

e-Mentoring As A New Paradigm For Learning

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Abstract

This is a position on a *new e-mentoring environment* based on the integration of the tutoring concept, which we will describe from the historical, pedagogical and technical perspective, with new available technologies that have not been used in this combination. We introduce it as *e-mentoring*, and describe the general system architecture for developing an e-mentoring environment explaining its advantages in contrast with other styles of e-learning. Specifically, a conceptual framework for the development of e-mentoring and a systems architecture for its implementation are outlined. We further describe one project in progress and scenarios within that project that help envision how e-mentoring would be applied to address the issues of an educationally under-served community of students.

e-Mentoring as a new paradigm for learning

Tutorial learning, coaching and mentoring are all forms of another paradigm for learning that has its ancient roots in dialogue and interaction. There are obvious advantages in the mentoring approach besides the one-on-one interaction. Frequent access to a source of knowledge, individualized learning and goal-driven learning situations contribute to the value of the approach. Mentoring, or learning from a master [1], with the perfect set of materials at hand, and in pursuit of adequate, meaningful and rewarding learning goals is an educational dream that few can attain. In a world where teachers are in short supply, classrooms are becoming unmanageably large, and students are expected to perform based on prescribed standards, the opportunities for mentoring, as a necessary supplemental learning paradigm are almost non-existent.

As always, technology offers opportunities for bridging the educational gap, but also, as is always the case, technology has had a highly differential impact on learning. Particularly, this form of learning is only available to students for whom the benefit of an online mentor is facilitated through special programs or projects and they must have consistent access to, for example, the Internet for the mentoring activities to have prolonged impact. Typically such mentoring activities are a casual occurrence in the educational process. A special school project, a business partner project, or a public interest activity will connect a student with an online mentor and a topic, often not by personal choice. Other initiatives have created pools of mentors that are accessible to students over a reasonable period of time. The impact is typically positive and the experience rewarding.

The problems with online mentoring are exactly the same problems that we encounter when we try to bring technology to bear on the learning process. Material inequities in the distribution of the technologies and the lack of high quality highly adaptable solutions are the major issues to consider. Unfortunately, nothing short of social and policy transformation will bring about educational technology equity. We cannot do enough about that issue. We can however, hope to significantly improve the quality of the solutions by, among other things, and given the more recent advances in technology developments, simply changing the perspective of the approach. What do we mean by that? e-mentoring can come of age, and can provide some of the advantages that we expect from highly adaptive tutoring situations.

Highly adaptive, highly interactive, personal learning blocks

For at least thirty years, researchers have not only worked on the problem of adaptability and interactivity, but have done so in concert, creating some excellent examples of highly adaptable and highly interactive online tutoring systems. Studies show that these kinds of approaches are on the right track, positioned to produce real gains in learning that can be measured without the need for accountability extremes [2]. We can see and feel the learning process taking place and we can measure the results in performance, time-on-task and complexity level promotion. The major drawback in this approach is not whether we have the technical and pedagogical skills available to make these experiences happen, it is not absence of powerful tools to design them, the problem is not quality the problem is quantity. We can do enough of it. Technology should provide a helping hand.

Ideally, what we need is a personalized learning space [3] that is highly adaptable, highly interactive and automatically created so that it can be recreated constantly as a permanent component of the learning system and the learning process. Existing systems for *automatic tutoring* and *online mentoring* fail to provide support for sustained and connected learning through technology. Existing approaches do not address sustainability and longitudinal support - at all. What we need to find is that perfect mix of automatic tutoring and online mentoring that is both highly adaptive and interactive and also personalized. We also want to be able to set off the creation of enough of these to support a large constituency of learners. Part of the problem is that human interaction is desirable and necessary. Since we know that there will always be more students than online mentors and more mentoring situations than available automatic tutorials, we must think of how to effect an e-mentoring environment in such a way that the automatic tutorials are created as a result of online mentoring sessions and are applicable to subsequent mentoring situations. We are pursuing an end-to-end solution that we refer to as e-mentoring, a form of e-learning.

An e-mentoring system

An e-mentoring System is defined as a technology platform to support all aspects of *automatic, personalized, sustained and longitudinally tractable online mentoring*. It should support the delivery of *just-in-time, just-enough, and just-for-you* asynchronous and synchronous *distance tutoring*. It should use knowledge discovery technologies to allow access to expert knowledge and/or focused collaboration; and, automatically designed mentoring modules. In order to accomplish these design goals we must use tools that can be tailored to assure maximum effectiveness in a both distributed and collaborative online learning environment.

The following is an outline of what the proposed e-mentoring system delivers.

