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ABSTRACT

This article examines various learning styles relative to computer use. The learning theories discussed are: (1) Productive thinking, (2) Creative thinking, (3) Attention directing, (4) Learning strategies, (5) Non-cognitive aspects, and (6) Beliefs.

This paper attempts to empirically measure the change in student attitudes caused by hands-on experience in computer usage. It is based on the reasoning that concrete experience will tend to lessen fear or aversion to computer use and, hence, will cause a positive change in student attitude toward use of computers in the educational process.

Two types of delivery systems were tested: MIS theory and hands-on instruction of microcomputers. Matched pairs of sections for the two types of delivery systems were used. The sample size for the pre-treatment (at the beginning of the semester) group was 212. The sample size of the post-treatment (at mid-term when the matched sections switched classrooms) group was 369.

The t-test was used to compare the attitude results of the concepts and the hands-on sections. The results indicate that those students who did gain concrete experience in the hands-on sections had a more positive attitude toward the use of computer technology in learning.

INTRODUCTION

This article presents the experience of one university in integrating the microcomputer in the introductory management information systems course and the impact of this integration on student attitudes. The first part of the article discusses the background and rationale for the study as well as the experimental setting. The second section contains information about the process of integrating the microcomputer in an introductory MIS course. The last part of the article details the impact of this integration on student perceptions.

BACKGROUND AND RATIONALE

The computer revolution has spanned 50 years of innovation. Beginning with ENIAC in 1944, we have moved through four generations of computers. Perhaps no single event has been more important than the introduction and widespread usage of microcomputers. Micros were popularly introduced in the late 1970s with Apple's introduction of the first commercially available personal computer. Through the '80s PCs have been developed with abilities exceeding some minicomputers and approaching those of the low-end mainframe. With the increase in power has come increased usage in various settings—especially within education.

Universities in general and schools of business in particular, have been quick to adapt and integrate PCs into courses and curriculum. Today, students learn skills not only of word processing and spreadsheets (for example, Lotus 1-2-3) but also learn about data bases, graphics and specialized software for courses in Economics, Finance, and Accounting. MIS faculty teach and develop courses geared to introduce students to the computer and these programs.

The present researchers were interested in examining student perception and attitudes toward this use of computer technology. Specifically, we sought to examine the impact of course integration of computers on student attitudes *toward* computers and PCs.

The use of microcomputers, or personal computers (PCs), in information systems and accounting education is a fact of life. Borthick and Clark (1987) trace the use of computers in accounting education to the late 1960s. They reason that since computer use in accounting education is growing, accounting educators should investigate the effects of this computer use. These effects could be evaluated, for example, by (1) comparisons of alternative ways and methods of using computing, and (2) comparisons of computer use with no computer use in various settings.

Borthick and Clark cite Minch and Ray (1986) in pointing out that one aspect of attitude that may be a factor in students' learning is their degree of computer anxiety or fear or aversion to computer use. They opine that "computer anxiety caused by lack of familiarity with computers should be surmountable with student use of computing in accounting education" (1987, p. 179).

Regarding student attitude toward computer integration, Borthick and Clark state that it is a proxy for the perceived learning value of computer use in accounting. One's attitude reflects receptiveness toward and expectations for learning particular subject matter (1987).

This paper attempts to empirically measure the change in student attitudes caused by hands-on experience in computer usage. It is based on the reasoning that concrete experience will tend to lessen fear or aversion to computer use and, hence, will cause a positive change in student attitude toward the use of computers in the educational process.

Baldwin and Reckers (1984), in a seminal adaptation of Kolb's Experiential Learning Model (1976) to accounting education, argue for using students' learning styles for advisement in college major selection and accounting instructor teaching styles.

The process would encompass classification of students into four groups based on scores obtained on Kolb's Learning Style Inventory (LSI) instrument. The LSI measures preference scores on four categories. These are: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). The four categories give rise to two continua, CE-AC and AE-RO. A specific student's preferred learning style is classified into one of four classifications based on their LSI score. These classifications are (1) Divergers, (2) Accommodators, (3) Convergers, and (4) Assimilators.

