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ABSTRACT

The purpose of this study is to develop a model to teach procedural knowledge using the Internet. Over a 3-week period graduate level education students (N=10) were provided 12 hours of instruction and access to the Internet. Data collection methods included pre-workshop questionnaires, weekly journal entries, and post-workshop questionnaires. The preliminary questionnaire contained questions about teaching experience, computer background, level of familiarity with the Internet, expected use of the Internet for personal and professional development, predicted usage time on the Internet, and reasons for participating in the workshop. The teaching model involved three phases: (1) direct group instruction; (2) tutoring; and (3) open exploration. The findings of the evaluation suggest several effective means of integrating Internet training into teacher education programs. The recommendations include anchoring instruction in an authentic activity, providing guided practice, integrating Internet training into a concise time frame, and minimizing overall instruction time. (DDR)

Running Head: PROTOTYPE OF A PROCEDURAL KNOWLEDGE TEACHING MODEL

# Prototype of a Procedural Knowledge Teaching Model

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Abstract

The purpose of this study was to develop a model to teach procedural knowledge using the Internet. Over a three-week period, 10 graduate education students were provided 12 hours of instruction and access to the Internet. We collected data via pre-workshop questionnaires, weekly journal entries, and post-workshop questionnaires. The findings of the evaluation suggested effective means of integrating Internet training into teacher education programs. Recommendations included anchoring instruction in an authentic activity, providing guided practice, integrating Internet training into a concise time frame, and minimizing overall instruction time.

## Prototype of a Procedural Knowledge Teaching Model

The literature is replete with accounts of research that report on the use of cognitive science methods in instruction (Bereiter & Bird, 1985; Brown, Bransford, Ferrara & Campione, 1983; Brown, Collins & Duguid, 1989; Bruer, 1993; Collins, Brown & Holum, 1991; Palincsar & Brown, 1984; Schoenfeld, 1985). Resnick (1987) states "research has located a 'psychological space' in which educationally powerful effects seem to occur, but it has not yet adequately explained what happens in space to produce the effects" (p. 27). In this study, we evaluated the learning tasks to identify the necessary steps to make one competent in navigating the Internet. These steps were put into sequenced learning program to teach procedural knowledge.

Recent advances in educational and technological development are challenging educators to redefine traditional approaches to teaching and learning. Accordingly, new partnerships are being formed between school practitioners and college faculty; and distance learning programs are effectively removing miles between classmates. America's local schools are becoming "global classrooms" (Morton & Mojkowski, 1991).

Today, more than 97% of American public schools have classroom computers, and increasing numbers of schools are connecting to the Internet or "information superhighway" (Gallo & Horton, 1994; National Center for Education Statistics [NCES], 1995). As a result, a number of "innovative" educational approaches will become soon commonplace. The success of each global classroom will be determined by the navigating skills of the teacher (Gallo & Horton, 1994), but the majority of teacher candidates feel unprepared to teach with computers (NCES, 1990), and few teacher training programs are preparing future educators to effectively use the

Internet to enrich their classrooms and contribute to their own personal development (Honey & Henriquez, 1993).

Research on the impact of computer network training on preservice teacher preparation has focused on the effects of computer access and usage, and students' attitudes (Delcourt & Kinzie, 1993; Hignite & Echternacht, 1992; Hunt & Bohlin, 1993; Sunal & Sunal, 1992). Findings suggest that developing computer network skills increases communication, improves the quality of lesson plans, and contributes to positive perceptions regarding the usefulness of the computer as a teaching tool.

To design an effective mean of integrating Internet training into a teacher education curriculum, a workshop was planned to evaluate the outcomes of short-term access and training on the skills and attitudes of graduate education students. We addressed the following questions:

1. Given direct group instruction, how effectively would students explore the Internet?

2. When students are given access and instruction, how much time do they spend on the Internet?

3. When students are given access and instruction, what Internet tools do they use most frequently?

4. During and after the Internet workshop, would students exhibit changes in behavior?

5. During and after the workshop, what plans to use the Internet would students report?

6. What were students' perceptions regarding the effectiveness of the workshop experience?

7. After completing the workshop, what recommendations would students make regarding integrating Internet training into teacher education curricula?

