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ABSTRACT

Sixty-five early childhood preservice students were administered the Kolb Learning Style Inventory and a survey to determine computer importance, knowledge, and attitude. The majority of the students were concrete experiential and active experiential. Forty-five percent of the subjects were primarily Divergers with the Accommodator being the preferred quadrant. Role play was the instructional strategy most preferred on the pre- and post-survey. Lecture, independent study, and computer assisted instruction were the least preferred. The students who were primarily concrete experiential had a moderate relationship to computer importance and computer knowledge. The reflective observation subjects had a negative relationship to computer attitude. There were no significant differences in the results of the survey after the students had completed five computer based lessons. Descriptions of the four computer based lessons used in this study are included. Recognizing individual differences and providing varied activities should be modeled in the college classroom. Twenty-seven references are given. (Author/IAH)

Learning Differences and Interactive Computer Programs

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Running head: LEARNING DIFFERENCES

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Abstract

Sixty-five early childhood preservice students were administered the Kolb Learning Style Inventory and a survey to determine computer importance, knowledge, and attitude. The majority of the students were concrete experiential and active experiential. Forty-five percent of the subjects were primarily Divergers with the Accommodator being the next preferred quadrant. Role play was the instructional strategy most preferred on the pre and post survey. Lecture, independent study, and computer assisted instruction were least preferred. The students who were primarily concrete experiential had a moderate relationship to computer importance and computer knowledge. The reflective observation subjects had a negative relationship to computer attitude. There were no significant differences in the results of the survey after the students had completed five computer based lessons. Recognizing individual differences and providing varied activities should be modeled in the college classroom.

Learning Differences and Interactive Computer Programs

Because college students use varied approaches for problemsolving and for processing information, they need a variety of experiences to enhance learning (Cronbach, 1977; Entwistle, 1981; Messick, 1976; Stice, 1987). Research supports incorporating computer-based instruction into college preparation programs to accommodate these individual differences (Battista & Krockover, 1984; Braun, 1984; Burger, 1985; Fowler, 1983; Reiff & Powell, 1991). Computer instruction is a viable alternative for incorporating "adaptive" teaching at the college level (Wittrock, 1986). Research is needed that recognizes individual differences and how computer-based programs meet various learning differences.

A computer coaching paradigm has three educational roles in relation to the student as summarized by Goldstein (Wittrock, 1986). The computer can be viewed as an expert with specific procedures for the student to complete a particular task; as a psychologist to judge the performance of the student; and as a tutor to provide feedback and other strategies when appropriate. For students who are analytical and sequential, the computer presents material in a step-by-step format with immediate and continuous feedback for the individual (Corno & Snow,

1986). Interactive computer programs can involve the student in a variety of nonthreatening situations (Rogers & Reiff, 1989).

Computers are adaptable and flexible within a learning environment. They can challenge and motivate students in a nonthreatening way. Preservice teachers should be exposed to the potential uses of computers in order to become more knowledgeable and secure about incorporating technology into their classrooms (Powell, 1985, 1987, 1989-90). College instructors have a responsibility to expose their students to a variety of resources, especially available computer assisted instructional programs, realizing all students do not learn the same way. Computer literacy should be a component by every education program.

Research needs to address questions regarding the individual differences of learners as well as their knowledge about and attitudes toward the computer. This study focuses on these questions:

1. What are the learning styles of the subjects based on the Experiential Learning Model (Kolb, 1976) and their instructional strategy preferences?
2. Are there any differences in the computer importance, knowledge, and attitude of students with different learning styles?

3. Are there any any significant differences in the students' responses on the computer survey before and after their experiences with the computer assisted instruction programs?

The Experiential Learning Model as developed by Kolb (1976) maintains that learning depends on the way people perceive and process information. These two dimensions represent combined learning/problem solving dimensions that are components of a learning cycle rather than isolated learning types (see figure 1).

