THE EFFECTS OF CONTEXTUAL, LEARNING-BASED

INSTRUCTION VERSUS COMPUTER-ASSISTED

INSTRUCTION ON BASIC SKILLS

IN SELECTED VOCATIONAL

COURSES

By

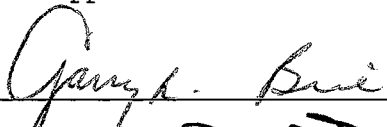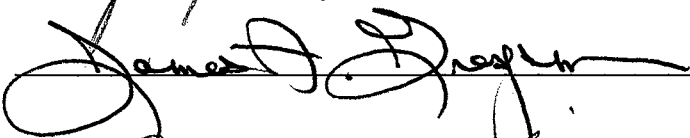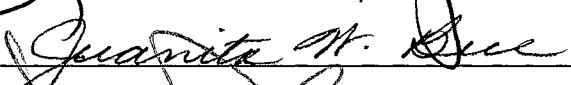JANET KAREN COX
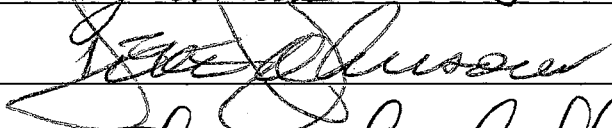
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As with all things, accomplishments are made possible only with the support of loved ones. I would like to express my appreciation to my family members who were so patient and understanding. My son Chad, his wife Heather, and my wonderful grandson Christian willingly sacrificed quality family time and continually encouraged and supported me. Much appreciation goes to my brother Bruce Miller, my wonderful sister-in-law Kaye, and their children Kurt and Kelli for their support and understanding when I missed family holidays.

For everyone's assistance in the completion of this endeavor, I am appreciative and will always be grateful.

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CHAPTER I

RESEARCH PROBLEM

Introduction

Each of Oklahoma's 49 area vocational school sites has a
learning resource center called an Education Enhancement Center (EEC).
It is the purpose of these centers 1) to help students to improve their
basic skills achievement level in both math and reading, 2) to help
students with higher math and science concepts as related to their
occupational training program, and 3) to assist any student who is
experiencing difficulties with the academic areas of a vocational
training program.

Most of the EECs have a similar organizational structure based
upon a student pull-out program in which the student is scheduled to
leave the vocational classroom and go to the EEC for a specified time
each week (usually about one hour). Furthermore, 32 centers have an
integrated learning system (ILS) which is computer-aided instruction
that individualizes students' reading and math instruction and monitors
their progression; for those centers not having an ILS then various
other computer-aided instruction, along with books, videos, and other
programs, are used to enhance the students' reading and math scores.

If students attend the EEC for at least an hour a week during the
school year, then students' basic skills scores are reported increasing
an average of one or two grade levels with the learning center approach
(Burgess, 1991). Moon (1993) reported an average of two-year grade
level gains for students when using an ILS. In addition to increasing
basic skills scores, other strengths to this approach include students'

receiving individualized instruction and in a mode which augments visual and auditory learners' capabilities.

Although definite strengths exist for learning centers and computer-aided instruction, areas of concern also surface. First of all, the transfer of learning is questionable. For example, a student may increase a math score and be able to perform division of fractions on the ILS, but can that student transfer the concept of dividing fractions to the vocational classroom? Other areas of concern include: 1) instructors do not feel that students should be pulled from their vocational program to attend the EEC as the teachers feel they do not have sufficient time for vocational instruction; 2) the kinesthetic/ tactile learner may not be helped as the ILS does not use an applied approach; and 3) the students might not like the feeling of segregation or having to leave the vocational classroom.

Because of these limitations, some of the EEC personnel are changing the EEC's organizational structure. While the majority of centers are using the learning center approach along with an ILS or other computer-assisted instruction, two of the centers are utilizing a contextual learning approach in their centers; at least four other school districts are using a combination of these two instructional approaches.

The two centers that have shifted to a contextual, learning-based model of instruction base their change on the premise of cognitive psychology. This includes: 1) learning is embedded in individual experiences; 2) learning is most effective in context; 3) collaboration enhances learning; and 4) learners need to recognize and question tacit assumptions (Sorohan, 1993).

Applying the principle that learning is most effective in context, the two centers changing to a contextual approach relate the math and reading lesson to the vocational training program in an applied manner whenever possible; one of the centers never has the students attend a lab session because the EEC instructor is always instructing in the

vocational classroom while the other one sometimes has the students attend the lab and sometimes the EEC instructor remains in the vocational classroom. Sticht (1989) found that marginally literate adults in a job-related reading program gained in job-related reading twice what they gained in general reading; they made more gains reading in context than through the use of other approaches.

Since it is an expressed concern by many educators and business people that students are graduating without the basic skills needed for workplace survival and since workers are expected to have greater reading and computational skills (Johnson & Thomas, 1992), it becomes contingent upon educators to find effective methods and modes of teaching the basics of reading and math. However, today's educators are confronted with the same challenge as Gagne in the 1970s: to find ways to instruct so that individuals will neither be held back in learning nor pushed forward before the mastery of essential prerequisites (Gagne, 1971). The EECs are experimenting with different modes of instruction in order to help determine the right mixture as referred to by Gagne and also to find the most effective way to help the student with learning basic skills.

Statement of the Problem

Basic skills instruction in Oklahoma vocational centers is primarily addressed through the learning resource center approach where an integrated learning system or other computer-assisted instruction is the primary tool of instruction utilized for increasing reading and math skills. However, since many vocational students are kinesthetic/tactile learners (Soliday, 1992), possibly a more applied, learning-based, contextual mode of instruction should be utilized. Furthermore, research (Berryman & Bailey, 1992) indicates that contextual learning instruction should increase a student's math and reading scores more than instructional modes that are not related to a student's interests and motivational areas, as in the ILS. Also,

instructors' and students' attitudes might be changed if instruction were not provided through a pull-out program. Since much research has been done on how people learn most effectively, the problem is to find the most effective form of instruction for the teaching of basic skills in vocational programs. It is not known whether basic skills of vocational students increase more in a behavioristic mode of learning by utilizing an integrated learning system or by a cognitivist, contextual mode. In addition, the problem involves an attitudinal disposition towards the EEC by both students and vocational instructors; it is not known whether either or both of those groups have a preference for either mode of instruction. Since effective learning has a relationship to the attitudes of the learner and teacher, one problem is to find which mode of learning is preferred which should, in turn, increase the students' scores.

Purpose of the Study

The purpose of the study was to determine if significant differences existed between the basic skills achievement growth of vocational students enrolled in Education Enhancement Centers (EEC) using two different instructional methodologies. One group used an instructional methodology where students were enrolled in a traditional EEC program which utilized a lab setting incorporating an integrated learning system for basic skills instruction. The other methodology was for the students to be instructed by an EEC instructor using contextually based basic skills instruction in the vocational classroom. It was also to help determine if teachers and/or students preferred a behavioral mode of instruction to a cognitivist one. Another purpose was to examine if certain student personality types achieved more in either of the two instructional methodologies. Data provided by this study may be used to help determine the effectiveness of the present instructional mode utilized in the Education Enhancement Center.

Objectives

The objectives of this study include: 1) to discover if reading and math achievement scores increase more by using contextual, learning-based instruction or by using an ILS or other computer-assisted instruction, 2) to determine if certain learning styles/personality types are more effective in either mode of instruction, 3) to determine students' and instructors' attitudes and preferences concerning both modes of instruction, and 4) to determine if there is a gender or age preference for either computer-assisted instruction or contextual, learning-based instruction.

The major questions developed to provide guidance in seeking answers to the objectives include:

1) Will students make more reading score gains using computer-aided instruction or contextual learning-based instruction?

2) Will students make more math score gains using computer-aided instruction or contextual, learning-based instruction?

3) Do instructors prefer the EEC personnel to use computer-aided instruction or contextual, learning-based instruction when teaching basic skills?

4) Do students prefer EEC personnel to use computer-aided instruction or contextual, learning-based instruction when teaching basic skills?

5) Do males have a preference for either computer-aided instruction or contextual, learning-based instruction?

6) Do females have a preference for either computer-aided instruction or contextual, learning-based instruction?

7) Do adults have a preference for either computer-aided instruction or contextual, learning-based instruction when learning basic skills?

8) Do high school students have a preference for either computer-aided instruction or contextual, learning-based instruction when learning basic skills?

9)   Does a student's learning style affect math and reading gains in either of the two instructional modalities?

Limitations

The limitations of this study included:

1.   The study was limited to four Oklahoma vocational-technical schools.

2.   The study was limited to students in the following five vocational programs: automotive technology, business and office technology, electronics, health science technology, and welding.

3.   Assessment was limited to standardized norm-referenced assessment with no authentic assessment used.

4.   Three of the vo-techs only post-tested those subjects who had scores low enough to use the remedial services of the EEC.

5.   Not as many Myers-Briggs Type Indicator assessments were received. However, relating the personality type to determine if certain types made more gains in either mode of instruction was not considered the thrust of the research; it was primarily used to see if there was a difference, and, if so, to explore that in future research studies.

Definition of Terms

The following definitions were used in this study:

Advance Organizers: Items such as analogies, concrete instances, or experiences that help bridge the gap between new information and prerequisite knowledge (Johnson & Thomas, 1992).

Basic Skills: For the purpose of this study, basic skills means common core skills in reading and math that students need to effectively function in a classroom setting (Burgess, 1991).

Cognitive Psychology: Science of how the mind works and deals with mental processes such as memory, perception, learning, thinking, reasoning, language, and understanding (Heckman, 1993).

Cognitive Science: For this study the combination of cognitive psychology (the study of the mind) and computer science (the study of computers) and has its roots with artificial intelligence (Johnson & Thomas, 1992).

Computer-Aided Instruction (CAI): Software that presents information, often branching to deal with different levels of understanding but usually does not have a computer management of student responses (Smith, D.K.P., 1992).

Contextual Learning: Meaningful application of information (Berryman & Bailey, 1992).

Declarative Knowledge: Knowing "what" (Heckman, 1993).

Education Enhancement Center: A learning resource center whose primary purpose is to meet the needs of students who have a deficiency in basic education (reading, math, and communicative skills) that is related to specific vocational training (Burgess, 1991).

Framing: Large images that provide a graphic representation of how concepts interrelate (Ellis, 1992).

Integrated Learning System (ILS): A hardware/software computer system which can be networked to a central computer that has curriculum software and a management system in order to track student performance (Bracey, 1991).

Metacognition: Refers to knowing about and controlling one's own thinking processes (Brown, 1978).

Modeling: Teaching strategy that allows students to visualize the procedures being taught (Johnson & Thomas, 1992).

Procedural Knowledge: Knowing "how" (Heckman, 1993).

Transfer of Learning: Experience or performance on one task influences performance on some subsequent task (Bigge, 1982).

Virtual Reality: A form of human computer interface characterized by an environmental simulation controlled in part by the user. It requires hardware that furnishes a sense of immersion, navigation, and manipulations (Helsel, 1992).