Collins, Brown, and Holum (1991) outlined the Principles for Designing Cognitive Environments and the pedagogical strategies to address content, method, sequencing, and social characteristics of the learning environment. In consult with these cognitive strategies, a procedural knowledge teaching model was implemented. The model was influenced by the research in cognitive science to make visible to students how they think, remember, and learn. An objective of the model was to craft activities to help students become reflective practitioners who realize the similarities between thinking and information processing as discussed by Bruer (1993).

The content of the lessons involves the teaching of procedural knowledge. The information is packaged, presented, and practiced in small chunks to facilitate learning. Direct group instruction, tutoring, and open exploration are the primary methodological approaches used. The lessons are sequenced to guide learners through a hierarchy of skills ranging from simple activities through complex tasks. To accommodate varying abilities of the group, the lessons start at a basic level. When students obtain minimal competence for the activity, they pursue their own interests and continue at their own pace. The sociocultural environment encompasses group instruction and independent assignments that embody nonstructured interactions among students.

## Methodology

Participation in this workshop was voluntary. However, students attended six two-hour workshop sessions over a three-week period. They also completed pre- and post-workshop questionnaires, and maintained weekly journal entries via e-mail. We analyzed the data in three stages: (a) pre-workshop observations; (b) workshop observations; and (c) post-workshop observations.

The teaching model involved three phases: Direct Group Instruction, Tutoring, and Open Exploration. In Phase I (approximately one hour), students received an Internet instructional guide that included a conceptual outline of Internet functions, step-by-step procedures for accessing the Internet and e-mail, and support material (e.g., article reprints, Internet addresses, e-mail "netiquette", etc.). During this phase, the instructors provided an overview of the lesson, introduced Internet vocabulary and features, and outlined specific steps for operating the computer, sending and receiving e-mail, and accessing the Internet.

In Phase II (approximately 30 minutes), instructors served as tutors monitoring students' progress as they worked independently or in collaboration with their colleagues to practice their navigating skills on the Internet. Instructors offered advice, suggested promising Internet sites, and assisted students who had difficulty.

In Phase III (approximately 30 minutes), characterized by open exploration, unstructured, open access to the Internet allowed students to pursue their own interests using the tools and skills which they had learned. Instructors were available as resource agents, but they did not actively monitor students' work.

**Stage 1: Pre-Workshop Observations**

To maximize individual attention, workshop enrollment was limited to 10 graduate education students (five women and five men). Prior to the first workshop session, each participant completed a preliminary questionnaire regarding: (a) teaching experience, (b) computer background, (c) level of familiarity with the Internet, (d) expected use of the Internet for personal and professional development, (e) predicted usage time on the Internet, and (f) reasons for participating in the workshop.

**Teaching experience.** On the basis of the profile data derived from the questionnaire, students included four classroom teachers and one administrator. Five of the students had recently completed their student teaching and were seeking positions.

**Computer background.** All students reported being comfortable with word processing; only a few indicated experience with specific applications such as spreadsheets, statistical packages, graphics, and in-house e-mail. One acknowledged limited experience with the Internet via a recent home connection; he commented that the workshop would provide the opportunity to "dedicate time to learn to use the Internet."

**Level of familiarity with the Internet.** When asked to give initial impressions of the Internet, a few students' responses were quite vague. "International computer network--I'm not exactly sure--I'm an Internet novice" admitted one participant. One of her colleagues agreed, acknowledging "I'm not sure what to expect." The other students had a general understanding of the Internet, describing it as "an on-line computer network which allows people to communicate," "a network [which] allows you to send large amounts of information to other locations very quickly," or "a very advanced e-mail system."

**Usage time**. Predictions of usage time ranged from two to eight hours per week beyond workshop sessions. Most students estimated that they would spend approximately four hours on

"I thought I might try to make connections for a math and science club that I have in school. The club is funded by a grant through [a state university] and the students might have access through the university."

Other students saw the Internet as a tool to assist them in their own educational development and professional careers. According to one participant the Internet offered an "opportunity to exchange and research information for [my] education thesis." Another hoped that she could use the Internet "for networking in job searches."

**Reasons for participating in the workshop.** When asked to report the reasons that they volunteered for the workshop, students admitted that they saw it as an "opportunity to learn about new available technology" that could be "helpful in my present and future career." One participant pointed out "many people (districts) I have interviewed with have expressed interest and I think this experience will look impressive on my resume."

Hoping that the workshop would provide some self-help therapy, an apprehensive participant reported "I have been anxious about using a communications network and this may alleviate my anxiety."

