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Instructional Use of Computers for Entry-Level Physical Therapy Education in the United States

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University of Scranton

November 30, 1992

A Dissertation Presented to

Nova University

for the Degree of

Doctor of Education (Ed.D.)

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Herbert E. Kosmahl Sr. (in memoriam)

Abstract

Little was known about the value of computer-assisted instruction (CAI) for entry-level physical therapy (PT) education. Factors that affect implementation and use of CAI in entry-level PT education had not been identified. Because of this paucity of information, decision-making about the implementation and use of CAI in entry-level PT education had been hampered.

This study used mail questionnaire survey methods to find:

1. The extent of use of computer-assisted instruction (CAI) in entry-level physical therapy (PT) education.
2. The perceived value of CAI compared to more traditional instructional methods for entry-level PT education.
3. What factors affect implementation and use of CAI in entry-level PT education programs.

Academic administrators of all entry-level PT programs in the United States (n= 123) were surveyed.

A response rate of 86.9% (n = 107) was achieved. The number of programs using CAI was low (n = 32, 29.9%) when compared to CAI use in nursing and medical education. Use within PT programs using CAI was also low.

A Likert-type scale was used to quantify the perceived value of CAI. The possible range of scores on the Likert-type scale was 21 to 147. Respondents rated the value of CAI at a median score of 117 (range 76 to 143, mean = 115.2, SD = 14.5). A Wilcoxon Rank Sum test was used to show that CAI users placed more value on CAI than did non-users ($W = 2119.5$, $p < .01$, two-tailed).

A five point scale was used to quantify the effect of resource, faculty, and student factors on the implementation and use of CAI. One resource factor (availability of relevant CAI software) was rated as having a very strong effect. Other resource and faculty factors were rated as having strong effects. Student factors were rated as having moderate effects.

The relationships between demographic variables (years of program accreditation, number of full-time-equivalent program faculty, number of program students

per year, degree awarded, annual tuition and fees, geographic location) and CAI use and value of CAI were investigated. None of the demographic variables were correlated with CAI use or perceived value of CAI.

The author concluded that academic administrators of entry-level PT education programs perceive CAI as a valuable instructional tool. CAI use in entry-level PT education is low, especially when compared to CAI use in nursing and medical education. A lack of available software that is relevant for use in entry-level PT education is perceived to be the major factor that limits the implementation and use of CAI. This is a very strong factor. The absence of a mechanism for sharing information about available, relevant software is a related, important factor.

The author recommends that a well organized, sustained effort to develop relevant CAI software for PT should be mobilized. The subject matter areas that can benefit most from CAI use should be identified. The types of CAI software (e.g., drill and practice, patient simulation, problem solving, remedial work, supplemental work, testing, etc.) that are most needed should be identified.

A medium for sharing information about CAI software for entry-level PT education needs to be established. The purpose of the medium should be to disseminate information about CAI software for PT to all entry-level PT programs.

The effects of student factors such as learning style, computer literacy, and interest in using computers should be studied in more detail. How these factors affect the implementation and use of CAI in entry-level PT education has not been adequately established.

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Chapter 1 - Introduction

Problem Statement, Background, and Significance

Problem Statement.

Little was known about the value of computer-assisted instruction (CAI) for entry-level physical therapy (PT) education. Factors that affect implementation and use of CAI in entry-level PT education had not been identified. Because of this paucity of information, decision-making about the implementation and use of CAI in entry-level PT education had been hampered (Thompson, 1987).

Background.

Health professions educators had written much about the use of computers. Medical, dental, nursing, pharmacy and other health professions educators had described computer use in their professional schools (Allen, 1986; Armstrong, 1983; Bitzer & Boudreaux, 1969; Brudenell & Stewart-Carpenter, 1990; Carew, Elvin, Yon & Alster, 1985; Gothler, 1985; Green, 1970; Harasym & McCreary, 1987; Harless, Duncan, Zier, Ayers, Berman & Pohl, 1990; Haynes, McKibbon, Walker & Ramsden, 1991; Henry, 1990; Jonas, Etzel & Barzansky,

1989, 1990; Lee, Watson, Argo, Kalish & Catlin, 1982; Meadows, 1977; Nardone, Schriner, Guyer-Kelley & Kositch, 1987; Nahata, 1986; Parks, Damrosch, Heller & Romano, 1986; Puskas, Fung, Anderson, Birek, Dempster, Heft, Torneck, Lewis, & McCulloch, 1991; Rippey & Voytovich, 1983; Sparks, 1990; Spector, 1984; Thomas, 1986, 1990a, 1990b; Van Dover & Boblin, 1991; Williams & Benedict, 1990). These reports are described in greater detail in Chapter 2.

A summary of the reported effects of computer use in health professions education included: time-savings for faculty and students, improvement in learning outcomes, quicker feedback on performance, more effective use of faculty time, increased availability of instruction, simulation for diagnosis and patient management, self-pacing of instruction, increased flexibility in delivery of instruction, and ease of management of instruction.

The many available reports suggested that health professions educators were taking advantage of these effects. Several surveys gave a good indication of the extent of CAI use, the value of CAI, and factors that affected implementation and use of CAI in nursing and

medical education (Gothler, 1985; Hebda, 1988; Jonas et al., 1989, 1990; Sparks, 1990; Spector, 1984; Thomas, 1986).

By contrast, little was known about the use of computers in entry-level PT education. The value of CAI for entry-level PT education had not been established. Factors that affect implementation and use of CAI in entry-level PT education had not been identified. The extent of CAI use in entry-level PT education had not been measured. The literature did not contain a report of any systematic, profession-wide collection of data on the topic (such as those that had been reported for nursing and medical education). The American Physical Therapy Association had not conducted a study of these issues (R. S. Myers, personal communication, April 12, 1991).

Only a few reports concerning CAI in entry-level PT education appeared in the literature (Adams, 1987; Francis, 1985; Guiteras, 1989; Hayes, Rogers, Sullivan, & Huber, 1991; McGown and Faust, 1971; Thompson, 1987). These were isolated reports of locally developed systems (these reports will be discussed in greater detail in Chapter 2). A literature search for further

evidence of CAI use in entry-level PT education had been unproductive (for details, refer to Appendix A).

It might have been theorized that the physical therapy profession was similar enough to other health professions that a separate body of physical therapy literature on the topic would have been redundant. Supporters of such a theory might have suggested that such a similarity would have explained the dearth of published citations.

Yet historically, the physical therapy profession had been described as unique. "Pathokinesiology is the distinguishing clinical science of physical therapy. . . . Physical therapy can claim the unique privilege of placing the role of exercise in health and disease in its proper scientific focus and perspective" (Hislop, 1975, p. 1071). Other evidence supported the unique nature of the physical therapy profession. Practice legislation in all 50 states prohibited others (including other health professionals) from practicing physical therapy. It seemed logical that a unique health profession should have produced a unique body of literature. Yet, this unique body of literature did

not exist. In fact, the paucity of literature suggested that the present study was required.

Significance.

Physical therapists had identified the need to study educational computer use. McGown and Faust (1971) were the first to report computer use in physical therapy education. They remarked, ". . . it seems fitting that another innovation of educational technology (computer-assisted instruction), should be explored in an attempt to evaluate its potential role in physical therapy education" (p. 1113). Twenty years later, Hayes et al. (1991) suggested that the need for research still existed. They proposed that the effects of factors such as costs of development and implementation, student attitudes toward computers, and student familiarity with computers required further study. They suggested that computers were used infrequently in physical therapy education. "Computers have been used for student testing in medicine, but have not been used extensively in physical therapy" (p. 65).

Only four reports of computer use in entry-level PT education appeared during the 20 years that separated the McGown and Faust and the Hayes et al. articles. One of these intervening authors (Thompson, 1987) clearly articulated why further research was needed. "More research is needed to support decisions related to fiscal allotments for computer use in college curricula" (p. 1237). Unfortunately, the required research was not available.

Rationale and Purpose

This author suggested the next step in the process was to study the existing use of CAI in entry-level PT education. Information was gathered about the perceived value of CAI (compared to more traditional means of instruction delivery). Data about factors affecting the implementation and use of CAI also were gathered. Analysis of these types of data provided some of the decision-making guidance called for by Thompson (1987).

Research Questions

The following research questions were formulated to accomplish the study aims:

1. What is the extent of use of computer-assisted instruction (CAI) in entry-level physical therapy (PT) education?
2. What is the perceived value of CAI compared to more traditional instructional methods for entry-level PT education?
3. What factors affect implementation and use of CAI in entry-level PT education programs?

Hypotheses

The following hypotheses were developed as a result of the research questions:

Hypothesis 1 (Null).

Educators in entry-level PT education programs do not perceive CAI as valuable.

Alternative to Null Hypothesis 1.

1a. Educators in entry-level PT education programs perceive CAI as valuable.

Hypothesis 2 (Null).

The perceived value of CAI for entry-level PT education is similar regardless of the amount of CAI use.

Alternative to Null Hypothesis 2.

2a. The perceived value of CAI for entry-level PT education is different for different amounts of CAI use.

Hypothesis 3 (Null).

There are no factors that are perceived to affect implementation and use of CAI in entry-level PT education.

Alternative to Null Hypothesis 3.

3a. There are faculty, student, resource and other factors that are perceived to affect implementation and use of CAI in entry-level PT education.

Hypothesis 4 (Null).

There is no correlation between the perceived importance of factors that affect implementation and use of CAI in entry-level PT education and amount of CAI use.

Alternative to Null Hypothesis 4.

4a. The perceived importance of factors that affect implementation and use of CAI in entry-level PT education is correlated with amount of CAI use.

Hypothesis 5 (Null).

There is no correlation between demographic factors (tuition level, number of students and full time faculty, how long accredited, geographic location and degree awarded) and amount of CAI use in entry-level PT education.

Alternative to Null Hypothesis 5.

5a. Some demographic factors are correlated with amount of CAI use in entry-level PT education.

Hypothesis 6 (Null).

There is no correlation between demographic factors (tuition level, number of students and full time faculty, how long accredited, geographic location and degree awarded) and perceived value of CAI in entry-level PT education.

Alternative to Null Hypothesis 6.

6a. Some demographic factors are correlated with perceived value of CAI in entry-level PT education.

Assumptions

Assumptions for the study were:

1. The perceptions of academic administrators could be used to identify the value of CAI and the factors that affect implementation and use of CAI in entry-level PT education. The author assumed that subjects followed survey instructions correctly.
2. Survey methodology could be used to collect significantly useful information about the topic. The author assumed that subjects provided accurate and honest responses to questionnaire items.

Limitations

Limitations of the study recognized by the author were:

1. The investigator was unable to personally administer the surveys. Therefore, it was possible that someone other than addressees may have completed the surveys.
2. There are several methods applicable to estimation of reliability (e.g., internal consistency, stability, equivalence). Internal consistency measures were used to estimate reliability of Sections 1 and 2 of the survey. Because of the nature of Section 3, it was inappropriate to apply a measure of internal consistency to that section. Readers should be aware that reliability information provided for the survey instrument did not exhaust all reliability estimation possibilities.
3. The population was academic administrators of entry-level PT education programs in the United States. Results should not be generalized beyond that population.

Variables

The variables of interest for this study were: 1) amount of CAI use, 2) perceived value of CAI, 3) factors that affect implementation and use of CAI, and 4) certain demographic descriptors of the PT education programs (i.e., tuition and fees, number of students and full time faculty, how long accredited, geographic location and degree awarded).

Definition of Terms

Academic Administrator of an Entry-Level PT Education Program.

The academic administrator of a physical therapy education program is a physical therapist with appropriate specialized training and experience and advanced academic preparation (normally a terminal degree). The administrator serves as the "director" or "chair" of the physical therapy program and faculty.

Amount of CAI Use.

This is an index of amount of CAI use. The score was based upon survey responses by academic administrators of entry-level PT programs. The score

was calculated by summing responses to Section 1 (items 2 through 18) of the survey (see Appendix B).

CAI Non-User.

A respondent was identified as a non-user if the Amount of CAI Use score was zero or one.

CAI User.

A respondent was identified as a user if the Amount of CAI Use score was two or greater.

Computer-Assisted Instruction (CAI).

CAI means the use of a computer to teach a subject (other than computing) via direct interaction of the student with the computer (Hebda, 1988).

Computerized Drill and Practice.

Repetitive presentation of a selection of questions via computer until the student answers them at some pre-determined level of proficiency (Alessi and Trollip, 1985).

Computerized Patient Simulation.

A computer program that imitates a patient encounter to teach a student about patient encounters (Alessi and Trollip, 1985).

Computerized Problem Solving.

A computer program that teaches problem-solving skills by requiring the student to solve a problem (Alessi and Trollip, 1985).

Computerized Remedial Work.

A computer program that helps the student remediate after performing inadequately.

Computerized Supplemental Work.

A computer program that offers course-related instruction not required by the course syllabus.

Computerized Testing.

A computer program that administers tests through the computer (Alessi and Trollip, 1985).

Content Expert.

Content experts were individuals who had used CAI to facilitate learning in college-aged (or older) learners. Content experts developed and validated items for the survey instrument.

Entry-Level Physical Therapy Education Program.

This is an educational program approved by the Commission on Accreditation in Physical Therapy Education (CAPTE). CAPTE is the only agency recognized by the Council on Post-Secondary Accreditation to

approve physical therapy education programs in the United States. Graduates of accredited entry-level PT education programs are qualified to sit for licensing examinations mandated by each of the 50 states. CAPTE accredits programs at baccalaureate, masters, and certificate levels. At this writing, about 50% of the 123 accredited programs award the master's degree, one program awards certificates, and the remainder of programs award a baccalaureate degree. Many of the baccalaureate programs are in the midst of transition to the master's degree.

Factors that Affect Implementation and Use of CAI.

These are faculty, student, resource, and other factors that could affect the implementation and use of CAI in entry-level PT education programs. Factors included on the survey were developed and established by content experts. An open-ended response area allowed respondents to add factors that had not been included on the survey (see Appendix B, Section 3).

Perceived Value of CAI.

This is a measure of the value of CAI for entry-level PT education programs. The score was based upon survey responses by academic administrators of entry-

level PT programs. The Likert scale technique was used to develop the measure or score. The score was calculated by summing responses to Section 2 (items 19 through 39) of the survey (see Appendix B).

Perceived Importance of Factors that Affect Implementation and Use of CAI.

This is a score that was developed for each of the factors based on the responses of each of the academic administrators to items in Section 3 of the survey instrument (see Appendix B).

Physical Therapist.

A physical therapist is ". . . a graduate from a physical therapy curriculum approved by . . . an agency recognized by . . . the Council on Post-Secondary Accreditation . . . [who is] licensed by the jurisdiction in which [he/she] practices" (APTA, 1972) to provide physical therapy services.

Physical Therapy.

"Physical therapy means the examination, treatment, and instruction of human beings to detect, assess, prevent, correct, alleviate and limit physical disability, movement dysfunction, bodily malfunction, and pain from injury, disease

> and any other bodily and mental conditions and includes the administration, interpretation, and evaluation of tests and measurements of bodily functions and structures; the planning, administration, evaluation, and modification of treatment and instruction, including the use of physical measures, activities, and devices, for preventive and therapeutic purposes; and the provision of consultative, educational, and other advisory services for the purpose of reducing the incidence and severity of physical disability, movement dysfunction, bodily malfunction, and pain." (American Physical Therapy Association [APTA], 1986)

Summary

Little was known about the use of computers in entry-level PT education. The value of CAI, factors that affect implementation and use of CAI, and the importance of these factors had not been identified. Decision-making about implementation and use of CAI was difficult because of the paucity of information.

The present research provides a nationwide study on the use of CAI in entry-level PT education, the perceived value of such use, and factors affecting its implementation and use. Academic administrators of entry-level PT education programs were surveyed using a mail questionnaire.

This study provides information of use to anyone concerned with the implementation and use of CAI in entry-level PT education programs. Thompson (1987) pointed out that "More research is needed to support decisions related to fiscal allotments for computer use in college curricula" (p. 1237). Data about the value of CAI, and about factors that affect the implementation and use of CAI are provided by this study.

Chapter 2 - Review of Literature

Introduction

The literature review concentrates on four topics germane to the present study. These are: 1) CAI in higher education, 2) CAI in health professions education, 3) CAI in entry-level PT education, and 4) survey research and questionnaires.

CAI in Higher Education.

Researchers have reported a broad array of benefits resulting from computer use in higher education. Kulik, Kulik, and Cohen (1980) conducted a meta-analysis of 59 studies that compared computer-based instruction (CBI) and conventional teaching. They found that computers improved learning outcomes and shortened instructional time. They concluded "It is clear that the computer can function satisfactorily in college courses and at the same time reduce time spent in instruction" (p. 538). Later, Kulik (1983) reaffirmed the benefits of CBI for college teaching. It was concluded that the computer can be used to help learners improve reading, writing, calculating and problem-solving skills.

Others have also noted that computer use can save faculty time. Lee, Watson, Argo, Kalish and Catlin (1982) developed a competency-based, computer-managed instruction model that was used to revise and manage curricula. They stated, "The most obvious benefits include savings in time for instructors and immediate feedback on performance for students" (p. 106).

Rupe (1985) examined studies and articles to assess benefits and limitations of CAI. Time savings was identified as an important advantage. Limitations identified were: 1) equipment and materials costs, 2) teacher readiness to use computers, and 3) student beliefs and anxiety toward computers.

Ely (1984) summarized the results of studies on the effectiveness of CAI during the preceding 20 years. CAI was reported as effective for tutorials, drill and practice, problem solving, simulations, inquiry and dialog. Heightened effectiveness for CAI that was observed with elementary and secondary students was reduced at the higher education level.

Another examination of the literature on CAI was presented by Chamberlin (1988). CAI use from kindergarten through college level was evaluated.

Chamberlin concluded that schools must take care in the selection, purchase and use of CAI software. A need for more research on the effects of CAI and successful implementation of CAI was identified.

Nordstrom (1988) also advised caution before committing resources to CAI. "Determining the relative effectiveness of a CAI software package over other available materials would seem desirable before committing large sums of money or the dedication of hardware resources to the acquisition and utilization of CAI" (p. 2).

Wise (1987) studied the effect of CAI using the PLATO system on student performance. Course grades were highly correlated to the number of CAI lessons completed by the student. Student acceptance of the system was evaluated with a questionnaire using Likert scale methodology. Student responses were positive.

Juchau (1988) investigated the effects of CAI on problem solving skills in mathematics courses. Pre and post tests were administered to experimental (CAI) and control (no CAI) groups. Improvement in mean test scores for the experimental group was approximately twice that for the control group.

Brebner (1984) conducted an experiment to evaluate the effects of a drill and practice CAI program for teaching written French to university students. Although student attitudes were favorable, no significant advantage to CAI was demonstrated.

Dowell, Binette and Lizotte (1989) presented the results of an evaluation of CAI for teaching program evaluation to psychology majors. Subjects were seniors and first year graduate students. Three experiments were conducted. A comparison of CAI versus paper and pencil text presentations did not demonstrate any significant differences. A comparison of pre and post tests for the CAI group showed a 36% increase in scores. This trend was not significant because of the small number of subjects. An evaluation of student attitudes toward CAI showed that CAI was more helpful than pencil and paper text-based presentation.

Rowley and Layne (1990) compared CAI to traditional classroom instruction for accounting education. Differences in pre and post test scores were compared for CAI and traditional instruction groups. CAI was shown to be twice as effective. Interestingly, results showed that under-prepared

students demonstrated greater increases in scores. Guidelines for successful use of CAI were presented as follows:

> Computer tutorials are generally recognized as effective when they are: aimed at specific groups of students, integrated with classroom instruction, used for specific subject matter, and proper setting and scheduling are established. (p. 3)

Kapoor and Lakhanpal (1990) also studied the effects of CAI on business students. Their findings supported Rowley and Layne's (1990) notion regarding a relationship between level of student preparedness and achievement. Those students with medium grade point averages benefitted most from the CAI.

Researchers have studied the effects of CAI for bibliographic instruction. Lawson (1987) used a CAI group, a tour group and a control group to determine the effects of CAI. The CAI group showed the highest post test mean ($p < .0001$). Students in the CAI group rated the CAI as equal to or better than the general library tour. It was concluded that CAI was more effective at teaching library skills. In a later

report, Lawson (1990) pointed out that there was a significant cost advantage to CAI bibliographic instruction.

Madland and Smith (1988) developed a CAI program to teach remedial students critical thinking skills for library use. In contrast to Lawson's reports (1987, 1990), results showed that the classroom presentation was superior to CAI, although students preferred CAI.

In summary, CAI has been perceived as beneficial for higher education, although benefits are reduced as compared to the effects of CAI for elementary and secondary education. CAI can improve learning outcomes and shorten instructional time. Computers can be used to help learners improve reading, writing, calculating and problem-solving skills. Benefits are greatest when CAI is specifically designed for a given subject and used with specific groups of students. Benefits seem to favor students who are under-prepared.

CAI in Health Professions Education.

The use of CAI in nursing, medical and other health professions education programs has been the subject of many studies and reports. Factors that affect implementation and use of CAI have been

identified for these groups. Early studies focused on the time savings afforded by the use of computers.

Bitzer and Boudreaux (1969) compared a CAI group with a conventional classroom group. The subjects were nursing students, and the subject matter was maternity nursing. There was no significant difference in post test scores between the two groups. However, the CAI students ". . . learned the same amount of material in from one-third to one-half the time required in the classroom" (p. 248).

Green (1970) described a computer program that was developed to plan for 14 clinical laboratory areas and schedule up to 95 students per class. She reported that the program saved 65 to 75 faculty manpower hours each semester. Faculty response to the system was positive. "Most faculty members were well aware of the time factors involved and reacted favorably to having been released from much tedious work at the beginning of the semester" (p. 41). Green clearly stated the time savings when she said, "The main advantage, of course, is that better use is made of faculty's time, and that their time can be used more effectively for

program planning, student counseling, class preparation, and personal enrichment" (p. 41).

Meadows (1977) felt that the most important benefits of computers were related to improving instruction. Still, several faculty time-related factors were noted. "Instructors are freed to focus upon the learner in the clinical setting after she has mastered the required content using the computer" (p. 20). Further, Meadows asserted, "Storage of information is an important function of the computer since it relieves the instructors of time consuming and tedious clerical tasks" (p. 16).

Armstrong (1983) alluded to the potential time-savings of CAI. "Instruction delivered with use of the computer can provide a product that lives long after the lecture" (p. 558). Once in place, CAI can be used over and over. It can be made available many hours a day.

Other benefits resulting from computer use in health professions education have been reported. Harasym and McCreary (1987) described the successful use of a microcomputer-aided patient simulator. The system was developed to increase medical students'

opportunities to diagnose and manage patient problems. It combined a microcomputer with an optional laserdisc player. The authors felt the system could be used successfully in other content fields.

Rippey and Voytovich (1983) described a computer-based method of confidence-testing that improved medical students' ability to assess probabilities during clinical diagnosis. Confidence testing is a procedure that uses probabilities to express confidence in one's decisions. The authors felt that "Confidence testing cannot be done properly without a computer" (p. 96). They felt the system allowed students to improve their assessment of their knowledge level.

Carew, Elvin, Yon and Alster (1985) developed a computerized study guide to augment a 15-week introductory course in nutrition. Students used 1,950 statements and review questions on main-frame or microcomputer to preview or review lectures or study for examinations. Highly positive program evaluation results were reported.

Nahata (1986) identified advantages of a pharmacy doctoral program's CAI independent-study component in

pathophysiology. These advantages were self-pacing, reduced faculty time commitment, and increased ability to work effectively with physicians. ". . . an important benefit of this program is the availability of pathophysiology courses of high quality with little time commitment by pharmacy faculty. This can provide time for pharmacy faculty to develop and teach other pharmacy courses and conduct research" (p. 279).

Nardone, Schriner, Guyer-Kelley and Kositch (1987) used computer-simulated case problems to teach skills in patient interviewing and symptom analysis. They found that the system helped teach symptom characterization but did not substitute for faculty teaching. Student team study on case simulations was recommended.

Harless, Duncan, Zier, Ayers, Berman, and Pohl (1990) described a computer-based patient simulation model called Technological Innovations in Medical Education (TIME). TIME used a computer and videodisc player to create a believable patient encounter. Three medical schools participated in a field test of TIME. Six faculty made ten presentations to 306 second year medical students. The authors concluded that for

simulating a real patient, the TIME patient simulation model was validated. They felt that TIME could serve as the basis for the development of new methods to teach and test medical students in the classroom setting.

There are several other references to the effects of computers in health professions education. Henry (1990) spoke to the need for medical students to research information in books and journals, access information, analyze it, and present findings. Henry stated that computer technology was available to do these tasks. Henry felt there were compelling reasons why personal computers were key to learning. Henry suggested that every medical student needed a computer.

Williams and Benedict (1990) spoke of the flexibility afforded by CAI. They described a system that was designed to ". . . replace up to 50% of the lecture content with CAI and use the class time to discuss the content on a more advanced level" (p. 202). The system used laptop computers to teach registered nurses enrolled in bachelor and master of science in nursing programs. Because the geographic region was rural, a flexible instructional delivery system was

required. The authors felt that the increased flexibility provided by CAI was a major strength of the program.

Haynes, McKibbon, Walker and Ramsden (1991) surveyed health sciences faculty members at McMaster University to determine their use of microcomputers. They found that the proportions of faculty using microcomputers increased significantly over three years (1986 to 1989). They felt that the extraordinary rate of adoption of microcomputers attested to their perceived usefulness.

Several extensive, profession-wide studies of the use of computers in nursing education have been reported. Spector (1984) surveyed the administrative heads of all associate and baccalaureate nursing programs in the South (n=342). The investigation was conducted to gather data that would serve as the basis for planning a regional project on computers in nursing education. The purpose of the project was to "Assist faculties in using computer technology as an instructional tool" (p.61). Data on the availability of, experience with, use of and expectations of computer applications were reported. Factors affecting

computer use were identified (e.g., faculty not prepared, cost). Spector concluded there was a high degree of interest in learning how to use computers in nursing education. Administrators wanted their faculties to set up networks with other computer users, and they believed regional reports and workshops would be of value.

Gothler (1985) summarized the computer-related results of the National League for Nursing's 1985 Nurse-Faculty Census (n=1,559, 92.6%). The primary factor that limited computer integration in the curriculum was lack of faculty readiness. Gothler commented on instructional computer use including instruction, testing and research. "Since few new graduates will be prepared to use computers, staff development programs in this area will also become increasingly important" (p. 510).

