are mentoring in a formal way. Some other traditional ways of mentoring include directed studies participation and thesis preparation. In each of these situations there is a formal commitment to guiding the student to success, either in the curriculum, a course, or to produce a product.

These examples of mentoring illustrate ways that a faculty member can provide a personalized learning experience. However, these experiences are often limited in scope and dura-

tion, and, except for advising, are generally isolated incidents that involve few faculty and students. Few long term mentoring relationships are associated with undergraduate education.

Seven years ago a freshman mentoring program was established by the Dean of Students at our university. Volunteers were recruited from among faculty to provide personal guidance to new, academically gifted students from faculty in the student's major during the freshman year. The School of CIS embraced the concept of mentoring and has incorporated in informal and formal activities within its academic community.

The involvement of School of CIS in the university mentoring program has been exclusively through the efforts of one of our faculty. However, the idea of mentoring as a means of becoming involved in the academic development of students has taken root and evidence of mentoring can also be found informally and informally within the CIS academic community. The CIS faculty member involved with the university-wide program initiates contact with mentees and serves as the primary mentor during the freshman year. In subsequent years, this faculty member maintains the contact and invites the participation of other faculty and students. Mentees of the university-wide program serve as leaders in these on-going projects. The remainder of this paper discusses the mentoring activities in the freshman year, the informal mentoring activities during the sophomore and junior years, and the formal mentoring during the senior year.

**FORMAL MENTORING IN THE FRESHMAN YEAR** New college students face many obstacles to successfully transition from high school to college: There are the external stresses of obligations to family, employment, and financial as well as the traditional stresses of brought on by course work, peer pressure, social interaction, time management, and more independence because of being away from home. Even those who are among the best academically prepared, possessing excellent high school grades and high ACT/SAT scores, are not immune to these obstacles to success. Students who should be academic leaders often fail to perform any better than at-risk students when they succumb to transition stress.

The University of South Alabama created a freshman mentoring program to provide additional support to academically gifted students. For many of these students, this is their first time away from home, the first time they must make decisions on their own. Volunteer faculty mentors are there to nurture these leaders-of-the-future during the embryonic stages of their academic development.

During the freshman year, students primarily participate in the university-wide program. The Dean of Students has established various programs and activities during that year to integrate these students into the university community. Emphasis is placed on adjusting to college life, study skills and social interactions. There are also educational field trips set-up by various faculty from around the university. Students are strongly encouraged to participate in the activities and network with other students in all disciplines of study.

The CIS faculty mentor participates in these university-wide activities and also establishes local CIS events for the freshmen members of the mentor program. Early in the process, social meetings are used to allow the new mentor participants to meet and talk to previous members. Many of these students take an

active role in the local student chapter of ACM or AITP, frequently assuming positions of leadership and involvement in the CIS tutoring program. By providing academic and personal advice, by assisting with decision making, and by involving the student in social and academic activities, the mentor personalizes the educational process for the freshman year and fosters an attitude of involvement and leadership in professional activities. In the next section we discuss the informal mentoring activities that result in the remaining years in the program from the freshman year relationship. The next section will describe how the faculty within our CIS program has fostered a mentoring environment.

**INFORMAL MENTORING IN THE FOLLOWING YEARS** The university encourages continued mentoring but it does not provide funding to support mentoring after the freshman year. Once benefits of freshman year mentoring were realized, the CIS mentor elected to mentor through the remainder of a mentee's academic career. Using the freshman experience as a springboard, the CIS freshman mentor and previous mentees extend the notion of mentoring to a larger portion of the CIS community. Three new types of mentoring takes place during this time: the mentoring relationship established in the freshman year is continued, the previous mentees assist in the mentoring of new mentees assigned to the faculty member, and more CIS faculty and students join in the advanced projects and activities.

The CIS mentor and a previous freshman mentee initiated a series of web projects that resulted in the involvement of several other faculty and students. The first web project involved the ACM student organization in which both mentor and mentee were active: this project created a demand for similar projects for other student clubs in which mentees were involved. Web projects provide excellent opportunity to explore the challenges of the CIS discipline since they are practical applications for developing a wide range of problem solving skills and extending classroom knowledge. They also furnish an opportunity for hands-on experience with data communications and networks that is useful when seeking employment in today's business sector [Belanger 1995]: network management, client/server architectures, internet protocols, message handling, file transfer, all are involved in these projects.

The CIS mentor assisted with finding computing resources, with recruiting CIS faculty for technical mentors, with managing the ACM project, and with maintaining an overview of succeeding web projects. The mentor emphasized the application of the Software Development Life Cycle (SDLC) for project planning and management and a divide-and-conquer approach to the project implementation strategy. The larger problem was broken down into micro-objectives that could be achieved through a well planned sequence of sub-goals [Gagne 1985, 1988], [Salisbury 1989], and [Doran 1993]. The accomplishment of the sub-goals lead to the completion of the overall goal, establishing overall effectiveness [Doran 1994].

