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AUTHOR	Hitchcock, A. Allen
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ABSTRACT

The problem that this practicum attempted to solve was that students in a vocational-technical college tended to underachieve in courses that were mainly cognitive in nature, as evidenced by low overall grade-point course averages and other measures. The researcher designed computer-based simulation/gaming instruction that aimed to increase motivation, attention, and retention of learning. Data were used from course grade-point averages, final-examination scores, and attitude surveys to evaluate results from the practicum solution. Two computer-based instructional aids were designed and developed: (1) an interactive wall-section game; and (2) an interactive delivery-truck and storage-building game. The study designed the wall-section game to help students learn 34 construction-terminology phrases that were basic to architectural technology. The truck and storage game was designed to help students learn the rules for organizing construction components into 16 industry-standard categories. Students used the two programs over an eight-month academic year in two different courses. An analysis of data revealed that the practicum solution achieved two outcomes. Two of the nine successful outcomes measured student satisfaction with learning and final examination grades. The student attitude survey used in this study is at the end of this monograph. (Contains 26 references.) (Author/VWC)

Improving Learning, Retention of Knowledge, and Attitude of Students in a Vocational-Technical College through Interactive Computer Technology

By
A. Allen Hitchcock
ITDE 3

A Practicum Report Presented to
the Ed.D. Program in
Instructional Technology and Distance Education
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Nova Southeastern University
2000

APPROVAL PAGE

This practicum took place as described.

Verifier: Donn Pittenger

Dean for Academic Affairs

Title

Thaddeus Stevens College of Technology
750 East King Street

Lancaster, PA 17602

Address

January 4, 2000

Date

This practicum report was submitted by Arthur Allen Hitchcock under the direction of the adviser listed below. It was submitted to the Ed.D. Program in Instructional Technology and Distance Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

Approved:

4/6/00

Date of Final Approval of Report

Bert Nelin, Ph.D., Adviser

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Table of Contents

Tables

Figures

ABSTRACT

Improving Learning, Retention of Knowledge, and Attitude of Students in a Vocational-Technical College through Interactive Computer Technology. Hitchcock, Allen, 2000: Practicum Report, Nova Southeastern University, Ed.D. Program in Instructional Technology and Distance Education. Computer-Based Instruction/Motivation/Memory.

The problem that this practicum attempted to solve was that students tended to underachieve in courses that were mainly cognitive in nature, as evidenced by low overall grade-point course averages and other measures. The writer designed computer-based simulation/gaming instruction that aimed to increase motivation, attention, and retention of learning. The writer used data from course grade-point averages, final-examination scores, and attitude surveys to evaluate results from the practicum solution.

The writer designed and developed 2 computer-based instructional aids: (1) an interactive wall-section game and (2) an interactive delivery-truck and storage-building game. The writer designed the wall-section game to help students learn 34 construction-terminology phrases that were basic to architectural technology. The writer designed the truck and storage game to help students learn the rules for organizing construction components into 16 industry-standard categories. Students used the two programs over an 8-month academic year in 2 different courses.

An analysis of the data revealed that the practicum solution achieved 2 outcomes. The 2 of the 9 successful outcomes were those that measured student satisfaction with learning and final examination grades.

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Chapter I: Introduction

Description of the Community

The community in which the practicum took place was a semi-rural city located in a Middle-Atlantic state. The city had a population of approximately 55,500 in 1999.

Writer's Work Setting

The problem context (the work setting) was a vocational and technical college established in 1905, accredited by the Middle States Association of Colleges and Schools and authorized to award Associate of Applied Science degrees in 15 technical and vocational programs.

The founder of the college believed that all people should have the opportunity to learn a trade regardless of class or financial status. The founder's vision of equal and affordable access for all students provided the foundation for the mission of the college. The college's guiding mission statement comprised two principles and a vision statement. The first principle Griscom stated was embodied in the statement that the college's mission was "to offer a two-year vocational and technical college education to disadvantaged or deserving students of the Commonwealth that will prepare them for employment and for full, effective lives as citizens of the community, the Commonwealth, and the nation" (Griscom, 1998, p. 1). The second principle was that "the college seeks to contribute to the educational, career, social, cultural, recreational, and personal needs of each student through its educational programs, its campus life, as well as through its qualified, caring faculty and staff" (p. 1). The vision statement asserted that the college would "be the best institution of its kind in adding value to the lives of the students so that they will find employment, be effective citizens, and reach their full potential as human beings" (p. 1).

The work setting was unique for three reasons: (a) the number of full-scholarship students, (b) the employment rate for graduates, and (c) the number of minority students. Statistics for the 1998 fall semester revealed that 65% of the 498 students received full scholarships that included all tuition, room, board, books, supplies, and equipment. The college awarded the full scholarships based on financial need, academic under-preparedness, or both. Information from the college's Office of Research revealed that 98% of the college's graduates found immediate employment or continued their education (Querry, 1998). The 20% minority enrollment was the highest of any 2-year college in the state (Griscom, 1998).

The staff and the population associated with this practicum were in the Architectural Technology program and included this writer, the writer's colleague (who taught second-year students), and 40 students (25 first-year and 15 second-year). Only the writer and the first-year students were involved in the practicum intervention. The second-year students participated by answering test questions that assessed recall of information that the writer taught in the first year. The 25 first-year students (enrolling fall 1998) shared the following characteristics:

1. All students resided in the state (a requirement of the college).

2. Eight students lived in the county in which the writer's college was located.

3. One of the entering students enrolled without meeting the required minimum high school grade-point average.

4. There were 5 women students.

5. There was 1 African-American, 1 Hispanic, and 1 Asian student.

6. Fourteen students resided on campus (all others were commuters).

7. Four students enrolled in remedial courses: one student enrolled in remedial English, 2 students enrolled

in remedial mathematics, and 1 student enrolled in remedial English and remedial mathematics.

8. The mean high school grade-point average was 2.66.

9. One student's high school grade-point average was 1.75 (the college policy was that 2.0 was the minimum high school grade-point average for admittance to the college).

10. The maximum high school grade-point average was 3.55.

11. The mean age of the students was 21.4 years.

The college used the American College Testing (1993) assessment test that generated data to determine prospective students' readiness and preparedness to enter the writer's program. The college used criteria for entering students that included minimum raw scores of 16 for reading skills, 22 for numerical skills, and 9 for elementary algebra skills. The writer's incoming class (25 students) for August 1998 had the following assessment test scores:

1. For the reading test section, the mean score was 18.1, the minimum score was 11, and 5 students' scores fell below the suggested cutoff of 16.

2. For the numerical test section, the mean score was 19.6, the minimum score was 13, and 17 students' scores fell below the suggested cutoff of 22.

3. For the algebra test section, the mean score was 12, the minimum score was 3, and 4 students' scores fell below the suggested cutoff of 9.

4. Eight students scored below the suggested cutoffs in two categories.

The college's admissions policy allowed the admissions department to consider factors other than the minimum scores in determining when to admit prospective students. This policy may have explained why 8 students failed to meet stated minimum assessment test scores, yet enrolled in the program. Additionally, the policy may have explained why 1 student enrolled without having met the stated minimum high school grade-point average.

The Writer's Role

The writer's roles and responsibilities in relationship to the practicum setting comprised four areas:

1. The writer had the exclusive responsibility to teach 25 first-year Architectural Technology students during the fall and spring semesters. The writer taught eight technical courses. The instruction provided students with a foundation of basic construction knowledge, drafting skills, and residential design principles.