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature aided in the examination of various aspects which might shed light on which instructional methodology should be used and how to validly assess people's attitudes. Two areas researched were learning theories in order to help determine what was currently being espoused about how people best increase, retain, and transfer knowledge and learning styles to determine if basic skills achievement were impacted by personality types. Another area, authentic assessment, helped define the limitation of the study. Instructional technology, especially the integrated learning machine, was explored to determine the instructional methodologies of these machines. Furthermore, more information was gained on qualitative research by exploring data gathering tool techniques used to untangle themes in interviews and surveys/questionnaires in order to attain validity in the qualitative portion of the study.

Learning Theories

The purpose for the research of learning theories was to 1) differentiate among four learning theories in order to delineate which theories were effective in the teaching of basic skills; 2) determine which theories were utilized in computer-assisted instruction and integrated learning systems; 3) map the design principles for effective learning instruction, and 4) determine the correlation of contextual learning to learning theory and effective instructional practices.

Application of Theory to Basic Skills

Many changes had taken place in the past 20 years concerning the nature and structure of the American workplace (Wirth, 1992). Wirth explained that the American workforce needed to be better educated, more adaptable to change, and capable of continual learning. Heckman (1993) reinforced this with the statement that the United States was in a transitional period between an industrial and information society known as the post-industrial society.

With the changing society, educators, psychologists, and others began to examine how humans learned in order to meet the demands of the changing workplace and society. This scrutiny coupled with experimentation had brought about differing views and theories of learning. Basically, there were four theories recognized in the literature. These included: mental discipline theory, behavioristic (stimulus-response) theory, the interactionist Gestalt-field cognitive theories, and the constructivist theories (Bigge, 1982).

Mental Discipline Theory

One of the theories, mental discipline, was predominantly in use prior to the twentieth century and primarily only vestiges of the theory remained in eclectic teaching theories today (Bigge, 1982). A brief description of this theory will be summarized in order to ascertain if this theory currently existed in some form of classroom or computer instructional design.

Proponents of the mental discipline theory believed that learning was a process of disciplining or training the mind. The mind lay dormant until exercised, and faculties of the mind such as memory, will, and reason were simply muscles of the mind which needed to be exercised. The learner was a passive unit. According to Bigge (1982), some of today's educators were perhaps unknowingly its exponents.

Practices of instruction occurring in this theory included drill, daily tests, recitations, strict discipline, and physical and mental

punishment. These practices were used in order to strengthen the faculties of attention, memory, will, and perseverance (Bigge, 1982).

Berryman writing in a National Council on Vocational Education (1991) article stated that there were certain assumptions about learning that were wrong. Some of these assumptions were based upon the principles of the mental discipline theory. According to Berryman, one false assumption based upon this theory was that learners were seen as passive vessels into which knowledge could be poured. Berryman further explained that passive learning had some destructive consequences. One was that it removed chances for exploration, discovery, and invention. Another was that the teacher and not the learner had control over learning. In this setting students visualized themselves as both subjects and objects in the world. When outside the classroom, the student could function in daily activities and interact with the setting such as in grocery shopping. However, in school the students perceived themselves to be objects and, therefore, had no control over problems or choices about problem solving. Berryman said:

> Control in the teacher's hands, not the students', undercuts
> students' trust in their own sense-making abilities. As
> important, it also undercuts the development of a particular
> set of higher-order cognitive skills...the "executive"
> thinking skills. These include goal setting, strategic
> planning, checking for accurate plan execution, goal-progress
> monitoring, plan evaluation, and plan revision--capabilities
> increasingly seen as critical for independent and effective
> learning. (p. xii)

The second false assumption based upon the mental discipline theory, according to Berryman in the National Council on Vocational Education (1991) article, was that learners were blank slates onto which knowledge could be inscribed. She corrected this by saying that instead learners brought with them to any new learning experience

concepts and constructs acquired elsewhere and that the teaching challenge was not to write on a clean slate but to confirm, disconfirm, modify, or add to what was already written on the slate.

Although the mental discipline theory was not used predominately as the main learning theory in the 1990s, certain aspects of it were still found in eclectic theories. However, educators espousing the school-to-work system, such as Berryman, were finding that the tenets of this theory were too limiting if the educators' goal was to train students for an ever-changing workplace where problem-solving skills were essential. Therefore, the practices of drill, recitation, rote memorization, and no interaction of students with learning, as mental discipline proposed, were too limiting for today's educational needs and should be used sparingly, if at all.

Behavioristic Theory

The behavioristic theory was also referred to as a stimulus-response conditioning theory; thus, it involved a relationship of some sort between a series of stimuli and responses with stimuli being the causes of learning and responses being the effects. Behaviorists interpreted learning in terms of changes in strength of connection, associations, behavioral tendencies, and habit strengths. For them, learning, then, was a change in observable behavior (Bigge, 1982). Some of the more popular forms were Thorndike's connectionism, Watson's behaviorism, Guthrie's practical behaviorism, Hull's physical behaviorism, and Skinner's radical behaviorism (Malone, 1991).

Certain principles were emphasized in the stimulus-response theory. These included: 1) the learner should be active; 2) repetition was important in acquiring a skill; 3) reinforcement and reward should be emphasized; and 4) novelty in behavior could be enhanced through imitation of models, cueing, and shaping (Hilgard & Bower, 1975).

Three basic assumptions, according to Bullock (1982), were identified in behaviorism. These included: 1) environmentalism, where the environment helped shape human behavior; 2) reinforcement, where consequences affected subsequent behavior; and 3) objectivism, where observation of external events was important to analyzing behavior.

Instruction from a behavioral theory viewpoint involved certain steps. Those were writing behavioral objectives; analyzing behavioral hierarchies, such as specifying duties and tasks; designing forms of practice to produce associative strengths; utilizing progressive reinforcement to effect behavioral change; presenting concepts that could be discriminated in order to produce a rule for generalized performance; and having conditions of training for building skills from component parts (Glaser, 1992).

Berryman stated that another false assumption was related to the behaviorist theory. This false assumption was, "Learning is the strengthening of bonds between stimuli and correct responses" (National Council on Vocational Education, 1991, p. 10). She further replied that American education reflected the behaviorist theory by breaking down complex tasks and ideas into components that could be separately trained. She admonished that this fractionation of learning resulted in individuals not being able to acquire and retain information because they lacked the understanding of the larger context which helped to give meaning.

Caine and Caine (1991) also noted deficiencies in the behavioristic theory by contending that it was another false assumption by educators to believe that behaviorism was an appropriate mold of how people learn. They felt it equated to a factory approach model which was predicated on the belief that learning could be reduced to parts and that rewards and punishments could be used to produce desired learning. They further claimed that behavioral instructional approaches ignored the power and vitality of the inner life of

learners along with a learner's capacity for creativity and ability to derive intellectually relevant meanings.

Caine and Caine (1991) elaborated on three points concerning the negative side of behaviorism. The first point dealt with rewards and punishment. They contended that a smiley sticker was just not a reward for a single act but impacted far beyond any single event because a teacher's behavior might have vast and sometimes invisible consequences. The second point was that when others than the learner controlled the rewards and punishment, then students began to look to others for direction instead of conjuring up answers themselves. The last point questioned the instructional design where all answers and outcomes were predetermined. Caine and Caine contended that for mastery skill to occur students must have opportunity to create their own meaning.

Much of today's educational system in the United States was based upon the behaviorist idea of rewards and punishment, time on task, quantitative modes of assessment, behavioral objectives, needs analysis, scope and sequence, and duties and tasks (Shubert, 1993). Furthermore, Brooks and Brooks (1993) elaborated on the instructional design of this theory by saying that teachers generally behaved in a didactic manner by disseminating information to students, and they corrected students' answers to validate student learning. Also, students primarily worked alone and with a fixed curriculum which relied heavily on textbooks and workbooks.

Cognitive Theory

"Cognitive theory as applied to learning means that learning is a process of knowledge construction rather than knowledge absorption and storage" (Heckman, 1993, p. 3). Heckman further explained that this theory was derived from cognitive psychology which is the science of how the mind works, specifically of how people collect, store, modify and interpret information.

Cognitive psychologists examined the learning process and not the product. They were not as interested in right responses on exercises and exams as they were on the students' being able to explain the process used in getting the response. Therefore, they relied on teaching students strategies, developing metacognitive skills, fostering cognitive monitoring skills, reflective thinking, relevance of material, and tying the material to real world contexts (Symons, Snyder, Cariglia-Bull, & Pressley, 1989).

Teaching strategies. Symons et al. (1989) explained that in order to gain competence in learning, a student needed to analyze task situations and determine strategies that would be appropriate in learning the information. The students needed to form a plan for executing the strategies. In teaching strategies the teachers explained a strategy that they would use in order to pass the procedural knowledge to the students. According to Symons et al. teachers needed to routinely and overtly select and use strategies. That would involve their thinking aloud in order to reveal how they were making decisions. Deshler and Shumaker (1986) even suggested that teachers model strategic thinking while doing mundane tasks such as role taking. In the teaching of strategies, modeling, guided practice, and corrective feedback should be employed (Pressley, Snyder, & Cariglia-Bull, 1987).

Some of the strategies included paraphrasing, self-questioning, visual imagery, first letter mnemonics, and error monitoring. Explaining more about the teaching of those strategies, Deshler and Shumaker (1986) responded:

> The following teacher behaviors appear to be critical to optimizing instructional gains through learning strategy instruction: providing appropriate positive and corrective feedback, using organizers throughout the instructional session, ensuring high levels of active academic responding, programming youth involvement in

discussions, providing regular reviews of key instructional

points and checks of comprehension, monitoring student

performance, requiring mastery learning, communicating high

expectations to students, communicating rationales for

instructional activities, and facilitating independence.

(pp. 586-587)

Fostering monitoring skills. The consensual view was that
cognitive monitoring was extremely important in strategy acquisition
(Baker & Brown, 1984; Paris, Wixson, & Palincsar, 1987; & Van Haneghan
& Baker, 1989). When students monitored their own progress, they could
determine if a strategy was working; this could lead to a change in
goals or strategies. When monitoring, students were encouraged to
remediate problems once they detected them. That helped them to take
corrective measures when problems were spotted and aided in the
teaching of higher-order and problem-solving skills (Symons et al.,
1989).

Developing metacognitive skills. Metacognition was the awareness
of one's knowledge about one's own cognitive processes or anything
related to them (Flavell, 1977). In helping students to develop
metacognitive skills, teachers made students aware of their thinking as
they performed tasks. Metacognition involved: 1) knowledge and
control of self concerning one's commitment, attitude, and attention;
2) knowledge and control of process including declarative, procedural,
and conditional knowledge; and 3) executive control of behavior which
involved evaluation, planning, and regulation (Marzano, Brandt, Hughes,
Jones, Presseisen, Rankin, & Suhor, 1988). By using metacognition, the
students would know where and when to use strategies; it could be
accomplished by telling the information to the students and by
providing extensive experience across settings where strategies could
be used (Symons et al., 1989).