The concrete experience stage (CE, feeling) emphasizes learning from particular experiences and being especially aware of other individuals and feelings. The reflective observation stage (RO, watching and listening) will have people looking at different points of view and being reflective before decisions are made. At the abstract conceptualization stage (AC, thinking) the learner will depend on reason and theory to understand the problem. In the active experimentation stage (AE, doing), learners prefers being involved and seeing how things really work.

Kolb (1979; 1984) does not believe any one style of learning is better or worse than the other. Each learning style has strengths and weaknesses for particular situations. He maintains learners must be

flexible and must adapt to the situation. "Learners must shift from being actors to being observers and from being directly involved to being analytically detached" (Sugarman, 1985, p. 264).

Kotar (1985) conducted a study with 331 graduate and undergraduates in four sub-groups. One subgroup consisted of 100 inservice elementary teachers. Preservice elementary teachers totaled 181 and other students majoring in fields other than education included 50 students. There was a significant relationship between learning style and their educational group. Preservice and inservice elementary teachers had a preference for the accommodator learning mode. The other university students preferred the assimilator learning style. All the teacher subgroups had significantly more concrete and active learning style scores then the other university subgroups.

The theoretical validity of the Learning Style Inventory was also supported by Kotar (1985). Relationships were found between learning style and preferred instructional type. Seventy-two percent of the accommodators chose activity as their preferred instructional type, while 42 percent of the assimilators expressed a preference for expositions. Activity had been defined as role-playing, simulations, and hands-on

experience. Lectures, readings, and films defined exposition. The university students' responses indicated that responses to the LSI formed word rating patterns consistent with the Experiential Learning Model.

According to Brown & Hayden (1980), the greatest number of noneducation college students were abstract conceptualizers, active experimenters, reflective observers, and concrete experiencers. Seniors consistently were more abstract conceptualizers while the freshmen had more varied styles. Assimilators and convergers were most dominant in two engineering classes (Stice, 1987).

Reiff (1988) found that the learning style modes of over 100 early childhood majors were predominantly concrete experiential or active experimenters. Reflective observation was consistently the least preferred mode of these majors. More than half of the students were classified as accommodators with the fewest being assimilators. These students preferred discussion in the college classroom with using the computer and programmed materials generally ranking last. Other research (Reiff & Powell, 1991) verifies the instructional strategies most preferred are discussion and role play with programmed materials and computer assisted instruction being least preferred.

Methods

Subjects

Sixty-five white female early childhood preservice students at a large Southeastern University participated in the study. Their grade point averages were at least 2.75 on a 4.0 scale. There was no separate course emphasizing computer literacy. Students were not exposed to computer interactive programs in any of their courses except the early childhood curriculum course included in this study. More students are using word processors for their written assignments but they have had none or minimal experiences on how to incorporate computer activities into the elementary classroom.

Procedures

The subjects were administered the Kolb Experiential Learning Style Inventory and the Instructional Strategy Inventory during the Early Childhood Curriculum class the quarter before student teaching.

A pre/post Survey was administered to determine subjects' importance, knowledge and attitude toward computers. On the first class meeting day of the quarter, subjects were also given an annotated list of the four CBI lessons, used in this study, as an integrative aspect within a

course on program and curriculum development. This course includes such topics as planning, teaching, management and pupil evaluation. Titles of the following descriptive lessons were also included in the courses syllabus:

1. Tenure: A Simulation of a First Year of Teaching. In this simulation, users make decisions similar to those of a first year teacher in order to attain tenure and a salary increase. Average completion time ranges from 30 minutes to 2 hours and the intended audience includes new teachers. The user becomes aware of the importance in the tenure decision of the approval of the principal, of his/her performance, and of the reputation he/she has with the faculty, students and parents. Experiences related to teaching are grouped under six areas during the course of the simulation. The areas are: Classroom management, Discipline, Criteria and issues related to pupil evaluation, Teaching techniques, Extracurricular activities, and Interpersonal relationships with co-workers. At the end of the simulated session, summary scores with corresponding averages are shown to users for responses related to Pupils, Faculty, and Parents.
2. Accommodating Individual Differences. This lessons helps the user to understand the importance of addressing individual needs within the

teaching-learning environment. Applications activities are also provided to encourage decision making in dealing with individual differences.