2. The writer developed and administered all testing for content mastery in each of the eight courses.

3. The writer developed, administered, and evaluated student opinion surveys for each of the eight courses.

4. The writer was responsible for the design, development, and evaluation of the curriculum for the first-year Architectural Technology students.

This practicum focused on two courses taught by the writer: (1) Materials of Construction and (2) Specifications, Estimating, and Contracts. Both courses were requisite core-courses that students had to master to help them apply critical thinking skills and problem-solving strategies to all subsequent course work. Moreover, students needed to master both courses to help them apply course knowledge and skills throughout their careers.

Chapter II: Study of the Problem

Problem Statement

The problem that this practicum attempted to solve was that students tended to underachieve in courses that were mainly cognitive in nature, as evidenced by their traditionally low overall course grade-point averages.

Problem Description

The problem was best described in terms of what knowledge students should have mastered after they completed the first year of study and what knowledge they demonstrated that they actually had mastered after they completed the first year. Students demonstrated insufficient mastery in the Materials of Construction course and the Specifications, Estimating, and Contracts course. The writer measured student achievement by course grade-point averages and final examination test scores.

Prior to the practicum implementation, the writer had not solved the problem because the writer had not changed the basic inventory of instructional methods. The primary instruction methods of lecture and group-based projects had not increased individual student motivation. The addition of Microsoft(R) PowerPoint(R) 97 (1997) slide presentations to enhance the lectures had not increased students' ability to recall knowledge. Components of the Microsoft(R) PowerPoint(R) 97 software program that the writer used to during the instruction included projection of lecture highlights on a screen, projection of pictures that amplified the lectures, and creation of printed handouts for students to use for taking notes.

Problem Documentation

The writer discovered evidence of the problem from four data sources (1997-1998 school year): (a) attitude surveys, (b) historical grade-point averages, (c) scores from the Visual Wall-Section Tests, and (d) comments from the second-year instructor.

The writer designed an Attitude Survey (see Appendix A) that examined how students' affective and cognitive behaviors might have contributed to the problem and that looked at how the writer's teaching methods and style might have contributed to the problem. The information source for the survey data was the Materials of Construction class of first-year students in the 1997-1998 school year (N = 16).

The survey consisted of 23 questions (Likert-scale, fill-in response, and demographic information). Of the 23 questions, 15 were Likert-scale based and used the following scale: (1) Strongly Disagree, (2) Disagree, (3) Neither Disagree nor Agree, (4) Agree, and (5) Strongly

Agree. Four questions were fill-in type. The remaining four questions helped to describe the student population in terms of age, gender, grade-point average, and year in college.

The writer used the survey to collect students' preferences for learning modes. Additionally, the writer used the survey to gather data about students' perceptions and attitudes about the weekly testing, traditional lecture format for instruction delivery, and group collaborative work. The writer analyzed the survey data and found 12 trends that helped to identify students' attitudes toward the two courses, as follows ($\underline{N}$ = 16, 1997-1998 school year):

1. Students tended to agree that the testing helped them to learn the material (Question 1). The average score for this question was 3.7.

2. Students tended to agree that they found the testing difficult (Question 2). The average score for this question was 3.3.

3. Students tended to agree that they found the group work to their liking (Question 5). The average score for this question was 4.1.

4. Students tended to remain neutral regarding liking a lecture format (Question 7). The average score for this question was 3.0.

5. Students tended to agree that they preferred to learn by problem solving, rather than by lecture (Question 8). The average score for this question was 3.3.

6. Students tended to disagree that before the course their knowledge was extensive (Question 11). The average score for this question was 2.4.

7. Students tended to agree that after the course their knowledge was extensive (Question 12). The average score for this question was 3.6.

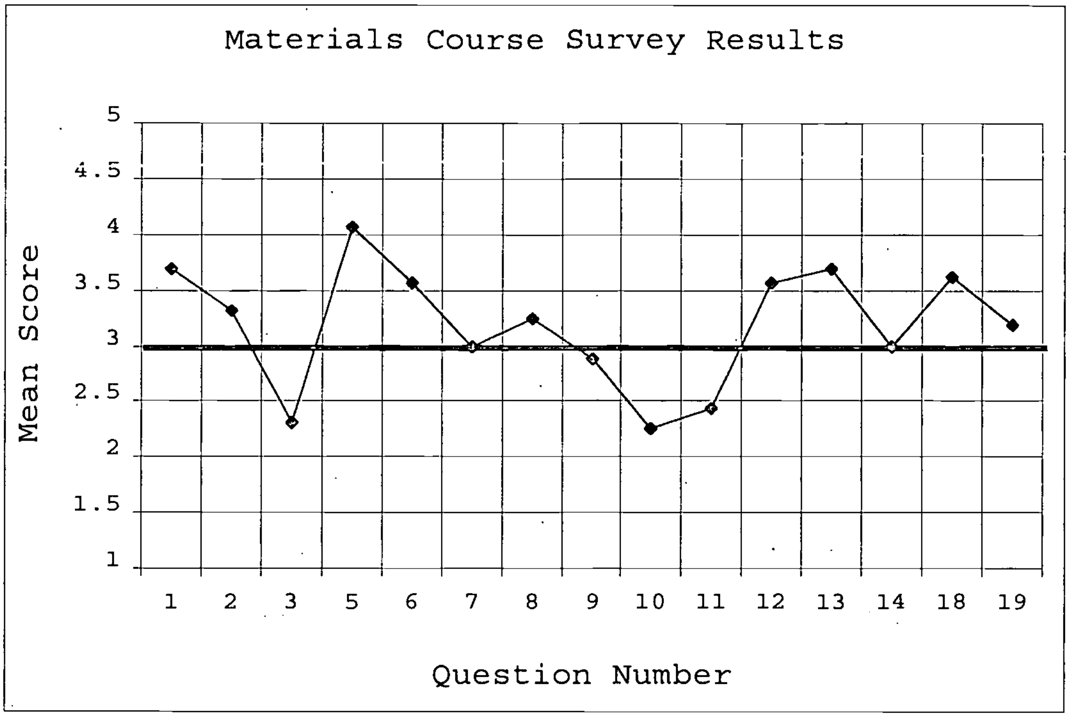
8. Students tended to agree that they learned best in a self-paced format (Question 18). The average score for this question was 3.6.

9. Students tended to agree that they liked to learn new information on their own schedule (Question 19). The average score for this question was 3.2.

10. In written response questions, 4 of the 16 students took the time to indicate that they disliked the lecture format.

11. Another 4 of the 16 students took the time to indicate that they disliked the large amount of information that the writer presented in the course.

12. Five of the 16 students took the time to indicate that they liked the group work format.



<u>Figure 1.</u> Graphic summary of the Attitude Survey data. The graph shows Likert-scale data only. The writer omitted Questions 4, 15, 16, and 17 from the graph because they were fill-in response type questions and did not create numerical data.

The graph in Figure 1 illustrates the mean scores for the 1997-1998 Materials of Construction course Attitude Survey of 16 students (see Appendix A for complete question wording). Scores above the mid-point of 3.0 represented positive responses ("Strongly Agree" and "Agree") to the question. Scores below the mid-point represented negative responses ("Disagree" and "Strongly Disagree").

The writer discovered evidence of the problem of student achievement in the class grade-book records. Table 1 summarizes the grade-book averages for the Materials of Construction and Specifications, Estimating, and Contracts courses. The information source was the students' grade-point averages earned in the first-year courses (N = 25, 1997-1998 school year). The data collection method consisted of reviewing and analyzing scores and grade-point averages found in the writer's grade-book. The grade-point average for the two cognitive-skill courses (Materials of Construction and Specifications, Estimating, and Contracts) was 77.0%. By examining the grade-book averages, the writer discovered that the final examination scores (a test of cognitive learning) were always lower than the laboratory exercise scores (the psychomotor-skill portion) of each course.