Reflective thinking. Another aspect of cognitive theory was that
students needed time to reflect on their learning. They needed to know

that it was appropriate to reflect upon what was required in a task and also reflect upon strategy selection (Symons et al. 1989).

Tying material to real world concepts. Contextual learning played an important role in cognitive theory. Heckman (1993) said that learning was closely related to the context in which it took place. Raizen (1989) agreed by saying that educators needed to identify and establish the connections between knowing and doing, and then they would be better able to facilitate the acquisition of competence. Raizen further explained that research on mental activity could not be in isolation from the social and physical context. Luterbach and Reigeluth (1994) also placed importance on context by saying that much of the learning in schools occurred out of proper context, and assignments had little relevance to future endeavors.

Tennyson (1992) discussed contextual learning at length. He began by saying that a context was a meaningful application of the information, including the content or task, skills, goals, and culture. He further replied that individuals could solve problems only if they possessed the necessary contextual knowledge.

Laurillard (1987) described in detail about the educational world being a different environment from the social world in which people lived. She explained that students could answer teachers' questions and pass tests and seemed to understand the concept in class; however, if the basic question were in a different style than they had studied, then students had difficulty. In talking about environments, Laurillard emphasized the difference between the unnatural environment of academic life, and if contextualization of learning were absent, then students could not automatically apply their school learning to life contexts.

Sternberg (1987) discussed intelligence and its relation to contextual learning. In his studies, he postulated that there was practical intelligence and intelligence as measured by IQ tests, and they were very dissimilar. He found that IQ did not correlate highly

with perceptions of people in the work field concerning who possessed intelligence in a particular field. For example, those with high or low IQs were not considered respectively as ones who were the most intelligent or least intelligent in a field of work. He explained that successful people had obtained tacit knowledge, the knowledge of what it was that counted in the real world. Therefore, he contended that real-world practical knowledge learned in a contextual manner was more important in success terms than academic knowledge.

Experiential learning was another component of cognitive theory. That type of learning began with students' direct experiences. It was based upon John Dewey's inquiry method where all learning was problem based. Reflection and abstract conceptualization were also components; however, the main component was a students' direct experience with the problem because that brought meaning and relevance.

Many schools continued to place importance on teacher-delivered instruction, rote memorization of facts, and rewards for the right answers. However, as explained by Sorohan (1993), that Industrial Age learning structure did not promote the skills needed by contemporary employers. That aligned with the cognitive theory which placed value on contextual and experiential learning and on the inquiry method where students built meaning and were able to solve problems. Of these, contextual learning was perhaps a priority if students were to receive relevance and meaning in their learning. Heckman (1993) summarized by saying, "Learning theory and instructional design which do not consider such contextual relationships put the...individual student at a disadvantage" (p. 13). Raizen (1989) further emphasized this point by saying that if students did not receive contextual learning, then their learning remained sealed within the confines of the classroom. Success within the school culture had little bearing on performance outside of the school (Brown, Collins, & Duguild, 1989). Teachers should view learning as being embedded in contexts (Heckman, 1993). In cognitive theory students also needed to be taught how to

strategize concerning solutions to problems. Teaching metacognitive skills along with the teaching of specific strategies helped achieve that.

Constructivism

Constructivism was not a theory about teaching but about learning (Brooks & Brooks, 1993). It distinguished itself from behaviorism and cognitivism by its interpretation of reality. In objectivism, which was defined as both behaviorism and cognitivism, reality was viewed as being "external to the knower with the mind acting as a processor of input from reality" (Cooper, 1993, p. 16). He added that meaning was derived from the structure of reality; the mind processed symbolic representations of reality. However, according to Cooper, the constructivist viewed that reality was determined by the experiences of the knower. Cooper continued distinguishing the three theories by adding that the theories shifted in their emphasis from an external to an internal view. Internal processing was not of interest to the behaviorist and only of interest to the cognitivist in explaining how external reality was understood. However, to the constructivist "external phenomena are meaningless except as the mind perceives them" (Cooper, p. 16). Furthermore, Cooper explained that the constructivist learner solved problems based on personal discovery and was intrinsically motivated.

Brooks and Brooks (1993) defined 12 descriptors of the constructivist classroom. These included: 1) teachers encouraged and accepted student autonomy and initiative; 2) teachers used raw data and primary sources along with other manipulative material; 3) teachers used terms such as classify, analyze, predict, and create; 4) teachers allowed student responses to drive lessons, shift instructional strategies, and alter content; 5) teachers inquired about students' understanding before sharing their own understanding of these concepts; 6) teachers encouraged students to talk with the teacher and peers;

7) teachers encouraged student inquiry; 8) teachers sought elaboration on students' responses; 9) teachers engaged students in experiences that might engender contradictions and then encourage discussion; 10) teachers allowed wait time for posing questions; 11) teachers allowed time for students to construct relationships and create metaphors; and 12) teachers nurtured students' natural curiosity through use of the learning cycle model.

Specific instructional techniques were given for constructivist learning. These included: 1) helping students organize their learning by using concept mapping; 2) building on what students already knew by using advance organizers; 3) facilitating information processing by providing real life context for instruction; 4) facilitating deep thinking by elaboration and use of cooperative learning, peer tutoring, and paired problem solving; and 5) making thinking processes explicit by using strategies such as self-monitoring, advance planning, self-checking, questioning, summarizing, predictions, generalizing, and evaluating alternatives and learning (Johnson & Thomas, 1992).

The dichotomy between this theory and behaviorism was exemplified in the following description of a constructivist classroom: 1) curriculum was presented whole to part and not fragmented as emphasis was on big concepts; 2) curriculum was not centered on textbooks but on all sources of data and manipulative materials; 3) students were viewed as thinkers and not as blank slates; 4) students primarily worked in groups and interacted with peers and the instructor who became the mediator; and 5) assessment was interwoven with teaching (Brooks & Brooks, 1993).

Constructivism was sometimes equated to low structure and permissiveness. However, Wilson (1993) contended that if students were to be creative, some kind of discipline and structure needed to be provided. According to Wilson, the teacher needed to make professional judgments about how much structure to impose.

While behaviorists taught in order for the student to get right answers, constructivists taught in order for students to construct knowledge. "People are not recorders of information, but builders of knowledge structures" (Resnick & Klopfer, 1989, p. 4), was a consensus statement of how constructivists felt towards learning. The behaviorists dominated the literature during the past several decades and produced prescriptive approaches to learning, but in light of what employers said about needing employees to analyze and synthesize, then the constructivist theory developed in order for students to be meaning makers. Constructivism promoted active and not passive learning and promoted students' assuming the responsibility for their learning (Peterson & Knapp, 1993).

Learning Theory as Related to Computers

Designed technological instruction had various developmental stages throughout its history. These stages paralleled the theories of behaviorism and cognitivism and were presently reaching towards constructivism (Cooper, 1993).

Behaviorism. The instructional mode for much of the computer software until somewhat recently was based on the early work of Skinner (Cooper, 1993). Skinner (1958) said:

> The teaching machine, like the private tutor, reinforces
> the student for every correct response, using this
> immediate feedback not only to shape his behavior most
> efficiently but to maintain it in strength in a manner
> which the layman would describe as holding the student's
> interest. (p. vii)

Hawkridge (1991) confirmed that by saying that the psychological roots of educational technology depended greatly on behaviorism. He went on to question that if the study of human cognition and not human behavior provided a basis for understanding learning, then why were

computer educational technologists persisting with the behaviorist model.

Golub (1983) said that behavioral computer-assisted approaches had a place if the intent were to have clearly delineated content where branching is constrained and where learner responses were either right or wrong. He further stated that too many computer programs functioned only as automatic pageturners and left the learner in a passive state.

Computer science instructional design based on behavioristic principles included low-level physical technology, relatively simple programming principles, use of electronic rather than electromechanical devices, sequencing, iteration, underdeveloped internal processing, and elicited learner responses evaluated in order to generate some sort of feedback. This approach was based upon repetition and feedback of correct responses but not upon depth knowledge (Cooper, 1993).

Cognitivism. Individual differences brought an awareness that computer instructional programs needed to change in order to keep abreast of what cognitivists were learning concerning the acquisition of knowledge and how people learn. These programs had to accommodate the evaluation of individual learner requirements, capabilities, and cognitive styles. Another important element to the cognitivist, cognitive strategies, also needed to be incorporated into these computer instructional programs (Cooper,1993). Therefore, cognitivism surfaced in technological endeavors.

However, as Cooper (1993) also noted, cognitively oriented computer-based learning required "a level of hardware previously unavailable, implementation mechanisms such as intelligent tutoring, hypertext, hypermedia, expert systems, and a design that emphasizes content structure" (p. 16). Although this equipment was limited, the introduction of hypermedia and hypertext was helping computer designers to move towards the cognitive theory.

Ellis (1992) suggested several ways that cognitivism and computer technology could unite. First of all, he felt that learners needed to

explore material at their own discretion; that would require multiple computer pathways through information. The technological designer could develop open loops that allowed information retrieval and storage that could lead to future discovery learning. Secondly, the computer environment would have to offer a system to assimilate new and challenging information. Third, the system would require the use of many scenarios in order for the learner to contextualize and increase knowledge growth. Chunking was the fourth function of a computer that Ellis specified if it were to align with the cognitivist theory; the designer would have to decide what the information units should be and how to integrate the chunks into the scheme. Mnemonic devices, concept mapping, advance organizers, imagery, metaphors, framing, contextualism, anchoring devices, and multimedia devices would also be necessary in order to move computer instruction into the cognitivist domain (West, Farmer, & Wolff, 1991).

Winn (1993) discussed the importance of contextual learning as related to technological design. He began by stating that if student learning were to be useful, it must be contextually based. He said, "In the real world, people do not solve problems by the logical application of decontextualized knowledge" (p. 16). He proposed that contextual learning and technological design need not be paradoxical; designers needed to incorporate metacognitive skills, inferential reasoning, and learning environments in which students constructed knowledge and ways that brought authentic activity into the classroom by the use of computers.

Constructivism. In constructivism problem solving was based upon personal discovery, intrinsic motivation, responsive environment, individual learning style, and active and reflective learning (Cooper, 1993). This added a degree of complexity to computer instructional design.

In order to address the needs of constructivism, a different form for computer instruction then needed to be addressed. That type of

design relied more on application that allowed for exploration, interaction between learner and computer, simulations, and virtual reality. However, the limitation of implementing that theory into computer design was that the network infrastructure was just being developed in order to support that type of design (Cooper, 1993).

Jonassen (1994) described a conundrum that constructivism posed for technological instructional design: if each learner were responsible for knowledge construction, then how could designers insure a common set of outcomes? He then defined what should be included in a constructivist technological design: multiple representations of reality, avoidance of oversimplification, focus on knowledge construction and not reproduction, contextualization rather than abstraction, real-world case-based learning environments rather than pre-determined instructional sequences, reflective practice, and collaborative construction of knowledge through social negotiation. He further described the constructivist designer's dilemma by saying that learning outcomes were not always predictable and that in this theory instruction should foster but not control the processing of the learner. Currently, he said, there were no design models for designing constructivist environments; however, designers had begun to refine a set of heuiristics for designing constructivist environments which should lead to a design model.