**Stage 2: Workshop Observations**

Every workshop session included instruction regarding terminology, tools, and effective means of navigating the Internet at the start of Phase I. However, major emphasis was placed on students' hands-on experience exploring and applying their new skills. Two instructors were available for advice and assistance during Phases II and III. The college's academic computer center provided students with free access to the Internet. Since there was no remote access

capability, students' time spent on the Internet was restricted by location and operation hours of the computer center.

Throughout the workshop, students completed weekly journals evaluating their experiences on the Internet. Students were encouraged to use their journal entries as opportunity to reflect on their weekly Internet experiences. They submitted each journal entry to the instructors via e-mail.

The weekly journal entries proved to be the most valuable source of data providing descriptive records of individual and group progression. At the end of each week, the students used their journal entries to describe their experiences relative to: (a) activities undertaken on the Internet; (b) time spent on the Internet; (c) discoveries (large or small); (d) problems/frustrations experienced; (e) feelings about the experience; and (f) integration of the Internet into other academic areas.

Through their candid journal entries, students provided insightful and personal views of their growth, progress, difficulties, and discoveries during the three-week journey on the Internet. These data built the core of information that documented how students reflected on their experience and how it affected their changes and development. Reflection at this phase fosters thinking about the activity and how one processes information and its salient characteristics for retention, understanding, and manipulating knowledge--in this case, procedural knowledge. Students' comments suggest that procedural knowledge tasks embedded in authentic learning activities are easier to assimilate or accommodate.

**Open exploration.** Each of the twice weekly, two-hour workshop sessions limited formal instruction to an hour or less, to provide brief introductions to one or two Internet tools.

Students were then given time to conduct their own discovery missions. This informal approach was well-received and successful with most of the students who "wandered off" in different directions based on their own interests and spirits of adventure:

"I contacted NASA and reviewed information regarding the Hubble [telescope]. I also found information...about recent planetary events, including the happenings on Jupiter and Mars."

"This week on the Internet I spent a lot of time exploring the NYSERnet gopher--especially the Empire Schoolhouse."

Initially, students' investigations tended to be a broad sampling of anything that they encountered. As the workshop progressed, their searches became more focused. For example, some chose to center on lesson plans and classroom activities:

"I explored 'enews'...you can get highlights of programs on the Discovery Channel...[and how] teachers use some of these programs in their classrooms."

Others treated the Internet as a research tool for their own professional development:

"I used CARL (Colorado Association of Research Libraries) to find some recent articles on my thesis topic."

As students gained confidence in their skills navigating the Internet, they became increasingly selective about their missions. Individual needs and interests clearly influenced the directions of their searches.

**Individual progression.** Students' improvement varied with some making slow but steady progression. Weekly journal entries sometimes included personal insights regarding how their individual learning styles affected headway on the Internet:

"I spent time exploring the resources we talked about in class. My learning style prefers a structured, organized system, and that is how I have approached my exploration...I explore the Internet in the order which we discussed topics in class."

For others, a single positive event resulted in a swift conversion. For example, one participant expressed discouragement after her first session when attempts to investigate the Internet failed. She had a change of perspective after one successful afternoon on the Internet:

"It was a little frustrating when I stayed after class last Tuesday and tried to experiment only to be refused access to the system in one way or another. But, after today, I have a **completely new attitude**. I have sent and received messages to people around the country. What a thrill I got this afternoon when my e-mail was answered almost immediately by Brendan Kehoe, the author of ZEN AND THE ART OF INTERNET, also the author of ARCHIE [an Internet tool]...His response was not only prompt, but very friendly and he has promised to send information on projects for middle school students."

After this reversal, this participant assumed a leadership role for the group. When she discovered exciting information or promising locations on the Internet, she used e-mail to forward her discoveries to the rest of the group. She encouraged her colleagues to follow up on particular Internet files and to participate in an Internet survey sent to her through e-mail. In examining her activities, what she considered promising were Internet sites anchored in authentic activities. It was also apparent that she was able to make greater inferences regarding Internet procedures when investigating professionally related topics.

However, not all workshop students responded positively to open exploration. One discouraged participant, who referred to herself in a journal entry as "a lonestar on the Internet,"

identified her own mode of learning and thinking, and noted that she felt overwhelmed and in need of more guidance.

"I have been frustrated...as a very convergent thinker, it has been difficult for me to explore what the Net has to offer. I feel without a specific goal in mind, the time I spend at the computer is too unstructured."