Table 1

Summary of 1997-1998 Course Averages

Course	Score %	Weight Factor	Grade %
Fall 1997 semester			
Materials of Construction course			
Lab	86.3	0.35	30.2
Final exam	66.2	0.30	19.9
Chapter test	75.3	0.35	26.3
Weighted mean grade			76.4
Spring 1998 semester			
Specifications, Estimating, and Contracts course			
Lab	90.0	0.60	54.0
Final exam	59.0	0.40	23.6
Weighted mean grade			77.6

The writer probed the aspects of retained knowledge and discovered the third area of evidence. In general, students' demonstrations of retained knowledge were below the writer's expectations, as measured by the Visual Wall-Section Test (shown in Figure 2). The information source was the 25 first-year and 15 second-year students (1997-1998 school year).

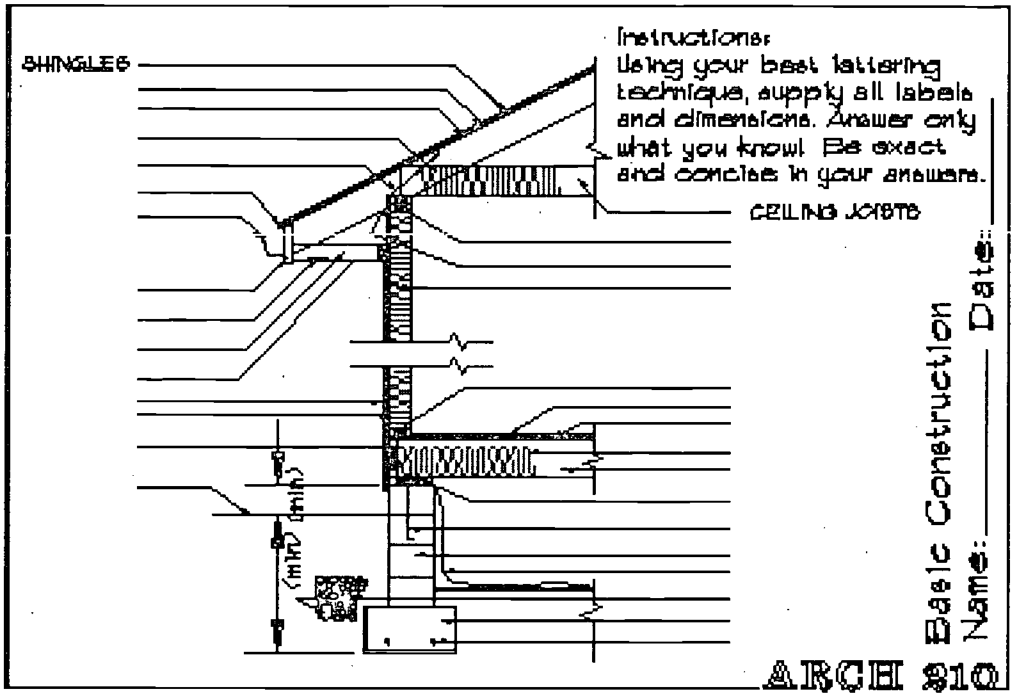
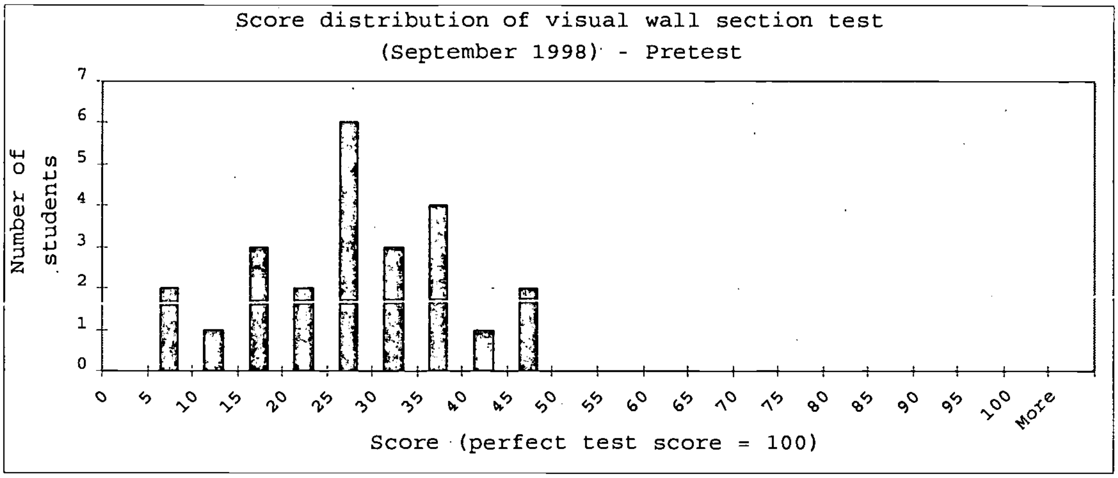


Figure 2. Visual Wall-Section Test used to measure retained knowledge of basic construction components.

To collect the data, the writer administered the Visual Wall-Section Test to the students and analyzed the test score data. The test measured basic construction terminology knowledge in a pretest and posttest format. Figure 3 summarizes the score data from the Visual Wall-Section Test. In Figure 3, the top graph represents a pretest condition for students (N = 24) before any instruction (in the first semester).



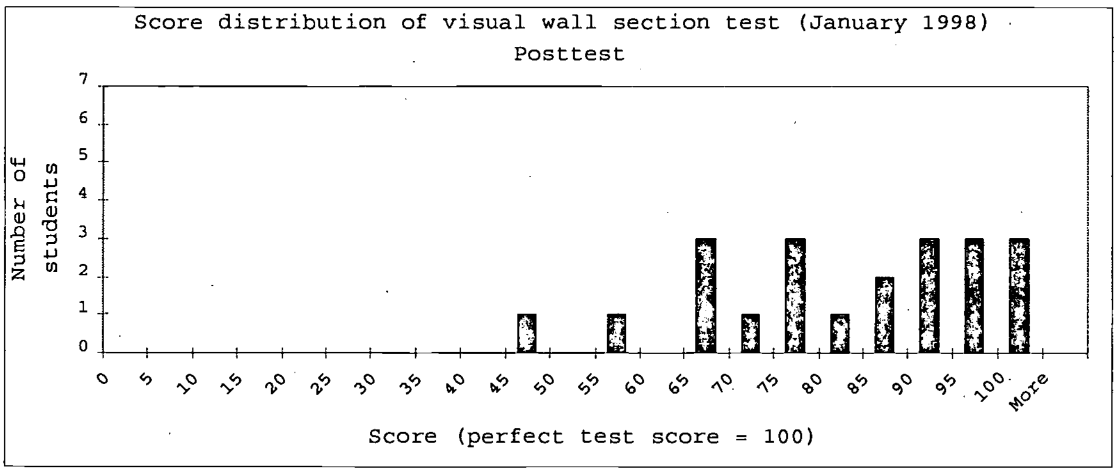


Figure 3. Graphic description of the Visual Wall-Section Test scores for pretest and posttest conditions.

The bottom chart represents a posttest condition for students (N =21) after just completing instruction in the Materials of Construction course and without any practicum intervention (in the second semester).