A few computer programs were beginning to move to the realm of constructivist theory. Since cooperative learning was a technique used by constructivists, computer programs were utilizing this aspect. Seymour (1994) added that if technology continued to grow exponentially, it was essential that effective methods such as cooperative learning be used in technology.

Also, microworlds which were computer simulations that students could construct for themselves in order to manipulate and explore the behavior of the world were in the design stages (Laurillard, 1988). She further suggested that computers should try to emancipate the

learner from the conventional program-controlled tutorial into environments that gave students maximum control over learning strategy and manipulation of content. Although, Laurillard agreed that limitations to the medium existed in order to produce that environment, she suggested that computer-assisted learning should be less didactic than it had been to date.

Another innovative computer design, the intelligent tutor, was also helping to address the constructivist views of learning. Woolf (1988) replied that intelligent tutors would reason about a student's knowledge, monitor his/her solutions, and custom-tailor teaching strategies to a student's individual learning pattern. Using heuristic knowledge, intelligent tutors would also help a student learn how to learn by showing students false paths taken in their cognitive approach and giving examples of problem-solving activities to explore (Woolf). Some of these systems were in trial operation, but many were in the developing stages.

Virtual reality was another technological medium that seemed promising in the light of contextual and experiential learning. Helsel (1992) explained that virtual reality in the not-too-distant future would allow a student not only to interact within virtual worlds, but it would be possible for the user to become someone else. She suggested that this medium should have a conceptual orientation where cognitive, social, emotional, and spiritual processes became the focus of the designer and not just the technological concepts where the emphasis was placed upon the mechanical. Furthermore, she stressed that this technological medium would replace the textbook orientation used in today's classroom.

Integrated Learning Systems

Integrated learning systems (ILS) were the primary mode of delivering basic skills instruction in Oklahoma's Education Enhancement Centers. ILS had multi-tasking systems which enabled them to access

different parts of software at the same time; therefore, some students could work on the addition of fractions, others on multiplication, while others worked on reading comprehension.

These systems did offer some advantages. Bracey (1991) said that they were an effective use of the computer. They were individualized and allowed students to progress at their own pace, offered immediate feedback, had a comprehensive basic skills curriculum in math and reading, and had a good student management tracking system. White (1992) added that they also 1) provided systematic exposure to the curriculum; 2) provided individual pacing and review; 3) tracked errors which re-exposed the student to more instruction in order to reach mastery level; 4) provided motivation through interactivity and game format; and 5) gave flexibility so that anyone could know exactly what a learner had been taught.

However, disadvantages also surfaced in regards to the ILS. These systems were based upon a behavioral theory with reliance on multiple choice questions, prescriptions, drill and practice, and no interaction. Sherry (1992) further explained that these systems had other disadvantages in their expense, difficult-to-learn management systems, and reports that made too many general assumptions about the student. Bailey (1992) added the disadvantage of loss of teacher curriculum control on the instructional image of a "drill and kill approach to basic skills learning" (p. 3). White (1992) also listed disadvantages; these were 1) the machines were not as effective as teachers; 2) they were too mechanical and impersonal; 3) students lost motivation due to boring instruction and repetition; and 4) they taught routine skills but not higher-order thinking or conceptual skills.

Bailey (1992) researched projects that dealt with the effectiveness of the ILS. In his research the consensus was that these systems had not reached their potential. Some of the disappointing results dealt with the ideology of autonomous tutoring by software. In order to improve their effectiveness, the systems needed to be revised

and refined based upon a more complete theory of effective classroom instruction and learning. However, Bailey also contended that there was support for these systems and that the future was positive, especially if there were a concerted effort between school and technological reform.

Becker (1992) contended that one great limitation of the ILS was in their non-ability to apply social learning activities into their curriculum. Since childhood learning was primarily a social activity, according to cognitive and social psychologists, Becker claimed that this function needed to be added to the integrated systems. He further replied that although these systems had evidenced occasional success, he felt that the developers and vendors of these systems were deceiving themselves if they believed the currently designed systems would lead to long-term consumer satisfaction by administrators, teachers, students, or parents.

Van Dusen and Worthen (1992) in a study of 23 schools in 10 states with over 300 ILS users found that if schools followed the implementation model offered by the system companies, then students' results would be more positive. Shore and Johnson (1992) concurred with this statement. First, the implementation model suggested that at least 25 percent of a student's instruction be on the ILS; however, over 80 percent of the students were scheduled less than one hour per week in Van Dusen and Worthen's study. Secondly, the model also suggested that teachers be involved with the students as they worked on the machines. Another component of the model was integration with the classroom curriculum; the material should not be taught in isolation but integrated with the rest of the curricula. Staff training was the last item mentioned as part of the model; this stated that all staff connected with its implementation should receive training on its correct usage.

Maddux and Willis (1992) reported on the controversial embryonic field of educational technology with an in-depth view of the problems

of an ILS. They stated that social, psychological, and technical problems persisted with those systems. Although they reported on empirical studies about the effectiveness of an ILS, they also contended that the quality of research was poor; they said that many of the studies were handed out by vendors or others, and they did not adhere to methodological analysis. They also said that a Johns Hopkins University scholar concluded that ILS research had serious flaws and that no definitive conclusions could be drawn from them.

Designed computer instruction appeared to be shifting from a behavioristic based theory to a constructivist theory. This moved computer design from a passive learner response mode based on repetitions and correct answers to an interactionist mode based on simulations, virtual reality, and active response-driven modes. However, the limitation was that the hardware and design model were just now being designed to match the instructional design requirements.

Wilson (1993) summarized by saying that instructional design was behavioristic in its orientation methods and research base. He paralleled that to computer instructional design but said that this latter design was moving toward a more global, holistic view rather than merely prescriptive. In effective computer instructional design, Wilson contended, there should be simulations, strategy games, multimedia learning environments, Socratic dialogues, coaching and scaffolding, and cooperative and collaborative learning.

Jonassen (1993) reinforced the idea that the educational technology community needed to shift focus from instructional technology where computers only aided in the delivery of instruction to intellectual technology which focused on designing arrangements in the learner's environment and developing mediating resources in which the learner was enabled to explore the learning task. Those environments would be complex, learner-oriented, engaging in higher-order thinking skills, and constructivistic. However, Jonassen added that if a technology paradigm were to shift, then technological designers needed

to begin to solve the problems that impeded that type of environment, and, he cautioned, educators in common schools needed to move more towards developing metacognitive skills and constructivist thinking instead of the emphasis now being placed on reproductive thinking.

Banathy (1992) argued that educational technology designers were aware of the ideal system needed for today's practices of cognitivism and constructivism. Although it had not been structured in the educational community, he challenged the designers to begin moving from the underdeveloped state of competence in systems design to the ideal system.

Bagley and Hunter (1992) described the educational reform movement concomitant with restructuring schools towards both a constructivist and cognitive/information process view of learning and a movement towards integrated uses of technology. They stressed that education was changing in order to meet societal and business/industry needs and that a synergism of technology and instruction would be forged to change this country from a nation at risk.

Laurillard (1988) summarized the dilemma of the ILS. She contended that the computer had never become a principal teaching method at any level of education because, like an ILS, it created modes corresponding to tutorials, experiments, drills, tests, and demonstrations, but it did not offer ways in which students had much control over learning strategy, the manipulation of learning content which referred to the way students experienced the domain being learned, or description of content where students constructed their own perspectives of a subject. Technological research design was moving in that direction, and simulation and intelligent tutors provided pedagogical improvements in those areas. However, Bailey (1992) emphasized, "A student's overall learning experience cannot and should not be handed over to ILS companies who produce the instructional systems and materials" (p. 3).

Kearsley (1987) personalized his feelings about computer instruction as reflected in the ILS by saying:

> Over the years I have become increasingly disenchanted with the value of computer-assisted instructional programs. The problem is that most of our current attempts to use computers for instruction are too simplistic to have significant effects on learning. We need much more sophisticated instructional software to really help people learn via computers. More specifically, we need to be able to incorporate the kind of teaching strategies and subject matter possessed by good teachers into our programs. (p. 27)

In the controversy concerning the use of integrated learning systems, Maddux and Willis (1992) explained that those systems were undoubtedly based upon behavioral theories of learning and teaching. However, since education was being based more on the cognitive and constructivist approach, those systems' capabilities in assessing factual knowledge, presenting information, and giving results of multiple choice tests were reaching obsolescence. They stated that this generation of teachers were comfortable with behavioristic tenets; however, the next generation would find the ILS to be regressive and backward. They continued by saying, "The learning theories that will probably influence schools throughout most of this decade not only do not support the ILS model, they are aggressively hostile to it" (p. 55).

However, Sherry (1992) suggested that because of the deficiencies mentioned by Maddux and Willis, the ILS would change in the future. The changes would encompass the prospects of intelligent tutoring systems and would refrain from behavioristic approaches and move more to cognitive/constructivist approaches.

Transfer of Learning

"Transfer of learning occurs when a person's learning in one situation influences his learning and performance in other situations" (Bigge, 1982, p. 252). Bigge further responded that transfer was basic to schooling. Unless transfer occurred so that students could use the knowledge gained in educational institutions and related it to daily life operations, then education was of little or no value. Therefore, transfer was essential in meeting the needs of the American workplace.

Since transfer of learning was deemed essential, the question evolved, "What were effective means of transfer?" Was there one learning theory (mental discipline, behaviorism, cognitivism, or constructivism) that was more effective with transfer? In order to answer those questions, this section will 1) give a somewhat historical approach about transfer research conducted in the twentieth century in order to determine what constituted effective transfer; 2) briefly examine how transfer principles related to the various theories in order to determine if any theory impacted transfer of learning more than others; and 3) summarize the findings from research detailing the effective means of transfer.

Although some felt little was known about the transfer of learning (Winn, 1993), some psychologists and educators had studied it extensively. Ellis (1965) found two generalizations based upon cognitive learning helped in understanding learning transfer. The first was that meaningful learning where time was spent understanding and analyzing a process was better than the behavioristic rote memorization for transfer. Secondly, along with giving the learner the opportunity to fully learn a particular type of problem, the added advantage of providing the student with many experiences in the problem-solving domain allowed the student to more easily transfer learning. However, Noble (1961) concluded from research experiments that meaningfulness related to a problem helped with acquisition of

knowledge but not with transfer. This disparity indicated the inconclusive information regarding transfer.

Haslerud and Meyers (1958) discovered through experiments that if the learner derived principles independently, then learning was more transferrable than if the principles were just given. This related to a constructivist approach to learning in that the learner makes meaning instead of mere rote memorization of facts.

Even in the behavioral era of learning, transfer was studied, and a cognitivist theory of metacognition emerged concerning the principles of transfer. For example, Travers (1963) found that if students were taught techniques and strategies in learning new information, then there was a higher degree of transfer.