This participant's uneasiness with the computer and Internet continued throughout the workshop. Two months after the workshop, she described her feelings:

"I was very leery of using computers--especially anything as big as the Internet. It was as confusing to use as I perceived it might be."

She was the only participant who was not interested in Internet access through the college and she felt that Internet training would only be effective if it were on a "one-to-one" basis.

These reactions suggest that while many students respond well--and in some cases flourish--when allowed to follow their own interests and concerns when exploring the Internet, a few find this approach intimidating and discouraging.

**Time, tools, and use.** When graduate education students have access and instruction, how much time do they spend on the Internet, and what tools do they use most frequently?

In the pre-workshop questionnaires, most students predicted that they would use their Internet connection four hours per week beyond workshop session. However, during the workshop, they reported much lower weekly usage time; most used their Internet connection for two hours or less per week besides workshop time.

Students reported several reasons for the time discrepancy. Outside interference affected one participant's access time. He felt "...frustrated that I cannot spend more time on the Internet.

[I] allocated time after Thursday's class, but the power outage canceled these plans." Another participant admitted that "my greatest frustration has been my own time limitations."

The need to travel to the computer center to access the Internet affected use because many students simply could not spare the travel time. One participant recorded in his journal that "tonight is the first time I've managed to get back to [the college] to work on the Internet. Total [weekly] time will be about an hour and fifteen minutes." Another echoed that he "...only spent about an extra hour and a half [because] I wasn't on campus other than Tuesday and Thursday."

Lack of access from home appears as a major element in the decreased amount of time spent on the Internet. One participant admitted "I haven't spent too much time on the Internet this week. I wish I had access from home." Another, who spent only one extra hour on the Internet, reported "I don't have a connection at home or I would use it more."

The single participant who consistently exceeded his predicted weekly time on the Internet had a personal account at home. The convenience of home access allowed him to explore and become more familiar with Internet resources:

"Between [the college] computer lab and [my] personal account at home, I think I averaged 5-6 hours per week on the Internet."

Convenient access emerges as a major influence on the time spent on the Internet and encourages investigation of the available resources.

The frequency with which students used Internet tools parallels the level of success experienced with each tool. Across the group, the first tool introduced--e-mail--was the one most frequently used. The majority of students felt comfortable with e-mail and many agreed that

"...most of the time I've spent on the Internet was used to send e-mail". Direct connection with experts in the field proved to be both exciting and rewarding:

"Once again the most excitement that I have found has come from working on e-mail. This past week I have received two messages from a woman educator in Maine. She is an expert on education and has turned out to be an excellent resource. In both cases, I forwarded the messages to the rest of the class."

Another e-mail enthusiast enjoyed the opportunity to access the "rich and famous," but warned her colleagues "...famous writers are really lazy about answering their fan mail...and I sent e-mail to a legislator in Albany, but I'm still waiting for a response."

Since it sometimes involved cryptic commands, most students viewed FTP as a more difficult tool to master. However, one participant said with pride, "with FTPs, I found that I could transfer a copy of the BIG DUMMY'S GUIDE TO THE INTERNET to my own disk...It was so exciting to be able to find the Guide, transfer it on to the disk, and then read the text!"

Overall, those who were most adventurous experimented with each new Internet tool, and often encouraged their less daring colleagues to join them.

**Discoveries--great and small.** Since most of the students knew very little about the Internet, they expressed concern about finding ways through the maze of information. The realization that they could master the basic skills to "surf the 'Net" was one of their earliest and greatest discoveries. Journal entries reflected their self-confidence in newly discovered computer skills:

"The greatest discovery I have made is that the Internet is not as intimidating to navigate as I thought it would be."

"The major discovery that I have made is that **I can do this**. I think that the other discovery would be that the Internet has an almost infinite amount of information available. I've already accessed information on Congress, higher education and baseball."

All discoveries were important, including negative ones. For instance, students learned that navigating the Internet is not always smooth and it has its share of "traffic jams." The schedule of the workshop coincided with Jupiter's comet collisions. In response to this historic astronomical event, the Internet was jammed with communications which resulted in glacially slow response time and frequent shut downs.

In addition, a local electrical blackout brought one workshop session to an abrupt halt. Such incidents had a temporary dampening effect on the students' enthusiasm, and they duly noted their reactions in the weekly journals:

"My problems/frustrations were mainly limited to not being able to gain access to the Internet. I'm not going to even mention the 'brown-out' on Thursday."