The Visual Wall-Section Test measured the basic construction-terminology knowledge that students should have possessed before entering the 2nd-year of Architectural Technology study. The tested knowledge was not complex, and the student performance requirement represented a simple recall of very basic information. The Visual Wall-Section Test of students' retained knowledge revealed that 6 of 21 students passed with a score of at least 90%. The writer believed that students who scored below 90% demonstrated that they had not mastered the basic knowledge.

Finally, the writer discovered evidence of the problem by talking to the second-year instructor of the Architectural Technology program. The instructor (the data source) talked about the 20 second-year students. The instructor stated that the students retained "virtually nothing," an assessment based on formal testing and application of construction-materials knowledge (J. Hamrick, personal communication, May 10, 1998).

Causative Analysis

The writer identified two possible causes of the problem. The first possible cause was that the writer's teaching methods did not match the students' needs. The writer first investigated whether a mismatch between teaching methods and students' needs existed. To analyze this possible cause, the writer administrated and evaluated attitude surveys to produce quantifiable data. The writer examined this cause by asking students to express opinions about the Materials of Construction and Specifications, Estimating, and Contracts courses. The writer uncovered three important findings from the investigation based on averaging the responses from all students returning the Attitude Survey (*N* = 16, 1997-1998 school year), reported as average scores in Figure 1:

1. Students tended to agree that they preferred to learn by problem solving, rather than by lecture (Question 8). The average score for this question was 3.3.

2. Students tended to agree that they learned best in a self-paced format (Question 18). The average score for this question was 3.6.

3. Students tended to agree that they liked to learn new information on their own schedule (Question 19). The average score for this question was 3.2.

The writer found that the anonymity of the opinion surveys prevented correlation between attitude and achievement for individual students although group trends were possible to identify. Additionally, the anonymity of the opinion surveys prevented correlation between teaching methods and achievement for individual students, although group trends were possible to identify.

Based on analysis of the survey data, the writer concluded that the lecture format of instruction did not match the students' needs for varied instruction (e.g., self-paced instruction and learning on their own schedules in addition to lectures). Consequently, the writer believed that this first cause contributed to the problem.

The second possible cause was that the students lacked the cognitive abilities or academic preparation to achieve effective learning. To analyze this possible cause, the writer looked for indicators of students' achievements and assessed their academic preparation. The writer examined the cause by evaluating the grade-point averages, content, and instructional methods for the Materials of Construction and Specifications, Estimating, and Contracts courses. The writer discovered five facts from the investigation (based on data from the 1997-1998 school year):

1. The Materials of Construction and Specifications, Estimating, and Contracts courses were lecture-based, cognitive, and academic in nature.

2. The student grade-point averages were low in the Materials of Construction and the Specifications, Estimating, and Contracts courses.

3. Eight of 25 first-year students scored below published college cutoff scores in two categories on the college entrance examination.

4. Seventeen of 25 first-year students scored below published college cutoff scores for numerical reasoning on the college entrance examination.

5. Six of 21 students who took the Visual Wall-Section Test 2 weeks after they had completed the Materials of Construction course scored 90% or better.

Additionally, the writer examined the issue of students' entry characteristics by performing statistical analyses (ANOVA) on data that related to high school grade-point averages, course achievement (measured by grade-point averages), and entrance-test scores ($\underline{N}$ = 24). The writer discovered two results of this investigation:

1. High school grade-point averages provided a low positive correlation to course achievement ($\underline{R}$ = .31).

2. Entrance testing provided a low positive correlation to course achievement ($\underline{R}$ = .29).

Based an analysis of the grade-point averages, entry characteristics, and testing data, the writer concluded that academic preparation contributed to the problem to a limited extent.

Relationship of the Problem to the Literature

The writer found information in the literature that associated the traditional lecture style of instruction to attention difficulties. Several authors observed that the traditional lecture usually did not engage a student's attention. The "average" student's attention was limited to about 15 minutes, after which time the student daydreamed or shifted attention to anything other than the lecture (Bonwell, 1997; Gardiner, 1994; Gardiner, 1998). Gardiner (1994) argued that a lack of attention in traditional lecture-based delivery caused diminished effectiveness of learning.

The writer discovered information in the literature that linked students' entry characteristics to student learning. Most students came to the classroom with minimal, if any, higher-level thinking skills, which were necessary to use in transferring new skills and knowledge to real-life tasks (Gardiner, 1998). Smith and Ragan (1992) suggested that the entry-level skills, entry-level knowledge, and attitudes of learners influenced the process of mastery. Smith and Ragan stated that learners generally filtered the instructional content and the instructor's delivery in ways that may have obscured the instruction. They also suggested that learners brought certain behaviors into the learning environment that diminished the effectiveness of learning.

The writer found information in the literature that suggested student motivation was an important aspect of effective instruction (Marchese, 1998). Gagné, as cited in Smith & Ragan (1992), stated that the student must first attend to the instruction and, if the student did not get beyond this first step, the effect of the instruction would be problematical. Without learner motivation, engaged learning (learning that lead to transferring and retaining knowledge) would be difficult, as suggested by Smith and Ragan. A common goal of instruction was that students be motivated toward learning. Hagen and Weinstein (1995) argued that a lack of motivation was a cause of ineffectual learning.

Smith and Ragan (1992) suggested that students would not produce effective learning without a positive sort of affective behavior (e.g., good study habits). Gardiner (1994) reported studies that indicated students spent very little time studying outside of class instruction time (in contrast to instructors' expectations). Gardiner cited a 1986 American Council on Education-UCLA CIRP study that stated that one-half of the students surveyed claimed to have spent less than 5 hours per week studying outside of class (n = 204,000). Gardiner cited a 1989 Rutgers University study that reported approximately 65% of undergraduate students spent only 2 hours per day studying. Gardiner argued that not studying outside of class resulted in surface learning that was not effective.

The writer looked at the issue of quality instruction and effective learning in the literature. Angelo and Cross (1993) argued that students often did not learn effectively when the instruction lacked quality. Angelo and Cross devoted an entire book to the purpose of achieving quality instruction. Instruction that promoted effective learning should be effective, efficient, and appealing (Smith & Ragan, 1992). According to Angelo and Cross, most college teachers came to teaching without training in educational theory and lacked skills to create high-quality teaching. Three separate studies, by Baird, Bloom, and Walberg, respectively, as cited in Gardiner (1994), revealed that a low quality of instruction correlated to a low quality of learning because this situation tended to emphasize a student's lack of ability. Each of the three studies concluded that any type of instruction other than conventional lectures resulted in "dramatically improved learning" (p. 97). A survey by Willits, Moore, and Enerson titled "Penn State - Quality of Instruction: Surveys of Students and Teachers at University Park" (as cited in Enerson, Johnson, Milner, & Plank, 1997, p. 9) found that student satisfaction with courses was directly related to "what *learners* [and not the teacher] saw, did, or discovered *because* of what the teacher did." This quote highlighted the centrality of the learners' experiences that lead to course satisfaction. Enerson (1997) explained that good quality teaching included both subject-matter expertise and explanatory expertise. Enerson argued that explanatory expertise created effective learning.

The place of memory in the learning process was very important, according to Gagné, as cited in Ramsey (1996). Gardiner (1994) described four separate studies by Brethower, Gustav, Heller, and McLeish that reported that students retained very little of what was taught in a lecture. Smith and Ragan (1992) argued that the memory problem began with a lack of transfer of short-memory information into long-term memory, often attributed to non-meaningful information (as interpreted by the student). Smith and Ragan added that poor organization of information resulted in minimal transfer to long-term memory. Smith and Ragan also reasoned that confusing cues and inappropriate recall strategies might have caused the inability to retrieve long-term memory information. Poor recall was one cause of non-mastery (Ramsey, 1996).