Baldwin and Reckers (1984) hypothesized that many accounting students would be classified as Convergers. That is, their dominant learning abilities are assumed to be Abstract Conceptualization and Active Experimentation. Also, a Converger's greatest strength is in the practical application of ideas.[1] The authors report some empirical support for their hypothesis. Baker, Simon, and Bazeli (1986) in a study of 110 senior accounting majors enrolled in a CPA Problems course, found 40 percent of accounting majors were Convergers. Brown and Burke (1987) also found some empirical support for the belief that the majority of accounting students and practitioners prefer the Converger's learning style.

Kolb's Experiential Learning Model conceptualizes learning as a circular process. Learning starts with "concrete experience," moves on to "abstract conceptualization" which leads to "active experimentation" and finally loops back to "concrete experience."

Baker, Simon, and Bazeli (1986, p. 12) conclude:

> Awareness of the diversity of learning style preferences in a single classroom is important for a teacher presenting material to that class. Prior research shows an association between students' learning styles and preferences for certain teaching methods as well as student preferences for faculty who have the same learning style as the student. The implications for faculty include the necessity to include a variety of learning opportunities in each class and the understanding that different students need different teaching approaches.

Empirical research to date in the accounting literature on learning style has used students enrolled in the introductory accounting course, the senior CPA Problems course, and Canadian students in all four years of the undergraduate accounting program.

Loyd and Gressard (1984) found a paucity of empirical studies on the existence of student computer anxiety and attitudes toward computers. They addressed this need by conducting an empirical study among high school and college students. Our study of students enrolled in the introductory information systems course will further understanding in this crucial area of education.

Since the increasing use of computers in accounting education is an undeniable fact, we wanted to create a learning environment in a first MIS course for accounting and other business majors that would try to incorporate as many of the different learning styles discussed by Kolb as possible. From Kolb's perspective, the most major deficiency in lecture-discussion type of accounting course would be the absence of "concrete experience." We designed an MIS course that would not only overcome this deficiency, but also created a laboratory-style situation in which we could study its impact on student attitude.

[1] For excellent summaries of Kolb's Experiential Learning Model, see Baldwin and Reckers (1984) and Baker, Simon, and Bazeli (1986).

This empirical project has been designed to achieve the following objectives:

1. To develop a course, unlike most accounting and some information systems courses, that introduces elements of "concrete experience" which is the beginning stage of Kolb's Learning Style Theory. The three other stages—Reflective Observation (RO), Abstract Conceptualization (AC), Active Experimentation (AE)— are also present in this course. This was done as a first step toward the development of courses incorporating ideal levels of all four stages of learning as suggested by Baker, Simon, and Bazeli (1986).
2. To mesure the change in students' attitudes toward computers caused by introducing "concrete experience" of computers into the course work.
3. To extend the generalizability of computer-based accounting and business education empirical studies to a group of students enrolled in an introductory management information systems course.

THE EXPERIMENTAL SETTING

The Introduction to Business Information Systems course is the class used by the College of Business to meet the AACSB information systems Common Body of Knowledge core. As a result, this particular class now covers the two content areas of computer concepts and hands-on computer topics. The concepts portion includes an introduction to those topics that are of interest to business majors such as parts of a management information system, systems analysis, strategic information systems, management of IS, and decision support systems. The hands-on component covers the areas of the disk operating system (DOS), electronic spreadsheets, and database management. The course is typically taken by students during their sophomore year.

All faculty members who teach this course receive a model syllabus that has been prepared by the course coordinator. This syllabus indicates the topical coverage for the concepts and the hands-on portions of the course.

A number of faculty members were concerned that some instructors might spend the entire semester concentrating on the hands-on component rather than limiting that time to 50 percent or less of the course. In order to prevent this, the information systems faculty divided the course into two halves with matching sections for each time slot in the schedule. One of these matched pair classes spends the first half of the semester in the computer classroom for the hands-on component while the other section remains in a regular classroom for the concepts component. At the midpoint of the semester, the two classes switch rooms.

One of the major benefits for both students and teachers of the hands-on component of this particular class is the microcomputer classroom. This classroom allows students to get immediate feedback and reinforcement of material concerning a software package as it is covered in the lecture. Since the student is actually able to immediately and concretely experience what has just been covered in the lecture, this approach dramatically decreases the amount of "start up" time involved in learning a package.