Researchers also distinguished among three areas which aided in transfer of learning. The first was verbalization which referred to the idea that verbalizing generalizations prior to application promoted transfer. Practice on a variety of tasks and overlearning also resulted in increased positive transfer (Houston, 1976; West, 1976).

West (1976) found that perceived similarity between tasks heightened by context would determine whether transfer between two situations was attempted. Furthermore, he said that objective structural similarity helped to determine whether transfer was positive or negative.

Berryman writing in a National Council on Vocational Education Journal (1991) explained that transfer of learning was promoted when learners could apply their new knowledge to problems that were relevant in the workplace. She further explained that similarities between the learning context and real life were critical to transfer. She also reinforced the idea that contextual learning played an important role in transfer by saying:

> However, if...knowledge is learned in isolation from realistic
>
> problem contexts and expert problem-solving practices, it
>
> remains inert in situations for which it is appropriate. In

other words, it will not transfer. It is only through
encountering domain knowledge in real problem contexts that most
students will learn its ... implications for other situations.
(p. 20)

Brooks and Brooks (1993) discussed the supposition that they
felt many teachers had about learning transfer. They explained that if
a teacher's classroom were based upon memorization of facts in order to
pass a test, then that teacher assumed transfer automatically occurred
because the learner had a sufficient knowledge base. However, Brooks
and Brooks contended that this information base was short-term, and
transfer only occurred sporadically.

Transfer Related to Theories

Bigge (1982) related transfer of learning implications to the
various learning theories. First of all, in mental discipline learning
was a matter of strengthening the mind and the faculties of memory,
will, reason, and perseverance; therefore, rote memorization, a
student's taking difficult subjects, and mental exercises in the
classics and logic would make a person effective in all areas where a
faculty was employed. In regards to this, transfer was considered to
be automatic because once a faculty was developed, it could be used any
time when appropriate. However, proponents of the other learning
theories disagreed that strenuous exertion expended in studying a
subject would necessarily equate to a student's being able to transfer
that knowledge to other situations. Behaviorists believed that
education best served the workplace if it conditioned students
efficiently. There should be well-ordered groups of connections that
related to one another and the world in useful ways. Conditioned
reinforcement, stimulus and response induction, and conditioned
generalized reinforcement were the behavioristic methods used in
learning transfer. Cognitivists also believed in generalizations, but
they added the dimension that the person must not only comprehend the

common factors in different generalizable situations but also must perceive them as applicable and appropriate to both situations and, therefore, understand how a generalization could be used. They must also desire to benefit by the commonality of the situations.

Constructivists and cognitivists believed that transfer would be better if the learner could discover relationships and if the learner could apply the learning to a variety of tasks including hands-on learning and utilizing lifelike situations. Also, the amount of intraproblem insightful learning determined the amount of transfer.

Bigge (1982) also described a research experiment on transfer of learning. In this experiment, the hypotheses that emerged included: 1) more transfer power developed if a learner could discover a concept individually rather than have an authoritative explanation of the concept first and before the individual discovery; and 2) making learners verbalize the rule they learned did not increase and may even decrease transfer power, which was contradictory to Houston's (1976) and West's (1976) findings.

Learning Styles

A new paradigm had surfaced in the 1980's and was changing certain aspects of both the educational and business arenas. Prior to this paradigm educators believed that certain people could not learn or only learn on a very limited basis. However, research indicated that today educators were accepting Sternberg's (1991) assessment that there were different ways of being smart; these ways included analytic, synthetic, and practical. However, he believed "only the first is typically recognized in schools" (p. 22). He further contended that those who were test-smart were typically recognized in schools, but that those who made the greatest contributions in our society were often not those with the highest IQs. Therefore, research in learning styles and brain research was leading educators to the new paradigm that all could learn. What our society once prioritized as elements of

intelligence was being examined closely; the results were inconclusive, but learning style research was indicating that individuals process information differently, and if the most appropriate learning style could be used for each individual in each situation, then all could learn.

Research on learning styles was proliferate with information ranging from the definition to learning styles matched with brain hemispheric research. With such a vast array of areas in which to select for learning style research, the topics will be limited to include: 1) the definition and brief historical background; 2) learning styles and assessment; 3) what instructors should discern from the assessment; 4) whether matching teacher to student style was the best choice; 5) the validity of the assessment and research; and 6) which instrument to use.

Learning style research was experiencing a heightened awareness for educators of the latter 1980's and the present decade. Educators were recognizing the merits of viewing learners from a holistic approach and realizing that one's learning ability involved more than just the cognitive processes. According to Keefe (1979), instruction and learning were not necessarily direct correlates. In the past educators basically felt that if instruction were adequate, then learning would naturally follow. However, this premise was being challenged and overall not being accepted. Educators were realizing more about the complexities of learning with many factors affecting the outcome. Therefore, many educators were examining various aspects of learning and to date had concluded that one's learning was affected by multiple aspects such as cognitive, affective, and physiological domains.

According to Keefe (1979), learning style research had a history dating back to 1892, but more emphasis was directed to this after World War II. Witkin's research began a serious study and prompted further research when he introduced the field dependence-independence theory

which he later broadened to the analytic-global concept (Witkin, 1976).
The Menninger Foundation built upon this research by adding a group of
cognitive control factors including differentiation versus
undifferentiation, leveling versus sharpening, and flexible versus
constructed control (Cotterell, 1982). Many aspects had been added
since 1960, but a consensus was developing that the learning
environment, an individual's learning style, and the teaching style
were all important components in the development of how one learns.

Although much had been learned about learning style, learning
style research was in its infancy in regards to answering certain
questions about how individuals process information and how this
process had implications on career decisions and other life choices.
For example, did an individual select an occupation primarily because
it facilitates expression of one's learning style? With learning
style research in the forefront of educational circles, many questions
were being raised concerning this topic and conflicting answers
appeared to be given, but at least most researchers had reached
consensus on the definition of learning style.

What Is a Learning Style?

Many definitions existed on learning styles, but most researchers
felt there was a difference between the terms learning style and
cognitive style; however, some interchanged one for the other.
Campbell (1991) denoted the following difference:

> Although they are not the same, "learning" style
> and "cognitive" style have been used synonymously
> in the professional literature. Learning style
> is the broader term and includes cognitive, affective,
> and physiological styles. (p. 356)

Brundage and MacKeracher (1980) differentiated between the two
by reporting:

> Consistent individual differences in the ways of
> organizing experiences into meanings, values, skills,
> and strategies are called cognitive styles. Consistent
> individual differences in the ways of changing meanings,
> values, skills, and strategies are called learning styles.
> (p. 45)

One of the most comprehensive of definitions found on learning styles was by Keefe (1979). He said, "Learning styles are characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 4).

Cornett (1983) distinguished the cognitive, affective, and physiological aspects of learning styles. She emphasized that the cognitive aspect included the way an individual decoded, encoded, processed, stored, and retrieved information. In contrast to this the affective aspects included the emotional and personality characteristics related to such areas as motivation, attention, locus of control, interests, willingness to take risks, persistence, responsibility, and sociability. Sensory perception, environmental characteristics (noise level, light, temperature, room arrangement), need for food during study, and optimal learning times were components of the physiological aspects.

It should be noted that not all researchers were in agreement with this classification of learning styles. Moran (1991) felt that there should be more attempts to distinguish between the important and peripheral correlates of learning style. Moran argued, "On what theoretical basis can a preference for eating 'a snack as I study' be equated in importance with a person's emotional reasons for learning something" (p. 241)? Feeling that the research on learning styles was less than adequate, Moran further explained the need for a rigorous conceptual and empirical analysis of the construct of learning style.

Curry (1983) proposed that all learning style measures be grouped into three main types of strata resembling layers of an onion. The outermost layer of the onion and the most observable style was labeled as instructional preference which referred to an individual's choice of environment in which to learn. Information processing was the second layer of the onion model and was considered as the individual's intellectual approach to assimilating information but did not directly involve the environment. The third layer was cognitive personality style which was defined as the individual's approach to adapting and assimilating information which did not interact directly with the environment.

Kolb (1981) assessed that people basically approached new learning situations either through feeling or thinking. He categorized learners into four distinct major learning styles: dynamic, analytic, common sense learners, or observable learners.

Gregorc (1979) also categorized learners into four areas. His divisions included concrete sequential, abstract sequential, abstract random, and concrete random.

Although these researchers used various terms to describe learners and categorized them differently, primarily they were assessing very similar dimensions of learning style. The dimensions used in the researchers ordering of learning styles included imaginative, logical, analytic, pragmatic, intuitive, conceptual, sociable, and investigative; most felt learners were combinations of more than one approach to some extent but had a predilection for one style, perhaps two, the majority of the time.

Assessing Learning Styles

Learning styles could be assessed by a variety of instruments; there were at least 32 commercially published instruments designed to assess different dimensions of learning style (Sternberg, 1991). Cornett (1983) emphasized, "In selecting a learning style instrument,

educators need to consider the validity, cost, time to administer, and ease of interpretations of the instrument" (p. 30).

Although the instruments varied greatly, they did have some similarities and purported to measure various preferences in learning styles; Smith (1982) listed 17 different learning style inventories that could be used to help adults determine their prevalent style. Some instruments measured only one dimension while others measured multiple dimensions. The following four instruments (Kolb, Gregorc, Myers-Briggs, and Witkin) had been used in measuring learning styles and were described by Campbell (1991).

Kolb's Learning Style Inventory had subjects rank order nine sets of four words. That was approximately a 10 minute self-report which assessed if learners were feeling (concrete experience), watching (reflective observation), thinking (abstract conceptualization) or doing (active experimentation).

The Gregorc Style Delineator helped to determine a person's perceptual and ordering preferences. That was a self-reporting instrument based on a rank ordering of four words and could be administered in five minutes. This assessment revealed four combinations of learning preference dualities: abstract sequential, abstract random, concrete sequential, and concrete random.

The Myers-Briggs Type Indicator (MBTI), based on the theory of psychologist Carl Jung, was a measure of personality dispositions and interests. The purpose of the instrument was to make the Jung's theory of psychological types understandable and useful in people's lives and to provide a measure of Jung's theory and types (Kapes & Mastie, 1988).

Myers and Myers (1980) included an explanation of the four bipolar scales of the MBTI and how these helped determine 1 of 16 types an individual was based upon the combination of the bipolar scales. First, Myers and Myers contended that the bipolar differences related to the way people preferred to use their minds--either the way they perceived or the way they made judgments. They defined *perceiving* as

the process of becoming aware of things and determined what people saw
in a situation and *judging* as the process of coming to conclusions
about what had been perceived and determined what people did about what
they saw.

Next, Myers and Myers (1980) discussed the first bipolar scale
which was related to perceiving. They said that people either became
aware of things directly through the five senses or through the process
of intuition, which was the indirect perception by way of the
unconscious. Therefore, the first bipolar scale related to whether
people liked to use their minds through the *S* or *N* preference: *S* for
sensing and *N* for intuition.