Chapter III: Anticipated Outcomes and Evaluation Instruments

Goals and Expectations

The writer had set three goals for the practicum:

1. Students would achieve high course grade-point averages and final-exam scores for the Materials of Construction and the Specifications, Estimating, and Contracts courses.

2. Students would show positive attitudes toward the Materials of Construction and the Specifications, Estimating, and Contracts courses.

3. Students would achieve mastery of basic construction terminology as evidenced by their performance on the Visual Wall-Section Test.

Expected Outcomes

The writer developed the following outcomes for this practicum:

1. The first-year students would demonstrate mastery of the Materials of Construction course. The standard of performance was that the class grade-point average would be at least 89%.

2. The first-year students would demonstrate mastery of the material on the final examination in the Materials

of Construction. The standard of performance was that the class grade-point average would be at least 75%.

3. The first-year students would show positive attitudes toward the Materials of Construction course. The standard of performance was that the students' attitudes toward the course would average at least 4 (on a 5-point Likert scale) concerning the Attitude Survey Question 13. Question 13 stated: "I feel confident that I learned a lot from the course."

4. The first-year students would rate as higher their perceptions of their knowledge in the Materials of Construction course. The standard of performance was that students would rate their level of knowledge increase at least 2.5 on the Likert scale, measured by the difference between the mean scores of Question 11 (entry-level knowledge) and Question 12 (knowledge after completing the course) of the Attitude Survey.

5. The first-year students would demonstrate mastery of the Specifications, Estimating, and Contracts course. The standard of performance was that the class grade-point average would be at least 89%.

6. The first-year students would demonstrate mastery of the material on the final examination in the Specifications, Estimating, and Contracts course. The

standard of performance was that the class grade-point average would be at least 75%.

7. The first-year students would show positive attitudes toward the Specifications, Estimating, and Contracts course. The standard of performance was that the students' attitudes toward the course would average at least 4 (on a 5-point Likert scale) concerning the Attitude Survey Question 13. Question 13 stated: "I feel confident that I learned a lot from the course."

8. The first-year students would rate as higher their perceptions of their knowledge in the Specifications, Estimating, and Contracts course. The standard of performance was that students would rate their level of knowledge increase at least 2.5 on the Likert scale, measured by the difference between the mean scores of Question 11 (entry-level knowledge) and Question 12 (knowledge after completing the course) of the Attitude Survey.

9. The first-year students would indicate mastery of basic construction terminology as evidenced by their scores on the Visual Wall-Section Test. The standard of performance was that at least 20 of the 25 students would score at least 90%.

Measurement of Outcomes

The writer measured the outcomes as follows:

1. The writer measured Outcomes 1 and 5 by recording and analyzing the results of weekly tests and final examinations. The writer recorded and analyzed this data for each course as part of the standard operating procedures planned for the semester. The writer summarized the data as grade-point averages for each student and as an overall average for each course.

2. The writer measured Outcomes 2 and 6 by recording and analyzing the results of final examinations for each course. The writer had developed a standard final examination for each course. The students took the final examinations during the last week of class. The writer allowed 4 hours for each exam and gave each exam on a separate day.

3. The writer measured Outcomes 3, 4, 7, and 8 by administering the Attitude Survey to each student for the courses and by analyzing the resultant data. The writer gave the Attitude Survey on the same day as the final examinations. Each student needed 15 minutes to answer the survey questions.

6. The writer measured Outcome 9 by recording the results of the Visual Wall-Section Test (see Figure 2). The writer allowed 1 hour for students to answer this fill-in-the-blank test. The writer analyzed the results in terms of the grade-point average for the test.

Chapter IV: Solution Strategy

Discussion and Evaluation of Solutions

The writer first reviewed the literature with a focus on instructional topics as potential solutions. Topics included what the traditional lecture format had to offer students, the hallmarks of quality instruction, and anchored instruction. The writer's second focus was on learning and students. Topics included the areas of engaged learning, the effect of technology on learning, retention of knowledge, long-term memory and short-term memory, student motivation, the effect of hypermedia on learning, the effect of multimedia on learning, hypertext for effective instructional delivery, the issue of learners' characteristics, and student attention spans.

The writer discovered several possible solutions and ideas based on the literature review. Many of the possible solutions focused on creating strategies to make learning effective. The writer explored each solution and decided which solution might help solve the problem of low achievement.

Jones, Valdez, Nowakowski, and Rassmussen (1998) characterized effective learning as challenging, authentic, and problem-based across various courses. Each of the writer's courses was complementary to the others. The Materials of Construction course and the Specifications, Estimating, and Contracts course tended to complement each other more than other course combinations. Additionally, students tended to optimize cognitive processes when placed in problem-solving situations that gave meaning to learning (Ramsey, 1996). The Cognition and Technology Group at Vanderbilt (1993) confirmed that meaningful and effective learning was a natural outcome of problem-based instruction that anchored learning in a context that students understood. The writer used this solution in the two courses by shifting the instructional emphasis in the courses from about 50% to 75% lecture-based to about 75% problem-based.

Kelly (1992) defined adult learners as those over the approximate age of 25 and suggested that non-threatening and non-evaluative classroom assessments helped adults to manage their learning environment. Because the writer's students had a mean age of 21.4 and shared several other characteristics of adult learners as defined by Kelly, the writer used some of Kelly's techniques in an effort to increase learning effectiveness. Classroom assessment techniques provided formative evaluation during the practicum implementation.

Kelly (1992) reported that adult learners found that cooperative learning could be effective and could provide necessary work-place skills. According to Jones, Valdez, Nowakowski, and Rassmussen (1998), collaboration was an important aspect of effective learning. The collaborative aspect of course work was in line with expectations of employers who said that graduates must be capable of team-based work (Bartz, 1998). The link between the classroom context and individual performance showed students the need for collaborative work efforts (Hagen & Weinstein, 1995). Gardiner (1994) cited eight studies that concluded that cooperative learning could enable students "to achieve almost any desired cognitive, affective, or motor learning outcome in any discipline" (p. 117). More cooperative-learning situations could provide for increased learning effectiveness during the practicum implementation. The writer made use of cooperative learning as an instructional approach in both courses.

Kelly (1992) suggested that adult learners benefited from experiential (situated) and context-based learning, such as learning in the workplace and hands-on class activities that related to real-world problems. The writer had observed that this aspect of learning worked well in the classroom. For example, when a student drew a wall section in class, the student performed a standard task found in the workplace. The literature helped to clarify the need for situated instruction in addition to the lecture format of information transmission (Smith & Ragan, 1992). Experiential learning tied in with the importance of creating an environment where engaged learning could occur. The concept of anchoring course-work and instruction in a context (contextualizing) was a vital necessity to promote active and effective learning (Branch, 1998; Dick & Carey, 1996; and Duchastel, 1996).

Ramsey (1996) stated that hypermedia, multimedia, and hypertext used for effective instructional delivery appeared to offer significant potential benefits. The use of technology tied in with the importance of creating an environment where engaged (effective) learning could occur. Ramsey argued that it was appropriate for education to use technology in pursuit of a rich learning environment. Dunlap and Grabinger (1996) reported that hypermedia, multimedia, and hypertext enabled learning that ranged from recall to higher-order thinking and problem solving. Gardiner (1994) stated that "very large gains in students' learning" (p. 121) could result from new and varied approaches to instruction that went beyond traditional lectures. The writer believed that the use of hypermedia, multimedia, and hypertext were instructional strategies that could improve student achievement in the Materials of Construction course and the Specifications, Estimating, and Contracts course. The writer used this solution as the basis for the practicum implementation.