Students are expected to demonstrate computer competence with all software tools covered in class. This means that they must show competence in DOS, database, and spreadsheets.

The computer literacy course for the university (offered through the English Department) covers a Mac-based word processing package and some students have not had exposure to a DOS-based word processing package, some faculty members spend a day or so introducing WordPerfect to their students. These instructors then typically require their students to either write a series of annotated bibliographies related to a topic that they have selected or require them to write an eight- to ten-page term paper.

While one section of the matched pair classes is in the computer classroom, the other is in a regular classroom receiving the MIS concepts coverage. These topics include MIS and decision support systems, artificial intelligence and expert systems, strategic information systems, connectivity and data communications, data management, systems analysis and design, prototyping, management of information systems, and evaluation of hardware and software.

DESCRIPTION OF THE STUDY AND ANALYSIS OF RESULTS

The use of matched pairs of course sections and the different treatment received by the students in each of those sections provided an ideal opportunity to examine the impact of the two modes of class presentation on the attitudes of the students toward the computer.

Hypothesis

The hypothesis that was empirically tested concerned the change in student attitude caused by concrete experience in computer usage. It was stated as:

> H_0: There is no change in the attitude of students toward computer usage enrolled in the first MIS course due to concete hands-on experience with computers.

Questionnaire

The questionnaire contained in Appendix A was designed and developed to achieve this goal. The first part of the instrument contains demographic questions. The second part requests the respondents' attitudes toward computers. Portions of a questionnaire designed by Matthews and Wolf (1983, p. 3) were used for this section. These researchers reported a high face validity and reliability; the split-half reliability of the instrument was .74 for the first factor (appreciative attitude toward computers). These are questions which are phrased in a positive manner. The second factor (critical attitude toward computers) had a split-half reliability of .78. These are questions which are phrased in a negative manner. Questions 33-37 were added by the authors.

The questionnaire was administered two times during the semester. The first time was at the beginning of the semester, that is, before the two treatments had been administered (Table 1). The second time was at mid-term, the point in the semester when the matched sections switched classrooms (Table 2).

Sample

The sample size used for the pre-treatment group was 212. Of this group, 47% were female and 53% were male. The majority of the students (63%) were native students rather than transfer students. A small portion (19%) owned their own microcomputer.

The sample size of the post-treatment group was 369. The demographic characteristics of this sample were the same as those of the first sample.

Results

The t-test was used to compare the attitude results of the concepts and the hands-on sections. The results of the study before the treatment was applied appear in Table 1. Note that agreement with items having negative connotations was taken as an indication of unfavorable attitude.

Table 1*. The T-Test Results of the Questionnaire before the Treatment Was Applied

	Concepts Group	Lab Group	Stat. Sign.
16. Our lives will continue to be better because of computers.....SD D N A SA	4.20	4.18	.86
17. The world is better because of computers.....SD D N A SA	4.00	3.96	.73
18. Computers mean progress.....SD D N A SA	4.19	4.18	.94
19. Computers help us achieve what we want.....SD D N A SA	3.95	3.91	.73
20. We need computers.....SD D N A SA	4.10	4.05	.66
21. By doing tedious tasks, computers allow people to do more creative tasks.....SD D N A SA	4.33	4.27	.56
22. Computers are really necessary.....SD D N A SA	3.98	4.04	.58
23. Computers are making our lives better.....SD D N A SA	3.97	3.90	.53
24. We are becoming too dependent on computers.....SD D N A SA	3.16	2.93	.07
25. Our freedom is being limited by computers.....SD D N A SA	2.31	2.33	.81
26. People are becoming too dependent on computers.....SD D N A SA	3.14	2.87	.06
27. Computers represent a real threat to privacy.....SD D N A SA	2.81	2.69	.36
28. My life has been over-complicated by computers.....SD D N A SA	2.20	2.32	.29
29. Computers are decreasing our freedom.....SD D N A SA	2.16	2.23	.48
30. Computers have too much control over people's lives.....SD D N A SA	2.41	2.43	.79
31. Technology is changing our lives too rapidly.....SD D N A SA	2.53	2.49	.70
32. Knowledge of microcomputer application software helps me with other courses.....SD D N A SA	4.00	3.85	.19
33. Knowledge of word processing software will be beneficial in other courses.....SD D N A SA	4.31	4.27	.65
34. Knowledge of data base software will be beneficial in other courses.....SD D N A SA	3.96	3.98	.84
35. Knowledge of spreadsheet software will be beneficial in other courses.....SD D N A SA	4.03	4.03	.99
36. Knowledge of the disk operating system will be beneficial in other courses.....SD D N A SA	3.88	4.08	.04**

* 1 = Strongly Disagree and 5 = Strongly Agree

The means of the two groups (concepts vs. hands-on) are presented for the attitude scale. Scores can range from 1 (SD) to 5 (SA).