Thomas (1986) surveyed all National League for Nursing accredited programs to "describe the current status of instructional computing in American Nursing Education, identify factors inhibiting the growth of instructional computing in nursing programs, and identify potential remedies for the identified

barriers" (p.221). Thomas commented, "Very little data-based information has been reported" (p. 221). Eighteen barriers ranging from cost and resource issues to lack of faculty readiness were identified. A lack of incentive for developing computer applications in the curriculum was also identified. Barriers were grouped as follows: 1) faculty development concerns, 2) hardware and software costs, and 3) resource and incentives. Interestingly, barriers related to students were not mentioned. Potential remedies for all barriers were suggested. Thomas concluded ". . . there is a need to study the effectiveness of CAI generally . . ." (p.227).

Hebda (1988) surveyed this group again to "update the profile on CAI in National League for Nursing accredited baccalaureate programs" (p. 24). Six reasons for non-use of CAI were identified. All but one of the reasons were related to funding and other resource issues. Items such as lack of facilities and lack of suitable CAI programs were cited. "Unsuitability of CAI as an educational tool" (p. 27) was also identified by 6.3% of respondents. Inadequate

funding was singled out as the major reason for non-use of CAI.

Sparks (1990) presented a compilation of data collected from studies on the topic up to that time. Besides cost and lack of faculty preparation, Sparks identified low quality and low quantity of software as major barriers to the implementation of instructional computing. Several recommendations for the use of computers in nursing education came from the Sparks study.

Other faculty and student factors that affect the use of CAI in nursing education have been reported. Parks, Damrosch, Heller, and Romano (1986) studied faculty and student perceptions about CAI. They compared perceptions of current levels of knowledge about computers in nursing education with desired levels of knowledge. Faculty and student respondents reported low levels of present knowledge, but they desired high levels. The authors concluded, "Hands-on experience with the application of the technology was considered essential for all students" (p. 112).

Brudenell and Stewart-Carpenter (1990) studied the relationship between learning style and attitudes

toward CAI. Subjects were adult students enrolled in a nursing research course. The Attitude Toward Computer Assisted Instruction Semantic Differential Tool (Allen, 1986) and the Learning Style Inventory (Kolb, 1976) were used to measure attitudes and learning styles. The authors emphasized that further study was required, but they commented that ". . . learning style information may be useful to identify those students who may have a less favorable attitude toward CAI" (p. 82).

Van Dover and Boblin (1991) developed a survey instrument to study student nurse preferences for using computers for learning. "In general, students showed the strongest preference for learning applications for clinical practice . . ." (p.75). Faculty used study results to " . . . begin planning for the future" (p. 79). The authors emphasized the importance of faculty experience and comfort with CAI. They also noted that faculty must be motivated to change the curriculum so as to accommodate CAI.

Data regarding computer use in medical schools has also been collected. Jonas et al. (1989) presented data compiled from the annual survey of schools

accredited by the Liaison Committee on Medical Education (n=142). CBI was a formal part of one or more courses or laboratories in 86 schools. Training in the use of computers was available in 94 schools, and 122 schools had computer terminals and software available for student use. By the following year, the number of schools reporting use of CBI rose to 117 (Jonas et al. 1990).

In summary, allied health professions educators have generated many reports indicating the usefulness of CAI for their respective fields. Factors that affect implementation and use of CAI have been studied. The nursing profession has been at the vanguard of research on these topics. Factors that affect CAI use in nursing education can be grouped as: 1) faculty, 2) student and 3) resource.

CAI in Entry-level PT Education.

The previous section shows some of the richness contained in health professions education research about CAI. By comparison, physical therapy literature on the topic is sparse.

McGown and Faust (1971) presented the first report on computer use in entry-level PT education. They

described a CAI program that was developed for review of anatomy and kinesiology of the knee. They studied the effectiveness of the program by administering post-tests to two groups at several time intervals. The subjects used the CAI for remedial purposes. Therefore all subjects had been instructed in the material by traditional means prior to the CAI experience.

The authors reported ". . . substantial achievement gains effected by the program" (p. 1118). This claim was supported by comparing achievement scores from previous traditional instruction to the CAI post-test scores. The authors concluded, "It [the CAI] appeared to be an efficient review method in terms of time cost to students and produced excellent learning gains which were relatively stable over a two-week period of time" (p. 1119).

Fourteen years passed before another report of computer use in entry-level PT education appeared. Francis (1985) developed a BASIC language program that provided an interactive demonstration of the length-tension relationship of skeletal muscle. Francis provided a description of the program and the source

code. An evaluation of effectiveness was not conducted.

Thompson (1987) compared the effectiveness of CAI with written, programmed instruction for physical therapist assistants. ANOVA was used to look for significant differences in post-test scores. Learning style inventory scores and an assessment of attitudes toward computers score were used to see if these items were related to post-test scores. "No difference was found in student performance after completion of testing using either CAI or written, programmed text. The Kolb Learning Style Inventory did not predict which students would show the greatest amount of learning while using the computer. A slightly positive correlation occurred between increased retention of material after CAI and student responses on a questionnaire about their preference for computers" (p. 1239).

Adams (1987) described a CAI package developed to allow student practice of problem solving skills in therapeutic exercise. An investigation of the effectiveness of the program was not conducted. Student feedback about the program was positive.

Guiteras (1989) developed a computer program called "The Lesion Game (tm)". This program simulated damage to parts of the neural pathways innervating the upper extremity (the brachial plexus). The program was set up so students interacted as they would if playing a computer game. The object of the game was to diagnose the lesion in as few guesses as possible. Guiteras did not conduct a critical study of the effects of the program. Guiteras' view on the utility of CAI in physical therapy education was expressed by the following statement. "I hope that the Lesion Game (tm) program will stimulate physical therapy educators to acknowledge the incredible potential that the personal computer has for supplementing physical therapy curricula" (p. 862).

Although the Adams and the Guiteras reports are not research reports, they give some indication of the ways CAI can be used in physical therapy education.

The most recent report concerning computers in PT education was presented by Hayes et al. (1991). They began their report by saying, "Educators in physical therapy seek efficient methods of teaching the ever-expanding curriculum and encouraging self-directed

learners" (p. 65). They used two computer-based patient management problems (CPMPs) to determine: "1) the relationship between students' attitudes about computers and their performance on CPMPs, 2) the relationship between students' prior experience with computers and their performance on CPMPs, 3) the relationship between students' prior clinical experience and their performance on CPMPs, 4) students' acceptance of CPMPs for assessing their application of the patient management process, and 5) the cost of implementing such a project in a baccalaureate entry-level physical therapy degree program" (p. 66). The authors concluded, "Computer-based patient management problems are an acceptable way to evaluate, in a safe environment and at a reasonable cost, students' ability to manage patients" (p. 69). The authors indicated a difference in their results as compared to those of Thompson (1987). "Our results conflict with those of Thompson, who found a significant correlation between a favorable attitude toward computers and performance of a CAI program" (p. 70).

A summary of the literature on CAI use for entry-level PT education is limited by the small size of the

literature base. Two studies investigated the effects of CAI for entry-level PT students (Hayes et al., 1991; McGown and Faust, 1971). These authors found CAI to be of value. One study (Thompson, 1987) used PT assistant students as subjects. Results indicated no difference between CAI and written programmed text. Although subjects were not entry-level PT students, results may be largely generalizable to that group. Three reports (Adams, 1987; Francis, 1985; Guiteras, 1989) are favorable for CAI, but these authors did not conduct a critical evaluation of their systems.

Survey Research and Questionnaires.

"One kind of research that often appears in the health sciences literature is survey research" (Rubinson and Neutens, 1987, p. 82). "Surveys are the most widely used technique in education and behavioral sciences for the collection of data. They are a means of gathering information that describes the nature and extent of a specified set of data ranging from physical counts and frequencies to attitudes and opinions" (Isaac and Michael, 1981, p. 128). "Surveys are used frequently to gather information about a large

population in order to answer a set of hypotheses" (Bailey, 1991, p. 60).

"The mailed questionnaire is the most common type of data-gathering procedure employed in survey research" (Hopkins and Gullickson, 1989, p. 1). "This is the single most widely used technique in education" (Isaac and Michael, 1981, p. 133). ". . . the word 'questionnaire' refers to an ordered arrangement of items (questions, in effect) intended to elicit the evaluations, judgements, comparisons, attitudes, beliefs or opinions of personnel" (Dyer, 1976, p. I-B 1).

Several advantages of mail questionnaires have been identified. Mail questionnaires: 1) are cost and time efficient, 2) avoid interviewer bias, 3) provide a greater assurance of anonymity, 4) allow the respondent to complete the survey when it is convenient for the respondent, 5) provide access to respondents dispersed over a large geographic region, 6) encourage accuracy because respondents can consult records before responding, 7) provide identical wording of questions for all respondents (Isaac and Michael, 1981; Rubinson and Neutens, 1987).

Likewise, there are potential disadvantages to mail questionnaires. These are: 1) potential for low response rate, 2) no assurance that the addressee actually was the one who completed the survey, 3) no control over immediate environment where survey was completed, 4) no assurance that the questions were understood, 5) lack of flexibility, 6) difficulty designing complex questionnaire formats (Isaac and Michael, 1981; Rubinson and Neutens, 1987).

Insuring an adequate response rate is paramount to the validity of a mail questionnaire survey (Best and Kahn, 1986, p.166). When the response rate is low, the researcher must ask, " . . . how would the results have been changed if all subjects had returned the questionnaire" (Isaac and Michael, 1981, p. 135)? However, the researcher should not expect a 100% rate of return (Isaac and Michael, 1981). What, then, constitutes an adequate response rate?

Rubinson and Neutens (1987) felt that the definition of an adequate response rate was " . . . a highly questionable topic because so many factors affect it" (p.107). They reported that a reasonable response rate is anywhere from 50% to 90%. Increasing

the response rate can improve the validity of the data collected (Kalman, 1988). Preventing respondent bias is important regardless of the response rate (Rubinson and Neutens, 1987).

Chang (1989) reported that, "Response rates in most mail surveys of journalists generally fall within 30 to 65 percent" (p. 2). Best and Kahn (1986) defined a low response rate as, " . . . less than 40 percent" (p. 166). Isaac and Michael (1981) suggested that response rates from 63% to 97% could be obtained by using follow-up mailings. Graetz (1985) was able to obtain a 78% response rate using a large (36 page) questionnaire. Boser (1990) obtained a range of response rates from 48% to 81% using various techniques. Brady (1989) reported obtaining a response rate of 90% by using the Dillman total design method. Green (1989) surveyed elementary and secondary school teachers and reported a 71% response rate.

Many factors have been reported to influence the response rate to mailed questionnaires. Some of these factors are: cover design, cover appeal letter, first question type, pre-notification, follow-up reminders, color of ink and paper, personalization, assurance of

confidentiality, offer of feedback on results, class of postage used, return deadline, homogeneity of the population, and the use of gratuities.

The effect of the questionnaire cover design has been discussed. Dillman (1978) felt that the questionnaire cover, ". . . is likely to be examined before any other part of the questionnaire. Therefore, [it] . . . is carefully designed to create a positive first impression" (p. 150). Dillman suggested that the study title, any necessary directions, the name and address of the study sponsor, and a graphic illustration are important components of the cover. Dillman felt that the graphic illustration was crucial. Its purpose is to add interest and to set the questionnaire apart from others that the respondent may have received in the past.

Frey (1991) studied the effect of cover design and type of first question on response rates to a mail survey of skydivers. The four experimental treatments were combinations of plain versus graphic covers and behavioral versus cognitive/analytical first questions. Frey did not find a significant difference between the treatments.

Nederhof (1988) investigated the effect of different cover styles. Subjects were 320 biotechnologists. A largely black contrastive cover gave an 11% higher response rate than a cover that was white-spaced and minimally contrastive.

Several investigators have studied the effects of cover letters on rate of return. Biner (1988) found that a cover letter offering a personal choice for response was more effective than a letter emphasizing the importance of the research. McKillip and Lockhart (1984) studied the effect of cover letters stressing value, utility or knowledge. Return rates were highest for cover letters that stressed utility and lowest for letters that stressed value.

Personalization of the cover letter has received attention in the literature. Dodd and Markwiese (1987) found no difference in return rates for personally signed versus photocopied cover letters. These results support the findings of Worthen and Valcarce (1985), who found no difference in return rate for personalized as compared to form cover letters.

Dillman (1978) spoke to the important aspects of the cover letter. He stressed that the cover letter

serves to introduce the survey and motivate an expedient response. It ". . . is virtually the only opportunity the researcher has for anticipating and countering respondent questions" (p.165). Dillman felt the following aspects of the study should be stressed in the cover letter: 1) the usefulness of the survey results, 2) the importance of the individual respondent for the success of the study, 3) that the response would be treated confidentially, and 4) that results of the study would be provided on request.

Prenotification has been studied as a variable that affects response rate. Farina, Dickson and Filipic (1990) looked at the difference between letter and telephone prenotification as compared to a group that was not prenotified. They found that the response rate for the letter prenotification group was better than the no prenotification group. The telephone prenotification group did not produce better return rates than the no prenotification group. Pitiyanuwat and Phattharayuttawat (1991) found that prenotification by mail effectively increased the rate of return.

The effect of various types of follow-up reminders on the response rate for mailed questionnaires has been

studied. Dillman (1978) suggested that the final reminder should be via certified mail. Nederhof (1988) compared a certified mail to a telephone reminder. No significant difference was observed. Suhre (1989) felt that follow-ups were most effective when conducted by telephone. Boser (1990) reported that a reminder letter after one week produced the highest response rate (81%) of the groups studied. Ogborne, Rush, and Fondacaro (1986) investigated the cost-effectiveness of telephone versus mail follow-ups for surveying health and social service professionals. They found that mail follow-ups were more effective.

The effect of a monetary gratuity on response rate has been investigated. Biner (1988) showed that the inclusion of a monetary gratuity significantly improved response rate. Hopkins and Gullickson (1989) presented some interesting comparisons on the effect of a monetary gratuity. They conducted a meta analysis that examined the effect of gratuities in relation to the number of follow-ups, the type of population surveyed, whether the gratuity was promised or enclosed and several other variables. They felt the gratuity typically had more impact than did an additional

mailing. They indicated the gratuity could be useful for professional and general populations.

Powers and Alderman (1982) studied the effect of offering feedback on results as related to response rate. They reported that offering feedback had a significant positive effect, but this effect was less than the effect of follow-up contacts. Dillman (1978) indicated that from one-half to two-thirds of survey respondents generally value the opportunity to see survey results.

The effect of various aspects of postage rates on survey return rates have been reported. Dillman (1978) suggested first class postage for initial mail-outs, return envelopes, and follow-ups. He used certified mail for the final follow-up. By contrast, Harvey (1986) found no difference between return rates for first and second class postage.

The color of the ink used on questionnaires and its effect on response rates has been investigated. Pitiyanuwat and Phattharayuttawat (1991) found that blue and green were more effective than black or red. Dillman (1978) mentioned that the color of the pen used for the signature should be blue.

Issues particular to mail surveys for professional groups have been discussed. Sobal (1990) looked at response rates for physician groups. Medical specialty was the only variable that produced significantly different results. Sobal concluded that the more homogeneous the group, the greater the response rate. Chang (1989) felt that time constraints was the factor that most influenced response rates among journalists. Ogborne et al. (1986) reported that mail follow-ups were more effective than telephone follow-ups among health and social service professionals. Sudman (1985) indicated that being sensitive to confidentiality concerns was most important for professional groups.

Several authors have reported that response bias is a function of the rate of return. Rubinson and Neutens (1987) felt that the chance for introducing response bias could be reduced by insuring a high rate of return. Chang (1989) reported that non-response seemed to have little biasing effect on organizational and marketing characteristics of the results of a survey of newspaper journalists. Jobber (1984) found that more of the interested respondents replied to a follow-up mailing (86%) than to the initial mailing

(71%). By contrast, Green (1989) found that there were only small differences in data quality and attitude-behavior across waves of respondents.

A summary to the literature on survey research and questionnaires is difficult to formulate because of the varied nature and findings of the studies. Certainly, thorough planning and meticulous attention to detail can be recommended. Perhaps Boser and Clark (1990) summed it up best when they suggested that questionnaire design and implementation is as much an art as it is a science.

Summary

Research indicated that CAI had been used successfully in higher education to improve learning outcomes, shorten instructional time, and to improve reading, writing, calculating and problem-solving skills. Allied health, medical and nursing education could benefit from the use of CAI. Nurse educators had conducted nation-wide surveys to identify factors that affect implementation and use of CAI in nursing education. These factors could be grouped as faculty, student, and resource.

In contrast to other health professions, entry-level PT educators had not studied the effects of CAI to any great extent. The value of CAI, and factors that affect its implementation and use in entry-level PT education had not been identified.

Mail survey questionnaires had been used successfully by nursing and medical educators to gather data about the use and effectiveness of CAI. Many factors affect the response rate and overall success of a survey conducted by mailed questionnaire. Successful survey research requires great attention to the mechanics of questionnaire development and implementation.

Chapter 3 - Method

Restatement of Research Questions

The research questions formulated to accomplish the study aims were:

1. What is the extent of use of computer-assisted instruction (CAI) in entry-level physical therapy (PT) education?
2. What is the perceived value of CAI compared to more traditional instructional methods for entry-level PT education?
3. What factors affect implementation and use of CAI in entry-level PT education programs?

Restatement of Hypotheses

The hypotheses that were developed as a result of the research questions:

Hypothesis 1 (Null).

Educators in entry-level PT education programs do not perceive CAI as valuable.

Alternative to Null Hypothesis 1.

1a. Educators in entry-level PT education programs perceive CAI as valuable.

Hypothesis 2 (Null).

The perceived value of CAI for entry-level PT education is similar regardless of the amount of CAI use.

Alternative to Null Hypothesis 2.

2a. The perceived value of CAI for entry-level PT education is different for different amounts of CAI use.

Hypothesis 3 (Null).

There are no factors that are perceived to affect implementation and use of CAI in entry-level PT education.

Alternative to Null Hypothesis 3.

3a. There are faculty, student, resource and other factors that are perceived to affect implementation and use of CAI in entry-level PT education.

Hypothesis 4 (Null).

There is no correlation between the perceived importance of factors that affect implementation and use of CAI in entry-level PT education and amount of CAI use.

Alternative to Null Hypothesis 4.

4a. The perceived importance of factors that affect implementation and use of CAI in entry-level PT education is correlated with amount of CAI use.

Hypothesis 5 (Null).

There is no correlation between demographic factors (tuition level, number of students and full time faculty, how long accredited, geographic location and degree awarded) and amount of CAI use in entry-level PT education.

Alternative to Null Hypothesis 5.

5a. Some demographic factors are correlated with amount of CAI use in entry-level PT education.

Hypothesis 6 (Null).

There is no correlation between demographic factors (tuition level, number of students and full time faculty, how long accredited, geographic location and degree awarded) and perceived value of CAI in entry-level PT education.

Alternative to Null Hypothesis 6.

6a. Some demographic factors are correlated with perceived value of CAI in entry-level PT education.

Restatement of Assumptions

Assumptions for the study were:

1. The perceptions of academic administrators could be used to identify the value of CAI and the factors that affect implementation and use of CAI in entry-level PT education. The author assumed that subjects followed survey instructions correctly.
2. Survey methodology could be used to collect significantly useful information about the topic. The author assumed that subjects

provided accurate and honest responses to questionnaire items.

Restatement of Limitations

Limitations of the study recognized by the author were:

1. The investigator was unable to personally administer the surveys. Therefore, it was possible that someone other than addressees may have completed the surveys.
2. There are several methods applicable to estimation of reliability (e.g., internal consistency, stability, equivalence). Internal consistency measures were used to estimate reliability of Sections 1 and 2 of the survey. Because of the nature of Section 3, it was inappropriate to apply a measure of internal consistency to that section. Readers should be aware that reliability information provided for the survey instrument did not exhaust all reliability estimation possibilities.

3. The population was academic administrators of entry-level PT education programs in the United States. Results should not be generalized beyond that population.

Discussion of the Population and Sample

The target group of respondents was the academic administrators of all entry-level PT education programs (n=123) accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE). CAPTE is the sole accrediting body for physical therapy education programs in the United States. Graduates of accredited programs are qualified to sit for licensing examinations mandated by each of the 50 states. A list of accredited programs is published periodically by the American Physical Therapy Association. The most recent list was used to identify the target group for this study (APTA, 1992, February).

This target group was the entire population. The survey was mailed to all 123 academic administrators. Since the entire population was surveyed, sampling procedures were not required.

The academic administrator of a physical therapy education program is a physical therapist with appropriate specialized training and experience and advanced academic preparation (normally a terminal degree). The administrator serves as the "director" or "chair" of the physical therapy program and faculty.

Survey instrument reliability was estimated by pre-testing the instrument on 30 randomly selected administrators (see section on Reliability of Instrument). Reliability estimates were high, therefore the final form of the instrument was identical to the pre-tested form. Data from these pre-tested respondents was included in the final data analysis.

Research Design

The survey research design was based upon the aims of the study. "Few surveys have but a single objective" (Warwick and Lininger, 1975, p. 56). This study sought to: 1) describe the use of CAI, 2) describe the perceived value of CAI, and 3) identify factors that affect the implementation and use of CAI in entry-level PT education.

The single cross section design was used. "This design involves the collection of information at a single point in time from a fraction of the population selected to represent the total" (Warwick and Lininger, 1975, p. 57). This study modified the single cross section design by extending data collection to the entire population.

The single cross section design can be categorized as non-experimental ex post facto research. This type of design is used when, ". . . the investigator wants to measure and compare two or more existing variables to see if there is a relationship between them" (Bailey, 1991, p. 45). In this study, the researcher looked for relationships between the amount of CAI use and: 1) factors that affect implementation and use of CAI and 2) perceived value of CAI.

Data Gathering Techniques.

Data was gathered using a mail questionnaire (see Appendix B). The "Total Design Method" (Dillman, 1978) was followed to maximize rate of return. Dillman prescribed nearly every aspect of the development and implementation of a mail questionnaire. Readers are

directed to Dillman's book for additional details of this method.

Dillman recommended three follow-up mailings. He reported that his system could produce response rates of from 70% to 75%. The rate of response for the present study was 86.9%.

A letter of endorsement from the vice-president of the APTA was included with each mailing (see Appendix C). The purpose of the endorsement letter was to maximize the rate of return. Besides representing the APTA, the vice-president was known to be familiar with the topic of CAI and higher education from previous research experience. It was hoped this familiarity would improve the credibility of the vice-president's endorsement.

The first follow-up was a post card that was mailed to all subjects one week after the initial mailing (see Appendix D). The purpose of this mailing was to jog memories and to alert all subjects that a questionnaire had been sent. Dillman stated that a surprising number of subjects do not receive the initial questionnaire, but do receive the first follow-up post card. A second questionnaire could be mailed

to those subjects who contact the investigator about the lack of a questionnaire. In the present study, there were no subjects who responded to the post card mailing by indicating they had not received the questionnaire.

It was difficult to measure precisely the effect of the first follow-up mailing. Dillman stated, "The reminder postcard is followed by a response burst that almost equals . . . that achieved by the first mailing." (p. 185) A small surge in questionnaire returns seemed to result from the first follow-up mailing.

The second follow-up mailing was sent to non-respondents three weeks after the initial mailing. The cover letter explained that the questionnaire had not been received and asked for its return (see Appendix E). A replacement questionnaire was included.

The final follow-up mailing was sent by certified mail seven weeks after the initial mailing. A cover letter and a replacement questionnaire were included (see Appendix F). The importance of this request was underscored by the fact it this was the fourth mailing. The recipient had to acknowledge delivery with a

signature. The certified follow-up produced several additional responses in the present study.

Procedures and Methods.

Confidentiality was maintained for all data collected. Neither individual respondents nor their institutions were identified in any reports. Questionnaires were coded, but only to facilitate follow-up requests for responses. Only the investigator had access to the coding key and the responses.

The proposal was submitted to the University of Scranton Department of Physical Therapy Department Review Board for approval of data collection from human subjects, in compliance with university and federal regulations. Data collection began after approval was obtained.

Subsequent sections of this chapter describe the procedures and methods used for the development and implementation of the survey instrument, the estimation of its validity and reliability, and the selection and use of statistical tests. Please see appropriate sections of this chapter for specific details.

Timeline of Activities.

Committee Approval to Begin Survey Validation	2/1/92
Prototype Instrument to Experts	2/3/92
First Round Expert Review Completed	2/24/92
First Round Results to Experts	3/8/92
Second Round Expert Review Completed, Validation Process Completed	3/27/92
First Mailing to Reliability Sample	4/27/92
One Week Follow-up Mailing	5/4/92
Three Week Follow-up Mailing	5/18/92
Seven Week Follow-up Mailing	6/15/92
Reliability Process Completed	6/29/92
First Mailing to Population	6/29/92
One Week Follow-up Mailing	7/6/92
Three Week Follow-up Mailing	7/20/92
Seven Week Follow-up Mailing	8/17/92
Survey Completed	8/31/92

Variables and their Treatment

The variables of interest for the study were: 1) amount of CAI use, 2) perceived value of CAI, 3) factors that affect implementation and use of CAI, and 4) certain demographic descriptors of the PT education

programs (i.e., tuition and fees, number of students and full time faculty, how long accredited, geographic location and degree awarded).

Amount of CAI Use.

Data about this variable was collected using Section 1 of the survey (see Appendix B). The questions were worded to quantify various types of CAI use. The design of the response scale allowed a range of scores from 0 to 61. The distribution of response scores indicated that respondents could conveniently be categorized as "CAI users" or "CAI non-users". The categorization was used to help analyze data concerning the perceived value of CAI.

Perceived Value of CAI.

A Likert-type scale was used to collect data about the perceived value of CAI (see Appendix B, Section 2). The design of the response scale allowed a range of scores from 21 to 147. The Spearman Rank Correlation coefficient was calculated for amount of CAI use with perceived value of CAI. The Wilcoxon Rank Sum Test was used to determine the differences in perceived value of CAI for the CAI users and non-users.

Factors that Affect Implementation and Use of CAI.

Previous studies had shown that certain faculty, student and resource factors affect the implementation and use of CAI in nursing education (Brudenell & Carpenter, 1990; Hebda, 1988; Thomas, 1986). Section 3 of the survey (see Appendix B) gathered data about such factors for entry-level PT education.

Respondents rated the importance of factors on the following scale: "NO EFFECT" = 0, "MINIMAL EFFECT" = 1, "MODERATE EFFECT" = 2, "STRONG EFFECT = 3, "VERY STRONG EFFECT = 4 (see Appendix B, Section 3 for operational definitions of terms). The importance of each factor was correlated with amount of CAI use using the Spearman Rank Correlation coefficient. This allowed a description of perceived factor importance by amount of CAI use. The Wilcoxon Rank Sum test was calculated for each factor to determine differences for users and non-users.