In addition to discovering possible solutions to the problem, the writer's review of current literature turned up a guiding idea that the writer used as a framework for the practicum project. Smith and Ragan (1992) suggested that Bloom's "mastery learning" concept was nearly universal in its application to learning. The writer created a graphic model to depict "mastery learning." This graphic model (see Figure 4) illustrated the relationships among instruction, learner behaviors, and learner mastery of knowledge and skills.

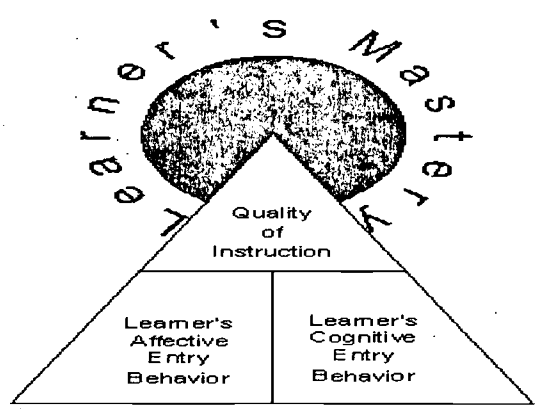


Figure 4. The Learner's Mastery Model: From Smith's and Ragan's (1992) description of Bloom's "mastery learning."

In this model, instructional quality and learner behavior supported the learner's mastery of a subject area. However, the supporting elements also worked to filter and modify the learner's ability to master instruction. This model of mastery learning clarified the systemic nature of learner characteristics and teaching quality. The writer decided to use the Learner's Mastery Model during the practicum implementation. The model served as a guiding principle of the link between effective teaching and effective learning.

Description of Selected Solution

The solution that the writer implemented corresponded to causes discovered in the analysis of student achievement data, student attitudes, and the literature (as discussed in Chapter II).

The writer encountered suggestions that a technologically enriched learning environment could lead to increased student learning effectiveness (e.g., Dunlap & Grabinger, 1996; Gardiner, 1994; Ramsey, 1996; and Smith & Ragan, 1992). Specifically, Ramsey (1996) argued that technology was well suited to create a rich learning environment and that technology that used hypermedia, multimedia, and hypertext could offer significant potential benefits. However, contrasting findings of previous studies required additional research studies. Petitt (as cited in Ramsey, 1996) found that multimedia instruction resulted in higher scores than did text-based instruction. Au (as cited in Ramsey, 1996) concluded that long-term memory improved by using computer-based instruction. Randel, Morris, Wetzel, and Whitehill (as cited in Ramsey, 1996) examined 14 studies and reported that simulation/gaming instruction resulted in increased long-term memory, as well as increased interest in the instruction. Ramsey reported that the three groups of studies found little difference in short-term memory improvement using technology as a substitute for conventional text-based instruction.

The practicum solution was composed of two parts. First, the writer used computer-based simulation/gaming instruction that aimed to increase retention of learning. Second, the writer used computer-based simulation/gaming instruction that aimed to increase student motivation and attention. The solution addressed the specific causes of the problem by the implementation of strategies suggested in the literature.

To help meet students' needs for variety in instructional delivery methods the writer created a computer-based simulation/game to supplement lectures in the Materials of Construction course. This game required students to accurately identify, place, and explain various components. The writer designed and developed the interactive wall-section game using ToolBook II(TM) (Asymetrix(R) ToolBook II(TM) Instructor, 1996), an authoring system for creating interactive courseware. The game included immediate feedback based on a student's actions during the gaming session and recorded students' scores. As one example of playing the game, students had to correctly identify a footing and match it to the appropriate word in a list on the same screen. This solution component focused on enhancing memory recall and interest. The writer designed this highly visual device to help anchor retained knowledge (Cognition & Technology Group at Vanderbilt, 1993).

The computer-based simulation/gaming instruction solution (designed and developed by the writer) for the Specifications, Estimating, and Contracts course used an imaginary building facade with 16 floors. The game required students to find specific construction components and place them on appropriate floors. The floors corresponded to a 16-division organization used in architectural design and construction to categorize construction components. The writer designed and developed the interactive building game using ToolBook II(TM) (Asymetrix(R) ToolBook II(TM)

Instructor, 1996). As one example of playing this game, students had to "pick" a door from a "delivery truck" and place the door on the eighth floor (the correct division). This solution component focused on problem solving, learning rules, memory recall, and motivation (interest in the game).

Report of Action Taken

In advance of the practicum implementation, the writer designed and developed two interactive simulation/gaming instruction modules: (1) an interactive wall-section game and (2) an interactive delivery-truck and storage-building game.

The writer's work during the practicum implementation included three principal activities:

1. The writer created and delivered all instruction related to the practicum, supervised all practicum interactive game playing, and administrated all testing related to the practicum implementation.

2. The writer kept a log (journal) of activity related to the practicum and periodically recorded anecdotal data from the practicum implementation activities.

3. The writer analyzed data related to the instruction by reviewing the log, course grade-point averages, survey responses, and test results.

The writer's work during the practicum implementation began during the spring semester, which included the Specifications, Estimating, and Contracts course and covered the first 4 months of the 8-month practicum implementation. The writer's work concluded after the fall semester, which included the Materials of Construction course and covered the remaining portion of the 8-month implementation. The following descriptions demonstrate the activities during the 8-month implementation.

At the beginning of the first month of the practicum implementation (the spring semester), the writer copied the computer-based simulation/gaming instruction program (designed and developed by the writer) for the Specifications, Estimating, and Contracts course onto a 100-megabyte portable diskette (the actual program used approximately 5-megabytes). The writer then loaded the program onto 25 computers. During the loading process, the writer checked every fifth computer to verify that the program worked as planned. The writer found that the program worked as planned, provided audible and visual feedback, and scored user input correctly. The writer assembled the students ($\underline{N}$ = 20 for the spring semester) and explained the concept of the interactive program (the game), the procedure to find the program on their computers, the procedure for starting the program, and the procedure for playing the game. The writer directed the students to play the game until they were confident that they had thoroughly learned the rules and organization presented in the game. The writer oversaw the students' playing of the interactive programs and encouraged students to keep playing the game at least once a week. The writer observed that all 20 students played the game once a week for the first 3 weeks of game usage.

During the second month of the implementation, the writer observed that an average of 12 students played the interactive game once a week. The writer observed that all 20 students used the on-line help portion of the game to help solve classroom exercises. The writer initiated two focus groups composed of 2 and 3 students respectively. The writer learned that the all students stated that they enjoyed playing the game, found the on-line help supportive in all their class work, and found that all aspects of the program worked to their satisfaction. Based on these focus group results, the writer coached all the students to continue using the program and the on-line help.

During the third month, the writer observed that an average of 6 students played the game once a week and all

20 students continued to use the on-line help on an average of once a week.

At the beginning of the fourth month, the writer gathered all the students together and recommended that all students play the game until satisfied that they had learned the information. At the end of the fourth month, the writer administered the final examination and attitude survey (Appendix A) to each of the students. The writer recorded the final examination scores, attitude survey responses, and course grade-point averages.