The only statistically significant result obtained that was at the .05 level was for question 37. It is surmised by the authors that this particular finding was the result of the students' coverage of this material in the hands-on portion of the course. Some instructors did not administer the exam until after some of the DOS related material had been covered. To maintain the validity of the study, only those questionnaires that were turned in before two weeks into the semester had passed were used.

Table 2 presents data from the second questionnaire administered after the treatment was received. The questionnaire items listed in Table 2 are those items for which the difference in mean responses was significant at the .05 level.

Table 2. T-test Results After the Treatment was Applied

		Concepts Group	Lab Group	Stat. Sign.
16.	Our lives will continue to be better because of computers.....SD D N A SA	4.1076	4.2759	.032
17.	The world is better because of computers.....SD D N A SA	3.8475	4.0138	.050
18.	Computers mean progress.....SD D N A SA	4.0090	4.2552	.001
19.	Computers help us achieve what we want.....SD D N A SA	3.8341	4.0828	.001
20.	We need computers.....SD D N A SA	3.7444	3.9862	.012
25.	Our freedom is being limited by computers.....SD D N A SA	2.6233	2.4345	.05
28.	My life has been over-complicated by computers.....SD D N A SA	2.6682	2.3655	.004
29.	Computers are decreasing our freedom.....SD D N A SA	2.5740	2.2621	.001
30.	Computers have too much control over people's lives.....SD D N A SA	2.6637	2.2966	.000
31.	Technology is changing our lives too rapidly.....SD D N A SA	2.7117	2.3655	.001
32.	Knowledge of microcomputer application software helps me with other courses.....SD D N A SA	3.7702	4.1241	.000
33.	Knowledge of word processing software will be beneficial in other courses.....SD D N A SA	4.2342	4.3862	.021

* 1 = Strongly Disagree and 5 = Strongly Agree

These results indicate that the null hypothesis was rejected. In addition to examining the differences between the two modes of presentation, the impact of the demographic variables from Part I of the instrument were tested. None of the variables such as exposure to microcomputers in high school, owning a microcomputer, prior microcomputer experience, year in school, and so forth provided any statistically significant differences that were of use to the study.

The results indicate that those students who had been in the hands-on section had a more positive attitude toward computers than did those who were in the sections covering the MIS concepts first.

CONCLUSION

These results indicate that those students who did gain concrete experience in the hands-on sections had a more positive attitude towards the use of computer technology in learning.

The t-tests have provided an interesting finding concerning apparent effects of lab training on both student groups' positive attitudes and prejudice. Table 2 indicates the students from the hands-on group have more positive attitudes toward computers and their value to society. Their negative attitudes toward computers were significantly lessened. The concepts group revealed an increase in negative attitude toward computers.

This result is further highlighted in Table 3. An examination of Table 3 indicates that the concepts group became less positive after the treatment on each of the seven positive questions that were statistically significant. On the other hand, the lab group showed a greater positive attitude on six of these seven questions.

Table 3. Differences in Question Averages Between the Pre-Test and Post-Test

	Concepts Group with Trend			Lab Group with Trend		
Positive Trend Questions	Pre-Test Value	Post-Test Value	Trend	Pre-Test Value	Post-Test Value	Trend
No. 17	4.20	4.10	-	4.18	4.28	+
No. 18	4.00	3.85	-	3.98	4.01	+
No. 19	4.19	4.01	-	4.18	4.25	+
No. 20	3.95	3.83	-	3.91	4.08	+
No. 21	4.10	3.74	-	4.05	3.99	-
No. 33	4.00	3.77	-	3.85	4.12	+
No. 34	4.31	4.23	-	4.27	4.39	+
Negative Trend Questions						
No. 26	2.31	2.62	+	2.33	2.43	+
No. 29	2.20	2.67	+	2.32	2.37	+
No. 30	2.16	2.57	+	2.23	2.26	+
No. 31	2.41	2.66	+	2.43	2.30	-
No. 32	2.53	2.71	+	2.49	2.37	-

This study suggests several avenues for further research. These are: (1) a longitudinal study tracking attitudes of introductory students over a period of years, (2) the expansion of the subjects to include upper-level accounting and business information systems majors, and (3) a more complex design that interrelates concrete experience, reflective observation, abstract conceptualization, and active experimentation.