An open-ended response area provided an opportunity for respondents to list factors not addressed by survey questions.

Demographic Descriptors of PT Programs.

Certain demographic descriptors (i.e., tuition and fees, number of students and full time faculty, how long accredited, geographic location and degree awarded) were correlated with amount of CAI use employing the Spearman Rank Correlation coefficient. The Wilcoxon Rank Sum test was used to determine if there were differences for users and non-users on the demographic variables. The number of full time faculty was obtained as an item on the survey questionnaire. All other demographic variables were excerpted from the Directory of Physical Therapy Education Programs (APTA, 1991a).

Instrumentation

A mail questionnaire survey instrument was used. ". . . the questionnaire has unique advantages and, properly constructed and administered, it may serve as a most appropriate and useful data-gathering device in a research project" (Best & Kahn, 1986, p 167). The mail questionnaire was considered suitable for use in the present study because of the geographic distribution of the population (academic administrators

of entry-level PT programs located throughout the United States). Dillman (1978, pp. 39-40) stated, "The researcher who wants to survey [subjects] who are likely to be scattered among the 50 states and several foreign countries probably only has one choice - the mail questionnaire." Mail questionnaires were considered appropriate for groups such as the academic administrator population. "They [questionnaires] are often a good means of collecting data from very specialized and highly motivated groups, such as . . . members of a professional organization" (Sheatsley, 1983, p. 198). The members of the population were physical therapists who administered educational programs accredited by CAPTE.

Prototype Instrument.

A prototype instrument was developed (see Appendix G). The prototype instrument served as the basis for development of the instrument used in the study. Content experts were enlisted to refine the instrument and to estimate its validity (see section on Validity of Instrument). Reliability was estimated using a measure of internal consistency (see section on Reliability of Instrument).

The prototype instrument was adapted from instruments developed for similar studies in nursing education (Hebda, 1988; Thomas, 1986, 1990a, 1990b). Items from these studies were modified by replacing terms such as "nursing" and "nurses" with "physical therapy" and "physical therapist".

The work of Hebda (1988) and Thomas (1990b) was used as a model for development of items for Section 1 (Amount of CAI Use) of the prototype instrument. Hebda and Thomas used the following items to quantify and qualify CAI use: 1) drill and practice, 2) problem solving, 3) testing, 4) tutorials, 5) simulations. Hebda used two additional items: 1) remedial work, 2) supplemental work. Both investigators used items to determine whether CAI was commercial, shareware, public domain, or locally developed. Thomas used items to identify types of computers (mainframe, minicomputer, microcomputer) and to identify whether computers were networked. Hebda asked whether CAI was being used in prerequisite courses.

Section 2 (The Value of CAI) of the prototype instrument was based on the work of Thomas (1990a). This section of the prototype instrument was a Likert

scale with seven response choices for each item. The problem of "response-set" (the tendency of respondents to answer consecutive items in a fixed pattern) was avoided by randomizing the order of positively and negatively worded items (Kalman, 1988).

Thomas developed two instruments to measure beliefs and feelings held by nurses and nursing students about computers and CAI. Thomas measured internal consistency (Cronbach's alpha) to estimate reliability of the instruments. Cronbach's alphas for Thomas' instruments were .91 for Form A and .92 for Form B. The alpha for the combined forms was .95. In addition, 24 nursing students took the instrument twice at a two week interval. The test-retest reliability coefficient was .88.

Thomas reported that face and content validity of the instruments was based on three factors: 1) the items were developed from actual statements made by nurses and nursing students, 2) the items were based on concepts derived from a review of the pertinent literature, and 3) the items were reviewed by content experts. Construct validity was estimated by comparing the responses of users and non-users. A significant

difference was established using t-test methodology ($p < .05$).

Section Three of the prototype instrument for the present study was based on work by Hebda (1988), and Thomas (1986, 1990b). Hebda surveyed deans and chairpersons of National League of Nursing accredited baccalaureate nursing programs about CAI use. Respondents identified six reasons for non-use of CAI. These reasons (e.g., inadequate funding, lack of facilities and lack of suitable programs) could be grouped as "resource" items.

Thomas (1986) developed a two-phase study to identify and rank barriers to growth and use of CAI. The first phase of the study used mail questionnaires with deans and directors of nursing programs. Eighteen barriers were identified. The second phase of the study used the Delphi technique to gain a consensus about the ranking of importance of the barriers. These barriers (e.g., cost of hardware/software, lack of faculty interest or training) could be grouped as "resource" and "faculty".

Thomas (1990b) surveyed nursing educators to study several elements of computing in nursing education. A

large number of factors relating to the use and implementation of CAI were studied. Factors could be grouped as "resource", "faculty", and "student".

Validity of Instrument

"Validity indicates the degree to which an instrument measures the construct under investigation" (Bohrnstedt, 1983, p. 97). The present investigation measured: 1) the amount of CAI use, 2) the perceived value of CAI, and 3) the perceived importance of factors that affect the implementation and use of CAI.

The process of developing a valid questionnaire began with the examination of previous work on the topic. "First, the researcher should search the literature carefully to determine how various authors have used the concept which is to be measured" Bohrnstedt, 1983, p. 99). Precedent existed for development of a questionnaire on the topic in nursing education (Gothler, 1985; Hebda, 1988; Sparks, 1990; Spector, 1984; Thomas, 1986). Medical educators had also collected data (Jonas et al., 1989, 1990). Four of these questionnaires (Hebda, 1988; Thomas, 1986, 1990a, 1990b) were used as models for the development

of the prototype instrument for this study. Best and Kahn (1986) commented on questionnaire validity and the function of content experts in the validation process.

> Basic to the validity of a questionnaire are the right questions phrased in the least ambiguous way. In other words, do the items sample a significant aspect of the purpose of the investigation? . . . The panel of experts may rate the instrument in terms of how effectively it samples significant aspects of its purpose, providing estimates of content validity. (p. 179)

A panel of three content experts was enlisted to refine the instrument and assess its validity. For the purpose of this study, the operational definition of a content expert was: an individual who had used CAI to facilitate learning in college-aged (or older) learners. Experts were recruited from the faculties of entry-level PT education programs (see Appendix H). Experts were asked to identify ambiguities and items that didn't contribute to the purpose of the study. The experts were asked to rate the items in terms of how effectively they sampled significant aspects of the

purpose of the instrument. This provided estimates of content validity (Best & Kahn, 1986).

The prototype instrument (see Appendix G) was used as a starting point for refinement and validity estimation. The Delphi technique (Cyphert and Gant, 1971; Isaac and Michael, 1981) was used to reach consensus among the experts. This technique involved two stages of review by the experts. Specific instructions to content experts are given in Appendix I.

Experts were asked to rate the extent to which each item sampled a significant aspect of its section using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. After the first review, each expert received the mean rating for each item, along with his/her individual rating for each item. The experts used this information to rate the items a second time. Comments about ambiguities and poorly constructed items were used to refine items and eliminate poor items.

First round ratings of the items were generally high (see Appendix J for a detailed report of first round ratings). Item number 18 (How many full time

faculty?) was rated low because it was misplaced. Relocating this item to the beginning of the survey improved its rating on the second round.

First round comments about ambiguities resulted in several changes in wording. The CAI definition was enlarged, as were the definitions of several other Section 1 terms to clarify their intent. The term "entry-level physical therapy education program" was used uniformly throughout the survey to clarify the target population. The respondent choices for Section 1 were changed from discrete percentages to percentage ranges. The choices "don't know" and "not applicable" were added to several items where appropriate.

Second round ratings for items were high (see Appendix K for a detailed report of second round ratings). Only five of the 48 items were rated less than the maximum rating of "3 - GREATLY". Two items received a mean rating of 2.76, two more were rated 2.33, and one item was rated "2 - MODERATELY". No additional ambiguities were identified in the second round.

Reliability of Instrument

Overview of the Reliability Concept.

Bohrnstedt (1970) described the term "reliability" as it can be applied to an attitude scale.

> Perhaps the best synonym is consistency. If no true change occurs in a given attitude an individual holds, does the attitude scale consistently yield the same ordering for him relative to others? . . . Obviously, reliability is not an all-or-none matter - there are degrees of reliability. (p. 83)

Best and Kahn (1986) indicated that the assessment of reliability for a questionnaire is not a simple matter. "It is more difficult to determine these qualities [validity and reliability] for some other data-gathering instruments or procedures such as . . . the use of a questionnaire . . . (p. 145)".

Historically, reliability had been estimated by assessing stability. Stability was determined by correlating test-retest scores. Over the years, problems with test-retest reliability estimates surfaced (Bohrnstedt, 1983).

In recent decades, the use of measures of equivalence have become popular alternatives for assessment of reliability (Bohrnstedt, 1983). One of the earliest equivalence methods to appear was the split-half method. The items on the instrument would be split into two equal halves. A correlation between the two halves would then be calculated.

"The split-half techniques have gradually been replaced by internal consistency methods for the estimate of reliability with cross-sectional data" (Bohrnstedt, 1983, p. 86). These methods use covariances among all items simultaneously. There is no need to decide on an arbitrary split of items.

Kuder and Richardson (1937) devised formulas for estimation of internal consistency for dichotomous (yes-no) items. Cronbach (1951) presented the most popular generalization of the Kuder-Richardson formulas that can be used with scaled response items. Cronbach's alpha was used for estimation of reliability of the survey instrument for the present study.

Reliability Estimation Method.

After the validity of the instrument had been estimated (see section on Validity of Instrument

above), a random sample of 30 academic administrators were chosen to pre-test the instrument. Cronbach's alpha was calculated using the results of this pre-test.

The random sample was selected from the February 1992 listing of accredited entry-level PT programs (APTA, 1992, February). After assigning sequential code numbers ranging from 1 to 123 for all programs, a random number table (McClave & Dietrich, 1988) was used to select the 30 academic administrators for the reliability pre-test.

An initial mailing and three follow up mailings were used to insure a high rate of return for the reliability pre-test. This was the same procedure used to survey the full population. This procedure and the timeline for mailings are described elsewhere in this chapter (see sections on Data Gathering Techniques and Timeline of Activities).

Twenty-six useable responses (86.7%) were returned for the reliability pre-test. One survey was unusable because Section 2 was not completed.

"Cronbach's alpha is appropriate for estimation of reliability when multiple items are used to produce a

scaled score." (Ford, Borgatta & Bohrnstedt, 1969) Section 1 of the survey used 17 items to produce a "use of CAI" score. Section 2 used 21 items to produce a "value of CAI" score. Cronbach's alpha was therefore an appropriate procedure for estimation of internal consistency (reliability) of Sections 1 and 2. A separate alpha was calculated for both sections on the pre-test. The Section 1 (use of CAI scale) alpha was .95, and the Section 2 (value of CAI scale) was .88. As a further estimation of internal consistency, alphas were calculated again when the entire population was surveyed. Alphas for the entire population were: Section 1 = .94, Section 2 = .90.

Section 3 of the questionnaire assessed the importance of several factors that affect the implementation and use of CAI. Section 3 was not designed to produce a single scaled score as is required by measures of internal consistency. Consequently, it would have been inappropriate to apply an internal consistency measure to Section 3. The inability to estimate internal consistency for Section 3 was declared as a limitation of the study.

Sampling

The entire population was surveyed. Therefore sampling techniques were not required (please refer to the Discussion of the Population and Sample section in this chapter).

Statistical Tests and Reasons for Selection

The purpose of inferential statistics is ". . . to make inferences from a sample to a population" (Bailey, 1991, p. 119). The present study surveyed the entire population. Therefore from one perspective, there was no need to infer from a sample to the population. Descriptive statistics were used to describe the variables for the population.

From another perspective, the population studied might have constituted a time-restricted sample because the population was studied at one point in time. From this perspective, the use of inferential statistics would allow inferences about future populations. The author used inferential tests for certain hypotheses to accommodate this second perspective. The presentation of descriptive and inferential statistics allows the reader to choose either perspective.

Four of the alternate hypotheses for the study proposed relationships among the variables. Alternate hypothesis 2a stated that the perceived value of CAI for entry-level PT education was different for different amounts of CAI use. To examine the proposed relationship, it was helpful to categorize respondents according to amount of CAI use. As discussed earlier in this chapter, respondents were categorized as CAI users or non-users (see section on Variables and their Treatment).

The choice of statistical tests was based upon the categorization scheme suggested by the response distribution. The Wilcoxon Rank Sum test was used (McClave & Dietrich, 1988). "The Wilcoxon Rank Sum test is the equivalent to the t-test for independent groups, but is used on non-parametric data" (Bailey, 1991, p. 125). The test determined if there was a difference in perceived value of CAI for users and non-users.

Parametric statistics are commonly used with investigations such as this study to take advantage of their increased power and sensitivity as compared to non-parametric tests (Vigderhous, 1977). Labovitz (1970, 1971), O'Brien (1979) and others (Borgatta &

Bohrnstedt, 1972; Kim, 1975, 1978) encouraged the use of parametric statistics with ordinal data. Others have criticized this practice (Mayer, 1970, 1971; Schweitzer & Schweitzer, 1971; Vargo, 1971). Henkel (1975) spent most of his paper pointing out situations where the practice would likely lead to misinterpretations of data. Yet, he acknowledged the limitations of his argument when he concluded "It is quite possible that there are many circumstances in which such a relaxation of level of measurement assumptions may be eminently reasonable" (Henkel, 1975, p. 24).

The author felt that the potential for robust analysis afforded by parametric statistics justified their use. If errors did occur, it was more likely that the strength of relationships were underestimated rather than overestimated (Borgatta & Bohrnstedt, 1972). Therefore, the parametric equivalent to the Wilcoxon Rank Sum test (Student's t-test) was also calculated.

Alternate hypothesis 4a proposed that the perceived importance of factors that affect implementation and use of CAI in entry-level PT

education was correlated with amount of CAI use. Correlation statistics were used to describe the relationships between amount of CAI use and each of the factors. Spearman's Rank Correlation coefficient was used to describe the relationships. (McClave & Dietrich, 1988) "It [Spearman's Rank Correlation] is used in descriptive research resulting in non-parametric data when items have been ranked and the investigator wishes to compare two sets of rankings to see if there is any type of relationship between them" (Bailey, 1991, p. 126). In this study, the ranking on amount of CAI use was compared to the ranking for each of the factors affecting CAI use. In addition, the parametric equivalent to Spearman's Rank Correlation (Pearson's Product Moment) was calculated.

Certain demographic data was available for the programs in the population (American Physical Therapy Association, 1991a). Alternate hypotheses 5a and 6a suggested that demographic variables such as tuition and fees, number of students and full time faculty, how long accredited, geographic location and degree awarded might be correlated to amount of CAI use or to perceived value of CAI in entry-level PT education.

Therefore, these demographic variables were correlated with amount of CAI use and to perceived value of CAI to determine if any relationships existed. Spearman's Rank Correlation and Pearson's Product Moment Correlation were calculated.

Formats for Presenting Results

The overall purpose of the study was to describe the use of CAI, the value of CAI, and factors that affect the implementation and use of CAI in entry-level PT education. Tabular presentation of data was used to allow rapid access to information. Narrative presentation was also used to completely describe the data. Questionnaire data were categorized as: "All Respondents", "CAI Users" or "CAI Non-Users" according to levels suggested by the response distribution.

Expectations

This study provides valuable information for anyone concerned with the implementation and use of CAI in PT education programs. Thompson (1987) pointed out that "More research is needed to support decisions related to fiscal allotments for computer use in

college curricula" (p. 1237). Data about the value of CAI, and about factors that affect the implementation and use of CAI are provided by this study.

The results of this study will help PT educators decide whether CAI can be used to meet specific goals of their educational programs. Educators are now able to compare factors to the existing situation in their educational programs. A diagnosis of resource allocations, policy and procedure changes, faculty and student matters, etc. needed to implement CAI is now possible.

Prior to the completion of this study, a "state of the art" description of CAI use in PT education was unavailable. This study provides such a description. A number of survey respondents commented on the usefulness of the study. The number of requests for a results summary was high. One respondent went so far as to thank the author for conducting the study.

Speaking about descriptive research, Best and Kahn (1986, p. 80) indicated, ". . . the results may suggest additional or competing hypotheses to test." Hypotheses suggested by this study will be discussed in Chapter Five.

Summary

Mail questionnaire survey methods were used to find:

1. The extent of use of computer-assisted instruction (CAI) in entry-level physical therapy (PT) education.
2. The perceived value of CAI compared to more traditional instructional methods for entry-level PT education.
3. What factors affect implementation and use of CAI in entry-level PT education programs.

Academic administrators of all entry-level PT programs in the United States (n= 123) were surveyed. Descriptive statistics for all variables were calculated. A response scale was used to quantify various types of CAI use. This "Amount of CAI Use" scale score was used to categorize respondents as CAI users or non-users. Differences between users and non-users for demographic variables (years of program accreditation, number of full-time-equivalent program faculty, number of program students per year, degree awarded, annual tuition and fees, geographic location)

were investigated using the Wilcoxon Rank Sum test. The Spearman Rank Correlation coefficient was calculated for Amount of CAI Use with all demographic variables.

A Likert-type scale was used to quantify the perceived value of CAI. Differences for CAI users versus non-users on perceived value of CAI was studied using the Wilcoxon Rank Sum test. Demographic variables were correlated with perceived value of CAI using the Spearman Rank Correlation coefficient.

A five point scale was used to quantify the effects of resource, faculty, and student factors on the implementation and use of CAI. The Wilcoxon Rank Sum test was used to find differences between CAI users and non-users for the effects of all factors. Spearman Rank Correlation coefficients were calculated for all factors with the amount of CAI use.

Chapter 4 - Results

Response Rate

A total of 107 (86.9%) usable surveys were returned in response to all mailings to the population (N = 123). Prior to data collection, an unusable response was defined as one where two or more items on one of the three sections of the survey instrument were not completed. Eight (6.5%) surveys were returned with entire sections uncompleted. These eight responses were declared unusable. No other returned surveys met the definition of an unusable response.

Of the total usable surveys, 26 (21.1%) were returned in response to pre-test reliability sample mailings, 9 (7.3%) to the first mailing to the remainder of the population, 42 (34.1%) to the first follow-up mailing (post card), 22 (17.9%) to the second follow-up mailing, and 8 (6.5%) to the final follow-up mailing (see Chapter 3 Data Gathering Techniques and Timeline of Activities for details on mailings). Since the pre-test and full population instruments were

identical, all responses from both mailings were included in data analysis (see Chapter 3 Discussion of the Population and Sample for details).

Demographic Variables

The demographic variables studied were: years accredited, number of faculty, number of students, degree awarded, annual tuition and fees, and geographic location. The number of faculty was obtained from responses to item 1 of the survey instrument. All other demographic variables were obtained from the Directory of Physical Therapy Education Programs (APTA, 1991a).

Frequency distributions were calculated for all variables to detect possible outliers. Outliers are scores or measurements that fall far outside the body of the data. The concept of an outlier raises the question of the accuracy of the score or measurement (McClave and Dietrich, 1988; Shott, 1990). No outliers were identified.

All demographic variables were analyzed for differences between CAI users and non-users. CAI users were defined as respondents who scored two or greater

on the Amount of CAI Use scale. Non-users were respondents who scored zero or one (see Table 7 and Chapter 1 Definition of Terms). No significant differences ($p = .05$) were discovered using the Wilcoxon Rank Sum test (t-tests also did not demonstrate any significant differences).

Years Accredited.

Table 1 lists the descriptive statistics for the number of years each program had been accredited by CAPTE.

Table 1

Years Accredited - Descriptive Statistics

	All Respondents	CAI non-users	CAI users
Median	19.0	19.0	19.0
Minimum	1.0	1.0	1.0
Maximum	64.0	64.0	64.0
Mean	22.8	23.3	21.5
SD	17.7	18.2	16.5

Note. No significant differences between non-users and users ($p = .05$, two-tailed).

Number of Faculty.

Table 2 lists the descriptive statistics for the number of faculty (full time and/or full time equivalent faculty for the entry-level PT programs). Fifteen respondents (13 [17.3%] non-users and 2 [6.3%] users) failed to report number of faculty.

Table 2

Number of Faculty - Descriptive Statistics

	All Respondents	CAI non-users	CAI users
Median	7.0	7.0	7.5
Minimum	4.0	4.0	4.0
Maximum	19.0	16.0	19.0
Mean	8.0	7.7	8.8
SD	3.1	2.6	3.8

Note. No significant differences between non-users and users ($p = .05$, two-tailed).

Number of Students.

Table 3 lists the descriptive statistics for number of students (per class for the entry-level PT programs). The Directory of Physical Therapy Education did not contain this data for one respondent (a non-user).

Table 3

Number of Students - Descriptive Statistics

	All Respondents	CAI non-users	CAI users
Median	40.0	40.0	44.0
Minimum	18.0	18.0	20.0
Maximum	110.0	100.0	110.0
Mean	46.2	45.0	49.0
SD	20.2	19.5	21.7

Note. No significant differences between non-users and users ($p = .05$, two-tailed).

Degree Awarded.

Entry-level PT education programs award baccalaureate degrees (BAC), masters degrees, or certificates (CERT). A certificate program is a post-baccalaureate program that qualifies the graduate to sit for a licensing examination. Only one program awards certificates. Many entry-level programs are in the process of transition from baccalaureate to masters programs. The frequencies (percentages) for degree awarded are listed in Table 4.

Table 4

Degree Awarded - Frequencies (Percentages)

	All Respondents	CAI non-users	CAI users
BAC	59 (55.1)	43 (57.3)	16 (50.0)
Masters	47 (43.9)	31 (41.3)	16 (50.0)
CERT	1 (.9)	1 (1.3)	0 (0.0)

Note. See text for explanation of abbreviations. No significant differences between non-users and users ($p = .05$, two-tailed).

Annual Tuition and Fees.

Descriptive statistics for annual tuition and fees are listed in Table 5. Listings are in dollar amounts.

Table 5

Annual Tuition and Fees - Descriptive Statistics

	All Respondents	CAI non-users	CAI users
Median	6042.00	5532.00	7541.00
Minimum	0.00	0.00	1104.00
Maximum	24946.00	24946.00	18050.00
Mean	7523.59	7394.16	7826.94
SD	5448.91	5795.64	4604.99

Note. All figures in dollar amounts. No significant differences between non-users and users ($p = .05$, two-tailed).

Geographic Location.

Geographic location was coded according to the regional accrediting body for each respondent institution (i.e. Middle States Association of Colleges and Schools [MS], New England Association of Schools and Colleges [NE], North Central Association of Colleges and Schools [NC], Northwest Association of Schools and Colleges [NW], Western Association of Schools and Colleges [WE], and Southern Association of Colleges and Schools [SO]). One entry-level PT education program accredited by CAPTE (and therefore included in this study) was located in Canada. That institution was accredited by the Association of Universities and Colleges of Canada (CA). Frequencies (percentages) for geographic location are listed in Table 6.

Table 6

Geographic Location - Frequencies (Percentages)

	All Respondents	CAI non-users	CAI users
MS	26 (24.3)	19 (25.3)	7 (21.9)
NC	35 (32.7)	27 (36.0)	8 (25.0)
NW	6 (5.6)	3 (4.0)	3 (9.4)
SO	24 (22.4)	17 (22.7)	7 (21.9)
NE	8 (7.5)	3 (4.0)	5 (15.6)
WE	7 (6.5)	5 (6.7)	2 (6.3)
CA	1 (0.9)	1 (1.3)	0 (0.0)

Note. See text for explanation of abbreviations. No significant differences between non-users and users ($p = .05$, two-tailed).

CAI Use Variables

Amount of CAI Use Scale.

Data about the amount of CAI use was collected using Section 1 (item 2 through item 18) of the survey instrument (see Appendix B). The questions were worded to quantify various types of CAI use. The design of

the response scale allowed a range of scores from 0 to 61. The distribution of response scores indicated that respondents should be categorized as "CAI users" (n=32, 29.9%) or "CAI non-users" (n=75, 70.1%). Table 7 lists the frequencies (percentages) for Amount of CAI Use scale scores.

Table 7

Amount of CAI Use - All Respondents - Frequencies

Score Range	Frequency	Percentage
0 - 5	75	70.1
6 - 10	0	0.0
11 - 15	7	6.5
16 - 20	15	14.0
21 - 25	6	5.6
26 - 30	4	3.7

CAI Use Variables - Users.

The median score for amount of CAI use for CAI users was 18.0 (range was 12 to 29), and the mean was

19.1 (SD = 4.5). The possible range of scores was from 0 to 61. Of the 32 CAI users, 7 (21.9%) reported that prerequisite courses used CAI. Twenty-five (78.1%) did not use CAI in prerequisites.

Eleven (34.4%) of the CAI users reported using mainframes or minicomputers for CAI. Mainframes and minicomputers were defined as high capacity, centrally located, multi-user computers. Twenty (62.5%) did not use mainframes or minicomputers. One (3.1% respondent did not answer this item. Twenty-six (81.3%) respondents used micro (personal) computers for CAI. Six (18.8%) users did not use microcomputers.

Eleven (34.4%) users responded that their microcomputers were connected in a local area network. Twenty (62.5%) users did not have a local area network. One (3.1%) respondent did not answer this item.

One (3.1%) user reported using telecommunication (communication with a computer at a remote, off-campus location) for CAI. One (3.1%) respondent did not answer this item. The remainder of users (n=30, 93.8%) did not use telecommunication.

Remaining CAI Use Variables - Users.

Items 4 through 14 were worded so users could indicate what percentage of courses used CAI in various ways. Frequencies (percentages) for these variables are listed in Table 8. The variables are: 1) developed locally 2) commercial, shareware, or public domain, 3) tutorials, 4) courses offer students the option to use CAI, 5) patient simulation, 6) drill and practice, 7) problem solving, 8) supplemental work, 9) courses require use of CAI, 10) testing, and 11) remedial work. The table lists the variables in descending order of use. Please see Appendix B for definitions of these variables.

Table 8

Remaining CAI Use Variables - Users

	Percent Range of Courses Using the Variable				
Variable	0% - 20	20 - 40	40 - 60	60 - 80	80 - 100%
Developed Locally					
n	18	0	1	4	9
%	(56.3)	(0.0)	(3.1)	(12.5)	(28.1)
Commercial, Shareware, Public Domain					
n	19	2	2	1	8
%	(59.4)	(6.3)	(6.3)	(3.1)	(25.0)
Tutorials					
n	22	5	2	0	3
%	(68.8)	(15.6)	(6.3)	(0.0)	(3.1)
Courses Offer Students the Option to Use CAI[a]					
n	24	2	3	0	2
%	(75.0)	(6.3)	(9.4)	(0.0)	(3.1)

Note. [a]One response missing for CAIO.