At the beginning of the fifth month of the practicum implementation (the fall semester), the writer copied a new computer-based simulation/gaming instruction program (designed and developed by the writer) for the Materials of Construction course onto a 100-megabyte portable diskette (the actual program used approximately 4-megabytes). The writer then loaded the program onto 25 computers. The writer did not check for full and correct program operation beyond observing that the programs performed the basic start-up correctly. The writer administered the Visual Wall-Section test (Figure 2) as a pretest. The Visual Wall-Section test was a standard test in the writer's class. The writer assembled the students (N = 25 for the beginning of the fall semester) and explained the concept of the interactive program (the game), the procedure to find the program on their computers, the procedure for starting the program, and the procedure for playing the game. The writer directed the students to play the game until they consistently scored 100% correct. The writer told students that after they scored a consistent 100% correct, they could stop playing for a week, then try again. The writer oversaw the students' playing of the interactive programs. The writer encouraged students to keep playing the game at least once a week and until they had mastered the game content as evidenced by 100% scores. The writer observed that all 25 students played the game three or four times a week for the first 4 weeks of game usage. During the first 3 weeks of game play, 15 students called the writer to observe an error message that their computers displayed upon beginning the game. The writer discovered that the computers did not recognize the sound cards (installed in the computers) and consequently did not play any audio during the game. At times when students did not use their computers, the writer attempted to configure the computers to recognize the sound cards. The writer spent 2 hours per day for 2 weeks attempting to remedy the sound problem and called the computer vendor for suggestions (to no avail). The writer did not solve the audio problem. The writer disregarded the audio problem based on observations that the students appeared to enjoy and play the game enthusiastically.

During the sixth month of the implementation, the writer observed that an average of 15 students played the interactive game once a week. The writer initiated two focus groups composed of 2 students each and a third group composed of 3 students. The writer learned that all students stated they enjoyed playing the game but two problems occurred. Each focus group student said that the computer did not play the audio portion of the game (this was consistent with the writer's observations during the first 3 weeks of game play). Five of the students from the focus groups explained that the computers gave maximum scores of 89%, in spite of the students correctly answering all of the problems. The writer investigated this problem and identified about one-third of the computers that gave limited maximum scores. The writer reinstalled the program on three computers to confirm the problem, but found no change in the scoring limitation. The writer played the game on two or three of the problem computers and produced similar limited scores in spite of correctly answering all of the problems. The writer found no solution, but based on the overall positive reaction of students to the game did not pursue the issue further.

During the seventh month, the writer observed that an average of 5 students played the game once a week. The writer heard from 2 students that they continued to be irritated with the computer problem of limited scoring.

At the beginning of the eighth month, the writer gathered all the students (N = 20 because of attrition) together recommended that they play the game until satisfied that they had learned the information. The writer realized that about one-third of the students had to guess when they achieved 100% scores because of the computer problem of limited maximum scores. The writer observed that all students played the game an average of 2 times a week during this month. At the end of the eighth month, the writer administered the final examinations, the Visual Wall-Section test, and attitude surveys (Appendix A) to each of the students. The writer recorded the final examination scores, Visual Wall-Section test scores, attitude survey responses, and course grade-point averages.

Chapter V: Results

Results

The problem that the writer hoped to solve was that students tended to underachieve in courses that were mainly cognitive in nature. Additionally, the writer hoped that the practicum would accomplish three goals. These three goals were:

1. Students would achieve high course grade-point averages and final-exam scores for the Materials of Construction and the Specifications, Estimating, and Contracts courses.

2. Students would show positive attitudes toward the Materials of Construction and the Specifications, Estimating, and Contracts courses.

3. Students would achieve mastery of basic construction terminology as evidenced by their performance on the Visual Wall-Section Test.

Based on the three goals of the practicum, the writer developed the following outcomes:

1. The first-year students would demonstrate mastery of the Materials of Construction course. The standard of performance was that the class grade-point average would be at least 89%.

This outcome was not met. The class grade-point average for the Materials of Construction course was 78.9%.

2. The first-year students would demonstrate mastery of the material on the final examination in the Materials of Construction course. The standard of performance was that the class grade-point average would be at least 75%.

This outcome was not met. The final examination grade-point average for the Materials of Construction course was 74.2%.

3. The first-year students would show positive attitudes toward the Materials of Construction course. The standard of performance was that the students' attitudes toward the course would average at least 4 (on a 5-point Likert scale) concerning the Attitude Survey Question 13. Question 13 stated: "I feel confident that I learned a lot from the course."

This outcome was met. The mean score for the Materials of Construction course was 4.2.

4. The first-year students would rate as higher their perceptions of their knowledge in the Materials of Construction course. The standard of performance was that students would rate their level of increased knowledge at least 2.5 on a Likert scale, measured as the difference between the mean scores of Question 11 (entry-level

knowledge) and Question 12 (knowledge after completing the course) of the Attitude Survey.

This outcome was not met. The mean score for the survey question dealing with a perceived increase in knowledge was 2.1.

5. The first-year students would demonstrate mastery of the Specifications, Estimating, and Contracts course. The standard of performance was that the class grade-point average would be at least 89%.

This outcome was not met. The class grade-point average for the Specifications, Estimating, and Contracts course was 81.4%.

6. The first-year students would demonstrate mastery of the material on the final examination in the Specifications, Estimating, and Contracts course. The standard of performance was that the class grade-point average would be at least 75%.

This outcome was met. The final examination grade-point average for the Specifications, Estimating, and Contracts course was 75%.

7. The first-year students would show positive attitudes toward the Specifications, Estimating, and Contracts course. The standard of performance was that the students' attitudes toward the course would average at

least 4 (on a 5-point Likert-scale) concerning the Attitude Survey Question 13. Question 13 stated: "I feel confident that I learned a lot from the course."

This outcome was not met. The mean score for the Specifications, Estimating, and Contracts course was 3.5.

8. The first-year students would rate as higher their perceptions of their knowledge in the Specifications, Estimating, and Contracts course. The standard of performance was that students would rate their level of increased knowledge at least 2.5 on a Likert scale, measured as the difference between the mean scores of Question 11 (entry-level knowledge) and Question 12 (knowledge after completing the course) of the Attitude Survey.

This outcome was not met. The mean score for the survey question dealing with a perceived increase in knowledge was 1.67.

9. The first-year students would indicate mastery of basic construction terminology as evidenced by their scores on the Visual Wall-Section Test. The standard of performance was that at least 80% of the students would score at least 90%.

This outcome was not met. Forty-five percent of students (*N* = 20) scored at least a 90%.

Discussion

Table 2 illustrates the results in a way that provides more detail.

Table 2

Summary of Outcomes' Results and Benchmarks

No.	Course	Content	Target Result	Actual Result	Met	Benchmark
1	Materials	Class GPA	89%	78.9%	No	76.4%
2	Materials	Final Exam GPA	75%	74.2	No	66%
3	Materials	Attitude	4	4.2	Yes	3.8
4	Materials	Learning	2.5	2.1	No	1.2
5	SEC	Class GPA	89%	81.4%	No	77.6
6	SEC	Final Exam GPA	75%	75%	Yes	59%
7	SEC	Attitude	4	3.5	No	ND
8	SEC	Learning	2.5	1.67	No	ND
9	Basic Terms	Wall-Section Test	80% score ≤90%	45% scored ≤90%	No	29% scored ≤90%

Note: NA = no previous class data; No. = outcome number; SEC = Specifications, Estimating, and Contracts; GPA = grade-point average; Benchmark = previous year's class average.