There were two ways of judging (Myers and Myers, 1980); one was
by thinking (T) and the other by feeling (F). Judging constituted the
second bipolar scale of either *T* or *F*. Thinking was a logical process
aimed at an impersonal finding, whereas feeling related to appreciation
and bestowing a personal, subjective value on things. Those indicating
a preference for the thinking scale preference would be identified as
being consistent and logical and grew more adept in the organization of
facts and ideas. However, those who preferred the feeling scale based
judgments on whether the ideas were pleasing or displeasing or
supporting or threatening and usually better handled human
relationships.

The TF preference was independent of the SN preference (Myers &
Myers, 1980). Therefore, the four combinations that might occur would
be *ST, SF, NF, or NT*. In defining those personality types they
concluded that the *ST* people focused on facts verified by the senses;
their personalities were practical and matter-of-fact. On the other
hand, the *SF* people approached their decision with warmth because their
feelings weighed how much things matter; they were more interested in
facts about people than things and tended to be sociable, sympathetic,
and friendly. The *NF* personality also possessed personal warmth but
did not center their attention on the concrete items; they, instead,

focused on possibilities or new truths and were characterized by their enthusiasm and insight. *NT* personalities approached possibilities with impersonal analysis by choosing a theoretical possibility and subordinating the human element. The NT seemed to be logical and ingenious and was most successful in solving problems in fields of special interest.

Myers and Myers (1980) further discussed bipolar differences by stating that people's use of perception and judgment also arose from their relative interest in their outer and inner worlds. This formed the bipolar preferences of either extraversion (E) or introversion (I). The introvert's main ideas evolved around the inner world of concepts and ideas, but the extravert's interests involved the outer world of people and things.

The last bipolar scale Myers and Myers (1980) discussed concerned attitudes; these scales were identified as either perceptive (P) or judging (j). Those with a judging attitude shut off perception to come to a conclusion; when they felt all the evidence was in and anything more would be irrelevant and immaterial, they arrived at a verdict. Conversely, judgment was never shut off with the people possessing the perceptive attitude; they felt that all the evidence was not in because new developments could occur and that it was too soon to do anything irrevocable.

Again, all of the bipolar scales were independent of each other. This made it possible for a person to have 1 of 16 personality types which included: ENTP, ESTP, ENFP, ESFP, ENJF, ESFJ, ENFJ, ESTJ, INTP, ISTP, INFP, ISFP, INTJ, ISFJ, INFJ, or INTJ. A description of these are included in the appendices.

Myers and Kirby (1994) directed a portion of their findings to type dominance. They suggested that each of the 16 types had a dominant, auxiliary, tertiary, and inferior function. They concluded that the dominant function was the one relied on most and was the most conscious and well-developed. The dominant function was the core of

one's personality. The auxiliary function was second in importance and provided balance between perceiving and judging and extraverting and introverting. The tertiary function was not a preferred function and was much less developed and conscious; it was the opposite bipolar scale of the auxiliary. The last function was called the inferior function which was the opposite of the dominant function. This was the least developed function and was the primary connection to the unconscious and the most difficult to use in one' conscious life.

Herman Witkin's Embedded Figures Test was designed for research with the field independent-field dependent aspect of cognitive style. It assessed analytic ability, social behavior, and body concepts. Using a different format, this instrument required that individuals locate a simple figure within a more complex design.

Implications of Results for Teachers

Moran (1991) believed that learning was affected significantly by the matching or mismatching of students' learning styles to a teacher's instructional techniques. Since that idea was echoed by other researchers, the assessment results measuring learning styles should be weighed carefully by teachers. Because of its implications as reported by researchers, this section will correlate teachers' and students' assessment results to instructional techniques.

Field Dependent-Independent--Embedded Figures Test

Regarding teaching methods, Witkin, Moore, Goodenough, and Cox (1977) reported that field independent teachers preferred more formal approaches, but field dependent teachers preferred frequent interaction with learners. Field independent teachers appeared to use questions as instructional tools, while field dependent teachers questioned to check what had been learned (Riding and Cheema, 1991).

Claxton and Murrell (1987) found that field dependents were more strongly influenced by peer groups and field independents more

autonomous. Furthermore, field independents-dependents exhibited differences in speech patterns with the field independents using more personal pronouns and field dependents referring to others more. They also indicated that those categorized as field dependent favored areas with more extensive interpersonal relations.

Witkin's (1976) research indicated that field dependent individuals preferred learning in groups, but field independent learners responded better to more independent and individualized approaches. Guild and Garger (1985) used Witkin's research to compile a list of students' characteristics in each of the two domains. For example, students who were labeled field dependent perceived things as a whole, made broad general distinctions among concepts, saw relationships, had a social relationship to the world and learned material with social control best. Students who were field independent perceived in parts, experienced in an articulated fashion, imposed structure or restrictions, made specific concept distinctions, saw little overlap, had an impersonal relationship to the world, and learned social material only purposely.

Riding and Mathias (1991) referred to field independents as analytics and to field dependents as wholists. "The positive strength of the wholists is that they see the whole picture, the negative that they find difficulty in separating out the parts" (p. 386). The antithesis was true for the analytics.

Miller (1991) ascribed the following characteristics to Kolb's categorization of learning styles. People with concrete experiences enjoyed relating to others, were good intuitive decision makers, functioned well in unstructured situations, and had open-minded approaches to life. Those classified in the reflexive observation category viewed things from different perspectives, appreciated different points of view, liked to rely on their own thoughts and feelings to form opinions, and valued patience, impartiality, and thoughtful judgment. Abstract conceptualists focused on logic, ideas,

and concepts and preferred thinking as opposed to feeling; they were good at systematic planning, manipulation of abstract symbols, quantitative analysis, and valued precision and the aesthetic quality of a neat conceptual system. The category of active experimentation focused on actively influencing people and changing situations; those people enjoyed doing things, taking risks, and liked to see results.

Claxton and Murrell (1987) used other terms in their research of Kolb's work. They used divergers for people who grasped an experience through concrete experience and transformed it through reflective observation. Assimilators were those who grasped the experience through abstract conceptualization and transformed it through reflective observation. Next, the convergers grasped the experience through abstract conceptualization and transformed it through active experimentation. The last group, the accommodators, grasped the experience through concrete experience and transformed it through active experimentation.

Kolb, Rubin, and McIntyre (1979) described divergers as taking in information concretely but processing it reflectively. Divergers generalized from what they saw; they were good at generating ideas and brainstorming and were people-oriented and emotional. However, they described assimilators as individuals who began with an abstraction and processed it reflectively; they thought and watched. Assimilators' primary strength was their ability to create theoretical models; they were less interested in people and focused on the soundness of ideas instead of the practical application. Accommodators were feelers and doers as they perceived experience concretely and processed it actively. They liked to focus on new things and have new experiences, were intuitive, impatient, and sometimes pushy. Convergers started with an idea and tested it through experimentation; therefore, they took in experience abstractly and processed it actively. Convergers were relatively unemotional and preferred to deal with things rather than people; also, they moved quickly to find the one correct answer.

Riding and Cheema's (1991) review of learning style literature found that teachers preferred learners who were low in divergent thinking even though they produced more original responses. The review also indicated that there was a high positive correlation between field independent and divergent learners.

Myers-Briggs Type Indicator

Myers and Kirby (1994) elaborated on the concept that educational systems influenced the developmental path of students and that few educational systems were organized to support various type preferences; this forced many students to work in non-preferred areas in educational settings. For example, elementary years supported sensing and judging preferences; they explained that intuitives often felt criticized at that age for being messy, daydreaming, and not following the rules. The thinking judgment was preferred by most educational systems to the feeling judgment. They also reported that traditional school systems were often very difficult for those identified as extraverted sensing because long verbal explanations, theoretical analyses, and memorization of facts de-motivated this type. Soliday (1992) reported that most vocational students were either ES or IS.

Some of the research corresponding to the Myers-Briggs Type Indicator (MBTI) indicated that high-drive introverts and low-drive extroverts were found to be at a significant disadvantage in retaining complex verbal material (Claxton & Murrell, 1987). These same researchers found that extroverts exhibited superior performance on psychomotor tasks. Furthermore, no differences were found in the retention of verbal material. Other results showed that intuitive types scored higher on aptitude measures in reading and writing because they converted symbols into meaning and on tests with theory and abstraction. It was found that sensing types were less motivated to read but took more time to read for details. Claxton and Murrell also

found that the MBTI was useful in providing information about teachers and teaching styles. For example, sensing types asked questions that sought facts and details with predictable responses, but intuitive types called for synthesis, evaluation, imagination, and hypothesizing. Sensing teachers were more likely to teach practical skills with facts and details; intuitive teachers taught lessons rich in abstractions and theory.

Myers and McCaulley (1985) further described type difference as related to learning. They found that IN types showed greater academic aptitude than the ES types who preferred the practical world of action. They further concluded that IN and J preferences made the main contributions to scholarly success. These researchers then summarized the relationship between type preference and academic achievement as : 1) academic aptitude was associated with a preference for IN, but feeling types tended to score higher on verbal abilities and thinking types on stress analysis measures; the P type scored higher than the J types and scores relating to breadth of information aptitude; 2) applications to studies led to higher achievement with the J type more willing to work and, therefore, were often overachievers; and 3) interest based on tasks that fit one's preference type led to higher achievement.

Myers and McCaulley (1984) also reported on students in remedial programs. They noted that S types were poorer readers. Furthermore, they delineated those with an S, F, or P preference often had difficulty with school. In college, the S and Fs had the greatest difficulty; the INP types preferred independent study, but this was disliked by IS types.

Gregorc Style Delineator

According to Schmeck (1988) the Gregorc Style Delineator assessed if an individual were concrete sequential. If so, an instructor would know that person probably was objective, persistent,

and careful with detail. Schmeck also noted that the abstract
sequential person had the characteristics of being evaluative,
analytical, logical, and oriented to research. Sensitive, aesthetic,
aware and spontaneous described the abstract random person while the
concrete random person was intuitive, experimenting, creative, and risk
taking.

Sternberg (1991) added more characteristics to the various
categories. Structured, practical, predictable and thorough were
additional traits of the concrete sequential. Conceptual and studious
were more traits of the abstract sequential. Added to the list of
traits for the abstract random were sociable, imaginative, and
expressive. The concrete random person was also original and able to
solve problems.

Claxton and Murrell (1987) told which strategies worked best with
the different learning groups. For example, concrete sequential
students preferred workbooks, demonstrations, programmed instruction,
and well-organized field trips; however, concrete random students
preferred games, simulations, independent study projects, and optimal
assignments. A preference for learning through reading and listening
and profiting from orderly and rational presentations from authorities
was a priority of the abstract sequential learner. Unlike the former
the abstract random student preferred unstructured environments and
enjoyed movies, group discussions, and television.

As could be determined from these four assessments alone, a
teacher could discern much about a student. With this knowledge, then,
the teacher could make a decision concerning whether to match a
students' style directly or whether a mismatch would be more
appropriate or whether to not even be concerned with the matching
issue.

<u>Matching Student and Teacher Style</u>

Controversy existed concerning whether a student would do better if the students' and teachers' learning styles were matched. The matching dilemma became a challenge when the multiplicity of ways matching could occur was analyzed. For example, does one match the overall style of teacher and student, tasks to abilities, or the cognitive, affective, or physiological domains?