Table 8 (continued)

Remaining CAI Use Variables - Users

	Percent Range of Courses Using the Variable				
Variable	0% - 20	- 40	- 60	- 80	- 100%
Patient Simulation					
n	26	0	4	2	0
%	(81.3)	(0.0)	(12.5)	(6.3)	(0.0)
Drill and Practice					
n	28	2	0	1	1
%	(87.5)	(6.3)	(0.0)	(3.1)	(3.1)
Problem Solving					
n	25	5	2	0	0
%	(78.1)	(15.6)	(6.3)	(0.0)	(0.0)
Supplemental Work					
n	25	6	1	0	0
%	(78.1)	(18.8)	(3.1)	(0.0)	(0.0)

Table 8 (continued)

Remaining CAI Use Variables - Users

	Percent Range of Courses Using the Variable				
Variable	0% - 20	20 - 40	40 - 60	60 - 80	80 - 100%
Courses Require the Use of CAI					
n	27	4	1	0	0
%	(84.4)	(12.5)	(3.1)	(0.0)	(0.0)
Testing					
n	29	3	0	0	0
%	(90.6)	(9.4)	(0.0)	(0.0)	(0.0)
Remedial Work					
n	31	1	0	0	0
%	(96.6)	(3.1)	(0.0)	(0.0)	(0.0)

CAI Use and Demographic Variables

Spearman Rank Correlation Coefficients were calculated for the amount of CAI use scale score with all demographic variables. None of the demographic

variables were significantly correlated with CAI use at the .05 level. Pearson Product Moment Correlation Coefficients were also calculated. The results were similar. Null hypothesis five (There is no correlation between demographic factors and amount of CAI use) was not rejected. Table 9 lists the correlation coefficients.

Table 9

Correlation Coefficients - CAI Use with Demographics

Demographic	Spearman	Pearson
Years Accredited	-.0984	-.0499
Number of Faculty	.0826	.1467
Number of Students	.0544	.0477
Degree Awarded	.0947	.0912
Tuition and Fees	.1199	.0336
Geographic Location	.1113	.0974

Note. All correlations not significant (p = .05).

CAI Value Variables

Value of CAI Scale.

A Likert-type scale was constructed from survey items 19 through 39 to quantify the value of CAI. Each item used a seven point response scale. The range of possible scores was from 21 to 147. The median score was 117.0. This score provided support for alternative hypothesis 1a (educators in entry-level PT education perceive CAI as valuable). Descriptive statistics for the value of CAI scale score are presented in Table 10.

Table 10

Value of CAI Scale - Descriptive Statistics

	All Respondents	CAI non-users	CAI users
Median	117.0	112.0	123.5
Minimum	76.0	76.0	87.0
Maximum	143.0	143.0	140.0
Mean	115.2	112.9	120.8
SD	14.5	14.5	13.3

The Wilcoxon Rank Sum test was used to test null hypothesis 2 (the perceived value of CAI for entry-level PT education is similar regardless of the amount of CAI use). Results showed that CAI users placed significantly more value on CAI than non-users ($p < .01$). A t-test also demonstrated this difference (Table 11 lists the pertinent statistics). The null hypothesis was therefore rejected. The statistical tests provided support for alternate hypothesis 2a (the perceived value of CAI for entry-level PT education is different for different amounts of CAI use).

Table 11

CAI Value - Non-Users versus Users - Wilcoxon Rank Sum and Student t-tests

Test	Non-Users	Users	Statistic
Wilcoxon			
Mean Rank	48.7	66.2	2119.5*
t-test			
Means	112.8	120.8	-2.7*

*p < .01, two-tailed.

Correlation statistics were calculated for CAI value with CAI use. A weak, positive correlation was demonstrated (Spearman = .32, p <.001, Pearson = .26, p <.01).

Null hypothesis 6 stated that there was no correlation between CAI value and the demographic variables studied. This hypothesis was supported by both Spearman and Pearson correlation coefficients:

none were significantly different from .00 at the .05 level. Table 12 lists the coefficients.

Table 12

Correlation Coefficients - CAI Value with Demographics

Demographic	Spearman	Pearson
Years Accredited	-.0767	-.0305
Number of Faculty	-.0536	-.0609
Number of Students	-.0370	-.0131
Degree Awarded	-.0335	-.0400
Tuition and Fees	-.0905	-.1083
Geographic Location	.0863	.0798

Note. All correlations not significant (p = .05).

Value of CAI - Likert Scale Items.

Items 19 through 39 formed a Likert-type scale for quantification of the value of CAI. The response choices for each item ranged from one to seven. The scale contained 11 positively-worded items (items 19, 21, 23, 25, 29, 30, 32, 35, 37,. 38, 39) and 10

negatively worded items (items 20, 22, 24, 26, 27, 28, 31, 33, 34, 36). The items were placed randomly in the scale to avoid response-set. This is the tendency of questionnaire respondents to answer consecutive items in a fixed pattern (Kalman, 1988).

Response choices and values for positively-worded items were: DISAGREE STRONGLY = 1, DISAGREE = 2, DISAGREE SLIGHTLY = 3, NO OPINION = 4, AGREE SLIGHTLY = 5, AGREE = 6, AGREE STRONGLY = 7. Response choices for negatively-worded items were identical, but these items were scored in reverse during data entry (e.g., DISAGREE STRONGLY was coded as 7, AGREE STRONGLY was coded as 1). This coding scheme insured that positive perceptions about CAI would receive higher scores than negative perceptions. Table 13 presents the descriptive statistics for items 19 through 39. Appendix B shows further details on each item.

Table 13 Descriptive Statistics - Items 19 to 22

Item		Median	Minimum	Maximum	Mean	SD
19	A[a]	6.0	2.0	7.0	5.6	1.0
	N[b]	6.0	2.0	7.0	5.4	1.0
	U[c]	6.0	3.0	7.0	6.1	0.9
20	A	6.0	2.0	7.0	5.2	1.5
	N	6.0	2.0	7.0	5.1	1.4
	U	6.0	2.0	7.0	5.5	1.5
21	A	5.0	2.0	7.0	4.9	1.3
	N	5.0	2.0	7.0	4.7	1.6
	U	5.5	2.0	7.0	5.3	1.3
22	A	5.0	1.0	7.0	5.2	1.3
	N	5.0	1.0	7.0	5.0	1.2
	U	6.0	3.0	7.0	5.6	1.3

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Table 13 (continued)

Descriptive Statistics - Items 23 to 26

Item		Median	Minimum	Maximum	Mean	SD
23	A[a]	6.0	3.0	7.0	5.8	1.0
	N[b]	6.0	3.0	7.0	5.8	1.0
	U[c]	6.0	3.0	7.0	6.0	1.0
24	A	6.0	1.0	7.0	5.2	1.4
	N	5.0	1.0	7.0	5.0	1.4
	U	6.0	3.0	7.0	5.6	1.3
25	A	5.0	1.0	7.0	5.1	1.5
	N	5.0	1.0	7.0	5.0	1.5
	U	5.5	2.0	7.0	5.4	1.6
26	A	6.0	2.0	7.0	5.3	1.4
	N	6.0	2.0	7.0	5.3	1.3
	U	6.0	2.0	7.0	5.3	1.7

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Table 13 (continued)

Descriptive Statistics - Items 27 to 30

Item		Median	Minimum	Maximum	Mean	SD
27	A[a]	6.0	2.0	7.0	5.9	1.0
	N[b]	6.0	1.0	7.0	5.7	1.1
	U[c]	6.0	4.0	7.0	6.3	0.8
28	A	6.0	3.0	7.0	5.7	1.1
	N	6.0	3.0	7.0	5.5	1.1
	U	6.5	3.0	7.0	6.3	1.0
29	A	6.0	2.0	7.0	5.9	0.9
	N	6.0	2.0	7.0	5.9	0.9
	U	6.0	4.0	7.0	6.1	0.8
30	A	6.0	1.0	7.0	5.8	1.1
	N	6.0	1.0	7.0	5.8	1.2
	U	6.0	4.0	7.0	6.0	0.9

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Table 13 (continued)

Descriptive Statistics - Items 31 to 34

Item		Median	Minimum	Maximum	Mean	SD
31	A[a]	6.0	4.0	7.0	6.0	0.9
	N[b]	6.0	4.0	7.0	6.0	0.9
	U[c]	6.0	4.0	7.0	6.2	1.0
32	A	5.0	2.0	7.0	4.9	1.4
	N	5.0	2.0	7.0	4.8	1.4
	U	5.0	2.0	7.0	4.9	0.8
33	A	6.0	1.0	7.0	5.9	1.0
	N	6.0	2.0	7.0	5.8	0.9
	U	6.0	1.0	7.0	6.1	1.2
34	A	6.0	3.0	7.0	5.9	1.1
	N	6.0	3.0	7.0	5.9	1.1
	U	6.0	3.0	7.0	5.9	0.8

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Table 13 (continued)

Descriptive Statistics - Items 35 to 38

Item		Median	Minimum	Maximum	Mean	SD
35	A[a]	6.0	2.0	7.0	6.1	0.9
	N[b]	6.0	3.0	7.0	6.1	0.9
	U[c]	6.0	2.0	7.0	6.2	0.8
36	A	6.0	1.0	7.0	5.1	1.3
	N	5.0	1.0	7.0	4.9	1.2
	U	6.0	2.0	7.0	5.6	1.3
37	A	6.0	2.0	7.0	5.5	1.1
	N	6.0	2.0	7.0	5.3	1.1
	U	6.0	4.0	7.0	6.0	0.9
38	A	5.0	2.0	7.0	4.7	1.3
	N	4.0	2.0	7.0	4.5	1.1
	U	5.0	2.0	7.0	5.2	1.4

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Table 13 (continued)

Descriptive Statistics - Item 39

Item		Median	Minimum	Maximum	Mean	SD
39	A[a]	6.0	2.0	7.0	5.7	1.0
	N[b]	6.0	2.0	7.0	5.5	1.0
	U[c]	6.0	4.0	7.0	6.0	0.8

Note. [a]All respondents. [b]Non-users. [c]Users. See Appendix B for details on items.

Factors Affecting Use of CAI Variables

Section 3 of the survey (items 40 through 48) collected data about factors that might affect the implementation and use of CAI in entry-level PT education programs (see Appendix B). An open-ended response area allowed respondents to add factors that were important but were not listed.

Factors listed were: faculty (faculty computer literacy - item 40, faculty interest in using CAI - item 41, peer support for CAI - item 42), student

(student computer literacy - item 43, student interest in using CAI - item 44, student learning style - item 45), resource (cost of hardware/software - item 46, availability of relevant software - item 47, institutional support for development/implementation of CAI systems - item 48). A five point scale was used to quantify each factor. The rating scale included the following response choices: NO EFFECT = 0, MINIMAL EFFECT = 1, MODERATE EFFECT = 2, STRONG EFFECT = 3, VERY STRONG EFFECT = 4 (see Appendix B for definitions). All factors were rated "two" (moderate effect) or better by the respondents. No factors were rated "one" (minimal effect) or "zero" (no effect). These findings support alternate hypothesis three (there are faculty, student, resource and other factors that are perceived to affect implementation and use of CAI in entry-level PT education).

Resource Factors.

Resource factors were rated highest. All resource factors (cost of hardware/software - item 46, availability of relevant software - item 47, institutional support for development/implementation of

CAI systems - item 48) received ratings of "four" (very strong effect) or "three" (strong effect). Item 47 (availability of relevant software) received the highest rating (median = 4.0, mean = 3.4). The effect of this factor was reinforced by seven respondents who listed "CAI availability" as important in the open-ended response section. Comments such as, "There are few CAI programs available that currently fit curricular needs", and, "Significantly - there is minimal CAI software available in PT" were typical.

Five additional respondents presented "time" as an important factor that was related to CAI availability. Two of these respondents explained that the time required to identify and implement relevant CAI software was important. Three respondents indicated that the faculty time commitment to develop relevant CAI was "tremendous".

Three additional respondents reported resource-related factors in the open-ended response area. Factors such as, "Type of computer (IBM, MAC), CAI tutors, service technicians, and availability of computers" were listed. Table 14 lists the descriptive statistics for the resource factors.

Table 14

Descriptive Statistics - Resource Factors

Item	Median	Minimum	Maximum	Mean	SD
47 - Availability of relevant software					
A[a]	4.0	1.0	4.0	3.4	0.8
N[b]	4.0	1.0	4.0	3.5	0.7
U[c]	4.0	1.0	4.0	3.3	0.9
46 - Cost of hardware/software					
A	3.0	1.0	4.0	3.2	0.9
N	3.0	1.0	4.0	3.1	0.9
U	4.0	1.0	4.0	3.4	0.8
48 - Institutional support for development/implementation of CAI systems					
A	3.0	0.0	4.0	3.1	1.0
N	3.0	0.0	4.0	3.0	1.0
U	3.5	1.0	4.0	3.4	0.8

Note. [a]A = all respondents. [b]N = Non-users. [c]U = Users. No significant differences between non-users and users ($p = .05$, two tailed).

Faculty Factors.

All faculty factors (faculty computer literacy - item 40, faculty interest in using CAI - item 41, peer support for CAI - item 42) received a median rating of "three" (strong effect). Three respondents used the open-response area to indicate important faculty-related factors. These were: "Faculty responsibility for CAI projects", "Negative attitudes of peers and unfounded fears of others", and "Preferences for other types of teaching/learning (besides CAI or lecture)". Item 42 (peer support for CAI) was the only factor (among all faculty, resource, and student factors) that demonstrated a difference for CAI users and non-users. The Wilcoxon Rank Sum test showed that CAI users felt peer support had a stronger effect than non-users ($W = 1995.5$, $p < .05$, two tailed).

Descriptive statistics for the faculty factors are listed in Table 15.

Table 15

Descriptive Statistics - Faculty Factors

Item		Median	Minimum	Maximum	Mean	SD
41 - Faculty interest in using CAI						
	A[a]	3.0	1.0	4.0	3.1	0.9
	N[b]	3.0	1.0	4.0	3.0	1.0
	U[c]	3.0	2.0	4.0	3.2	0.8
40 - Faculty computer literacy						
	A	3.0	0.0	4.0	2.7	1.1
	N	3.0	0.0	4.0	2.6	1.2
	U	3.0	0.0	4.0	3.0	1.1
42 - Peer support for CAI						
	A	3.0	0.0	4.0	2.2	1.3
	N	2.0*	0.0	4.0	2.1*	1.4
	U	3.0*	0.0	4.0	2.7*	0.9

Note. [a]A = all respondents. [b]N = Non-users. [c]U = Users.

* Non-users significantly different from users ($p < .05$, two tailed).

Student Factors.

The student factors (student computer literacy - item 43, student interest in using CAI - item 44, student learning style - item 45) received median scores of"two" (moderate effect). No additional student-related factors were listed in the open-ended response section. Table 16 lists the descriptive statistics for student factors.

Table 16

Descriptive Statistics - Student Factors

Item	Median	Minimum	Maximum	Mean	SD
45 - Student learning style					
A[a]	2.0	0.0	4.0	2.2	1.1
N[b]	2.0	0.0	4.0	2.2	1.1
U[c]	2.0	0.0	4.0	3.1	0.9
44 - Student interest in using CAI					
A	2.0	0.0	4.0	2.2	1.2
N	2.0	0.0	4.0	2.2	1.2
U	2.0	0.0	4.0	2.2	1.2
43 - Student computer literacy					
A	2.0	0.0	4.0	2.0	1.1
N	2.0	0.0	4.0	2.1	1.1
U	2.0	0.0	4.0	1.9	1.0

Note. [a]A = all respondents. [b]N = Non-users. [c]U = Users.

No significant differences between non-users and users (p = .05, two tailed).

Factors and CAI Use.

Spearman Rank Correlation coefficients were calculated for the faculty, student and resource factors with the CAI use scale score. No significant correlations were discovered at the .05 level. Null hypothesis four (there is no correlation between the perceived importance of factors that affect implementation and use of CAI in entry-level PT education and amount of CAI use) was not rejected. Pearson Product Moment Correlation coefficients also supported this position. The correlation coefficients are listed in Table 17.

Table 17

Correlation Coefficients - CAI Use with Resource, Faculty, and Student Factors

Demographic	Spearman	Pearson
Item 40	.1909	.1705
Item 41	.0677	.0829
Item 42	.1275	.1841
Item 43	.0478	-.0129
Item 44	.0382	.0092
Item 45	-.0174	.0212
Item 46	.1189	.1624
Item 47	.0137	-.0412
Item 48	.1996	.1719

Note. All correlations not significant (p = .05).

Summary

The first research question for this study was: "What is the extent of use of CAI in entry-level PT education?" The data showed that 29.9% of programs used CAI. Amount of CAI use was measured on an ordinal

scale with a range of possible scores from 0 to 61. Among CAI users, the median for the CAI use scale score was 18.0 (range 12.0 - 29.0) and the mean was 19.1 (SD 4.5).

The second research question asked: "What is the perceived value of CAI compared to more traditional instructional methods for entry-level PT education?" CAI value was measured using a Likert-type scale (range of possible scores from 21 to 147). Data showed that respondents considered CAI to be valuable (median = 117.0, range 76.0 to 143.0, mean = 115.2, SD = 14.5).

The third research question asked: "What factors affect implementation and use of CAI in entry-level PT education?" A five point scale was used to quantify the effect of resource, faculty and student factors. possible rating scale responses ranged from NO EFFECT = 0 to VERY STRONG EFFECT = 4. Respondents rated all factors MODERATE EFFECT = 2 or higher. None of the factors were rated MINIMAL EFFECT = 1 or NO EFFECT = 0.

Resource factors were rated highest with median scores of VERY STRONG EFFECT = 4 or STRONG EFFECT = 3. Faculty factors were rated next with median scores of

STRONG EFFECT = 3. Student factors were rated lowest with median scores of MODERATE EFFECT = 2.

Chapter 5 - Discussion, Implications, and Recommendations

Quality of the Data

The author is confident that the data represents the respondents' answers to survey items. Response instruments and data entry files were reviewed twice for potential errors. Data entry corrections were made using the respondents' answers on the response instruments.

Frequency distributions were calculated for all variables to detect outliers. Outliers are scores or measurements that fall far outside the body of the data. The concept of an outlier raises the question of the accuracy of the score or measurement (McClave and Dietrich, 1988; Shott, 1990). No outliers were identified.

Response Rate

"When conducting surveys, a high response rate is always desirable" (Boser, 1990, p. 1). The response

rate for the present study was 86.9% (n = 107) from the population of 123. This compares quite favorably with response rates for other survey research studies (APTA, 1991b; Barnes, 1977; Boser, 1990; Brady, 1989; Dodd and Markwiese, 1987; Hebda, 1988; Hopkins and Gullickson, 1989; Kalman, 1988; Ogborne, Rush, and Fondacaro, 1986; Sobal et al., 1990; Thomas, 1986).

The survey instruments used by Hebda (1988) and Thomas (1986) served as models for the instrument used in the present study. The response rate for the present study was considerably higher than the rates obtained by either Hebda (76.9%) or Thomas (51.0%). Other studies from the nursing profession using mail questionnaire methodology have reported response rates of from 51.4% to 92.6% (Bednash, Berlin, and Haux, 1991; Gothler, 1985; Spector, 1984; Van Dover and Boblin, 1991).

Based upon a comparison to these studies, the response rate for the present study was quite good. The high response rate combined with the fact that the entire population (not a sample) was surveyed suggests that the potential problem of non-response bias was minimized for the present study.

Amount of CAI Use

Of the 107 respondents, 32 (29.9%) reported CAI use in their entry-level PT programs. This is much less than the amount of CAI use reported for medical and nursing curricula.

Jonas et al. (1990) reported CAI use by 82.4% (n = 117) of United States and Canadian medical schools accredited by the Liaison Committee on Medical Education. Bednash et al. (1991) reported a 91.2% (n = 416) CAI use rate among baccalaureate and higher degree nursing programs surveyed. As far back as 1986, 48.4% (n = 164) of National League of Nursing accredited baccalaureate nursing programs were using CAI (Hebda, 1988). It appears that entry-level PT programs are far behind their counterparts in medicine and nursing education on amount of CAI use.

The percentage of courses requiring students to use CAI, and the percentage of courses offering students the option to use CAI was reported for PT programs using CAI (n = 32). Required use of CAI was low. Eighty-four point four percent (n = 27) of users reported that CAI use was required for less than 20% of courses in their entry-level PT education program.

Twelve point five percent (n = 4) of users required CAI in 20% to 40% of courses. One (3.1%) respondent indicated that CAI was required in 40% to 60% of courses. None of the CAI users required CAI use in more than 60% of courses.

Seventy-five point zero percent (n = 24) of CAI users reported that CAI use was optional for 20% or less courses. Optional CAI use was reported for from 20% to 40% of courses (6.3%, n = 2), and 40% to 60% of courses (9.3%, n = 3). Two CAI users (6.3%) reported that CAI was offered as an option in 80% to 100% of courses.

These findings indicate that in the programs where CAI is being used, it is being used minimally (primarily in less than 20% of courses in the entry-level PT program). This accentuates the low amount of CAI use in entry-level PT programs. The author was unable to locate any report from nursing or medical education showing the amount of CAI use within education programs using CAI. Therefore it was not possible to compare the findings of this study to others on amount of CAI use within programs.

CAI use in prerequisite courses was low. Twelve (11.3%) of the respondents reported CAI use in prerequisite courses (7 CAI users [21.9% of 32 users] and 5 non-users [6.7% of 75 non-users]). These percentages compare poorly to Hebda's results where 33.3% (n = 168) of respondents reported CAI use in courses required before nursing content (Hebda, 1988).

The low use of CAI for PT prerequisites is puzzling. CAI software for topics such as anatomy, physiology, neuroscience, medical terminology, etc. are available through commercial sources. Such topics seem appropriate for PT prerequisite courses. A number of survey respondents indicated that there was a need for a forum to disseminate information about software available for PT CAI. Perhaps the lack of information about available software is responsible for the low use in prerequisite courses.

Forty-three point seven percent (n = 14) of PT CAI users reported using locally-developed software for CAI, and 40.7% (n = 13) reported using software available through commercial, shareware, or public domain sources. By contrast, Hebda (1988) reported that 91.7% (n = 143) of nursing CAI users used

commercially available CAI packages, and 39.1% (n = 61) used locally developed software for CAI. The large difference in commercial CAI use suggests that there is less CAI software available for entry-level PT education. This important reason for the relatively low use of CAI in entry-level PT programs was identified by several respondents.

The various types of hardware used by PT CAI users were: mainframes or minicomputers 34.4% (n = 11), microcomputers 81.3% (n = 26), local area network 34.4% (n = 11), and telecommunication 3.1% (n = 1). Thomas (1986) reported that 76% of nursing students used mainframes and minicomputers, and 53% used microcomputers. The contrast between PT and nursing on hardware platforms may be a function of the passage of time. Thomas' survey was conducted during the winter of 1983-84. Advances in hardware technology have placed increasing amounts of computing power on the desktop. Present-day hardware use by the nursing education profession may mimic the PT situation more closely.

The types of PT CAI use were ranked based on the percent of courses using the various types of CAI.

"Tutorials" was the most frequently used type of CAI, and "remedial work" was the least frequently used. Although Hebda (1988) did not report types of CAI used, data on this issue were collected (T. L. Hebda, personal communication, December 6, 1991). In contrast to the present study where respondents were asked to report the percent of courses using the various types of CAI, Hebda asked, "What do you believe are the best uses of computer assisted instruction?" Table 18 gives a comparison of the ordering of CAI types between the present study and Hebda's study.

Table 18

Types of CAI Use

Type	Ranking	
	Kosmahl	Hebda
Tutorials	1	3
Drill & Practice	2.5	4
Problem Solving	2.5	2
Patient Simulation	4.5	1
Supplemental Work	4.5	7
Testing	6	5
Remedial Work	7	6

The reader is cautioned that the comparison is between quantity of PT courses using types of CAI, and nursing opinions about the best uses for types of CAI. Yet, one can see that actual use in PT differs from nursing opinions about best use in several ways.

The largest difference is for "supplemental work". PTs ranked this item 4.5 (a tie with "patient

simulation"), and nurses ranked it 7 (last). A possible explanation for the discrepancy would be a difference in opinion about the importance and usefulness of CAI in general. If nurses place more value on CAI, then it follows that nurses would be more likely to use CAI in a primary (not supplemental) role.

Another difference between the groups is for "patient simulation". Nurses ranked "patient simulation" 1, but the PT CAI users ranked this item at 4.5. Hayes et al. (1991) felt that computer patient simulation provided a reasonable and cost effective method to allow PT students to accept responsibility for the consequences of their actions without endangering a patient. Constructing any CAI software is a time-consuming process, but perhaps the interactivity required for realistic patient simulation is especially developer-intensive. The time required for development may explain the difference between actual use of patient simulation CAI in PT and nursing opinions about what would be the best use for CAI. A direct comparison to actual use in nursing would be interesting if it were available.

The ordering of "tutorials," "drill and practice", "problem solving," and "patient simulation" show a reversal of priorities for the two groups. It is likely that tutorials and drill and practice CAI materials are easier to develop than problem solving and patient simulation materials. The explanation for why PT programs use tutorials and drill and practice CAI most frequently may be that these types of materials are most easily developed, and therefore most widely available. It would be very interesting to compare types of CAI use in entry-level PT education with types of CAI use in other professions. It is unfortunate that reports on actual use of CAI types in other professions could not be found.

CAI Value

A number of CAI programs have been evaluated for effectiveness outside the field of physical therapy (Bitzer & Boudreaux, 1969; Carew et al., 1985; Dowell et al., 1989; Harasym & McCreary, 1987; Harless et al., 1990; Juchau, 1988; Lawson, 1987, 1991; Madland & Smith, 1988; Nardone et al., 1987; Nahata, 1986; Puskas et al., 1991; Rowley & Layne, 1990; Williams &

Benedict, 1990;). The effectiveness of several CAI programs for physical therapy has also been evaluated (Hayes, 1991; McGown & Faust, 1971; Thompson, 1987). All of these studies put a positive value on the specific CAI program being studied. Yet, none of these studies looked at the overall value of CAI as an instructional tool.

As a group, the academic administrators in the present study perceived CAI as valuable. The median score on the "Value of CAI" scale was 117.0 (range 76.0 to 143.0, possible range of scores from 21.0 to 147.0). The mean was 115.2 (SD = 14.5). Only two respondents scored lower than the center point of the possible range of scores (84.0). Given this high value placed upon CAI by the respondents, it is reasonable to eliminate "low perceived value of CAI" as a factor that prevents the implementation or use of CAI for entry-level PT education. It seems likely that if the decision to use CAI was based only on the perceived value of CAI, more PT programs would use CAI.