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APPENDIX A

Dear College of Business Information Systems Student:

Your cooperation in filling out the enclosed questionnaire is requested. This questionnaire requires approximately twenty minutes. The purpose of this questionnaire is to measure the effectiveness of curriculum changes to the data processing courses at Illinois State University.

Please do not sign the questionnaire; your responses are anonymous.

Computer Usage Survey

I. Background Information

Please enter the information requested below.

1. Today's date is: _____
2. My section is (01-16) ____ Time course meets ____ Days of the week ____
3. Year Born: 19 _____
4. Major (or intended major): _____

Please check the appropriate response for the questions below.

5. Gender: Male ☐ Female ☐
6. Year in School: Freshman (0-29 hrs.) ☐ Senior (90-120 hrs.) ☐
   Sophomore (30-59 hrs.) ☐ Graduate (over 120 hrs.) ☐
   Junior (60-89 hrs.) ☐ Other ☐
7. Are you a transfer student? Yes ☐ No ☐
8. Overall GPA: 3.0-4.0 ☐ 2.5-2.99 ☐ 2.0-2.49 ☐ Below 2.0 ☐
9. Previous college data processing course work: (A course in which the *entire term* is devoted to data processing, computer science, computer programming, management information systems, or other computer concepts.)

   No courses ☐
   1-2 courses ☐
   3-4 courses ☐
   Over 4 courses ☐

10. Number of courses that integrated the computer: (For example, a finance course that used the computer as a tool to aid a financial decision.)

    No courses ☐
    1-2 courses ☐
    3-4 courses ☐
    Over 4 courses ☐

11. Average number of hours spent per week on this course outside of class:
    0-1 ☐
    1-3 ☐
    3-6 ☐
    6-9 ☐
    Over 9 ☐
12. Exposure to computers in high school: Some ☐ None ☐
13. Do you own a microcomputer? Yes ☐ No ☐
14. Do you plan to purchase a microcomputer? Yes ☐ No ☐
15. Do you plan to select the Business Information Systems (BIS) sequence? Yes ☐ No ☐

II. Attitude Toward Computers

Please circle the response that most closely matches your feelings about the following statements.

SD = Strongly Disagree D = Disagree N = No Opinion
A = Agree SA = Strongly Agree

16. Our lives will continue to be better because of computers.....SD D N A SA
17. The world is better because of computers.....SD D N A SA
18. Computers mean progress.....SD D N A SA
19. Computers help us achieve what we want.....SD D N A SA
20. We need computers.....SD D N A SA
21. By doing tedious tasks, computers allow people to do more creative tasks.....SD D N A SA
22. Computers are really necessary.....SD D N A SA
23. Computers are making our lives better.....SD D N A SA
24. We are becoming too dependent on computers.....SD D N A SA
25. Our freedom is being limited by computers.....SD D N A SA
26. People are becoming too dependent on computers.....SD D N A SA
27. Computers represent a real threat to privacy.....SD D N A SA
28. My life has been over-complicated by computers.....SD D N A SA
29. Computers are decreasing our freedom.....SD D N A SA
30. Computers have too much control over people's lives.....SD D N A SA
31. Technology is changing our lives too rapidly.....SD D N A SA
32. Knowledge of microcomputer application software helps me with other courses.....SD D N A SA

33. Knowledge of word processing software will be beneficial in other courses.....SD D N A SA
34. Knowledge of data base software will be beneficial in other courses.....SD D N A SA
35. Knowledge of spreadsheet software will be beneficial in other courses.....SD D N A SA
36. Knowledge of the disk operating system will be beneficial in other courses.....SD D N A SA