Riding and Mathias (1991) asserted, "Students continually taught with materials and methods which do not match their cognitive style, will, therefore, find difficulty in learning" (p. 385). Ford (1985) agreed by saying that extensive research on matching and mismatching of material and types of learners showed that students learned faster and more effectively when a match occurred.

Thompson (1991) reported that research findings were inconclusive concerning increases in student learning if styles were matched. "Among those researchers who provide evidence that matched conditions result in increased achievement are Canfield, Dunn and Abraham" (p 4). However, she said that Adams, McLeod, Ballard and Fox showed no association between matching and improvements.

Andrews (1989) noted some difficulties with matching. He said:

> The most common approach to learning styles is to match teacher and learner style. While that will produce rapid initial learning, there are three reasons that it may not be the best approach. First, there will be nothing to produce change in the learner's approach, strengthen weaknesses, or teach functioning in difficult situations. Second, teaching is difficult in modes other than one's preferred mode. Third, any group will contain a variety of learning preferences; matching styles becomes very difficult, at best. (p. 33)

Cornett (1983) said that Gregorc reported that a mismatch could be a detriment to effective style aspects, producing anger, avoidance behaviors, procrastination, and even major emotional problems. Saracho and Dayton (1980) further contended that matching students and teachers on field dependence was found to be unrelated to achievement test gains.

Validity of Assessment and Research

With a proliferation of assessment instruments and a paucity of validation research, researchers were having growing concerns about learning style assessment instruments and the validity of both the instruments and the research. Moran (1991) stressed, "Clearly, therefore, the task of constructing construct validation research or tests of learning styles is essential if this field is to earn serious scientific credibility" (p 241). Moran continued to say that little had changed since Curry's research in 1983 where she said that learning style researchers had not unequivocally established the reality or utility of the concept.

Riding and Cheema (1991) felt that a fundamental weakness in most assessments was that they measured only one end of a dimension. They gave an example of how a high score on the Group Embedded Figures Test indicated field independence, and a low score only assumed field dependence. However, the low score could have been due to a variety of other factors such as motivation or visual defect. "This deficiency may have been responsible for causing field-dependence-independence to be thought to be related to intelligence and may explain why field independents usually do best on many types of tasks" (p 210).

Research also indicated some concerns of specific assessment instruments mentioned previously. For example, Claxton and Murrell (1987) stated that a criticism of Witkin's model was the negative traits associated with field dependents. They said that only a few of the 24 tests that measured field dependence-independence displayed

adequate construct validity. However, those same researchers stated that the Myers-Briggs Type Indicator had high face validity. Moran (1991) also discussed concern with Witkin's model.

It did appear that considerable doubt existed about the validity of Kolb (Moran, 1991). Claxton and Murrell (1987) expressed the same concern; they felt the inventory was more useful for dialogic than diagnostic purposes. They continued saying that Kolb's model was useful for the adult in that metacognition was an empowering tool.

Adult Learning Style Research

Was there a difference between pre-adult and adult learning styles? Much of the research about learning styles was generalized and did not denote specific age difference; therefore, an assumption was made that the informational research applied to both groups. However, some research was applicable to only the adult population. Following is a review of literature pertaining only to adult learning styles, whereas the previous sections included information applicable to the adult and pre-adult population.

Sweeny (1988) asserted that if a teacher were to be attentive to the diversity of learning styles, then effective teaching had to be influenced by developmental changes. In other words, one could not just examine an adult's learning style, but one should also superimpose that with knowledge of developmental stages and assess where each individual was in relation to the stage.

Partridge (1989) believed that it would be advantageous to use the results of a learning style assessment in designing programs. She especially referred to literacy programs and how these were many times based on remedial practices but felt that it might be more appropriate to base these on a learning style.

However, Korhonen and McCall (1985) suggested that the search for an ideal instrument for assessment of learning style was on-going. They also said that the learning environment interacted with learning

style and that the environment needed to be more narrowly defined to determine which aspects impacted achievement.

Campbell (1985) summarized the results of adults in a military environment using the MTBI to determine learning style preferences and cognitive structures. His findings concluded that classifying characteristics by type had obvious implications to teacher style. He added that countering a student's learning style increased the risk of ineffective learning. Furthermore, he felt the MTBI was a useful instrument in identifying specific preferences of cognitive structure.

Tarule and Weathersby (1979) pointed out that there was stability in learning style preferences from childhood to adulthood. However, those preferences could be expanded or deepened due to the acquisition of methods with opposite strengths.

Witkin (1976) also felt that there was stability over time concerning cognitive styles. He said: "We can predict with some accuracy that a person who has a particular style one day will have the same style the next day, month, and perhaps even years later" (p. 15).

Some researchers noted differences by grouping older and younger learners. Hunter and McCants (1977) found that older students preferred a structured environment stressing organization, but younger students had a preference for peer and teacher affiliation; this correlated to field independence and dependence.

Schmidt (1984) did not do a study of the typical Kolb or Witkin theory but did conclude in his findings that adults did have preferences for areas relating to learning styles. He found that a majority of adult students had strong preferences for setting their own learning goals and liked to work independently; this correlated to the field independent. Also, adults had low preferences for engaging in competitive activities, such as timed-tests, and for engaging in social activities with either instructors or peers, again correlating to field independence.

Hoffer (1986) examined the question: Did adults learn more effectively in the auditory, visual, or tactual-kinesthetic modality across or within subject matter? Four conclusions were drawn from this study:

> First, adults do possess a dominant sensory modality by which they learn more effectively across at least two subject matter areas. Second, there is no one dominant modality by which all adults learn more effectively within subject matter. Third, adults' dominant sensory modalities are not related to age or years of formal education. Fourth, multimodal teaching approaches are not beneficial for most adult learners. (p. 145)

Authentic Assessment

Since the literature research on learning theories was proliferate with the concept that students learn better in context and through application rather than lectures and rote learning, a problem surfaced when assessing the outcomes of students' learning. The problem centered on whether standardized tests with multiple choice questions could adequately equate to a students' knowledges and abilities in assessed areas. As Herman, Aschbacher, and Winters (1992) asserted, "Tests are useful and productive to the extent that they represent significant outcomes for students and the important goal of classroom instruction" (p. 3). They continued by saying that for tests to be valid and useful, test content had to match the knowledge, skills, and dispositions the teachers were teaching and the students were expected to acquire. In order to do this, they said teachers needed to consider alternative assessments which asked students to perform, create, or produce; tapped higher-level thinking and problem-solving skills; used tasks that represented meaningful activities; and involved real-world applications.

Linn, Baker, and Dunbar (1991) developed the following criteria for assessment: 1) teachers should plan from the outset to assess the consequences of the assessment, such as having positive consequences or adverse effects on disadvantaged students; 2) the assessment should consider fairly the cultural background of students being assessed; 3) the assessment should support accurate generalizations about student capability and have cognitive complexity in which students were required to use complex thinking; 4) the content quality should be consistent with the best understanding of the field and reflect important aspects of the discipline; 5) the content coverage of assessment should include aligning the assessment with the curricula and represent the full curriculum over a series of assessments; 6) meaningful problems that are realistic and worthwhile was a main consideration for more contextualized assessments, and 7) assessments should be cost effective. Alternative assessment was a developing field, and according to those authors, the criteria would need to be refined later.

Assessment should be linked to the implications from the cognitive learning theory instead of the behavioristic learning theory (Herman, Aschbacher, & Winters, 1992). Some of the implications noted by these authors included encouraging divergent thinking and multiple modes of expression, emphasizing critical thinking skills and relating new information to personal experience, providing choices in tasks and how to show mastery, not overusing timed tests, providing opportunity to revise and rethink, allowing students to have input into test standards and to self-evaluate, and providing for group work and real-life tasks.

In order to provide performance assessment effectively, there needed to be a relationship between assessment and learning (Marzano, Pickering, & McTighe, 1993). They suggested that teachers assess students by asking them to complete performance tasks that required them to meet identified standards which were developed across content

standards and lifelong learning standards. Content standards dealt with the academic knowledge and skill which belonged to a certain discipline, and lifelong learning standards reflected knowledge and skills that cut across the disciplines and were applicable to life situations outside the classroom.

Data Gathering Tools

The Interview

The interview provided a researcher a way to obtain reliable and valid measures through a face-to-face conversation in which the roles of the interviewer and respondent changed continually (Key, 1994). Although this appeared to be a widely held view, conversely some of the research disagreed about the reliability and validity of qualitative interview techniques. Although the desiderata for an interview were numerous, a conundrum existed because there was an insufficient corpus of reliable, valid analysis procedures for qualitative data gathering tools, such as interviewing (Miles, 1979).

Miles and Huberman (1984) targeted several strategies to refine this inchoate material into trustworthy qualitative data. They said that there needed to be certain steps that interviewers used to report their findings; these included data reduction, data display, and conclusion-drawing verification. Data reduction techniques included: 1) conceptual frameworks which were graphic structures of major variables denoting relationships between them; 2) research questions which stated explicitly what one was wanting to know; 3) sampling which needed to be explained more fully, especially the various samples used such as actors, settings, events, time periods, and processes, and 4) instrumentation decisions concerning whether it be minimal and thereby emphasized construct and contextual validity or actively preplanned which emphasized internal validity, generalizability, and manageability of the data.

Miles and Huberman (1984) listed further techniques for interviewing that would help add reliability and validity. These included contact summary sheets, coding, memoing, site analysis meetings, and interim site studies. By using contact summary sheets, the researcher summarized a site visit by including people and events involved, questions addressed, new hypotheses or speculations discovered, and questions targeted for the next visit. Memoing was a brief conceptual look at some aspect of the data set, such as an insight, a category, an emerging explanation, or a striking event. In multiple-site studies, site analysis meeting forms gave the researcher an opportunity to step back from the flood of fieldwork and take an interim stock by recording main themes, emerging hypotheses, alternative explanations, disagreements, next step for data collection, and coding scheme revisions. The interim site summaries were short provisional syntheses of what the researcher learned about the site and what was still to be pursued. The summaries reviewed findings, looked at the robustness of the data supporting the findings, and set the next data collection agenda.

Coding, described by Miles and Huberman (1984), was a way to group like items together using either descriptive or second level explanatory codes. Oppenheim (1966) described coding frames as classification schemes for responses from the main sample. He suggested to begin the coding frames only after all or a substantial part of the responses had been completed. To design a coding frame, one should, as Oppenheim suggested, put the text of a question at the top of the page and below that list from a representative sample of responses all of the various answers given to that question with each answer preceded by the case number. Next, the researcher should continue that process until all questions were listed on a single page with the various responses under each question.

The process imposed a set of classificatory categories for all questions, but Oppenheim (1966) made clear that when the researcher

used the entire sample and classified the responses into the sample categories, some information would be lost because compromises often had to be made. In making a decision to retain or disregard a category, Oppenheim stated that it was pointless to retain a category that was used by too few people. The exception to that was to include the rare response if it were hypothesized that a certain type of response might be absent or very rare. Oppenheim also explained that coding categories could also be combined and was sometimes necessary when dealing with small subanalyses. He said each category should be designated in the clearest possible way and should be described in words or with a label.