3. Domain-, Criterion-, and Norm Referenced Tests. In this lesson, students are taught the basic differences between criterion and norm referenced tests. Exercises are also provided in which they have to determine under what conditions would each evaluation type be appropriate.
4. Instructional Procedures. This lesson provides exercises and practical situations which relate to how to: gain attention, present the objective, review prerequisite material, provide direction, present information, present practice and feedback, and assess learning.

In addition, participating subjects and their instructor(s) were given a printed handout describing how to access the lessons on NovaNET (formerly PLATO) followed by one-to-one or small group orientation assistance in nearby NovaNET laboratories. Six to eight sites were technically equipped with the NovaNET instructional Delivery System (Board of Trustees of the University of Illinois, 1990). Subjects were advised to take the lessons in conjunction with approximate dates when related content was presented by traditional mode in their classrooms.

Completion time for the lessons by the group as a whole ranged from 30 minutes to 1 1/4 hour. Periodic debriefing sessions relating the interactive computer lessons to the scope and sequence of the program and curriculum course were held. Users were also encouraged to raise questions about the lessons as they completed them during the six weeks of campus based instruction.

Instrumentation

The Computer Survey (Balajthy, 1988) consists of 18 statements related to the individual's viewpoint on the importance of computers, knowledge of computers, and attitude toward the computer. The students responded on a 7 point scale from strongly disagree to strongly agree.

The Instructional Strategy Preference Survey is a ranking of 10 strategies related to how the student prefers to learn in the college classroom (Reiff, 1988).

The Kolb Learning Style Inventory (1979) assesses the relative significance of each mode in the cycle for the individual. The LSI is a nine item, self-administered instrument. Learners are to rank four words in each item from one which is most descriptive of their learning style to one which is least descriptive. Each word corresponds to one of the four

learning modes: Concrete Experience (feeling), Reflective Observation (watching), Abstract Conceptualization (thinking) and Active Experimential (doing).

The inventory yields six scores CE, RO, AC, AE, and two combination scores (AC minus CE; AE minus RO). The combination scores indicate an individual's preferred position on the abstract-concrete dimension and on the reflective-active dimension. Subjects are then classified into the learning style categories of Diverger, Assimilator, Converger, and Accommodator.

Individuals may have relatively balanced cycles or they may emphasis one or more modes. High scores would probably indicate confidence when exposed to that aspect of the cycle, while low scores would probably suggest frustration with activities associated with that mode. Kolb maintains effective learning means being appropriately competent in each mode. The LSI has shown there are differences in preferred learning styles. Although students may have preferences for ways to learn, they can develop their capacities in other areas.

The reliability and validity of the Kolb learning Style Inventory is summarized in the manual (1976). Learning style scores were correlated

with personality test, performance tests, and preferences for particular learning situations and teachers. Each of the four basic LSI scales were split into halves to determine reliability. Coefficients of about .80 were determined for the two combination scores AC-CE and AE-RO. However, other research questions their test-retest reliability data (Freedman & Stumpf, 1978 cited in Sugarman, 1985). Sugarman (1985) maintains there are weaknesses with Kolb's instrument. The LSI is a forced-choiced questionnaire and its ranking and scoring methods result in the four dimensions being dependent on one another. In addition a high score on one dimension means lower scores on others.

Ferrell (1983) and Karrer (1988) compared several learning style instruments to determine their constant validity as described by Keefe (1979). The Kolb inventory was the only valid instrument based on the results of factor analysis. Information from these studies have supported Kolb's theory of learning style. Other research has also reinforced the validity of Kolb's four-stage problem-solving of learning (Sugarman, 1985).

Results

The responses of the early childhood students on the Kolb Learning Style Inventory indicated the majority to be active experiential (36%) and

concrete experiential (36%). Abstract conceptualization (18%) and reflective observation (12%) were the least preferred modes. Forty-five percent of the subjects were primarily in the Diverger quadrant with the Accommodator (28%) being the next preferred quadrant. Only five percent preferred the Assimilator mode and four percent the converger. Role play was the instructional strategy most preferred on the pre and post survey. Lecture, independent study and computer assisted instruction consistently were least preferred by the students. Their responses are shown on Table 1.