It is also worth noting that CAI users placed significantly more value on CAI than did non-users ($p < .01$, two-tailed). Whether this difference can be

attributed to experience with CAI requires further study.

Of the 21 items on the "Value of CAI" scale, 16 were rated with a median score of 6.0, and five were rated with a median score of 5.0 (the range of possible scores was from 1.0 to 7.0 for each item). The high ratings for the majority of items suggests that many aspects of the use of CAI are viewed positively by PT academic administrators.

Item number 21 (CAI promotes independent learning to a greater degree than the traditional use of lecture and textbook) was one of the items rated 5.0 . This "mildly positive" rating was somewhat surprising since the operational definition of CAI for the survey emphasized direct interaction of the student with the computer. It had been anticipated that independent learning would be perceived as increasing the value of CAI. A Wilcoxon Rank Sum test revealed that CAI users felt significantly more positive about this item than did non-users ($W = 2124.5$, $p < .01$, two tailed). We can conclude that users feel CAI promotes independent learning to a greater degree than do non-users.

Two other items rated 5.0 dealt with saving time (item 25, CAI can save faculty time, and item 38, CAI can save student time). The mildly positive ratings on these items point out the caution with which PT academic administrators view claims of time savings for CAI. The Wilcoxon Rank Sum test showed that CAI users felt significantly more positive about item 38 (save student time) than did non-users ($W = 2069.0$ $p < .05$, two tailed). There was no significant difference between the two groups for item 25 (save faculty time).

The two remaining items rated 5.0 were item 22 (CAI inhibits learning because the personal interaction necessary for learning is eliminated), and item 32 (CAI can decrease much of the burden on faculty to provide tutorial and remedial instruction). The Wilcoxon Rank Sum test showed that users felt significantly more positive about item 22 than did non-users ($W = 2071.5$, $p < .05$, two tailed). This suggests that users feel a decrease in personal interaction resulting from CAI use does not inhibit learning.

The Wilcoxon Rank Sum test did not show a difference for the two groups on item 32. Both groups felt that CAI use could decrease the burden on faculty

to provide tutorial and remedial instruction. This effect was perceived as mildly positive.

Factors Affecting CAI Use

Resource Factors.

Resource factors (cost of hardware/software - item 46, availability of relevant software - item 47, institutional support for development/implementation of CAI systems - item 48) were perceived to have the strongest effects on the implementation or use of CAI. Of these, availability of relevant software was clearly the most important factor.

Fourteen respondents used the open-ended response area to reinforce the lack of available, relevant software for entry-level PT education. Typical comments were, "Biggest factor is availability," "There are few CAI programs available that currently fit curricular needs", " . . . availability of appropriate programs are the major deterrents", "I don't think we have a great deal available." Entry-level PT education must make greater efforts to develop relevant CAI software. Commercial developers could be enlisted to help with this task.

Another aspect of the unavailability issue is the absence of information about available CAI. The results of this survey show that a fair number (n = 32) of entry-level PT education programs are using CAI. Yet, quite a number of respondents indicated that there was no easy method to find out what CAI software was available. Here are some typical comments: "If it's available, how do we access it?", "Do you have a list of CAI packages?", "I would like to know what is available", "How and where does one find CAI software for P.T. education?", "There needs to be some sort of shared database of CAI applications in physical therapy."

The importance of the lack of CAI software, and the importance of the lack of information about CAI software is different for PT education as compared to nursing education. Thomas (1986) studied 18 barriers to growth and use of instructional computing in nursing education. Lack of useful software ranked ninth in importance behind cost and faculty development concerns. Hebda (1988) listed six reasons cited for non-use of CAI in nursing education. Lack of suitable commercial programs and insufficient knowledge about

appropriate programs ranked fourth and fifth respectively. Inadequate funds was listed as most important in the Hebda study. Clearly, availability of CAI is not as critical a factor for nursing education as for PT education.

Faculty Factors.

All faculty factors (faculty computer literacy - item 40, faculty interest in using CAI - item 41, peer support for CAI - item 42) were rated as having a strong effect on implementation or use of CAI. A Wilcoxon Rank Sum test showed that CAI users felt peer support had a stronger effect than did non-users ($W = 1995.5$, $p < .05$, two tailed).

The findings regarding strength of faculty effects is in general agreement with the findings of Thomas (1986). Of 18 factors studied, Thomas found that faculty development factors were ranked three through seven behind cost factors. Williams and Benedict (1990) found that there was a lack of recognition for the development of CAI software as a scholarly endeavor. Software development did not "count" toward tenure or promotion. They remarked, "A change in this policy would be useful in increasing the amount of

software designed by faculty members" (p. 203). Faculty cooperation and support for the implementation and use of CAI seems essential if CAI is to be implemented successfully. Peer support mechanisms such as tenure and promotion policies should recognize CAI development as valuable.

Student Factors.

Of the three types of factors studied (resource, faculty, and student) student factors (student computer literacy - item 43, student interest in using CAI - item 44, student learning style - item 45) were perceived to have the least effect on implementation and use. Still, these factors were rated as having a moderate effect.

Hayes et al. (1991) found that performance on PT CAI problem solving experiences did not correlate with student opinions about or experience with computers. By contrast, Thompson (1987) found a significant correlation between a favorable attitude toward computers and performance on a CAI program by PT assistants. Brudenell and Stewart-Carpenter (1990) suggested that learning style information could be

useful to identify nursing students with negative attitudes toward CAI.

The results of the present study suggest that student factors have a moderate effect on the implementation and use of CAI. No studies investigating the effect of student factors on the implementation and use of CAI could be found for comparison. Student perceptions may differ from the perceptions of academic administrators on this issue.

Hayes et al. (1991) suggested that PT students' attitudes toward computers needed further study. This author agrees. More work needs to be done before the effect of student factors can be clearly established. Researchers should correlate actual student learning style, interest in using computers, and computer literacy with amount of CAI use.

Demographics

None of the demographic variables studied (years accredited, number of faculty, number of students, degree awarded, tuition and fees, geographic location) were correlated significantly with amount of CAI use or with perceived value of CAI. Wilcoxon Rank Sum tests

did not show any differences between users and non-users for any of the demographic variables ($p = .05$). The demographic variables studied do not have any effect on implementation and use of CAI.

Conclusions

Research Question 1 - What is the extent of use of CAI in entry-level PT education?

CAI is used by 29.9% of entry-level PT education programs. This figure is much less than percentages reported for nursing and medical education. For those PT programs using CAI, its use is generally limited to 20% or less of courses in the curricula.

Demographic variables (years of program accreditation, number of full-time-equivalent program faculty, number of program students per year, degree awarded, annual tuition and fees, geographic location) are not correlated with amount of CAI use. CAI users and non-users are similar for these demographic variables.

Research Question 2 - What is the perceived value of CAI compared to more traditional instructional methods for entry-level PT education?

Academic administrators of entry-level PT education programs perceive CAI as a valuable instructional tool. A Likert-type scale with a possible range of scores from 21 to 147 was constructed to rate the value of CAI. The median score was 117.0.

CAI users perceive more value than do non-users for CAI. There is a weak, but significant ($p < .001$) positive correlation between amount of CAI use and perceived value of CAI.

Demographic variables (years of program accreditation, number of full-time-equivalent program faculty, number of program students per year, degree awarded, annual tuition and fees, geographic location) are not correlated to perceived value of CAI.

Research Question 3 - What factors affect implementation and use of CAI in entry-level PT education programs?

A lack of available software that is relevant for use in entry-level PT education is perceived to be the major factor that limits the implementation and use of

CAI. This is a very strong factor. The absence of a mechanism for sharing information about available, relevant software is a related, important factor.

Factors that are perceived to have a strong effect on whether CAI is implemented and used are: cost of hardware/software, institutional support, faculty computer literacy, faculty interest, peer support.

Student factors are perceived to have a moderate effect on the implementation and use of CAI. These factors are: student computer literacy, student interest, student learning style.

The perceived importance of factors related to the implementation and use of CAI is not correlated to amount of CAI use.

Recommendations

A well organized, sustained effort to develop relevant PT CAI software should be mobilized. The subject matter areas that can benefit most from CAI use should be identified. The types of CAI software (e.g., drill and practice, patient simulation, problem solving, remedial work, supplemental work, testing, etc.) that are most needed should be identified. The

development effort should be centrally coordinated so that efforts are not duplicated. Faculty should work with professional (commercial?) developers to insure that products meet needs. The effects of products should be evaluated by systematic research.

More emphasis needs to be placed on information-sharing among PT CAI users. Perhaps more important, information must be shared with non-users. This author is unaware of any source that catalogs CAI programs for PT education. APTA has constructed a list of computer software available for PT. However, this list does not contain CAI software. Its focus is software for PT practice management.

A system for sharing information about CAI software for entry-level PT education needs to be established. The purpose should be to disseminate information about PT CAI software to all entry-level PT programs. The format could be a symposium or meeting (with published proceedings), a periodical newsletter, an on-line database, or any other publishable format. Responsibility for maintenance and distribution of the system should be assigned to a component of APTA. It seems appropriate that the Department of Education of

APTA (a staff office of the national organization) or the Education Section of APTA (a special interest group of PT educators) should serve as a repository and dissemination point.

The effects of student factors such as learning style, computer literacy, and interest in using computers should be studied in more detail. How these factors affect the implementation and use of CAI in entry-level PT education has not been adequately established.

Summary

This inquiry used a mail questionnaire to study the use of CAI in entry-level PT education. The perceptions of academic administrators were used to establish the value of CAI and factors that affect the implementation and use of CAI in entry-level PT education. CAI use was found to be low, especially when compared to CAI use in nursing and medical education. Recommendations for increased use of CAI in entry-level PT education were offered.

Respondents felt that CAI was valuable, with CAI users ascribing more value than non-users. Respondents

felt the lack of availability of relevant CAI software was the strongest of the factors affecting whether CAI was implemented or used. Two other resource factors (cost and institutional support) and three faculty factors (computer literacy, interest, and peer support) were perceived as having a strong effect. Student factors (computer literacy, interest, and learning style) were perceived as having a moderate effect.

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Van Dover, L., & Boblin, S. (1991). Student nurse computer experience and preferences for learning. Computers in Nursing, 9, 75-79.

Vargo, L. G. (1971). Comments on "The assignment of numbers to rank order categories". American Sociological Review, 36, 517-518.

Vigderhous, G. (1977). The level of measurement and "permissible" statistical analysis in social research. Pacific Sociological Review, 20, 61-72.

Warwick, D. P., & Lininger, C. A. (1975). The sample survey: Theory and practice. New York: McGraw Hill.

Williams, R. D., & Benedict, S. (1990). RN education flexibility utilizing laptop computers. Computers in Nursing, 8, 201-203.

Wise, R. L. (1987). PLATO based computer assisted instruction: An exploration. Springfield, MO: Paper presented at the annual meeting of the National Council of Geographic Education. (ERIC Document Reproduction Service No. ED 301 525).

Worthen, B. R., & Valcarce, R. W. (1985). Relative effectiveness of personalized and form covering letters in initial and follow-up mail surveys. Psychological Reports, 57(3, part 1) 735-744.

Appendix A

Literature Search CAI in Entry-level PT Education

Cumulative Index to Nursing and Allied Health Literature.

Records	Request
5	CAI and Physical Therapy Education

Kosmahl, E. M. (1987). Computer generated patient instructions. Clinical Management in Physical Therapy, 7(6), 24-29.

This article describes the use of a word processor to prepare written handouts for patient instruction. CAI is not part of the topic.

Thompson, E. C. (1987). Computer-assisted instruction in curricula of physical therapist assistants. Physical Therapy, 67, 1237-1239.

This article compares the effectiveness of CAI with written, programmed instruction for physical therapist assistants. The article is discussed in greater detail in Chapter 2.

McClean, D. A., Nimmo, M. A., Bradley, P. D. & Ferguson, R. A. (1985). The use of a computer interfaced electromyogram in evaluative practicals for physiotherapy students, Physiotherapy, 71, 430-432.

This article discusses the use of a computer interfaced electromyographic apparatus in physiotherapy education in a British school. An evaluation of the effects of the apparatus is not reported.

Francis, K. (1985). Model of skeletal muscle length/tension relationship . . . interactive computer model. Physical Therapy, 65, 238-242.

This article presents a BASIC language program that allows the computer to simulate some of the physiologic properties of muscle. An evaluation of the effects of the program is not reported.

Williams, C. S., Chalmers, R. J. & Salter, P. M. (1982). Microcomputers in physiotherapy education. Physiotherapy, 68, 318-319.

This is an article describing the use of microcomputers in British physiotherapist education.

Educational Resources and Information Clearinghouse (ERIC).

Records	Request
850	CAI
123	Physical-Therapy
0	CAI and Physical-Therapy
25498	Computer
3	Physical-Therapy and Computer

Claus, R. N. (1990). Trainable mentally impaired/severely multiply impaired/autistic impaired/severely mentally impaired. Product evaluation report 1989-1990. Saginaw, MI: (ERIC Document Reproduction Service No. ED 329 031).

This article describes special education services available for trainable mentally impaired. Nothing about CAI and entry-level PT education is presented.

Lee, E. C., Watson, D. R., Argo, J. K., Kalish, R. A., & Catlin, P. C. (1982). A model for competency-based, computer-managed instruction in allied health. Journal of Allied Health, 11, 106-114.

This article describes a computer managed instruction system for dietetic and physical therapy certificate students. The computer program managed student progress toward curricular objectives by monitoring test scores. CAI per se did not appear to be part of the system.

Appendix B

Survey Instrument

Cover Letter

Dear :

Health professions educators have reported benefits and disadvantages resulting from the use of computer-assisted instruction (CAI). By contrast, little is known about the use of CAI in entry-level physical therapy (PT) education. Do PT educators use CAI? Is it of any value? What factors affect its implementation and use? The answers to these questions could facilitate decision-making about CAI.

You are uniquely qualified to provide input on these issues by virtue of your position as an academic administrator of an entry-level PT education program. Your responses will be analyzed with responses from all academic administrators to reach conclusions about the topic.

Please give your assistance to this project by completing the attached survey. Your opinions are very important. They will help to form a national consensus about CAI use in PT education. Preliminary trials show that about 15 minutes will be required to complete the survey.

Please be assured that confidentiality will be maintained for all responses. Forms are coded only to eliminate follow-up mailings once your questionnaire has been returned. Your identity and that of your institution will not appear on any report resulting from this study.

Results will be presented through appropriate national journals and meetings. I would be happy to send a summary of the results after the data analysis has been completed. You may receive a summary of the results by checking the "send results summary" box at the end of the survey.

I would be most happy to answer any questions you might have about this study. Please write or call. Please return the survey by *DESIRED RETURN DATE* in the stamped and addressed envelope included in this mailing.

Thank you very much for your interest and assistance.

Sincerely,

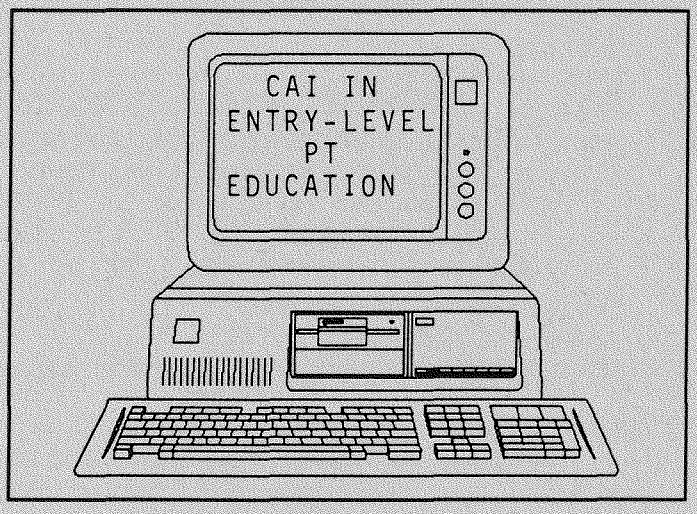
Edmund M. Kosmahl, P.T., M.S.
Assistant Professor

INSTRUCTIONAL USE OF COMPUTERS FOR ENTRY-LEVEL PHYSICAL THERAPY EDUCATION IN THE UNITED STATES

The extent and nature of the use of computer-assisted instruction (CAI) has been reported by other health professions educators. However, little is known about the use of CAI in entry-level PT education. How much is CAI being used in entry-level PT education? Does it have any value for entry-level PT education? What factors affect its implementation and use?

The purpose of this survey is to find answers to these questions. Please give your assistance to this project by answering all of the questions. Data will be reported in aggregate form only. No respondent or institution will be identified on any report. Forms are coded only to eliminate follow-up requests once you have returned your answers.

Thank you very much for your help.



Return to:
Edmund M. Kosmahl, P.T., M.S.
Department of Physical Therapy
University of Scranton
800 Linden Street
Scranton, PA 18510-4586
(717) 941-7783

First, a preliminary question:

1. How many full-time faculty (or full-time equivalents) are employed at your entry-level physical therapy (PT) program?

1. **HOW MANY?** ____

CAI DEFINITION:

For the purposes of this survey, computer assisted instruction (CAI) is defined as **"THE USE OF A COMPUTER TO TEACH A SUBJECT (OTHER THAN COMPUTING) VIA DIRECT INTERACTION OF THE STUDENT WITH THE COMPUTER."** The definition includes any combination of an individual or multiple students interacting with an individual or multiple computers. The key phrase in the definition is, ". . . direct interaction of the student with the computer." The definition does not include the use of a computer by an instructor to augment a lecture or demonstration if the student does not directly interact with the computer (such as the "passive" use of a computer as a "slide projector" or "video monitor" to present material to students). The student must interact with the computer.

Section 1: CAI use at your Entry-Level Physical Therapy Program

The purpose of this part of the survey is to find out how much CAI is being used in your entry-level PT education program. Please be as accurate as possible with your responses. Check the circle that represents your response. For all questions, check **ONLY ONE** circle.

2. Is CAI used in any courses offered **BY YOUR ENTRY-LEVEL PT PROGRAM**?

	YES	NO
2.	○	○

3. Is CAI used in any **PREREQUISITE COURSES** required by your entry-level PT program and offered by your institution?

	YES	NO	DON'T KNOW	N/A
3.	○	○	○	○

IF YOU RESPONDED "YES" TO QUESTION NUMBER 2, PROCEED TO QUESTION NUMBER 4 ON PAGE 2.

OTHERWISE SKIP TO QUESTION NUMBER 18 ON PAGE 3.

What percent of CAI used in your entry-level PT program courses . . .		CHOOSE A PERCENT RANGE				
		0-20	20-40	40-60	60-80	80-100
4. is available through commercial (copyrighted), shareware ("try before you buy" copyrighted), or public domain (non-copyrighted) sources?	4.	0	0	0	0	0
5. was developed locally at your institution?	5.	0	0	0	0	0
What percent of entry-level PT program courses . . .						
6. **REQUIRE** the student to use CAI?	6.	0	0	0	0	0
7. offer students the **OPTION** to use CAI?	7.	0	0	0	0	0
8. use COMPUTERIZED **drill and practice** (repetitive presentation of a selection of questions until the student answers them at some pre-determined level of proficiency)?	8.	0	0	0	0	0
9. use COMPUTERIZED **patient simulation** (a computer program that imitates a patient encounter to teach a student about patient encounters)?	9.	0	0	0	0	0
10. use COMPUTERIZED **problem solving** (a computer program that teaches problem-solving skills by requiring the student to solve a problem)?	10.	0	0	0	0	0
11. use COMPUTERIZED **testing** (a computer program that administers tests through the computer)?	11.	0	0	0	0	0
12. use COMPUTERIZED **tutorials** (a computer program that teaches by carrying on a dialogue with the student)?	12.	0	0	0	0	0
13. use COMPUTERIZED **remedial work** (a computer program that helps the student remediate after performing inadequately)?	13.	0	0	0	0	0

What percent of entry-level PT program courses . . .		CHOOSE A PERCENT RANGE				
		0-20	20-40	40-60	60-80	80-100
14. use COMPUTERIZED **supplemental work** (a computer program that offers course-related instruction not required by the course syllabus)?	14.	O	O	O	O	O

		YES	NO	DON'T KNOW
15. Mainframe and minicomputers are high capacity, centrally located, multi-user computers. Does your entry-level PT program use a mainframe or minicomputer for CAI?	15.	O	O	O
16. Does your entry-level PT program use micro (personal) computers for CAI?	16.	O	O	O

IF YOU RESPONDED "YES" TO QUESTION NUMBER 16, PROCEED TO QUESTION NUMBER 17.

OTHERWISE SKIP TO QUESTION NUMBER 18.

		YES	NO	DON'T KNOW
17. Are any of the micro (personal) computers connected in a local area network?	17.	O	O	O
18. Does your entry-level PT program use telecommunication (communication with a computer at a remote, off-campus location) for CAI?	18.	O	O	O

Section 2: The Value of CAI

Now for some questions about the value of CAI for entry-level PT education as compared to more traditional means of instruction such as lecture or demonstration. Even if your program does not use CAI, your response is vitally important. For the purposes of this section "value of CAI" is defined as the **"WORTH OR UTILITY OF CAI AS COMPARED TO MORE TRADITIONAL METHODS OF INSTRUCTION SUCH AS LECTURE OR DEMONSTRATION."** Use the following scale for questions 19 to 39.

1= DISAGREE STRONGLY 2= DISAGREE 3= DISAGREE SLIGHTLY
4= NO OPINION 5= AGREE SLIGHTLY 6= AGREE 7= AGREE STRONGLY

			1	2	3	4	5	6	7
19.	PT students can learn quite well by using CAI.	19.	O	O	O	O	O	O	O
20.	There is no compelling reason to use CAI with PT students.	20.	O	O	O	O	O	O	O
21.	CAI promotes independent learning to a greater degree than the traditional use of lecture and textbook.	21.	O	O	O	O	O	O	O
22.	CAI inhibits learning because the personal interaction necessary for learning is eliminated.	22.	O	O	O	O	O	O	O
23.	An advantage of CAI is that it allows access to instruction whenever the student is able (or wants) to learn.	23.	O	O	O	O	O	O	O
24.	CAI is undesirable because an instructor is not always available to answer student questions that may arise.	24.	O	O	O	O	O	O	O
25.	CAI can save faculty time.	25.	O	O	O	O	O	O	O
26.	PT students would be uncomfortable using CAI.	26.	O	O	O	O	O	O	O
27.	Because physical therapy is such a "hands-on" profession, CAI is not useful for teaching PT students.	27.	O	O	O	O	O	O	O
28.	It's not worth the effort needed to learn how to use CAI.	28.	O	O	O	O	O	O	O

1= DISAGREE STRONGLY	2= DISAGREE	3= DISAGREE SLIGHTLY
4= NO OPINION	5= AGREE SLIGHTLY	6= AGREE	7= AGREE STRONGLY

			1	2	3	4	5	6	7
29.	Computer simulation of patients can allow students to practice diagnosis and treatment planning without using actual patients.	29.	O	O	O	O	O	O	O
30.	Computer simulation of patients can allow students to practice diagnosis and treatment without causing harm to living individuals.	30.	O	O	O	O	O	O	O
31.	PT's rarely use computers in practice, so using CAI during PT training seems pointless.	31.	O	O	O	O	O	O	O
32.	CAI can decrease much of the burden on faculty to provide tutorial and remedial instruction.	32.	O	O	O	O	O	O	O
33.	CAI should be avoided because it minimizes the instructor's participation in PT education.	33.	O	O	O	O	O	O	O
34.	Learning about CAI is the worst part of PT education today.	34.	O	O	O	O	O	O	O
35.	I would like to increase my knowledge of how CAI can be used for PT education.	35.	O	O	O	O	O	O	O
36.	Most CAI programs are so difficult to use that they result in frustration rather than learning.	36.	O	O	O	O	O	O	O
37.	I believe a move toward increasing the use of CAI would benefit physical therapy.	37.	O	O	O	O	O	O	O
38.	CAI can save student time.	38.	O	O	O	O	O	O	O
39.	I would like to see our entry-level PT program increase its use of CAI.	39.	O	O	O	O	O	O	O

Section 3: Factors Affecting CAI Use

Here are some questions about the importance of factors that affect (either positively or negatively) the implementation or use of CAI in entry-level PT education. Even if your entry-level program does not use CAI, your response is vitally important. Please give your opinion as accurately as possible. The following definitions apply to these questions:

"NO EFFECT" = 0

This factor has no influence on the implementation or use of CAI in entry-level PT education.

"MINIMAL EFFECT" = 1

This factor has little effect on the implementation or use of CAI in entry-level PT education. If the factor is perceived as positive, it will help; but not much. If the factor is perceived as negative, it could be easily overcome with the resources available at your program.

"MODERATE EFFECT" = 2

This factor affects the implementation or use of CAI a fair amount. If the factor is perceived as positive, implementation or use of CAI will be easy. If the factor is perceived as negative, a reasonable expenditure of effort and resources (available at your entry-level program) will be required to overcome the negative effect.

"STRONG EFFECT" = 3

This factor has a substantial effect on the implementation or use of CAI in entry-level PT education. If the factor is perceived as positive, it will help quite a bit. Implementation or use of CAI will be very easy. If the factor is perceived as negative, a significant amount of effort and resources must be expended to overcome the negative effect. The entry-level program may need to consult external resources to overcome the negative effect.

"VERY STRONG EFFECT" = 4

The effect of this factor is very powerful. If the factor is perceived as positive, it is almost certain that CAI will be implemented or used. If the factor is perceived as negative, tremendous resources (both internal and external) must be expended to implement or use CAI. A negative effect may prevent implementation or use of CAI regardless of the resources expended.

HOW STRONGLY DO THE FOLLOWING FACTORS AFFECT THE IMPLEMENTATION OR USE OF CAI IN ENTRY-LEVEL PHYSICAL THERAPY EDUCATION?

0 = NO EFFECT 1 = MINIMAL EFFECT 2 = MODERATE EFFECT 3 = STRONG EFFECT 4 = VERY STRONG EFFECT

			0	1	2	3	4
40.	Faculty computer literacy?	40.	O	O	O	O	O
41.	Faculty interest in using CAI as an instructional tool.	41.	O	O	O	O	O
42.	Peer support for CAI (i.e. does the faculty evaluation system such as tenure/promotion acknowledge the development and implementation of CAI as valuable)?	42.	O	O	O	O	O
43.	Student computer literacy?	43.	O	O	O	O	O
44.	Student interest in using CAI as a learning tool?	44.	O	O	O	O	O
45.	Student learning style?	45.	O	O	O	O	O
46.	Cost of hardware/software?	46.	O	O	O	O	O
47.	Availability of software that is useful and relevant for PT education?	47.	O	O	O	O	O
48.	Institutional support for the development and/or implementation of CAI systems?	48.	O	O	O	O	O

PLEASE USE THE SPACE BELOW TO LIST AND RATE ANY OTHER FACTORS THAT YOU FEEL AFFECT THE IMPLEMENTATION OR USE OF CAI IN ENTRY-LEVEL PT EDUCATION. USE THE BACK OF THE SURVEY IF ADDITIONAL SPACE IS NEEDED.