Despite the fact that only two of nine outcomes were met, the writer believed that the practicum was successful. Each outcome result was an improvement over previous classes. Improvement was the overall goal for the practicum as stated in the title. For example, the Materials of Construction course final examination grade-point average missed meeting the outcome target-average by only eight-tenths of a point. More significantly, the final examination grade-point average was an improvement of approximately eight points over the benchmark score from the previous class. As a second example, the Specifications, Estimating, and Contracts course grade-point average missed meeting the outcome target by approximately eight points but showed an improvement over the benchmark average of approximately four points. Even the construction-terminology test results showed an improvement of 55% over the benchmark test score average, although falling short of the outcome target.

Thus, based on the data shown in Table 2, the writer is confident that improvement occurred in each outcome area, although the improvement was not as large as the writer had hoped would occur.

An unforeseen, but positive offshoot of the computer-based instruction was that students used the

Specifications, Estimating, and Contracts interactive game's on-line help screens to aid in making accurate building component classifications during group projects throughout the semester in other technical course work. Thus, this interactive game provided students with a tool to aid in learning the organization and structure of the 16 building component categories for the entire year. Hartley and Davies, as cited in Kemp, Morrison, & Ross (1998), suggested that instructional procedures that arranged and organized course information facilitated effective learning. By introducing this interactive game to the students when the semester began, the writer provided an advanced organizer that served as an effective preinstructional strategy (Kemp, Morrison, & Ross).

The computer-based instruction worked to give students learning opportunities outside of regular class time and at a pace chosen by the students. This concept of self-paced learning was an idea that appealed to students as evidenced in the initial research for this practicum. Students played the Specifications, Estimating, and Contracts interactive game throughout the semester at times of their own choosing. Kemp, Morrison, & Ross (1998) argued that self-paced learning tended to improve learning and retention of information.

The appeal of the computer-based learning games surfaced during periodic observations of the students. The writer observed students as they used both games. About two-thirds of the students made audible comments of interest ("ooos," "aaahs," and "cool") when they played the game the first few times.

Several issues emerged from the students' use of the interactive wall-section game. The first issue surfaced during a mid-semester focus group discussion in which one-quarter of the students complained that they were frustrated with the wall-game. Their frustration was with odd scoring of the game. All students used identical computers (newly installed in August 1998), and the writer installed the game using identical procedures (and the same installation disk). However, about one-third of the wall-section games gave a maximum score of 89% although students answered all questions correctly. Reinstallation of the wall-section game on the problem computers made no change. One student (who possessed advanced computer skills and construction knowledge) reported being "angry" because the game did not score correctly and stopped playing. This situation continued to be an irritant for two students throughout the semester. Shellnut, Knowlton, & Savage, (1999) suggested that students needed to *correctly* assess their progress in a positive manner and this would generate confidence to persevere in the game. Thus, this apparent hardware problem may have caused students to not work as diligently as they might have if the correct scores had registered at the game's end. Further, this issue may have contributed directly to the practicum's failure to meet Outcomes 1, 2, 4, and 9 because at least three students lost interest in playing the game.

A second issue with the wall-section game was the lack of audible feedback while playing the game. The writer had installed the wall-game on other computers (not the student computers) without a problem. However, the students' computers did not recognize the sound cards installed in them and did not play the audible portion of the game program. This problem did not prevent the students from using the program. The game did provide graphic feedback; however, the writer had intended that the graphic feedback would include sound for interest and reinforcement. Additionally, the computers gave annoying messages that announced that the computer could not play the intended sounds. These messages popped up as students started the games. During the first 3 weeks of game play, students called the writer to their computers to see the messages. In spite of the sound problem, students said that they enjoyed the game. In fact, the writer observed that two students continued to play the game in the second semester (after the Materials of Construction course had ended). The writer spent over 10 hours attempting to get the computers to play sound, with no success. As no technology support existed on campus and the computer vendor provided no workable solutions, the writer stopped trying to solve the sound problem. The writer believed that the game functioned as intended without the addition of sound (which only amplified the graphic feedback). Mory (1996) reinforced the writer's belief by reporting that only half the feedback (task-specific) studies confirmed "significant improvements in learning" (p. 929).

A third issue surfaced regarding how much time on-task was required of the students. Students who played the wall-section game asked when they could stop playing the game. The writer told the students that they could stop when they consistently scored 100%. Although students provided all the correct answers, the game did not always reward students with complete scores. Thus, students stopped playing the game before scoring 100% causing the writer to lose control of the number of times these students reviewed the material. During focus group discussions, several students said that they could never be quite sure that they had answered the questions correctly. They stopped playing when they believed that they had supplied all the correct answers. Thus, although students clearly enjoyed the game, they may not have gotten the full benefit of the wall-section game. Shellnut, Knowlton, & Savage, (1999) argued that students needed to gain accurate assessments of their progress to judge where they were in the learning process. Knowing accurate scores would have contributed to students gaining confidence in their work.

In summary, although only two outcomes were met, the practicum clearly did improve students' learning and attitudes.

Recommendations

The first recommendation is for the writer to repeat the wall-section game work in next year's Materials of Construction course. As noted above, the final examination mean score was within eight-tenths of the goal. A new class of students might meet the goal without additional intervention by the writer.

The second recommendation is that authors of computer-based educational games should install their products on several computers (including the actual intended machines) to test for compatibility and full functionality. Computers may not work as expected for the simplest of tasks.

Dissemination

The writer disseminated findings from the first half of the practicum implementation in a poster session at the Nova Southeastern University Summer Institute of 1999. The writer received positive interest in the work from attendees at this conference who took time to chat.

The writer plans to submit this paper to the Educational Resources Information Center (ERIC). If accepted, the practicum would offer guidance to others planning computer-based instruction, especially in a vocational-technical college setting.

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APPENDIX A

ATTITUDE SURVEY

This survey is to find out what you thought about the
Construction Materials Course.

The Construction Materials course is different from other courses in that it uses extensive testing and uses exercises that require critical reading. Additionally it is presented in a traditional lecture format. So, please answer the following questions. **Please do not tell me what you think I might want to hear!**

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1	The testing helped me to learn the information that I need to know	SA	A	N	D	SD
2	I found the testing to be difficult to do well in	SA	A	N	D	SD
3	I did better on the material course tests than other tests (include math, etc.)	SA	A	N	D	SD
4	The testing could be improved this way					
5	I like doing group exercises	SA	A	N	D	SD
6	The group exercises helped me to learn the information that I need to know	SA	A	N	D	SD
7	I enjoy learning in a lecture format	SA	A	N	D	SD
8	I prefer to learn new information by solving problems, rather than in lecture	SA	A	N	D	SD
9	I prefer to do individual exercises to learn new information/apply knowledge	SA	A	N	D	SD
10	I prefer to learn new information by independent reading	SA	A	N	D	SD
11	Before taking the course, my knowledge about materials was extensive	SA	A	N	D	SD
12	After taking the course, my knowledge about materials is extensive	SA	A	N	D	SD
13	I feel confident that I learned a lot from the course	SA	A	N	D	SD
14	I could have learned more if the course had been presented in a different format.	SA	A	N	D	SD
15	I liked this **most** about the course					
16	I disliked this **most** about the course					
17	I would change the course this way					
18	I learn best in a self-paced learning environment	SA	A	N	D	SD
19	I like the flexibility to learn new information on my own time or schedule	SA	A	N	D	SD
20	My age is	18-22	23-27	28-32	32 +	
21	My overall grade point average is	Below 1	1 to 1.9	2 to 2.9	3 to 4	
22	My gender is	F	M			
23	My year in college is	1st	2nd			

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Author(s): A. Allen Hitchcock

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