Insert Table 1 about here

The early childhood students indicated on the pre and post computer survey a definite recognition of the importance of the computer. However, their computer knowledge remained inadequate.

Their attitudes were generally positive about the computer. The students, however had a less favorable attitude after completion of the

computer programs but not significantly more. A wide difference of opinion seemed to have occurred.

Insert Table 2 about here

Students who were primarily concrete experiential had a moderate relationship to computer importance of $r = .21$ ($p < .04$) and computer knowledge $r = .25$ ($p < .02$). The reflective observation subjects had a negative relationship to computer attitude of $r = -.22$ ($p < .04$).

Discussion

Preservice students are expected to provide for individual differences in the classrooms; yet, most of their college instructors ignore the importance of recognizing learning diversity and using varied methods. Computer based instruction allows students to experience content through a different media than the traditional course format. For those students whose learning style is more concrete and sequential activity oriented, computer-assisted instruction would be an appropriate option. Other

students such as reflective learners should be introduced to this method of instruction but they may feel more uncomfortable and frustrated. Teachers must recognize and understand these differences.

Misunderstanding may occur between people with extremely different learning styles. Instructors might perceive their own learning style as the only way to process information or to consider problems. For instance, accommodators may view assimilators as unrealistic and assimilators may see accommodators as "irresponsible pragmatists." Furthermore, convergers may think divergers are "indecisive" (Sugarman, 1985, p. 265). Communication about different learning styles and approaches are needed in the college classroom in order for preservice students to apply this information in their own classrooms (Reiff, 1983).

Students are generally apprehensive about using the computer (Reiff, 1988; Reiff & Powell, 1991); thus they need be reassured about their concerns. However, a haphazard or limited interaction with the computer is not sufficient to change attitudes. A systematic intensive commitment is needed for the inclusion of computer instruction into college classrooms. Therefore, computer programs must be continually evaluated to determine their appropriateness and effectivess.

Students should be exposed to strategies representative of all the learning modes in Kolb's experiential cycle. Learners will like what they are learning and understand it better if a variety of approaches are used. If students are engaged in all four stages of the cycle, more learning should occur. The computer can make recognizing and accommodating individual differences become a reality in the college classroom.

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Table 1

Summary of Strategy Preferences #1

	Instructional Strategy Preferences			
	Most Preferred		Least Preferred	
	1	2	9	10
Role Play	33%	19%	–	5%
Individual Projects	–	5%	10%	–
Simulation	10%	29%	5%	–
Discussion	29%	14%	–	–
Lecture	5%	5%	10%	52%
Lecture/Discussion	–	–	10%	19%
Peer Tutoring	19%	29%	10%	–
Programmed Materials	–	–	5%	–
Computer Assisted Instruction	–	–	24%	10%
Independent Study	–	–	29%	14%

N = 65

Summary of Strategy Preferences #2

Kelly, (for Dr. Reiff) Thank you.

Please put #1 on one overhead, enlarge if possible. Same w/ #2.

I think you already made an overhead of the figures

	Instructio			
	Most Preferre			
	1	2		
Role Play	31%	1		
Indiv. Project	3%			
Simulation	19%	2		
Discussion	19%	1		
Lecture	11%	3%	19%	19%
Lecture/Discussion	–	3%	3%	14%
Peer Tutoring	14%	11%	6%	–
Program Material	–	8%	6%	3%
Computer Asst. Inst.	3%	6%	25%	19%
Independent Study	–	3%	14%	25%

N = 65

Table 2

Summary of Computer Importance, Knowledge and Attitudes

	Pre		Post	
	Mean	SD	Mean	SD
Computer Importance	33.35	5.88	33.26	6.92
Computer Knowledge	18.60	8.33	19.18	8.16
Computer Attitudes	30.03	7.75	27.69	11.29