An e-mentoring system integrates:

- ✓ Content management and delivery
- ✓ Video conferencing for real time interaction with a mentor
- ✓ White board for communicating ideas
- ✓ Voice or chat for personal communications
- ✓ Application sharing for collaborative work
- ✓ Profile portfolios for assessment or other forms of evaluation
- ✓ Focused digital library for personalized support
- ✓ Other technical features to support those functions

It also integrate team functions such as:

- ✓ Access to mentors and bios
- ✓ Records of student profile and past mentoring portfolio
- ✓ Records patterns of interests and priorities
- ✓ Support for learning goals and refinement of goals
- ✓ Knowledge discovery and best-fit analysis

And, it should be able to cope with such technical issues as:

- ✓ Rich interactive media
- ✓ Synchronous and asynchronous media access
- ✓ Two-way video streaming
- ✓ One-way content playback
- ✓ Content to access mode synchronization
- ✓ Content storage, management and security

The integration of all of these features, functions and issues into discrete system components should result in a system that is significantly different and robust. The system should be able to reuse both content and knowledge in effective ways and to position the student at the right point in the mentoring process each time, based on the analysis of the combined goals, history and situation data.

The integration platform

The integration platform for the e-Mentoring System is divided into five components that house the software and data for the system.

These are:

1. Front-End, what the users see
2. Back-End, where specialized tools reside
3. Deep-End, where the content and data is stored
4. Side-End, for active controls
5. Common-End, where the system configuration resides

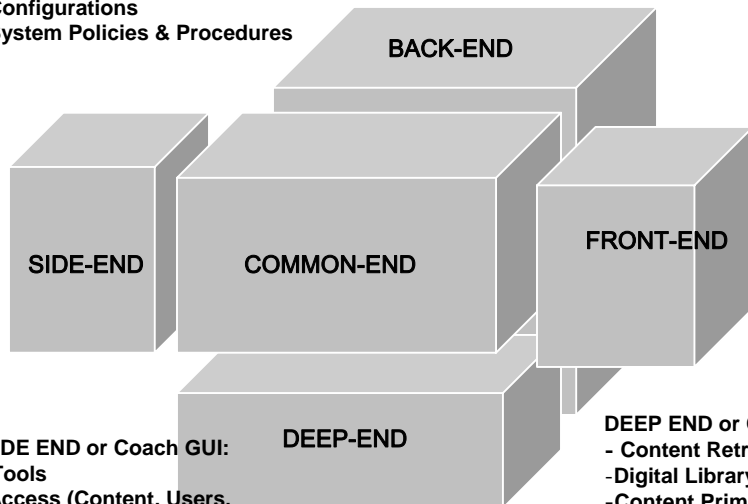
The e-Mentoring System Architecture

COMMON END or Common Functions:

- Secured Sockets
- Primitives and Structures
- Client and Customer Profiles
- Coach Profiles
- Configurations
- System Policies & Procedures

BACK END or Control Side:

- Billing
- Authorization, Security & Security Mgmt. .
- Secured Access Control



FRONT END or Client -Side:

- GUI
- Applications Real-Time Delivery
- Average User One or More Users (e.g. Multicast)

SIDE END or Coach GUI:

- Tools
- Access (Content, Users, Profiles, Billing, Preferences, etc.)
- Specialized Platform
- Client Mgmt.
- Automatic Presentation
- Synchronous and Asynchronous
- Engagement Support
- Revenue Generating End

DEEP END or Content Side:

- Content Retrieval
- Digital Library Content Storage
- Content Primitives
- Content Relationships and Synch.
- Content Generation Organization
- Applications
- Distributed Server Implementation
- Shared Server Implementation

Figure 1. Architecture of the e-mentoring

The e-mentoring session as building blocks of a knowledge incubator

More often than not independent learning and informal learning is disconnected from the formative learning process.

This discourages learners from pursuing personal interests that lead to experimentation and discovery.

But these are some very valuable intellectual building blocks that should be nurtured and sustained.

In the e-mentoring approach these units are used to support knowledge building and to correlate the resulting building blocks of knowledge in a kind of *personal knowledge incubator*.