"This week I discovered what a REALLY bad 'net day' is like (power outage)."

However, one participant reacted to the week's events rather philosophically, observing "Power failure at 1400 hours on Thursday was humbling. We cannot burn the printed matter just yet!" Other frustrations with the Internet involved the uneven quality of information regarding access to particular files:

"This week's frustration was the lingo on the FTPs. There's not enough information on the screen to tell the beginner what to do next."

The reality of the Internet is that it is a "project in progress" and is subject to many outside influences. The lessons learned through the best and the worst of the Internet are all valuable and contribute to the development of new navigators.

**Changes in behavior**. Well into the workshop sessions, diverse plans were made to integrate Internet into professional lives:

"I plan on inquiring about other ways to have access at work, at school or at home. I'm sure that I'm going to use the Internet to help me with [my research courses] this year. I also found some terrific projects on Internet and I would like to attempt to try some out in my classroom."

One participant, unsure of her skills at the beginning of the workshop, was able to picture herself teaching Internet skills to her own students:

"This week on the Internet, I learned the most important part: how to teach this thing. I think that the kids I will be teaching will be more 'guru-ish' than myself, but one cannot depend on that."

This workshop experience was expected to modify both behavior and attitudes toward the Internet and its use. However, in some instances, the experience affected students' personal lives:

"I was planning to go out of town this weekend and thought that I probably would not get back on Internet until next Tuesday. Now, I am trying to figure out how I can find time to get back here to check for new mail, and to go searching for more interesting 'finds'."

"It is 5:15 and I have been sitting in front of this terminal since 1:00. I can understand how some people can become 'hackers'. I strongly believe that if I had this system at home I could get caught up for hours, even days on end."

There was also a heightening of awareness regarding press coverage of the Internet. After the first workshop session, students began assuming active roles in the instruction process by bringing in copies of magazine and newspaper articles about the Internet to share with their colleagues:

"I have found that after taking this workshop, I am more aware of Internet resources that are mentioned in magazines and newspapers."

"I read...an article [about] people who have been using the Internet since the early 1980s--and they still keep discovering resources and information that they did not know existed!...newspapers and magazines have finally caught on to the pervasiveness of computers and the Internet in our society."

**Stage 3: Post-Workshop Observations**

Two months after the workshop's conclusion, all students completed a follow-up questionnaire which assessed: (a) current access to the Internet; (b) future plans to use the Internet in their classrooms, professional development, and personal lives; (c) effect of the workshop experience on their perceptions of the Internet; and (d) advice regarding integrating the Internet into graduate education curriculum.

**Current access to the Internet**. In the follow-up questionnaire, only two of the 10 students reported access to the Internet; one had acknowledged having a home connection prior to the workshop. The other student reported that as an earth science teacher, he looked forward to a classroom connection which would allow:

"...my students [to] be in contact with students in the same course, but in other areas of the country...I know that I will be trying to get in touch with teachers [across] the country...and I

think that my students would be a little more interested in learning...if they were using a computer to contact other students. "

**Future plans to use the Internet.** Although other students reported no immediate access to the Internet, most had definite ideas about how they and their students would use it:

"I have spoken to many students and they are extremely excited about it. They want to use it for research, information, and interaction."

"I would use it to access worldwide educators via the Internet [to discuss] research, exchange teaching ideas, and [use it] as a sounding board for educational issues and feedback. As a future educator, I need to be ahead of the students, many of whom have access to this technology now."

" By...[using it] as an educational 'well'...I could tap into limitless libraries of information for technical/educational journals, reports, etc. and do FTPs."

**Effect of workshop experience on perceptions**. All but one participant considered the workshop to be a positive learning experience that heightened their computer confidence and skills. Students' enthusiasm was still evident two months after the workshop:

"...this has been a great experience. I've learned a lot about Internet in a very short period of time."

"Overall, I'm happy that I was given a chance to take this workshop. I can finally use the computer to do something more than writing papers and making graphs."

"I have become much more confident when using the computer, and this experience has done much to reinforce that."

"I feel that the Internet is now something that everyone can use, not just computer hackers and experts."

Initially, the fear of becoming "lost" on the Internet was a primary obstacle for many students. But, their increased skills and confidence helped to alleviate this fear:

"I am no longer overwhelmed by the thought of accessing the Internet. Although I am still somewhat unsure of where I may navigate, I am no longer intimidated by the possibility of 'getting lost' on the highway."