N = 65

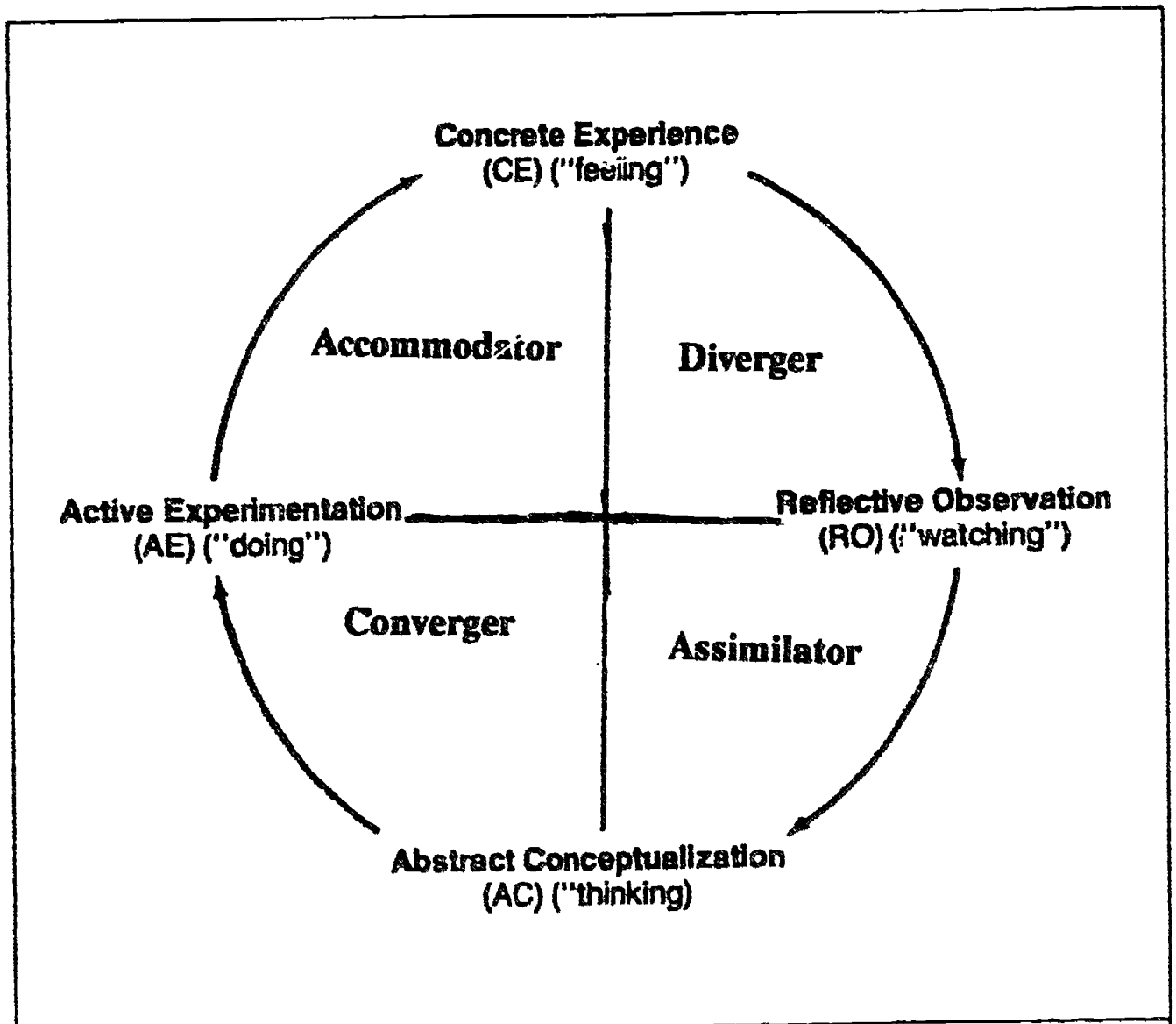

Figure 1. Kolb's Four-Stage Learning Cycle.