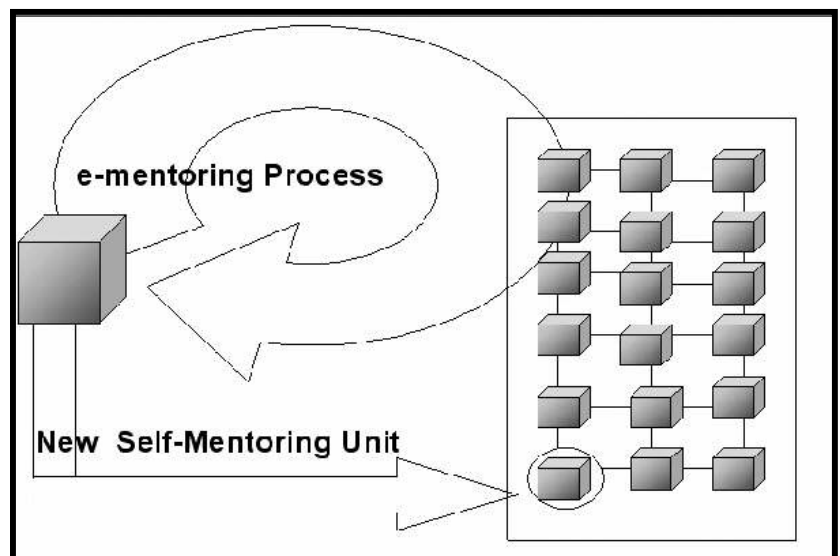


Figure 2. e-mentoring knowledge incubator.

Scenarios

The following scenarios describe various e-mentoring situations that we identified as part of our research in collaboration with the Hispanic College Fund (HCF) an organization that is interested in supporting career development of under-privileged minority students through a sustained e-mentoring approach. In this case e-mentoring compensates for the lack of academic support infrastructure that many HCF students experience.

Many students receive HCF scholarships to pursue their field of interest but face struggles to understand the specifics of the academic process or the job market need encouragement to get through and understand the long-term value of a college education. Through e-mentoring students can get the help they need before entering college, while pursuing their academic dreams and once they are employed. The e-mentoring environment will help to identify, evaluate, teach and mentor students. Identification starts with basic information and student questionnaires. The environment to help guide students while they are being considered for scholarships and college entrance keeps a pool of available mentors. Once in college, students are assigned mentors from government, industry or from our retired workforce by matching the interests of the students with the appropriate mentor. The sponsoring organization, in this case the HCF, tracks the need for mentors in specific areas and tries to find a mentor for each student's need at every stage of the process.

Interactive e-learning techniques are used to facilitate access to curriculum, online resources, personal support and automated evaluations. Data-mining, multimedia and communications technologies are integrated in the solution to support students creating an *end-to-end mentoring environment* that nurtures and retains them. The e-mentoring environment places the student at the core of the process, facilitating the students' needs as a student, as an independent learner and as a future member of the workforce.

The process starts when a student is identified by the HCF and an entry is made in the HCF database that becomes a pointer to a living curriculum vita for the student through his career. This link is created as more than information; it becomes a service with history that is updated for the students and facilitates keeping track of the students' progress as it helps to guide them. This is the kind of extra help that disadvantaged students require to succeed and that should ordinarily come from mentoring, when a normal mentoring infrastructure is in place. Providing scholarships is just one aspect of supporting disadvantaged students. Mentoring becomes the academic success factor when students are deprived access to a supportive nurturing environment. Lending a helping hand with academic work and advice is often crucial to success for students that do not have professional parents, for example, or when the students seek a field of specialization for which there are no available role model or expert in the immediate academic environment.

In addition to the general purpose of providing a portfolio and professional resources services, e-mentoring can be used as a tool addressing needs and requirements driven by corporate and government organizations interested in the students. e-Mentoring can also supplement the academic process in important and meaningful ways. Following are some examples.

The corporate scenario

A leading manufacturer has been supporting Hispanic students through the HCF for several years by providing scholarships for 18 students per year. This is a philanthropic gesture focused on engineers because the company understands the need for qualified engineers in the future.

While the investment made does help support a smart but disadvantaged group of students that would otherwise not become engineers, the corporation would also like to ensure that their philanthropic dollars generate both a social and corporate return on investment. It had been difficult to follow results and know exactly how their contribution was making a difference, and while the company had forged a solid relationship with the HCF, there were no links to the students themselves. Ideally, corporate sponsors would like to be able to hire some of the students they support through the years, but there was no mechanism available for doing that. In practice, most philanthropy has a global return on investments, in that the impact is felt in the long term at the national level, but not by the individual corporations in the specific areas supported; e-mentoring changes all that.

Through the e-mentoring environment provided by the HCF, the manufacturer is able to establish a relationship with students early in the academic process through an e-mentoring facility that connects engineers at the corporation with the students they support. Initially, a corporate mentor is assigned to each HCF student supported, in this case the mentors are practicing engineers and the students were identified by the HCF for their specific interest in the defense industry. The e-mentoring solution provides interactive, two way video and audio sessions over the Internet through special software made available to the students. Mentors and students can share application software and media sometimes only available to industry engineers as part of their work. The solution also includes an interactive online-shared white-board and messaging system. This kind of direct support given by the mentors is practical in nature and specific to the academic needs of the students, helping to prepare them for the real work environment.