OTHER FACTORS	RATING 0	1	2	3	4

Are there any additional comments that you would like to make? Please use this space for additional comments.

Your contribution to this effort is very greatly appreciated. If you would like a summary of results, please check the box. Thank you!

☐ send results summary

Appendix C

Endorsement Letter - Jane Walter

Oakland UNIVERSITY
Physical Therapy Program
School of Health Sciences
Rochester, Michigan 48309-4401
(313) 370-4041

May 27, 1992

Dear Colleague,

It is my opinion that the research that Mr. Kosmahl is conducting regarding CAI use in physical therapy educational programs is very important to our understanding of the degree to which high technology is supplementing higher education. During my own doctoral dissertation studies in which I investigated the ethical dilemmas of computerizing the college campus, I became aware of the degree to which computers are supplementing all levels of education and the relatively limited use in physical therapy educational programs that I was familiar with at that time (1986-87).

Students are now entering physical therapy educational programs with significant exposure to virtual laboratories and a wide variety of computer support systems. It is very important for the profession and the academic community to understand the student's and faculty member's readiness to explore and use this technology in physical therapy education.

I look forward to receiving Mr. Kosmahl's survey and urge you to take part in this very important study. The results of this work will be of great importance to our profession and our colleagues in physical therapy education.

Sincerely,

Jane Walter, PT, EdD
Associate Professor & Director
Vice President
American Physical Therapy Association

JW/dm
SURVEY.JW

Appendix D

First Post-card Reminder

Dear

About a week ago, I mailed a survey questionnaire to you. The title of the questionnaire is "INSTRUCTIONAL USE OF COMPUTERS FOR ENTRY-LEVEL PHYSICAL THERAPY EDUCATION IN THE UNITED STATES." **Please** complete and return the questionnaire. Your response is vital whether or not your program uses computer-assisted instruction. A response from all academic administrators will prevent a biased report. **Your response is very important** to the success of this project.

If you have already returned the questionnaire, please accept my sincere thanks.

Sincerely,

Edmund M. Kosmahl, PT, MS
Assistant Professor
Department of Physical Therapy
University of Scranton
Scranton, PA 18510-4586

Appendix E

Second Follow-Up Letter

Mailing Date

Mailing Address

Dear :

About three weeks ago, I wrote to you seeking your opinions about computer assisted instruction (CAI) for entry-level physical therapy (PT) education. As of today, I have not received your completed questionnaire.

This study has been undertaken to learn more about three aspects of CAI. How is CAI being used in entry-level PT education? What is the value of CAI? What factors affect the implementation and use of CAI? Several early respondents have indicated that more information about the use of CAI in PT education is needed. Other authors have stated academic administrators need more information on this topic to make decisions about the use of CAI.

I am writing to you again because of the significance each questionnaire has to the usefulness of this study. An unbiased report requires responses from all academic administrators. Your response is essential for the success of the study.

Please be assured that confidentiality of responses will be strictly observed. Neither you or your institution will be identified in any report that results from this study. Preliminary trials have shown that about 15 minutes are required to complete the questionnaire.

If your questionnaire has been misplaced, a replacement has been enclosed. A stamped and addressed return envelope has also been included for your convenience. Please complete and return the questionnaire as soon as possible.

Your cooperation is greatly appreciated. If you have recently returned your questionnaire, please accept my sincere thanks for helping with this important project.

Sincerely,

Edmund M. Kosmahl, P.T., M.S.
Assistant Professor

Appendix F

Third Follow-Up Letter

Mailing Date

Mailing Address

Dear :

During the past seven weeks, I have written to you several times about my study on computer assisted instruction (CAI) for entry-level physical therapy (PT) education. As of today, I have not received your completed questionnaire.

The number of questionnaires returned so far is encouraging. Still, the accuracy of the research report depends on you and others who have not responded. Experience suggests that academic administrators who have not returned questionnaires may hold different opinions about CAI. Responses from all academic administrators are needed to prevent a biased report.

This is the first nationwide study of CAI for entry-level PT education. The results will be particularly important for academic administrators either using or contemplating the use of CAI. The utility of the results depend on how accurately I can describe what academic administrators feel about CAI.

For these reasons, I am sending this by certified mail to insure delivery. In case my previous correspondence has not reached you, I have included a replacement questionnaire along with a stamped and addressed return envelope. May I urge you to complete and return the questionnaire as soon as possible?

Be assured that confidentiality of responses will be strictly observed. Neither you or your institution will be identified in any report resulting from this study. Preliminary trials have shown that about 15 minutes will be required to complete the questionnaire.

Your contribution to the success of this study will be greatly appreciated. Please help to insure an accurate report by completing and returning the questionnaire.

Sincerely,

Edmund M. Kosmahl, P.T., M.S.
Assistant Professor

Appendix G

Prototype Survey Instrument

INSTRUCTIONAL USE OF COMPUTERS FOR

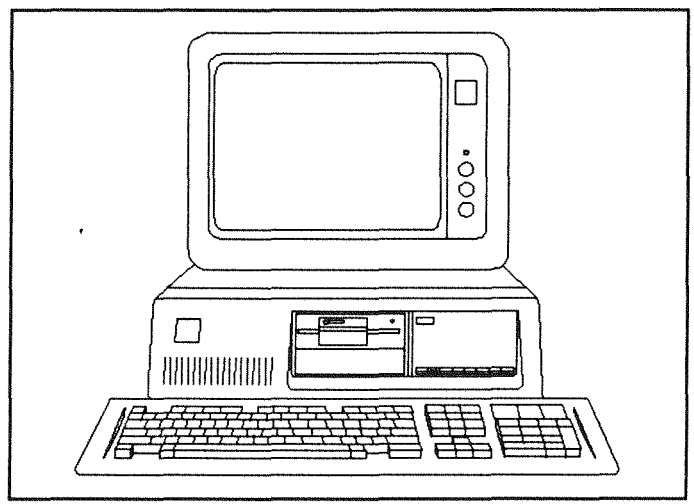
ENTRY-LEVEL PHYSICAL THERAPY EDUCATION

IN THE UNITED STATES

The extent and nature of the use of computer-assisted instruction (CAI) has been reported by other health professions educators. However, little is known about the use of CAI in PT education. How much is CAI being used in PT education? Does it have any value for PT education? What factors affect its implementation and use?

The purpose of this survey is to find answers to these questions. Please give your assistance to this project by answering all of the questions. Data will be reported in aggregate form only. No respondent or institution will be identified on any report. Forms are coded only to eliminate follow-up requests once you have returned your answers.

Thank you very much for your help.



Return to:
Edmund M. Kosmahl, P.T., M.S.
Department of Physical Therapy
University of Scranton
800 Linden Street
Scranton, PA 18510-4586

CAI DEFINITION:

For the purposes of this survey, computer assisted instruction (CAI) is defined as "the use of a computer to teach a subject (other than computing) via direct interaction of the student with the computer."

Section 1: CAI use at your Physical Therapy Entry-Level Program

The purpose of this part of the survey is to find out how much CAI is being used in your physical therapy education program. Please be as accurate as possible with your responses. Check the circle that represents your response. For all questions, check **ONLY ONE** circle.

1. Is CAI used in any courses offered **BY YOUR PHYSICAL THERAPY DEPARTMENT**?

	YES	NO
1.	O	O

2. Is CAI used in **any PREREQUISITE COURSES** required by your physical therapy program?

	YES	NO	DON'T KNOW
2.	O	O	O

IF YOU RESPONDED "YES" TO QUESTION NUMBER 1, PROCEED TO QUESTION NUMBER 3.

OTHERWISE SKIP TO QUESTION NUMBER 18.

		0%	20%	40%	60%	80%	100%
3. What percent of CAI used in your departmental courses is available to the general public through commercial, shareware, or public domain sources?	3.	O	O	O	O	O	O
4. What percent of CAI used in your department courses was developed locally for your (or a colleague's) use?	4.	O	O	O	O	O	O
5. What percent of department courses **REQUIRE** the student to use CAI?	5.	O	O	O	O	O	O

		0%	20%	40%	60%	80%	100%
6.	What percent of department courses offer students the **OPTION** to use CAI?	6. O	O	O	O	O	O
7.	What percent of department courses either require or offer students the option of **computerized drill and practice**?	7. O	O	O	O	O	O
8.	What percent of department courses either require or offer students the option of **computerized patient simulation**?	8. O	O	O	O	O	O
9.	What percent of department courses either require or offer students the option of **computerized problem solving**?	9. O	O	O	O	O	O
10.	What percent of department courses either require or offer students the option of **computerized testing**?	10. O	O	O	O	O	O
11.	What percent of department courses either require or offer students the option of **computerized tutorials**?	11. O	O	O	O	O	O
12.	What percent of department courses either require or offer students the option of **computerized remedial work**?	12. O	O	O	O	O	O
13.	What percent of department courses either require or offer students the option of **computerized supplemental work**?	13. O	O	O	O	O	O
14.	Mainframe and minicomputers are high capacity, centrally located, multi-user computers. Does your program use a mainframe or minicomputer for CAI?	14. **YES** O		**NO** O			
15.	Does your department have micro (personal) computers for CAI use?	15. **YES** O		**NO** O			

IF YOU RESPONDED "YES" TO QUESTION NUMBER 15, PROCEED TO QUESTION NUMBER 16

OTHERWISE SKIP TO QUESTION NUMBER 17

16. Are any of the micro (personal) computers connected in a local area network? — 16. **YES** O **NO** O

17. Is telecommunication (communication with a computer at a remote, off-campus location) used for CAI? — 17. **YES** O **NO** O

18. How many full time faculty are there at your entry-level program? — 18. _____

Section 2: The Value of CAI

Now for some questions about the value of CAI for physical therapy entry level education as compared to more traditional means of instruction such as lecture or demonstration. Even if your program does not use CAI, your response is vitally important. For the purposes of this section "value of CAI" is defined as the "worth or utility of CAI as compared to more traditional methods of instruction such as lecture or demonstration." Use the following scale for questions 19 to 39.

1 = DISAGREE STRONGLY 2 = DISAGREE 3 = DISAGREE SLIGHTLY
4 = NO OPINION
5 = AGREE SLIGHTLY 6 = AGREE 7 = AGREE STRONGLY

		1	2	3	4	5	6	7
19. Physical therapy students can learn quite well by using CAI.	19.	O	O	O	O	O	O	O
20. There is no compelling reason to use CAI with physical therapy students.	20.	O	O	O	O	O	O	O
21. CAI promotes independent learning to a greater degree than the traditional use of lecture and textbook.	21.	O	O	O	O	O	O	O

1 = DISAGREE STRONGLY	2 = DISAGREE	3 = DISAGREE SLIGHTLY	
	4 = NO OPINION		
5 = AGREE SLIGHTLY	6 = AGREE	7 = AGREE STRONGLY	

			1	2	3	4	5	6	7
22.	CAI inhibits learning because the personal interaction necessary for learning is eliminated.	22.	O	O	O	O	O	O	O
23.	An advantage of CAI is that it allows access to instruction whenever the student is able (or wants) to learn.	23.	O	O	O	O	O	O	O
24.	CAI is undesirable because an instructor is not always available to answer student questions that may arise.	24.	O	O	O	O	O	O	O
25.	CAI can save faculty time.	25.	O	O	O	O	O	O	O
26.	CAI can save student time.	26.	O	O	O	O	O	O	O
27.	Because physical therapy is such a "hands-on" profession, CAI is not useful for teaching physical therapy students.	27.	O	O	O	O	O	O	O
28.	Computer simulation of patients can allow students to practice diagnosis and treatment planning without using actual patients.	28.	O	O	O	O	O	O	O
29.	Computer simulation of patients can allow students to practice diagnosis and treatment without causing harm to living individuals.	29.	O	O	O	O	O	O	O
30.	Physical therapists rarely use computers in practice, so using CAI during physical therapy training seems pointless.	30.	O	O	O	O	O	O	O
31.	CAI can decrease much of the burden on faculty to provide tutorial and remedial instruction.	31.	O	O	O	O	O	O	O
32.	CAI should be avoided because it minimizes the instructor's participation in physical therapy education.	32.	O	O	O	O	O	O	O

1 = DISAGREE STRONGLY	**2 = DISAGREE**	**3 = DISAGREE SLIGHTLY**
	4 = NO OPINION	
5 = AGREE SLIGHTLY	**6 = AGREE**	**7 = AGREE STRONGLY**

			1	2	3	4	5	6	7
33.	It's not worth the effort needed to learn how to use CAI.	33.	O	O	O	O	O	O	O
34.	Learning about CAI is the worst part of physical therapy education today.	34.	O	O	O	O	O	O	O
35.	I would like to increase my knowledge of how CAI can be used for physical therapy education.	35.	O	O	O	O	O	O	O
36.	Most CAI programs are so difficult to use that they result in frustration rather than learning.	36.	O	O	O	O	O	O	O
37.	I believe a move toward increasing the use of CAI would benefit physical therapy.	37.	O	O	O	O	O	O	O
38.	Physical therapy students would be uncomfortable using CAI.	38.	O	O	O	O	O	O	O
39.	I would like to see our physical therapy program increase its use of CAI.	39.	O	O	O	O	O	O	O

Section 3: Factors Affecting CAI Use

Here are some questions about the importance of factors that affect (either positively or negatively) the implementation or use of CAI in physical therapy education. Even if your program does not use CAI, your response is vitally important. Please give your opinion as accurately as possible. The following definitions apply to these questions:

"NO EFFECT" = 0

This factor has no influence on the implementation or use of CAI in physical therapy education.

"MINIMAL EFFECT" = 1

This factor has little effect on the implementation or use of CAI in physical therapy education. If the factor is perceived as positive, it will help; but not much. If the factor is perceived as negative, it could be easily overcome with the resources available at your program.

"MODERATE EFFECT" = 2

This factor affects the implementation or use of CAI a fair amount. If the factor is perceived as positive, implementation or use of CAI will be easy. If the factor is perceived as negative, a reasonable expenditure of effort and resources (available at your program) will be required to overcome the negative effect.

"STRONG EFFECT" = 3

This factor has a substantial effect on the implementation or use of CAI in physical therapy education. If the factor is perceived as positive, it will help quite a bit. Implementation or use of CAI will be very easy. If the factor is perceived as negative, a significant amount of effort and resources must be expended to overcome the negative effect. The program may need to consult external resources to overcome the negative effect.

"VERY STRONG EFFECT" = 4

The effect of this factor is very powerful. If the factor is perceived as positive, it is almost certain that CAI will be implemented or used. If the effect is perceived as negative, tremendous resources (both internal and external) must be expended to implement or use CAI. A negative effect may prevent implementation or use of CAI regardless of the resources expended.

HOW STRONGLY DO THE FOLLOWING FACTORS AFFECT THE IMPLEMENTATION OR USE OF CAI IN PHYSICAL THERAPY EDUCATION?

0 = NO EFFECT 1 = MINIMAL EFFECT 2 = MODERATE EFFECT
3 = STRONG EFFECT 4 = VERY STRONG EFFECT

			0	1	2	3	4
40.	Faculty computer literacy?	40.	O	O	O	O	O
41.	Faculty interest in using CAI as an instructional tool.	41.	O	O	O	O	O
42.	Peer support for CAI (i.e. does the faculty evaluation system such as tenure/promotion acknowledge the development and implementation of CAI as valuable)?	42.	O	O	O	O	O
43.	Student computer literacy?	43.	O	O	O	O	O
44.	Student interest in using CAI as a learning tool?	44.	O	O	O	O	O
45.	Student learning style?	45.	O	O	O	O	O
46.	Cost of hardware/software?	46.	O	O	O	O	O
47.	Availability of software that is useful and relevant for physical therapy education?	47.	O	O	O	O	O
48.	Institutional support for the development and/or implementation of CAI systems?	48.	O	O	O	O	O

PLEASE USE THE SPACE BELOW TO LIST ANY OTHER FACTORS THAT YOU FEEL AFFECT THE IMPLEMENTATION OR USE OF CAI IN PHYSICAL THERAPY EDUCATION. USE THE BACK OF THE SURVEY IF ADDITIONAL SPACE IS NEEDED.

Are there any additional comments that you would like to make? Please use this space for additional comments.

Your contribution to this effort is very greatly appreciated. If you would like a summary of results, please check the box. Thank you!

☐ send results summary

Appendix H

Vitae - Expert Panel

February 1992

CURRICULUM VITAE

Name	Jancis K. Dennis, M.App.Sci.(Phty)
Social Security Number	254-51-6205
MCG Title(s)	Assistant Professor Director of the Center for the Study of Physical Therapy Education (Done on a part-time basis)
Office Address	Department of Physical Therapy CH-100
Office Telephone	(404) 721-2141

PERSONAL

Home Address	3609 Nassau Drive Augusta, Georgia 30909
Home Telephone	Unlisted
Date of Birth	September 6, 1938
Place of Birth	Melbourne, Australia
Citizenship	Australian
Sex	Female
Race	Caucasian
Marital Status	Divorced
Children	Jane Eliza Dennis - October, 1961 Antony Russell Dennis - June, 1963 Malcolm James Dennis - December, 1966 Hugh Stirling Dennis - July, 1968

EDUCATION

High School

Morongo, Presbyterian Girls College, Geelong,
Victoria, Australia. January, 1950 - December, 1955.
Matriculation certificate.

Professional

Physiotherapy School of Victoria,
Victoria, Australia. March, 1956 - December, 1958.
Diploma of Physiotherapy.

Professional (Continued)

Lincoln Institute of Health Sciences,
Melbourne, Australia. 1977 - 1980 (part-time).
B.App. Sci. (Phty).

Swinburne College of Technology,
Melbourne, Australia. 1976 - 1980 (part-time).
B.A.

Graduate

Lincoln Institute of Health Sciences,
Melbourne, Australia. 1982 - 1986.
M.App.Sci.(Phty.).

Nova University,
Fort Lauderdale, Florida. 1992.
Doctoral Student. Computer Education.

Board Certification

Licensed Physiotherapist, Victoria, Australia 1959 - present.
Licensed through Georgia State Board of Physical Therapy, Nov 1986 - present.

PROFESSIONAL

Clinical Appointments

1959	Royal Melbourne Hospital
1959	Epworth Hospital
1960/61	Geelong and District Hospital
1970/72	Grace McKellar House: Geriatric Rehabilitation Unit
1960/72	Private Practice (Part-time)
1986	Temporary Charge Physiotherapist: Footscray Society for the Aged

Academic Appointments

Tutor-demonstrator:
Lincoln Institute of Health Sciences
School of Physiotherapy
Melbourne, Australia
1973 - 1974

Academic Appointments (Continued)

Lecturer:
Lincoln Institute of Health Sciences
School of Physiotherapy
Melbourne, Australia
1974 - 1976

Senior Lecturer:
Coordinator of Third Year Studies
Coordinator of Clinical Education
Lincoln Institute of Health Sciences
School of Physiotherapy
Melbourne, Australia
1977 - 1986

Assistant Professor
Academic Coordinator of Clinical Education:
School of Allied Health Sciences
Department of Physical Therapy
Medical College of Georgia
Augusta, Georgia
September, 1986 - present

Director
Center for the Study of Physical Therapy Education (CSPTE) 1991.

Committee Assignments

Staffing Committee
Lincoln Institute of Health Sciences
Melbourne, Australia
1984 - 1985

Australian Physiotherapy Association
National Quality Assurance Committee
1984 - 1986

School of Allied Health Sciences
Medical College of Georgia
Faculty Affairs Committee
1989

Department of Physical Therapy. MCG
Curriculum Committee, 1987 - present.

Department of Physical Therapy. MCG
Admissions Committee, 1989-90

Committee Assignments (Continued)

Department of Physical Therapy
Medical College of Georgia
Chairperson, Task Force on Faculty Workload, 1989.

Educational Policies Committee, MCG, 1990.

School of Allied Health Faculty Council, 1990, 1991.

Physical Therapy Association of Georgia: Region V
Program Committee, 1992.

Dean's Promotion & Tenure Committee, 1992.

Research and Training Grants Awarded

Principal Investigator, Medical College of Georgia Research Institute. Measurement of Knowledge Structure in Physical Therapy. Co-investigators: Bella J. May, Ed.D and Cynthia David, Ph.D. $6,925.

Co-investigator, American Physical Therapy Association. Investigation of Models for a Center for the Study of Physical Therapy Education. Principal Investigator: Jan F. Perry, Ed.D. and Cynthia David, Ph.D. other co-investigator.

SCIENTIFIC AND PROFESSIONAL SOCIETIES

Member, American Physical Therapy Association (APTA)

Member, APTA Sections for Education, Neurology, Community Health and Obstetrics and Gynecology

Member, Australian Physiotherapy Association (APA)

Member, Society for Judgment and Decision-Making

Member, Sigma Xi

COMMUNITY ACTIVITIES

Master Gardener, Georgia Extension Service

Consultant, Senior Center, Augusta, GA.

Stroke Club

PRESENTATIONS AT NATIONAL, REGIONAL AND STATE MEETINGS

Dennis J.K. 1984; Questionnaire Design, presented to Multidisciplinary seminar on Quality Assurance, Peer Review Resource Center, July.

Dennis J.K. 1985; Independent practice and referral procedures in Australia, presented at the American Physical Therapy Association Conference, New Orleans, Louisiana, June.

Dennis J.K. and Thomas S.A. 1985; Task analysis of independent practice in physiotherapy: the effect of gender and specialist certification upon clinical behavior; presented at the American Physical Therapy Association Conference, New Orleans, Louisiana; June.

Dennis J.K. 1986; Task analysis of independent practice in physiotherapy: the effects of sex and qualification on the structuring of clinical time; presented at Australian Physiotherapy Association Conference, Hobart; April.

Dennis J.K. 1987; Symposium on Clinical Education; invited participant; World Confederation of Physical Therapy, Australia; May.

Dennis J.K. and May B.J. 1987; Practice in the Year 2000: Expert Decision-Making in Physical Therapy; Proceedings of the Xth Int. Congress. World Confederation of Physical Therapy, Australia.

Dennis J.K. 1989; Defining the master clinician: Alternative perspective; Open Forum on Research and Education; American Physical Therapy Association Conference, Nashville, Tennessee; June.

David C.L., Dennis J.K., Rohe D.A., and Wessling, K.C. 1991; The Development of Computer-Assisted Instructional Materials in Physical Therapy; poster presentation at the Combined Sections Meeting of the American Physical Therapy Association, Orlando, Florida; February.

PRESENTATIONS AT NATIONAL, REGIONAL AND STATE MEETINGS (Continued)

McKeough, D.M. and Dennis, J.K. 1991; Taxonomy of Motor Tasks: A Model for Teaching Movement Analysis and Goal Setting; platform presentation at Combined Sections Meeting of the American Physical Therapy Association, Orlando, Florida; February.

May B.J., Smith H.G. and Dennis J.K. 1992; Regional Clinical Visits and Continuing Education; poster presentation at the Combined Sections Meeting of American Physical Therapy Association, San Francisco, California; February 1992.

Dennis, J.K., May, B.J. and Putnam, J.M. 1992; Propositional Analysis: A Tool to Compare Representation of Clinical Knowledge of Master and Novice Clinicians; poster accepted for presentation at the 1992 Annual Conference of the American Physical Therapy Association, Denver, Colorado; June 1992.

MEETINGS, VISITING PROFESSORSHIPS, ETC.

October 1984; Visiting Professorship in the Office of Medical Education Research and Development; College of Human Medicine, Michigan State University, East Lansing.

March 1985; Higher Education Research and Development Society of Australia: Conference on Problem Based Learning; Sydney, University of New South Wales.

May 1985; Introduction to the Feldenkrais Method, Lincoln Institute of Health Sciences: 12 hour course in Awareness Through Movement.

May 1985; Gerontology Special Interest Group: Dr. Osa Jackson workshop; Brisbane, Queensland.

May 1985; Australian Physiotherapy Association Conference; Brisbane, Queensland.

June 1985; American Physical Therapy Association Conference; New Orleans, Louisiana.

June 1985; Optimizing Healing Abilities and Performance, American Physical Therapy Association Conference; New Orleans, Louisiana.

April 1986; Australian Physiotherapy Association Conference; Hobart, Tasmania.

May 1986; Manipulative Therapy Special Interest Group; Basic Spinal Course.

MEETINGS, VISITING PROFESSORSHIPS, ETC. (Continued)

May 1986; Gerontology Special Interest Group; Physiotherapy in Nursing Homes.

February 1987; Combined Sections Meeting; American Physical Therapy Association; Atlanta, Georgia.

April 1987; Motor Control Update; University of West Virginia.

September 1987; Motor programming and its dysfunctions: Implications for assessing and treating the neurological patient; Duke University Medical Center.

October 1987; Clinical Education.

November 1987; Feldenkrais, Level One, Dallas, Texas, The Institute for Human Movement Studies.

February 1988; The Business of Physical Therapy; Community Health Section, American Physical Therapy Association, Washington, DC.

February 1988; Combined Sections Meeting; American Physical Therapy Association; Washington, DC.

May 1988; Feldenkrais Level Two, Washington, DC.

June 1988; American Physical Therapy Association Conference, Las Vegas, Nevada.

July 1988; Health Sciences Education Conference, Cumberland College of Health Sciences, Sydney, Australia.

November 1988; Physical Therapy Association of Georgia Meeting, Unicoi, Georgia.

May 1989; Medical Informatics and Education Symposium; University of Victoria.

June 1989; American Physical Therapy Association Conference, Nashville, Tennessee.

February 1990; American Physical Therapy Association; Combined Sections Meeting, New Orleans, Louisiana.

May 1990; Acute Management of Traumatic Brain Injury; Seminar Presented by Walton Rehabilitation Hospital, Augusta, Georgia.

MEETINGS, VISITING PROFESSORSHIPS, ETC. (Continued)

August 1990; Promoting Excellence in Education, Section for Education and Department of Education, American Physical Therapy Association, Fort Lauderdale, Florida.

August 1990; Grant Writing Workshop; Section for Education and Department of Education, American Physical Therapy Association; Fort Lauderdale, Florida.