Another common outcome of the workshop experience was the realization of the seemingly limitless potential of the Internet:

"[The workshop] has given me a better appreciation of the vast wealth...that can be tapped into. I didn't realize what a powerful information/communication tool Internet can be."

"I had perceived it as some new technological nightmare. I now know that it is potentially the most helpful research and information tool to date."

Several students acknowledged that "surfing the 'net" could be addictive. They were apprehensive as the end of the workshop approached. One anxious participant admitted:

"I am beginning to become nervous that my e-mail access and my access to the entire 'net will be cut off next week. I will send an e-mail message to [the Dean] requesting that she not make us go 'cold turkey' off the Internet. I feel there is so much that I have yet to explore."

**Integrating Internet into teacher training**. Upon reflection on integrating the Internet into teacher training programs, the students strongly recommended that training be incorporated from the beginning. Most agreed with these observations:

"...the class opened my eyes to the vast opportunities that the Internet could provide to education students...If [the College] integrated teaching and access to the Internet, it would provide students with a competitive edge in today's market. I cannot think of one class that I have taken [in which] I could not have used Internet."

"Assignments in the graduate program are usually very current and very specific. On the Internet we can access the most up-to-date information and practices in the field. We can speak directly to authorities on every subject. We can be 'cutting edge' in our own classrooms and our courses."

Some students recommended that the Internet be integrated into all classes, and not limited to computer and research courses. To accomplish this goal, it was "strongly recommended that the faculty be familiar with Internet."

The importance of remote access was also seen as a critical factor when integrating Internet into the curriculum, especially for commuting graduate students:

"The School of Education should allow access by students enrolled in specific courses (example, [graduate research courses])...Remote access (with necessary login IDs and passwords) would be ideal for the commuting student."

## Discussion

The study examined the dichotomy between changing one's behavior and altering one's perceptions. It appears that it is more difficult to transubstantiate behavior rather than perception. An interpretation of these findings indicates that interest does not automatically provide sufficient motivation to translate into action. A broader implication of these findings suggests that methods

of instruction not structured or embedded in authentic learning situations may be inadequate to empower students to convert their interests--no matter how strong--into knowledge.

At the heart of the issue is the independent variable of amount of time necessary to train students to use the Internet as a productive tool. In general, the more speed and accuracy with which the skill or procedure is performed, the freer students are to devote the limited capacity of their short-term memory to deal with other issues (Gagne, 1985; Miller, 1956). Upon reexamination, it appears that it is not only a matter of time, but also the structure of realistic tasks within the time frame. For us, this meant situating the task in an authentic learning activity in which the students anticipated learning a skill that would enhance their teaching performance.

The reactions and feedback furnish enough evidence to provide school administrators and college faculty with direction regarding Internet training and access for teacher/navigators in global classrooms. We offer the following recommendations to integrate the Internet into teacher education programs:

**Method of training.** The findings suggest that the training sessions be designed to guide learners through a hierarchy of skills ranging from simple activities through complex tasks. To accommodate varying abilities among students, lessons should start at a basic level and move rapidly to keep interest levels high. The lessons should progress from direct instruction and guided practice, to open exploration. Teaching should require students to make limited inferences during direct instruction and broader inferences during open exploration. We believe that the inferences connect the learner to the steps in the instructional process and to the formation and internalization of procedural knowledge. As the level of inferences increases at each step, the learner must develop broader concepts and greater understanding of the topic. In

addition, a procedural knowledge teaching model should be developed further to integrate Internet training into a concise time frame to maximize student comprehension and minimize overall instruction time.

**Remote access**. As documented by participant data, remote access from the college, schools, and homes would increase interaction time with the Internet and enhance investigation of its resources. Students in research classes would have access to current research, libraries around the world, and researchers at most colleges and universities. Students could submit "paperless" assignments which faculty members could review, edit, and return with comments. Group work via the Internet would allow students at various locations to "meet" and collaborate on projects. Remote access would be especially important for a commuter population, such as graduate students.

**Teaching approaches**. While the open exploration approach was effective with most students, training programs must provide alternative techniques for those who require more structure and guidance. Assignments could be tailored to match the interests and needs of each student situating the lesson in an authentic learning activity. This would allow more adventurous students to explore on their own when completing a project, while apprehensive learners could follow structured guidelines to investigate resources on the Internet. Group projects may also produce a synergistic combination of skills that would benefit both adventurous and cautious students.

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