Sophomore and Junior mentees are given significant responsibilities for the project: they interact with the CIS mentor regarding the project goals; they work closely with the CIS faculty technical mentors for project implementation strategies; and they serve as project managers for new recruits. This involvement increases their technical, interpersonal, and leadership skills and it

also results in their evolving to the role of mentor. They experience the benefits of giving and the complexities of working with others when they show peers how to apply Polya's problem solving strategy to task assignments and when they share technical knowledge necessary to carry out task assignments. Projects like these offer a practical means of expanding the presence of mentoring within the School of CIS academic community by extending the university freshman mentoring program goals and by increasing participation of additional CIS faculty and students. In the next section, we discuss an in-class approach to mentoring during the senior year.

**FORMAL MENTORING IN THE SENIOR YEAR The capstone of the CIS undergraduate curriculum is a two quarter sequence that involves team-oriented projects. The objectives, constraints, and student diversity of the sequence result in a challenge for students and a complex management problem for the instructor.**

.Projects are intended to bridge the gap between academia and the real world, and, therefore, are of greater complexity and of longer duration than could be achieved in previous classes.

.Accountability for individual activities and for collaboration with team members are major components of individual assessment.

.Individual and group writing assignments and informal and formal presentations are required.

.Students view the sequence as an opportunity to personalize the curriculum: The instructor must balance the short-term student requests with long-term employer expectations.

To achieve course objectives and to satisfy student interests, an independent-team model for course management is used: each team functions as a self-managed team with project problem different from that of any other team. A loosely-coupled association with other members of the class is maintained with two types of events. Weekly class meetings provide an open forum for reporting on team progress and for discussing team strategies; special class meetings provide a means of critiquing formal team presentations before they are made before a public audience.

While the independent-team model provides the flexibility for meeting course objectives and satisfying student interests, it does create another problem. Although a solitary faculty member can be expected to provide guidance for the project management process for all teams, a team's project may require technical or domain knowledge unfamiliar to the instructor. Mentors are recruited, either by a team or by the instructor, to supply the expertise necessary for a successful project experience. During the past two years, twenty-five project teams have formed mentoring relationships with thirty-eight individuals. Several sources of qualified mentors exist. We are proud of the enthusiastic support from our own CIS faculty: about 85% of our CIS faculty have volunteered as domain and/or technical mentors for project teams. Other university faculty have also been utilized: one project involved faculty from statistics, engineering, and finance. CIS alumnus participation brings the past, present, and future together: four alumni have participated in three separate projects involving new technology. Teams have also received guidance from CIS professionals from a local engineering firm, a

printer manufacturer, a real estate agent, a principal of a middle school, and the corps of engineers. These affiliations have provided experiences that otherwise would be unavailable.

**DISCUSSION Mentoring has always had a presence in academia. The university freshman mentoring program and the commitment of one of faculty to mentoring has resulted in an increased presence within our CIS academic community. The benefits of a deliberate approach to mentoring are numerous.**

Mentoring establishes an environment for leadership development (for faculty as well as students). We have observed that students who participate in this mentoring process evolve into leaders. These students assume leadership roles in extracurricular CIS activities and on senior project teams. They also are active in student organizations and are a visible presence on campus. The example and leadership provided by these students extends to include many additional students not initially involved with the university-wide mentor program.

A mentor is a role model. Mentoring provides the opportunity to teach character, ethics, and the need for life-long learning by example. Each of us has a story of special help and guidance that we received during our personal and professional development-- we succeeded because of nurturing that we received along the way. By their unselfish giving, mentors communicate a responsibility for continuing the tradition of nurturing--for being a good citizen in the profession and in society.

Mentoring results in an individual approach to education and greater involvement of faculty in the academic development of students (the human element). The experiences of being mentored in the freshman year, interacting with other CIS faculty and students on special projects in the succeeding years, and mentoring of other CIS students, result in a broader and more intense development of individual technical, communication, and interpersonal skills. Several of the mentees have joined in with faculty in presentations to conferences.

In an academic environment, a mentor provides insight into learning beyond the traditional classroom setting. We believe that our approach to building mentoring into our academic program, through in-class and out-of-class activities, is an additional way to incorporate the human aspect of learning that Soloway was addressing in San Jose.

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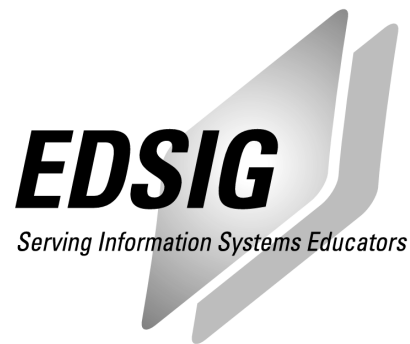
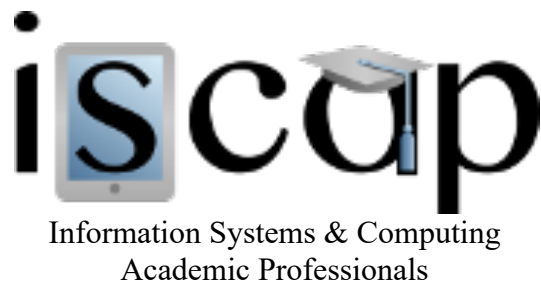
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