As relationships are built among mentors and students, the e-mentoring software tracks progress. Students showing special interest and qualifications eventually apply for internship positions, expanding their knowledge of work requirements and the company. All of these activities are managed through the environment so that mentors can better understand the needs and objectives of the students. Eventually, as the students near graduation, the mentor works with the student to assist them in applying for jobs and actually transitioning to permanent assignments at the corporation. The e-mentoring continues on the job as part of the corporate mentoring program that also uses the e-mentoring solution. The success of the philanthropic program is measured through the increased numbers of HCF scholars becoming employees of the corporation, on the level of productivity of the new engineers at the beginning of their career, and on the retention rate at the corporation during the difficult first three years of employment when turnover is greatest.

The agency scenario

A major Federal Agency employs a large number of interns each summer. The costs, in addition to salaries, include the identification process for selecting promising graduates and future employees, as well as interviewing the student for the summer job, selecting and training the

students prior to arrival, and even placing them in suitable living accommodations. There is significant investment in these interns. Unfortunately, very few (less than 10%) of the students go on to full time employment with the agency upon graduation resulting in a very low rate of return on the investment that the agency has made years after year in these students. Reasons for the poor recruiting rate are many: uninteresting work during the internship, lack of a connection with the work and social community during the internship, no follow-up after the student returns to school (losing interest in the organization altogether), and no effective mechanism to understand the outcome of the internship experience, beyond the exit interview, to help understand the concerns that may lead students away from the agency.

Recently the agency instituted HCF's e-mentoring environment and is using it to prepare future interns through a single recruiting and e-mentoring service. HCF students were able to interact with the agency through mentors on the job. Through informal weekly forums and online chats, students got a first glance look at what it might be like to work at the Agency in Washington or elsewhere in the country, and see for themselves what the possible jobs involve, what the job requirements are and who the people are who work on site, where they come from, where they went to school, etc. While these sessions are informal and general in nature, they provide the first important step towards deciding on whether or not to apply for internships. Once that decision is made, the students are then assigned a mentor who guides a group of students at a time through the job application and other possible support functions such as a housing process. If a job offer is made, a special mentor is assigned by job category, to start to work with the future intern before he or she arrives on board.

As the students are individually trained during the spring before their internship, department or the area where the student will be interning also groups them. The students begin a process of building a relationship with the agency and acquiring new skills at the same time. Upon the interns' arrival in the summer, the intern has learned much of their role and how their role fits in to the "bigger picture" at the agency, something that can be daunting tasks for interns in large government organizations. The interns will also have established a relationship with their mentor(s) that will provide both a valuable network to later help enhance their productivity, and also a level of comfort to better manage the politics and expectations that can be bewildering to a new, young and inexperienced employee in a large organization.

As the students leave to return to school in another part of the country, it is inevitable that the distance and change of venue will create a disconnect that will grow over time. For this reason, the agency continues to use the e-mentoring environment as a practice method for all contact with interns in the long-term. Mentoring relationships continue over time with specific goals designed to continue to develop the students and support their academic work and future professional careers. Given the interest established, particular emphasis is given to leadership and professional development at this time. Past and future interns are part of the community created by the agency and over time this includes permanent employees that are recruited as part of a continuing talent nurturing process resulting in steady improvement in recruiting and retention.

The academic scenario

There are several groups of HCF students (junior/senior) that have been taking part of the HCF e-mentoring program for one to two years. These students are at various universities through the US but share common interests in specific academic areas where they eventually want to

seek employment. One group is interested in communications and Public Relations. Through the e-mentoring environment, the HCF has been able to find a mentor who is already teaching an online course in communications at major university. Using the system, our group of HCF students is able to join in special session of the same online course, and even earn college credit for their participation. Since the HCF students are not students at the particular university where the online course is given, the e-mentoring solution provides them with the resources to receive instruction online.

The HCF keeps track of their progress and after completion of their online course, through e-mentoring they connect with individual mentors and prospective employers, as part of how the environment supports them over time, in addition to providing special courseware opportunities. Additional online courses provided through the environment are prepared in collaboration with universities, industries and government agencies, allow students to self-teach themselves at their own pace and do not require an instructor. e-mentoring provides additional courseware facilities including testing and evaluation. Some of these courses may even lead to college credit depending on individual academic requirements, and others may be taken by HCF students just to gain skills and prepare for the job market. In all cases a community of interest is created where students can share questions with a pool of other students and with online experts.

By helping to increasing repertoire of online courseware that can be accessed through the environment, corporations and government agencies are able to participate in the academic training of the students in ways that universities cannot facilitate. Student performance in these self-taught courses can be used as an indicator of ability to perform on the job and is used by HCF to facilitate recruiting. Fundamentally, the coordinated, informal courseware resources is in many ways a way to start training online to better prepare our workforce and to eliminate the time and money wasted on retraining of new hires on the job. It helps students start the job more productively with basic training and a pre-established network of colleagues and mentors.

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