October 1990; Balance Deficits in the Neurological Patient, Atlanta, Georgia.

February 1991; American Physical Therapy Association; Combined Sections Meeting, Orlando, Florida.

February 1991; Focus: Geriatric Physical Therapy: An Advanced Tutorial; Presented by the Section for Geriatrics, American Physical Therapy Association; Orlando, Florida.

March 1991; Chest Physical Therapy: The Pulmonary System; Department of Physical Therapy, Beth Israel Hospital; Boston, Massachusetts; March 4-8.

March 1991; Visiting Professorship at Center for Medical Education; McGill University; Montreal, Quebec, Canada.

INVITED WORKSHOPS/SEMINARS

May B.J. and Dennis J.K. 1984; Developing Competence in Problem-Solving; two day workshops presented for faculty development at Auckland Polytechnic, New Zealand, August 16-17 and Dunedin Polytechnic, New Zealand, August 20-21.

Dennis J.K. and D'Arcy M. 1985; Co-covenors on Intercountry workshops in clinical education; Melbourne, Australia. Presented in conjunction with Queens University, and the University of Western Ontario, Canada; August.

Henry J.N. and Dennis J.K. 1987; Clinical Instructor Development; 1.5 day workshop presented at University of West Virginia, Morgantown, West Virginia, April.

May B.J. and Dennis J.K. 1987; Clinical Reasoning and Clinical Decision-Making; 1 day post Congress Workshop presented at World Confederation for Physical Therapy, Sydney, Australia; May.

Jackson O., May B.J. and Dennis J.K. 1988; Clinical Decision-Making in Gerontology: Update; Workshop presented at Oakland University, August.

INVITED WORKSHOPS/SEMINARS (Continued)

May B.J. and Dennis, J.K. 1988; Clinical Instructor Development Workshop, Medical College of Georgia, October 21-22.

May B.J. and Dennis J.K. 1989; Clinical Reasoning in Physical Therapy; Workshop presented for the Illinois Consortium for Clinical Education; March.

Dennis J.K. and McKeough D.M. 1989; Motor Learning: Applications in Rehabilitation; workshop presented for Medical College of Georgia, Department of Physical Therapy Alumni Program; May.

Dennis J.K. and May B.J. 1990; Issues in home care: How we handle them; Dogwood Conference; March - April; Atlanta, Georgia.

McKeough, D.M. and Dennis, J.K. 1991; Taxonomy of Motor Skills: A Theoretical Model for Goal Setting and Treatment Planning; TELNET Conference; June 20.

Dennis, J.K. and McKeough, D.M. 1991; New Concepts in Motor Control; Center for the Study of Physical Therapy Education, Medical College of Georgia; October 5.

Dennis, J.K. and McKeough, D.M. 1991; Recent Trends in the Management of Dysfunction Following CVA, Gwinnett Technical School, Atlanta, Georgia; October 26.

ABSTRACTS

Dennis, J.K. "The Management of Chondromalacia Patellae: A Long Term Solution." McConnell, J. *Australian Journal of Physiotherapy* 32:215-223, 1986. *Physical Therapy* 68:132, 1988. (Abstract)

Dennis, J.K. "The Absolute Visual Analogue Scale (AVAS) as a Measure of Pain Intensity." Zusman, M. *Australian Journal of Physiotherapy* 32:244-246, 1986. *Physical Therapy* 68:270-271, 1988. (Abstract)

Abstractor, Book Reviewer and Reviewer of Audiovisual Materials for the American Physical Therapy Association, 1988 - present.

Umphred, D.A. (Ed) Neurological Rehabilitation, 2nd edition; St. Louis; CV Mosby, 1990. (Book Review) [request from publisher to review for 3rd edition]

Dennis, J.K. *Contemporary Management of Motor Control Problems: Proceedings of II Step Conference* Foundation for Physical Therapy; American Physical Therapy Association Neurology Section and Section on Pediatrics; in press. (Book Review)

ABSTRACTS (Continued)

Dennis, J.K. Factors associated with the rheumatoid arthritis patients' compliance with home exercises and splint use; O'Carrol, M. and Hendriks, O. *Physiotherapy Practice* Vol. 5(3), 1989. Submitted for publication in *Physical Therapy* in July 1991. (Abstract)

PUBLICATIONS IN REFEREED JOURNALS

Dennis, J.K. "Decisions made by physiotherapists: A study of private practitioners in Victoria." *The Australian Journal of Physiotherapy*, 33:3:181-191, 1987. (Article)

Dennis, J.K. "What physiotherapists in private practice do: The effects of sex and training on clinical behavior." *The Australian Journal of Physiotherapy*, 33:4:245-252, 1987. (Article)

Dennis, J.K. and May, B.J. "Computer-Assisted student clinical placements." *Journal of Physical Therapy Education*, Vol. 4 No.2, Fall, pp. 87-92, Fall 1990. (Article)

May, B.J. and Dennis, J.K. "Expert decision-making in physical therapy - A survey of practitioners." *Physical Therapy*, Vol. 71, No. 3, pp. 190-206, March 1991. (Article)

BOOKS/CHAPTERS/OTHER PUBLICATIONS

Dennis, J.K. and David, C.L. 1992. Physical Therapy Patient Simulator. Computer assisted learning program for student evaluation of patient cases.

May, B.J. and Dennis, J.K. "Decision Making in Home Health." *Home Health and Rehabilitation: Concepts of Care,* Edited by B.J. May. Philadelphia: F.A. Davis Co., 1992, in production.

Dennis, J.K. and McKeough, D.M. "Mobility." *Home Health and Rehabilitation: Concepts of Care,* Edited by B.J. May. Philadelphia: F.A. Davis Co., 1992, in production.

May, B.J. and Dennis, J.K. "Caregivers." *Home Health and Rehabilitation: Concepts of Care,* Edited by B.J. May. Philadelphia: F.A. Davis Co., 1992, in production.

Computer Experience

Shell

In conjunction with Dr. C. David, Ms. Dennis has almost completed the developmental work on a patient simulator - an interactive, problem solving computer program. The simulator is designed to accommodate evaluation data from any patient case study, simple or complex. Faculty can enter the data into the program's bank, including feedback from a panel of experts. Students using the program are required to evaluate the 'patient', develop treatment goals, and management plans; and on completion of the task they may seek feedback from the expert panel. The program can be used by either an instructor in front of the whole class or by students as individuals, or groups. While in its developmental stage the program was shown to academicians within the Physical Therapy profession and external interest has been expressed in it. CSPTE has had an inquiry from an out-of-state faculty member who is planning to come to MCG and learn to use this program. One of the goals of CSPTE is to offer this kind of individualized continuing education for physical therapy faculty. This will further enhance the reputation of the Department of Physical Therapy at MCG for its expertise in education.

Computerization of the Clinical Education Data

Work on the computerization of the clinical education program began as early as 1988 when Dr. May and Ms. Dennis received a grant of a Zenith Computer for this purpose. In conjunction with the Ms. K Gordon of HIM , the Administrative Coordinator in Clinical Education and other members of the clinical education team, Ms. Dennis has coordinated the development of a sophisticated data management system to facilitate the storage and retrieval of data about the clinical education program. There have already been many inquiries from other physical therapy programs who are interested in streamlining the management of clinical education data.

Computerization of Clinical Assignments

The assignment of students to clinical facilities is a complex and time consuming activity. As student numbers grow and the availability of clinical facilities becomes more competitive, assignment becomes more difficult. The clinical education faculty, under the leadership of Ms. Dennis, have spelled out their decision rules for assignment and have shared these with Ms. K Gordon of HIM. Using report formats from the clinical education data base, the assignment process has been streamlined. The next step is the development of a match program for the clinical courses. When the computer match programs have been finalized, it is Ms. Dennis' vision that the Center for the Study of Physical Therapy Education {CSPTE} may be able to offer a computer match service to schools and facilities within Georgia, thus affording increased recognition for the School and the Institution.

CURRICULUM VITAE

NAME Richard Johnston
ADDRESS 97 Chateau Terrace
Snyder, New York 14226

PERSONAL DATA
Date of birth - August 26, 1942
Married - Two children
Citizenship - USA

EDUCATION

SCHOOL	PROGRAM	DEGREE	DATE
State University of New York at Buffalo	Physical Therapy	Bachelors of Science	1964
State University of New York at Buffalo	Physiology	Master of Arts	1972

EMPLOYMENT

INSTITUTION	POSITION	DATES
Daemen College	Professor	1985-Present
Daemen College	Program Director	1986-88
Daemen College	Associate Professor	1976-84
Veterans Administration Hospital, Buffalo, New York	Physical Therapist	1965-76
Veterans Administration Hospital, Batavia, New York	Physical Therapist	1964-65

CONSULTING POSTIONS

Degraff Hospital — Physical Therapist (Electromyographer) — 1979 - Present

PROFESSIONAL AFFILIATIONS

American Physical Therapy Association
Section on Clinical Electrophysiology

AWARDS

Faculty Merit Award 1981
Sigma Phi Epsilon Outstanding Professor 1986-1987

PUBLICATIONS

Electrically Elicited Quadriceps Femoris Muscle Torque as a Function of Various Electrode Placements. S. Barnett, K. Cooney, R. Johnston. 1991 Journal of Clinical Electrophysiology, Vol. 3, No. 8:5-8

Computer Instruction Enters Physical Therapy Classrooms. 1991 Advance for Physical Therapists, Vol. 2, No. 12. 10-11

Changes in Quadriceps Femoris Muscle Strength Using Isometric Exercises Versus Electrical Stimulation. R. Kubiak, K. Whitman, R. Johnston. 1987 The Journal of Orthopaedic and Sports Physical Therapy, Vol 8, No. 11:537-554

Compound Nerve Action Potentials Produced By Signals From Various Clinical Stimulators. R. Johnston, S. Kasper. 1986 Physical Therapy 66:785

Hamstring and Back Flexibility Secondary to Stretching Exercise. R. Johnston, M. Buzzelli. 1984 Physical Therapy, 64:715-716

The Effect of Artificially Induced Ischemia On Motor Coordination. L. Puzzi, R. Johnston. 1982 The Student Physical Therapist. Spring Edition 9-12

Objective Measurement of Hamstring and Low Back Flexibility.

S. Connelly, A. Lane, R. Johnston. 1981 The Student Physical Therapist. Spring Edition 5-8

Volume Conducted Muscle Action Potentials During Sensory Latency Tests. M. Kroth, R. Johnston, 1981 The Student Physical Therapist. Spring Edition 19-12

Health and Fitness Evaluation. T. Marble, R. Johnston. 1982 The Student Physical Therapist. Spring Edition 13-15

Cervical Muscle Electromyography During Cervical Traction. R. Johnston, P. Cowles, L. Stone. 1979 Physical Therapy 59:581

Ankle Clonus in Patients With Spinal Cord and Supraspinal Lesions: An Electromyographic Analysis. R.Johnston, K. Lee. 1977 Archives of Physical Medicine and Rehabilitation. 58:568-572

Myofeedback - A New Method of Teaching Breathing Exercises in Emphysematous Patients. R. Johnston, K. Lee. 1976 Physical Therapy. 56:826-829

Electrically Induced Flexion Reflex In Gait Training of Hemiplegic Patients. K. Lee, R. Johnston. 1976 Archives of Physical Medicine and Rehabilitation. 57:311-314

Myofeedback For Muscle Retraining In Hemiplegic Patients. K. Lee, E. Hill, R. Johnston, T. Smiehorowski. 1976 Archives of Physical Medicine and Rehabilitation. 57:588-591

Effect of Below-Knee Bracing On Knee Movement: Biomechanical Analysis. K. Lee, R. Johnston. 1974 Archives of Physical Medicine and Rehabilitation. 55:179-182

Biomechanical Comparison Of 90-Degree Plantar Flexion Stop and Dorsi-Flexion Assist Ankle Braces. K. Lee, R. Johnston, 1973 Archives of Physical Medicine and Rehabilitation. 54:302-306

Effects of Cooling on the Ankle Jerk and H-Response in Hemiplegic Patients. N. Urbscheit, B. Bishop, R. Johnston. 1971 Journal of the American Physical Therapy Association. 51:983-990

The Achilles Tendon Reflex and the H-Response During and After Tendon Vibration. C. Arcangle, R. Johnston, B. Bishop. 1971 Journal of the American Physical Therapy Association. 51:899-902

Mechanical Vibration of Skeletal Muscles. R. Johnston, B. Bishop, G. Coffey.970 Journal of the American Physical Therapy Association. 50:599-605

Changes in Alpha and Gamma Motoneuron Excitability With Respiration. B. Bishop, R. Johnston, W. Walsh. 1970 Archives of Physical Medicine and Rehabilitation. 51:383-391

Role of the Gamma Motor System in the Achilles Tendon Reflex of Hemiplegic Patients. B. Bishop, S. Machover, R. Johnston, W. Walsh, M. Anderson. 1968 Archives of Physical Medicine and Rehabilitation. 49:498-707

A Quantitative Assessment of Gamma Motoneuron Contribution to the Achilles Tendon Reflex in Normal Subjects. B. Bishop, S. Machover, R. Johnston, M. Anderson. 1968 Archives of Physical Medicine and Rehabilitation.

RESEARCH PRESENTATIONS

A Computer Assisted Instructional Program In Electrotherapy. R. Johnston Poster Presentation at the 1991 Combined Sections Meeting of the American Physical Thearpy Association, Orlando Florida

Computer Interactive Software Programs For Teaching Problem Solving Skills and Anatomical and Clinical Concepts. R. Johnston, P. Schaub Presented at the 1990 New York State American Physical Therapy Association Meeting Albany, New York Winner of the 1990 Robert S. Salant Award Special Interest Presentation

Computer Interactive Software Programs For Teaching Problem Solving Skills and Anatomical and Clinical Concepts. R. Johnston, P. Schaub. Platform Presentation 1990 APTA Annual Conference, Anaheim, California

Computer Interactive Software Programs To Strengthen Clinical Problem Solving Skills. P. Schaub, R. Johnston Poster Presentation 1990 APTA Annual Conference, Anaheim, California

Effects of Helium-Neon Laser on Latency and Amplitude of a Compound Nerve Action Potential Elicited from the Sciatic Nerve Of a Bullfrog. H. Tong, R. Johnston Platform Presentation by H. Tong 1990 APTA Annual Conference, Anaheim, California

Changes in Quadriceps Femoris Muscle Strength Using Isometric Exercises Versus Electrical Stimulation. R. Kubiak, K. Whitman, R. Johnston. Presented at the 1987 New York State American Physical Therapy Association Meeting in New York City

Nerve Action Potentials Produced From Clinical Stimulators. R. Johnston, S. Kasper. 1986 National Conference of the American Physical Therapy Association Meeting, Chicago

Hamstring and Back Flexibility Secondary to Stretching Exercise. R. Johnston, M. Buzzelli 1984 National Conference of the American Physical Therapy Association Meeting, Las Vegas, Nevada

Nerve Action Potentials Produced by a 2500 Hz Signal Modulated at 50 Hz. R. Johnston. Presented at the 1984 New York State American Physical Therapy Association Meeting, Buffalo, New York

Displayed The Student Physical Therapist journal at the 1981 National Conference of the American Physical Therapy Association Meeting, Washington, DC

Cervical Muscle Electromyography During Cervical Traction. R. Johnston, P. Cowles, L. Stone. 1979 National Conference of the American Physical Therapy Association Meeting, Atlanta, Georgia

PRESENTATIONS OF STUDENT RESEACH PROJECTS

The following are presentations of research projects completed by senior students under my supervision

Effects of Helium-Neon Laser on Latency and Amplitude of a Compound Nerve Action Potential Elicited from the Sciatic Nerve Of a Bullfrog. H. Tong. 1989 New York State American Physical Therapy Association Meeting, New York, New York

Latency of the Sensory Action Potential of the Superficial Radial Nerve in Response to Helium-Neon Laser. M. Findura, J.S. Donovan 1988 New York State American Physical Therapy Association Meeting, Buffalo, New York

The Effect of Electrode Placement On Isometric Torque Produced By The Quadriceps Femoris Muscle In Response To Electrical Stimulation. S. Werni and K. Cooney. 1988 New York State American Physical Therapy Association Meeting, Buffalo, New York

Quadriceps Muscle Response To Electrical Stimulation Of The Dorsal and Volar Surfaces Of the Foot. N. Marceau. 1988 New York State American Physical Therapy Association Meeting, Buffalo, New York

Changes In EMG Activity Of Paraspinal Muscles Following Postural Stress Of These Muscle. J. Buno, J. Winners of the 1987 George Lawn Research Award.

Strength and Use Dominance In The Lower Extremities. R. Bovier, D. Stevenson. 1984 New York State American Physical Therapy Association Meeting, Buffalo, New York

Isotonic and Isokinetic Exercises and Their Effect On Electrically Produced Muscle Fatigue. P. Hlushko, J. Donnely 1984 New York State American Physical Therapy Association Meeting, Buffalo, New York

Motor Neuron Facilitation Following A Maximal Isometric Contraction. C. Lipani, K. Price 1984 New York State American Physical Therapy Association Meeting, Buffalo, New York

Electromyographic Analysis of Cervical Traction. P. Cowles, L. Stone 1978 State Conference of the Council Of Licensed Physiotherapists of New York Inc., Grand Island, New York

Health and Fitness. T. Marble 1980 State Conference of the Council Of Licensed Physiotherapists of New York Inc., Grossingers, New York

WORKSHOPS PRESENTED

Critical Analysis of Electrical Stimulation. September 22, 1990 Sponsored by the Buffalo Conference Group and Daemen College Dale Fish, Ph.D, P.T. and Richard Johnston, P.T.

Electrotherapy Update. (For Daemen College Alumni) R. Johnston March 14, 1987

Electrotherapy Seminar - Theory and Clinical Applications. November 1986
R. Johnston and B. Stewart Sponsored by PMR Products, Inc. Albany, New York

Electrotherapy Workshop. November 1985 Sheraton Airport Inn, Rochester, New York

CONTINUING EDUCATION

Stanley V. Paris Lecture, "Current Ternds In The Treatment Of Spinal Disorders". April 30, 1991, Twin Tiers Rehabilitaiton Center, Elmira, New York

Differential Diagnosis in the Neurological Patient: Implications for Treatment. Sponsored by WNY District APTA. March 8,9, 1991 D'Youville College

Sportsmedicine Seminar II Cross-Training. Presented by SUNYAB School of Medicine. December 5, 1990

Thermal Agents A Symposium/Workshop For Academic and Clinical Educators. Section on Clinical Electrophysiology of the American Physical Therapy Association. Hahnemann University August 1987

Electrotherapy/Electrophysiology Symposium/Workshop for Electrotherapy Educators. Section on Clinical Electrophysiology. Marquett University July 1986

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Oslo 12.8.91

Richard Johnston from Daemen College, Physical Therapy Department, visited The College of Physiotherapy in Oslo, Norway, 12.08.91.

He gave a lesson in "Computer-Assisted Instuction in Physical Therapy Classrooms".

The lesson was planned for teachers at our college, in addition to some external teachers connected to the college.

Anne Margrethe Holmboe
Assistant Principal

Michael L. Moran
1816 Dickson Avenue
Scranton, PA 18509

(W): (717) 288-5496
(H): (717) 961-1273

Educational Background

SUNY Stony Brook: Bachelor of Science in Physical Therapy, 1978.

University of Scranton: Master of Science in Human Resources Administration, 1983.

Nova University: Doctor of Science in Training and Learning Technologies, 1991.

Work History - Physical Therapy

College Misericordia, Physical Therapy Program, Dallas, PA: Assistant Professor.
March 1992 to present.

Manor Health Care, Kingston PA: Geriatric Physical Therapist.
April 1988 to February 1992.

Moran Physical Therapy, Scranton PA: Private practice.
May 1984 to April 1988.

Spinks and Violand PT, Monticello NY: Staff Physical Therapist.
May 1983 to May 1984.

Mercy Hospital, Wilkes-Barre PA: Staff, Chief Physical Therapist.
June 1981 to May 1983.

Allied Services for the Handicapped, Scranton PA: Staff, Chief Physical Therapist.
June 1978 to June 1981.

Work History - Computers

Moran Computer Resources. Independent producer of computer-assisted instruction for health professions.
January 1988 to present.

International Customized Software, Ft. Lauderdale FL: Systems Analyst.
February 1990 to present.

Therasys, Inc. Shawnee Mission, KS: Assistant developer of the Physical Therapy Online Network.
January 1990 to present.

Publications

Learning to Use a Computer a Wise Time Investment. PT Bulletin, pp. 6, 61. Fall Student Issue, 1989.

Non-Traditional Means Used for PT's Advanced Education. PT Bulletin, pp.4-5, January 31, 1990.

Don't Think Much of Computers?...They Could Make You a Better PT. PT Bulletin, pp. 18-19, 119. Feb. 7, 1990.

PT's Can Exchange Information Quickly and Without Paper. PT Bulletin, pp. 4-5. February 28, 1990.

Computers Can Reduce the Effort of Keeping Up With the Profession. PT Bulletin, pp. 14-15, 33. Spring Student Issue, 1990.

Using Utah Pilot to Develop Computer-Assisted Instruction in Patient Care Plan Documentation. Geri-Topics, Summer 1990,13(3).

Technology Corner. PT Bulletin, pp. 2, 37. September 12, 1990.

Technology Corner. PT Bulletin, pp. 9, 58. October 10, 1990.

How to Shop for Your First Computer. PT Bulletin, p. 7. October 31, 1990.

Grant Writing: A Necessary Skill for our Future. PT Bulletin, Fall Student Edition, 1990.

Nursing Homes Face Complex Challenges As New Regulations End Patient Restraints. PT Bulletin, pp. 12-13. January 9, 1991.

Using Technology to Write Pediatric Physical Therapy Articles. Pediatric Physical Therapy. Pediatric Physical Therapy, 1991, 3(2), 106-108.

Using Computer Technology to Facilitate Communications and Article Preparation During a Geriatric Physical Therapy Affiliation. Geri-Topics, Summer 1991, 14(3), 20-21.

Monitoring Quality and Performance Through Computer Application. (With M. Brimer). Physical Therapy Forum, 1991, 10(35), 4-5.

The Unix Operating System. (With M. Brimer). Clinical Management, 1991, 11(5), 52-55.

Hypertext Computer-Assisted Instruction for Geriatric Physical Therapists. Physical & Occupational Therapy in Geriatrics. In Press.

Geriatric Physical Therapy Continuing Education: New Opportunities Through Distance Education. (With M. Brimer). Geri-Topics. In Press.

Sorbsan - a Topical Wound Care Product: a Literature Review and Implications for Physical Therapists. (With M. Brimer). Geri-Topics. In Press.

Professional Organizations

Member, American Physical Therapy Association.

Member, Pennsylvania Physical Therapy Association.

Member, National Eagle Scout Association.

Professional Contributions

Contributor: article and book reviews - Journal of the American Physical Therapy Association.

Member: Editorial Board, Geri-Topics.

Member: Business Advisory Board, PC/Computing Magazine.

Consultant: College Misericordia, Dallas PA: Developing Physical Therapy Program.

Clinical Instructor: University of Scranton, Penn State University, Philadelphia College of Pharmacy and Science.

Laboratory Assistant: University of Scranton.

Honors and Awards

Selected for 1992-1993 editions of Who's Who in American Education and Who's Who Among Human Services Professionals.

Professional Interests

Artificial Intelligence; Computer-Assisted Instruction; Computers; Computing Technology; Ergonomics; Geriatric Physical Therapy; Non-Traditional Education; Physical Therapy Education; Software Development; Telecommunications.

References

Available upon request.

Appendix I

Instructions to Content Experts

Expert Instructions - First Round

The attached survey "Instructional Use of Computers for Entry-Level Physical Therapy Education in the United States" is a prototype instrument. Its final form will be used to gather data from academic administrators of physical therapy education programs. Your help is being requested to refine the instrument and to estimate its validity. The process will require two rounds of review.

The purposes of the review are to: 1) eliminate ambiguities and items that do not contribute to the purpose of the instrument, 2) add items that contribute to the purpose but whose content has not been included in the prototype items, 3) estimate the extent to which the items sample a significant aspect of the purpose of the study.

Specific instructions for each section of the instrument follow. Please estimate the extent to which each item samples a significant aspect of its section using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Section One.

The purpose of this section is: to gather information about the amount and type of computer assisted instruction (CAI) used by the respondents. Please comment on the clarity of wording for each item. If there are ambiguities, give an example of how to re-word the item. If you feel there are significant aspects of the purpose of this section that the items do not address, please add items that do so. Please estimate the extent to which each item addresses a significant aspect of this section using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Section Two.

The purpose of section two is: to decide the value of CAI as reported by the respondents. Likert Scale methodology will be used to analyze the data. This method uses both positive and negative statements to collect information about the topic (value of CAI).

Please comment on the clarity of wording of each item. If there are ambiguities, give an example of how to re-word the item. If you feel there are significant aspects of the value of CAI that the items do not

address, please add items that do so. Please estimate the extent to which each item addresses a significant aspect of the value of CAI using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Section Three.

The purpose of this section is: to decide the importance of factors perceived to affect the implementation and use of CAI. Please comment on the clarity of wording of each item. If there are ambiguities, give an example of how to re-word the item.

A review of the literature has suggested the significant categories of factors are faculty, student, and resource. The survey accommodates the entry of "other" factors by respondents.

If you feel there are significant factors that the items do not address, please add items that do so. Please estimate the extent to which each item addresses a significant aspect of the factors by using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Expert Instructions - Second Round

Thank you for completing the first round evaluation of the enclosed survey instrument (Instructional Use of Computers for Entry-Level Physical Therapy Education in the United States). For this second round evaluation, your help is being sought to reach a consensus on the extent to which the items sample a significant aspect of the purpose of the study.

Please rate each item on the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. For each item, your first round rating and the consensus (arithmetic mean) rating from the group of first round evaluators are listed. Please give your second round rating after considering the first round ratings. Specific instructions for each section follow.

Section One.

The purpose of this section is: to gather information about the amount and type of computer assisted instruction (CAI) used by the respondents. Please estimate the extent to which each item addresses a significant aspect of this section using the

following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Section Two.

The purpose of section two is: to decide the value of CAI as reported by the respondents. Likert Scale methodology will be used. This method uses both positive and negative statements to collect information about the topic (value of CAI). Please estimate the extent to which each item addresses a significant aspect of the value of CAI using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Section Three.

The purpose of this section is: to decide the importance of factors perceived to affect the implementation and use of CAI. Please estimate the extent to which each item addresses a significant aspect of the factors by using the following scale: 0 = NOT AT ALL, 1 = SLIGHTLY, 2 = MODERATELY, 3 = GREATLY. Write your rating next to each item number.

Appendix J

First Round Ratings by Experts

Key: D = Dennis, J = Johnston, M = Moran

INSTRUCTIONAL USE OF COMPUTERS FOR

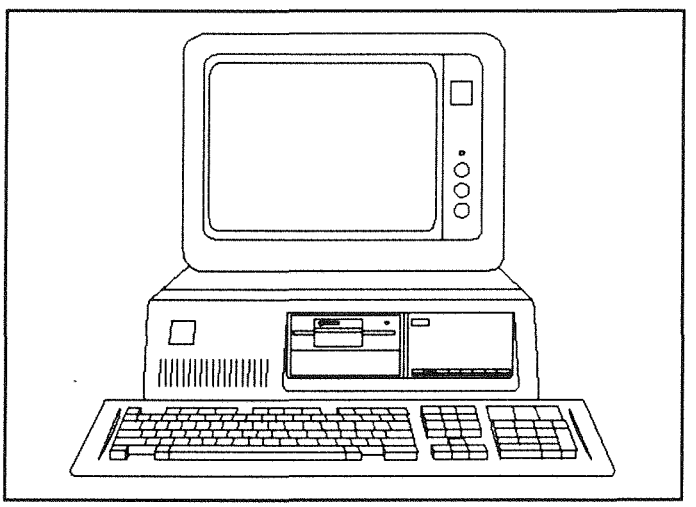
ENTRY-LEVEL PHYSICAL THERAPY EDUCATION

IN THE UNITED STATES

The extent and nature of the use of computer-assisted instruction (CAI) has been reported by other health professions educators. However, little is known about the use of CAI in PT education. How much is CAI being used in PT education? Does it have any value for PT education? What factors affect its implementation and use?

The purpose of this survey is to find answers to these questions. Please give your assistance to this project by answering all of the questions. Data will be reported in aggregate form only. No respondent or institution will be identified on any report. Forms are coded only to eliminate follow-up requests once you have returned your answers.

Thank you very much for your help.



Return to:
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CAI DEFINITION:

For the purposes of this survey, computer assisted instruction (CAI) is defined as "the use of a computer to teach a subject (other than computing) via direct interaction of the student with the computer."

Section 1: CAI use at your Physical Therapy Entry-Level Program

The purpose of this part of the survey is to find out how much CAI is being used in your physical therapy education program. Please be as accurate as possible with your responses. Check the circle that represents your response. For all questions, check **ONLY ONE** circle.

1. Is CAI used in any courses offered **BY YOUR PHYSICAL THERAPY DEPARTMENT**?

		YES	NO
MEAN=3 D=3, J=3, M=3	1.	O	O

2. Is CAI used in **any PREREQUISITE COURSES** required by your physical therapy program?

		YES	NO	DON'T KNOW
MEAN=2.3 D=1, J=3, M=3	2.	O	O	O

IF YOU RESPONDED "YES" TO QUESTION NUMBER 1, PROCEED TO QUESTION NUMBER 3.

OTHERWISE SKIP TO QUESTION NUMBER 18.

		0%	20%	40%	60%	80%	100%
3. What percent of CAI used in your departmental courses is available to the general public through commercial, shareware, or public domain sources?	3.	O	O	O	O	O	O
MEAN=2.6, D=3, J=2, M=3							
4. What percent of CAI used in your department courses was developed locally for your (or a colleague's) use?	4.	O	O	O	O	O	O
MEAN=2.6, D=3, J=2, M=3							
5. What percent of department courses **REQUIRE** the student to use CAI?	5.	O	O	O	O	O	O
MEAN=3, D=3, J=3, M=3							

		0%	20%	40%	60%	80%	100%
6.	What percent of department courses offer students the **OPTION** to use CAI?	6. O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3					
7.	What percent of department courses either require or offer students the option of **computerized drill and practice**?	7. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
8.	What percent of department courses either require or offer students the option of **computerized patient simulation**?	8. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
9.	What percent of department courses either require or offer students the option of **computerized problem solving**?	9. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
10.	What percent of department courses either require or offer students the option of **computerized testing**?	10. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
11.	What percent of department courses either require or offer students the option of **computerized tutorials**?	11. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
12.	What percent of department courses either require or offer students the option of **computerized remedial work**?	12. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
13.	What percent of department courses either require or offer students the option of **computerized supplemental work**?	13. O	O	O	O	O	O
		MEAN=2.6, D=3, J=2, M=3					
14.	Mainframe and minicomputers are high capacity, centrally located, multi-user computers. Does your program use a mainframe or minicomputer for CAI?	14. **YES** O	**NO** O				
		MEAN=2.6, D=2, J=3, M=3					
15.	Does your department have micro (personal) computers for CAI use?	15. **YES** O	**NO** O				
		MEAN=2.6, D=2, J=3, M=3					

IF YOU RESPONDED "YES" TO QUESTION NUMBER 15, PROCEED TO QUESTION NUMBER 16

OTHERWISE SKIP TO QUESTION NUMBER 17

16. Are any of the micro (personal) computers connected in a local area network?

16. **YES** O **NO** O

MEAN=1.3, D=0, J=1, M=3

17. Is telecommunication (communication with a computer at a remote, off-campus location) used for CAI?

17. **YES** O **NO** O

MEAN=2.3, D=2, J=2, M=3

18. How many full time faculty are there at your entry-level program?

18. _____

MEAN=1, D=0, J=0, M=3

Section 2: The Value of CAI

Now for some questions about the value of CAI for physical therapy entry level education as compared to more traditional means of instruction such as lecture or demonstration. Even if your program does not use CAI, your response is vitally important. For the purposes of this section "value of CAI" is defined as the "worth or utility of CAI as compared to more traditional methods of instruction such as lecture or demonstration." Use the following scale for questions 19 to 39.

1 = DISAGREE STRONGLY **2 = DISAGREE** **3 = DISAGREE SLIGHTLY**
4 = NO OPINION
5 = AGREE SLIGHTLY **6 = AGREE** **7 = AGREE STRONGLY**

		1	2	3	4	5	6	7
19. Physical therapy students can learn quite well by using CAI.	19. MEAN=2.6, D=2, J=3, M=3	O	O	O	O	O	O	O
20. There is no compelling reason to use CAI with physical therapy students.	20. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
21. CAI promotes independent learning to a greater degree than the traditional use of lecture and textbook.	21. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O

1 = DISAGREE STRONGLY	2 = DISAGREE	3 = DISAGREE SLIGHTLY
	4 = NO OPINION	
5 = AGREE SLIGHTLY	6 = AGREE	7 = AGREE STRONGLY

		1	2	3	4	5	6	7
22.	CAI inhibits learning because the personal interaction necessary for learning is eliminated.	22. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
23.	An advantage of CAI is that it allows access to instruction whenever the student is able (or wants) to learn.	23. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
24.	CAI is undesirable because an instructor is not always available to answer student questions that may arise.	24. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
25.	CAI can save faculty time.	25. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
26.	CAI can save student time.	26. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
27.	Because physical therapy is such a "hands-on" profession, CAI is not useful for teaching physical therapy students.	27. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
28.	Computer simulation of patients can allow students to practice diagnosis and treatment planning without using actual patients.	28. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
29.	Computer simulation of patients can allow students to practice diagnosis and treatment without causing harm to living individuals.	29. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
30.	Physical therapists rarely use computers in practice, so using CAI during physical therapy training seems pointless.	30. O	O	O	O	O	O	O
		MEAN=2.3, D=1, J=3, M=3						
31.	CAI can decrease much of the burden on faculty to provide tutorial and remedial instruction.	31. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						

1 = DISAGREE STRONGLY	2 = DISAGREE	3 = DISAGREE SLIGHTLY
	4 = NO OPINION	
5 = AGREE SLIGHTLY	6 = AGREE	7 = AGREE STRONGLY

		1	2	3	4	5	6	7
32.	CAI should be avoided because it minimizes the instructor's participation in physical therapy education.	32. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
33.	It's not worth the effort needed to learn how to use CAI.	33. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
34.	Learning about CAI is the worst part of physical therapy education today.	34. O	O	O	O	O	O	O
		MEAN=2.3, D=1, J=3, M=3						
35.	I would like to increase my knowledge of how CAI can be used for physical therapy education.	35. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
36.	Most CAI programs are so difficult to use that they result in frustration rather than learning.	36. O	O	O	O	O	O	O
		MEAN=2.6, D=2, J=3, M=3						
37.	I believe a move toward increasing the use of CAI would benefit physical therapy.	37. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
38.	Physical therapy students would be uncomfortable using CAI.	38. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
39.	I would like to see our physical therapy program increase its use of CAI.	39. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						

Section 3: Factors Affecting CAI Use

Here are some questions about the importance of factors that affect (either positively or negatively) the implementation or use of CAI in physical therapy education. Even if your program does not use CAI, your response is vitally important. Please give your opinion as accurately as possible. The following definitions apply to these questions:

"NO EFFECT" = 0

This factor has no influence on the implementation or use of CAI in physical therapy education.

"MINIMAL EFFECT" = 1

This factor has little effect on the implementation or use of CAI in physical therapy education. If the factor is perceived as positive, it will help; but not much. If the factor is perceived as negative, it could be easily overcome with the resources available at your program.

"MODERATE EFFECT" = 2

This factor affects the implementation or use of CAI a fair amount. If the factor is perceived as positive, implementation or use of CAI will be easy. If the factor is perceived as negative, a reasonable expenditure of effort and resources (available at your program) will be required to overcome the negative effect.

"STRONG EFFECT" = 3

This factor has a substantial effect on the implementation or use of CAI in physical therapy education. If the factor is perceived as positive, it will help quite a bit. Implementation or use of CAI will be very easy. If the factor is perceived as negative, a significant amount of effort and resources must be expended to overcome the negative effect. The program may need to consult external resources to overcome the negative effect.

"VERY STRONG EFFECT" = 4

The effect of this factor is very powerful. If the factor is perceived as positive, it is almost certain that CAI will be implemented or used. If the effect is perceived as negative, tremendous resources (both internal and external) must be expended to implement or use CAI. A negative effect may prevent implementation or use of CAI regardless of the resources expended.

HOW STRONGLY DO THE FOLLOWING FACTORS AFFECT THE IMPLEMENTATION OR USE OF CAI IN PHYSICAL THERAPY EDUCATION?

0 = NO EFFECT 1 = MINIMAL EFFECT 2 = MODERATE EFFECT
3 = STRONG EFFECT 4 = VERY STRONG EFFECT

		0 1 2 3 4
40.	Faculty computer literacy?	40. O O O O O MEAN=3 D=3, J=3, M=3
41.	Faculty interest in using CAI as an instructional tool.	41. O O O O O MEAN=3 D=3, J=3, M=3
42.	Peer support for CAI (i.e. does the faculty evaluation system such as tenure/promotion acknowledge the development and implementation of CAI as valuable)?	42. O O O O O MEAN=3 D=3, J=3, M=3
43.	Student computer literacy?	43. O O O O O MEAN=2.6 D=2, J=3, M=3
44.	Student interest in using CAI as a learning tool?	44. O O O O O MEAN=2.6 D=2, J=3, M=3
45.	Student learning style?	45. O O O O O MEAN=2.6 D=2, J=3, M=3
46.	Cost of hardware/software?	46. O O O O O MEAN=3 D=3, J=3, M=3
47.	Availability of software that is useful and relevant for physical therapy education?	47. O O O O O MEAN=3 D=3, J=3, M=3
48.	Institutional support for the development and/or implementation of CAI systems?	48. O O O O O MEAN=3 D=3, J=3, M=3

PLEASE USE THE SPACE BELOW TO LIST ANY OTHER FACTORS THAT YOU FEEL AFFECT THE IMPLEMENTATION OR USE OF CAI IN PHYSICAL THERAPY EDUCATION. USE THE BACK OF THE SURVEY IF ADDITIONAL SPACE IS NEEDED.

Are there any additional comments that you would like to make? Please use this space for additional comments.

Your contribution to this effort is very greatly appreciated. If you would like a summary of results, please check the box. Thank you!

☐ send results summary

Appendix K

Second Round Ratings by Experts

Key: D = Dennis, J = Johnston, M = Moran

INSTRUCTIONAL USE OF COMPUTERS FOR

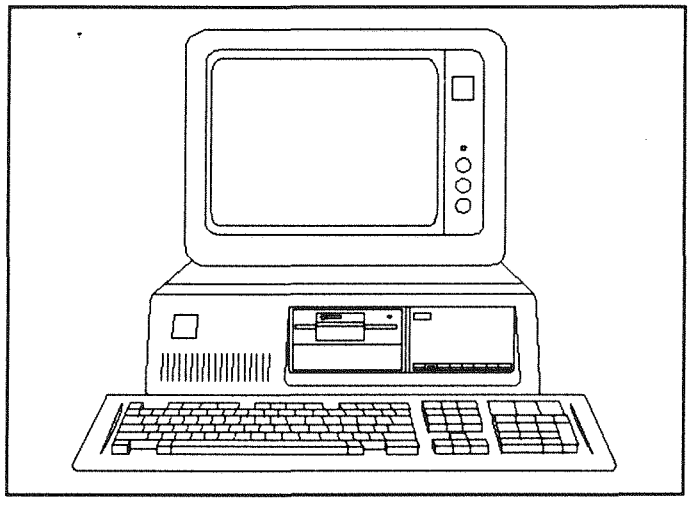
ENTRY-LEVEL PHYSICAL THERAPY EDUCATION

IN THE UNITED STATES

The extent and nature of the use of computer-assisted instruction (CAI) has been reported by other health professions educators. However, little is known about the use of CAI in entry-level PT education. How much is CAI being used in entry-level PT education? Does it have any value for entry-level PT education? What factors affect its implementation and use?

The purpose of this survey is to find answers to these questions. Please give your assistance to this project by answering all of the questions. Data will be reported in aggregate form only. No respondent or institution will be identified on any report. Forms are coded only to eliminate follow-up requests once you have returned your answers.

Thank you very much for your help.



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Scranton, PA 18510-4586 (717) 941-7783

First, a preliminary question:

1. How many full-time faculty (or full-time equivalents) are employed at your entry-level physical therapy (PT) program?

1. **HOW MANY?** ____

MEAN=3, D=3, J=3, M=3

CAI DEFINITION:

For the purposes of this survey, computer assisted instruction (CAI) is defined as **"THE USE OF A COMPUTER TO TEACH A SUBJECT (OTHER THAN COMPUTING) VIA DIRECT INTERACTION OF THE STUDENT WITH THE COMPUTER."** The definition includes any combination of an individual or multiple students interacting with an individual or multiple computers. The key phrase in the definition is, ". . . direct interaction of the student with the computer." The definition does not include the use of a computer by an instructor to augment a lecture or demonstration if the student does not directly interact with the computer (such as the "passive" use of a computer as a "slide projector" or "video monitor" to present material to students). The student must interact with the computer.

Section 1: CAI use at your Entry-Level Physical Therapy Program

The purpose of this part of the survey is to find out how much CAI is being used in your entry-level PT education program. Please be as accurate as possible with your responses. Check the circle that represents your response. For all questions, check **ONLY ONE** circle.

2. Is CAI used in any courses offered **BY YOUR ENTRY-LEVEL PT PROGRAM**?

MEAN=3, D=3, J=3, M=3

	YES	NO
2.	O	O

3. Is CAI used in any **PREREQUISITE COURSES** required by your entry-level PT program and offered by your institution?

MEAN=3, D=3, J=3, M=3

	YES	NO	DON'T KNOW	N/A
3.	O	O	O	O

IF YOU RESPONDED "YES" TO QUESTION NUMBER 2, PROCEED TO QUESTION NUMBER 4 ON PAGE 2.

OTHERWISE SKIP TO QUESTION NUMBER 18 ON PAGE 3.

What percent of CAI used in your entry-level PT program courses . . .	CHOOSE A PERCENT RANGE				
	0-20	20-40	40-60	60-80	80-100
4. is available through commercial (copyrighted), shareware ("try before you buy" copyrighted), or public domain (non-copyrighted) sources?	4. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
5. was developed locally at your institution?	5. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
What percent of entry-level PT program courses . . .					
6. **REQUIRE** the student to use CAI?	6. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
7. offer students the **OPTION** to use CAI?	7. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
8. use COMPUTERIZED **drill and practice** (repetitive presentation of a selection of questions until the student answers them at some pre-determined level of proficiency)?	8. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
9. use COMPUTERIZED **patient simulation** (a computer program that imitates a patient encounter to teach a student about patient encounters)?	9. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
10. use COMPUTERIZED **problem solving** (a computer program that teaches problem-solving skills by requiring the student to solve a problem)?	10. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
11. use COMPUTERIZED **testing** (a computer program that administers tests through the computer)?	11. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
12. use COMPUTERIZED **tutorials** (a computer program that teaches by carrying on a dialogue with the student)?	12. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				
13. use COMPUTERIZED **remedial work** (a computer program that helps the student remediate after performing inadequately)?	13. O	O	O	O	O
	MEAN=3, D=3, J=3, M=3				

CHOOSE A PERCENT RANGE

What percent of entry-level PT program courses . . .

		0-20	20-40	40-60	60-80	80-100
14.	use COMPUTERIZED **supplemental work** (a computer program that offers course-related instruction not required by the course syllabus)?	14. O	O	O	O	O

MEAN=3, D=3, J=3, M=3

		YES	NO	DON'T KNOW
15.	Mainframe and minicomputers are high capacity, centrally located, multi-user computers. Does your entry-level PT program use a mainframe or minicomputer for CAI?	O	O	O

MEAN=3, D=3, J=3, M=3

		YES	NO	DON'T KNOW
16.	Does your entry-level PT program use micro (personal) computers for CAI?	O	O	O

MEAN=3, D=3, J=3, M=3

IF YOU RESPONDED "YES" TO QUESTION NUMBER 16, PROCEED TO QUESTION NUMBER 17.

OTHERWISE SKIP TO QUESTION NUMBER 18.

		YES	NO	DON'T KNOW
17.	Are any of the micro (personal) computers connected in a local area network?	O	O	O

MEAN=2, D=2, J=1, M=3

		YES	NO	DON'T KNOW
18.	Does your entry-level PT program use telecommunication (communication with a computer at a remote, off-campus location) for CAI?	O	O	O

MEAN=2.7, D=3, R=2, M=3

Section 2: The Value of CAI

Now for some questions about the value of CAI for entry-level PT education as compared to more traditional means of instruction such as lecture or demonstration. Even if your program does not use CAI, your response is vitally important. For the purposes of this section "value of CAI" is defined as the **"WORTH OR UTILITY OF CAI AS COMPARED TO MORE TRADITIONAL METHODS OF INSTRUCTION SUCH AS LECTURE OR DEMONSTRATION."** Use the following scale for questions 19 to 39.

1= DISAGREE STRONGLY 2= DISAGREE 3= DISAGREE SLIGHTLY
4= NO OPINION 5= AGREE SLIGHTLY 6= AGREE 7= AGREE STRONGLY

			1	2	3	4	5	6	7
19.	PT students can learn quite well by using CAI.	19. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
20.	There is no compelling reason to use CAI with PT students.	20. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
21.	CAI promotes independent learning to a greater degree than the traditional use of lecture and textbook.	21. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
22.	CAI inhibits learning because the personal interaction necessary for learning is eliminated.	22. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
23.	An advantage of CAI is that it allows access to instruction whenever the student is able (or wants) to learn.	23. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
24.	CAI is undesirable because an instructor is not always available to answer student questions that may arise.	24. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
25.	CAI can save faculty time.	25. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
26.	PT students would be uncomfortable using CAI.	26. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O
27.	Because physical therapy is such a "hands-on" profession, CAI is not useful for teaching PT students.	27. MEAN=3, D=3, J=3, M=3	O	O	O	O	O	O	O

1= DISAGREE STRONGLY 2= DISAGREE 3= DISAGREE SLIGHTLY
4= NO OPINION 5= AGREE SLIGHTLY 6= AGREE 7= AGREE STRONGLY

		1	2	3	4	5	6	7
28.	It's not worth the effort needed to learn how to use CAI.	28. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
29.	Computer simulation of patients can allow students to practice diagnosis and treatment planning without using actual patients.	29. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
30.	Computer simulation of patients can allow students to practice diagnosis and treatment without causing harm to living individuals.	30. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
31.	PT's rarely use computers in practice, so using CAI during PT training seems pointless.	31. O	O	O	O	O	O	O
		MEAN=2.3, D=2, R=3, M=2						
32.	CAI can decrease much of the burden on faculty to provide tutorial and remedial instruction.	32. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
33.	CAI should be avoided because it minimizes the instructor's participation in PT education.	33. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
34.	Learning about CAI is the worst part of PT education today.	34. O	O	O	O	O	O	O
		MEAN=2.3, D=2, J=3, M=2						
35.	I would like to increase my knowledge of how CAI can be used for PT education.	35. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
36.	Most CAI programs are so difficult to use that they result in frustration rather than learning.	36. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						
37.	I believe a move toward increasing the use of CAI would benefit physical therapy.	37. O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3						

1= DISAGREE STRONGLY 2= DISAGREE 3= DISAGREE SLIGHTLY
4= NO OPINION 5= AGREE SLIGHTLY 6= AGREE 7= AGREE STRONGLY

			1	2	3	4	5	6	7
38.	CAI can save student time.	38.	O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3							
39.	I would like to see our entry-level PT program increase its use of CAI.	39.	O	O	O	O	O	O	O
		MEAN=3, D=3, J=3, M=3							

Section 3: Factors Affecting CAI Use

Here are some questions about the importance of factors that affect (either positively or negatively) the implementation or use of CAI in entry-level PT education. Even if your entry-level program does not use CAI, your response is vitally important. Please give your opinion as accurately as possible. The following definitions apply to these questions:

"NO EFFECT" = 0

This factor has no influence on the implementation or use of CAI in entry-level PT education.

"MINIMAL EFFECT" = 1

This factor has little effect on the implementation or use of CAI in entry-level PT education. If the factor is perceived as positive, it will help; but not much. If the factor is perceived as negative, it could be easily overcome with the resources available at your program.

"MODERATE EFFECT" = 2

This factor affects the implementation or use of CAI a fair amount. If the factor is perceived as positive, implementation or use of CAI will be easy. If the factor is perceived as negative, a reasonable expenditure of effort and resources (available at your entry-level program) will be required to overcome the negative effect.

"STRONG EFFECT" = 3

This factor has a substantial effect on the implementation or use of CAI in entry-level PT education. If the factor is perceived as positive, it will help quite a bit. Implementation or use of CAI will be very easy. If the factor is perceived as negative, a significant amount of effort and resources must be expended to overcome the negative effect. The entry-level program may need to consult external resources to overcome the negative effect.

"VERY STRONG EFFECT" = 4

The effect of this factor is very powerful. If the factor is perceived as positive, it is almost certain that CAI will be implemented or used. If the factor is perceived as negative, tremendous resources (both internal and external) must be expended to implement or use CAI. A negative effect may prevent implementation or use of CAI regardless of the resources expended.

HOW STRONGLY DO THE FOLLOWING FACTORS AFFECT THE IMPLEMENTATION OR USE OF CAI IN ENTRY-LEVEL PHYSICAL THERAPY EDUCATION?

0 = NO EFFECT 1 = MINIMAL EFFECT 2 = MODERATE EFFECT 3 = STRONG EFFECT 4 = VERY STRONG EFFECT

		0 1 2 3 4
40.	Faculty computer literacy?	40. O O O O O MEAN=3, D=3, J=3, M=3
41.	Faculty interest in using CAI as an instructional tool.	41. O O O O O MEAN=3, D=3, J=3, M=3
42.	Peer support for CAI (i.e. does the faculty evaluation system such as tenure/promotion acknowledge the development and implementation of CAI as valuable)?	42. O O O O O MEAN=3, D=3, J=3, M=3
43.	Student computer literacy?	43. O O O O O MEAN=2.7, D=3, J=3, M=2
44.	Student interest in using CAI as a learning tool?	44. O O O O O MEAN=3, D=3, J=3, M=3
45.	Student learning style?	45. O O O O O MEAN=3, D=3, J=3, M=3
46.	Cost of hardware/software?	46. O O O O O MEAN=3, D=3, J=3, M=3
47.	Availability of software that is useful and relevant for PT education?	47. O O O O O MEAN=3, D=3, J=3, M=3
48.	Institutional support for the development and/or implementation of CAI systems?	48. O O O O O MEAN=3, D=3, J=3, M=3

PLEASE USE THE SPACE BELOW TO LIST AND RATE ANY OTHER FACTORS THAT YOU FEEL AFFECT THE IMPLEMENTATION OR USE OF CAI IN ENTRY-LEVEL PT EDUCATION. USE THE BACK OF THE SURVEY IF ADDITIONAL SPACE IS NEEDED.

	RATING
OTHER FACTORS	**0 1 2 3 4**

Are there any additional comments that you would like to make? Please use this space for additional comments.

Your contribution to this effort is very greatly appreciated. If you would like a summary of results, please check the box. Thank you!

☐ send results summary

Biographical Sketch of Student

Edmund M. Kosmahl is a native Pennsylvanian who resides with his wife Margaret, and children Jennifer and Phillip, in Gouldsboro, Pennsylvania. He received a bachelor of science degree in physical therapy from Temple University in 1972. He practiced clinically in and about the Philadelphia area for 11 years.

Upon receiving a master of science degree (concentration in physical therapy, again from Temple University) in 1983, Mr. Kosmahl accepted a faculty position in the Physical Therapy Department at the University of Scranton, in Scranton Pennsylvania. A tenured assistant professor since 1989, Mr. Kosmahl is responsible for teaching kinesiology, therapeutic exercise, orthopaedic physical therapy, and thermal and electro-therapeutic modalities. He continues to practice clinically in the Scranton area. He has conducted research in the areas of human muscle performance and computer-assisted instruction. Mr. Kosmahl has published in several scientific journals related to the practice of physical therapy.

Nova University
Center for Computer and Information Sciences

I certify that I have read and am willing to sponsor this dissertation submitted by Edmund M. Kosmahl. In my opinion, it conforms to acceptable standards and is fully adequate in scope and quality as a dissertation for the degree of Doctor of Education (Ed.D.) at Nova University.

12-7-92
Date

Barry A. Centini, Ph.D.

I certify that I have read this document and in my opinion it conforms to acceptable standards and is fully adequate in scope and quality as a dissertation for the degree of Doctor of Education (Ed.D.) at Nova University.

12-11-92
Date

John Kingsbury, Ph.D.

I certify that I have read this document and in my opinion it conforms to acceptable standards and is fully adequate in scope and quality as a dissertation for the degree of Doctor of Education (Ed.D.) at Nova University.

12-1-92
Date

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