One last item that Oppenheim (1966) mentioned was using identifying case numbers for classification numbers. For example, gender could be designated 1 for male and 2 for female; the second digit could indicate the age, either high school or adult; the third number could indicate the site, and the last two digits identifying any given respondent.

In planning analysis for coded items Oppenheim (1966) said that first tabulations could be frequency distributions. Next, an analysis of the interrelations between the variables should be conducted by seeing how much a code category had been used, how many times it was in the sample, or whether there were enough respondents to make comparisons with other responses. If control groups were used, the comparisons should be between control and experimental groups.

Data display, as noted by Miles and Huberman (1984) made narrative text, which could be bulky, monotonous, and overloading, easier to understand, ordered, and structured. Data display lent itself to graphic representations which included context charts, growth gradients, explanatory figures, and descriptive and explanatory matrices.

Context charts mapped the relationship among roles, groups, and settings which made up the context of the individual behavior. The

flow of information, assistance, or influence between actors could be mapped and coded.

Growth gradients illustrated an increase over time of some critical variable. Those could be shown graphically in line form with critical events or actions relevant to the variable mapped on the line.

Explanatory figures took several approaches; the first was the use of scatter plots which could be used to display multiple site variables and to note clusters of sites as related to the variable. Another explanatory figures was event-state flow charts which assembled the key events during a particular time period. Causal networks was the last explanatory figures explained; these displayed the most important independent and dependent variable in a study and the deterministic relationships among them, but an accompanying narrative text usually was needed for full effect.

Descriptive matrices included systematic displays for words; the rows and columns of the matrix included almost any aspect of the data, such as time periods, persons, groups, roles, event classes, settings, processes, or key variables. These made local contexts able to be seen holistically and not lost in dispersed narrative. The type of descriptive matrices was broad and included checklists, time-ordered chronological matrices, role-ordered ones distributing data according to their sources, and conceptually clustered matrices which brought together variables connected by theoretical ideas.

The last type of data display explained was the explanatory matrix which aided in sorting out explanations, reasons, and causes for observed phenomena. Examples included: 1) effects matrix which displayed a process' result or outcome; 2) dynamics matrix which examined the strains and other forces for changes in a setting and their resolution; 3) process-outcome matrix which traced the outcomes of different processes; 4) event listings which displayed a series of critical events over time, and 5) site-ordered predictor-outcome matrix that arrayed sites by a general variable such as smoothness of

implementation and then displayed each site's standing on a number of predictors of that outcome.

The last item discussed by Miles and Huberman (1984) in order to keep interviewing data and other qualitative data from being arcane and ineffable included techniques for conclusion drawing and verification. They said that most conclusion-drawing tactics amounted to doing two things: reducing the bulk and bringing a pattern to them. That was accomplished by using metaphors, counting, noting patterns or themes, seeing plausibility, clustering, subsuming particulars into the general, noting relationships between variables, and finding intervening variables. Verification involved building a logical chain of evidence and making conceptual/theoretical coherence by using the following tactics: 1) checking for representativeness, 2) checking for researcher effects, 3) triangulating across data sources and methods, 4) weighting the evidence, 5) making contrasts and comparisons, 6) checking the meaning of outliers, and 7) using extreme cases.

Interviews could either be structured or unstructured (Van Dalen, 1979). He said that the structured interview had a standardized, formal format with questions being presented in the same manner and order, the same introductory and concluding remarks used, and controls that were admitted in order to form scientific generalizations.

In describing the unstructured interview, Van Dalen (1979) referred to these descriptors: flexible, few restrictions, free expression of thoughts by subjects, and few directive questions asked. Kerlinger (1986) added that the unstructured interview should be as carefully planned as one that was not structured.

Advantages for interviews surfaced including increasing objectivity by having the interviewee interpret the importance of variables, being more flexible than other qualitative techniques, such as questionnaires and surveys, and reducing inconsistency and ambiguity attributed to other forms of qualitative data collection (Taylor & Bogdan, 1984).

Van Dalen (1979) listed several advantages and disadvantages for the unstructured interviews. He said the interviewer could do follow-up or gain unexpected insights or emerging situations, redirect the inquiry to areas pertaining to the topic, and could delve into in-depth explanations of issues. He said the disadvantages primarily centered around the quantification of qualitative data because it was difficult to summarize or evaluate the generalizability of the data due to non-uniform tactics being used and the difficulty in using it to test and verify hypotheses.

Interviews also had two different types of questions that could be used. Kerlinger (1986) labeled them as closed, or fixed-alternative, and open-ended items. He described the closed questions as being limited in responses, such as *yes, no*, or *don't know*. The advantages was that reliability was high due to uniformity. However, the disadvantages included not enough depth inquiry or probing to find out more about the respondent's attitude, limited answers, and the respondent might have had a more appropriate answer that was not one of the choices. Kerlinger also explained the greatest benefits of the open-ended questions as being more in-depth answers that could lead to unanticipated relationships and hypotheses and answers providing clearer perceptions.

The Survey/Questionnaire

A questionnaire was a series of predetermined questions that could be answered in a variety of ways, including oral and written responses. Its use was based upon an underlying assumption: each individual question would work (Berdie, Anderson, & Niebuhs, 1986). They further stated that a valid questionnaire was one that stimulated accurate, relevant data.

Validity was an important component of a questionnaire. Question phrasing and selection influenced validity. It had to be designed

according to particular specifications and with specific aims (Berdie, Anderson, & Niebuhs, 1986).

Berdie, Anderson, & Niebuhs (1986) also gave the following procedures in designing a questionnaire: 1) it should begin with a few interesting, non-threatening questions; 2) items should be grouped into logical coherent sections; 3) important items should never be placed at the end; 4) items should be numbered so that the respondent would not become confused in completing the form; and 5) it should be as easy to complete as possible. They also added that clear communication was essential, and questions should be constructed which were unambiguous and self-explanatory. They further explained other items affecting response rate included question order, wording of question, question and questionnaire length, and guaranteed anonymity of the respondent. They also cautioned against writing questions that the respondent would not know whether to answer factually or opinionatively, using more than one adverb or adjective, avoiding general adjectives and adverbs and vaguely defined words or words with more than one meaning, avoiding the use of double negatives, questions phrased in the negative and hypothetical questions.

Oppenheim (1966) gave further suggestions for the construction of attitude measurement. He said that attitude scales consisted of statements in which the respondent was asked to agree or disagree, and their chief function was to divide people roughly into broad groups. Their construction should be based upon unidimensionality or homogeneity, linearity, and equal or equal-appearing intervals, reliability, validity, and reproducibility. Unidimensionality meant that the scale should be about one thing at a time and that all the items should measure one thing. Linearity involved constructing the scale following the straight line model using some sort of scoring system. Reliability involved consistency and whether the instrument would be completed the same a year from now. Validity referred to the scale measuring what it purported to measure, but he replied that

presently there was no way of making sure an attitude scale was valid. Reproducibility meant that the score conveyed exactly which units were covered and that a score could show by means of a single figure which statements the respondent agreed with and which he/she disagreed.

Oppenheim (1966) also discussed attitude scaling methods which included likert scales. He considered them to be less laborious than some other scales and said they correlated highly with Thurstone scales. Unidimensionality was a primary concern in this scale, and the weighted scales of 5 for strongly agree to 1 for strongly disagree made scoring less complex. Oppenheim gave steps to produce a likert scale which included first composing an item pool with not too many neutral or extreme items at either end of the continuum. Next, the decision had to be made of whether a high score should mean a favorable or unfavorable attitude; therefore, he suggested using a few neutral questions so that each statement could be judged to be positive or negative. After scoring each item from 1-5, the item scores were added to obtain a total score. In the construction of a likert scale, there should be items that express positive attitudes, some expressing negative, and with others expressing deviations from extreme to inspired. By doing this, the researcher could deduce from the answers whether, for example, some responses were mildly positive, others were moderately negative, but none showed extreme hostility. Since scoring needed to be consistent, Oppenheim said that for each item the researcher would have to decide whether the scale needed to go from 5 to 1 or from 1 to 5, depending on whether the item was written positively or negatively. All of the positive items needed to have the same direction and likewise for the negative statements.

Oppenheim (1986) further discussed the advantages of the likert scale. One was that the reliability was good with a reliability coefficient of .85 often achieved. These scales tended to perform very well when it came to a reliable, rough ordering of people with regard to a particular attitude. Another advantage was that by using the

internal-consistency method of item selection, the likert scale
approached unidimensionality.

One disadvantage, according to Oppenheim (1966), included its
lack of reproducibility with the same total score being obtained in
many different says. Because of this, the pattern of responses became
more interesting than the total score. Other disadvantages were that
the scale offered no metric or interval measures, it lacked a neutral
point so that one knew where scores in the middle ranges changed from
mildly positive to mildly negative, and that middle ranges could be due
to lukewarm responses, lack of knowledge or attitude, or to the
presence of both strongly negative and strongly positive responses in
which they would balance one another.

Summary

Through this review of literature it was discerned that the
behavioristic teaching approach was a questionable mode to be used in
teaching today's students the work skills needed by current employers.
It appeared that the cognitivist and constructivist modes were more
applicable to the teaching of higher order thinking skills and problem
solving as they stressed processes and not correct answers. Contextual
learning emphasized in cognition and constructivism appeared to make
learning more relevant for students, and, therefore, they could make
application of their academic knowledge to life contexts. The
interpersonal skills seemed also to be better enhanced by those two
modes rather than behaviorism as they emphasized collaboration and
cooperative learning among students.

Contextual and experiential learning were espoused in the
cognitivist and constructivist theories as being a more effective means
of learning. It appeared that these were needed to enhance cognitive
learning and problem solving. Although the research indicated a more
contextual approach, these findings were somewhat recent and no
research was found to see if these findings were applicable to a

learning resource room and the teaching of basic math and reading
skills.   Because of this, the EECs need to do research to determine if
their basis of operation should be changed from the behavioristic ILS
approach to one where contextual, experiential learning is used in
teaching basic math and reading skills.

Learning theory as related to computers paralleled that as
related to academic learning via traditional, non-technological modes.
Much of computer software engineering was built upon the behavioristic
theory with only recent designs approaching the cognitivist domain.
The research consensus seemed to indicate moving towards cognitivism
and constructivism in software design; however, the hardware was still
in infant design stages to support the cognitive and constructivist
approaches of simulation, intelligent tutoring, chunking, concept
mapping, contextual learning, and more interaction and exploration
between learner and computer.

The literature also shed serious doubt as to the effectiveness of
the ILS.   Since these systems were based upon a behavioristic approach,
the consensus of the research appeared to be that they were ineffective
tools in the teaching of basic skills.   These systems were designed to
reinforce learning by the behavioristic approaches of repetition and
correct responses.   They did not allow for interaction, the use of
cognitive strategies, metacognition, or personal discovery learning.
However, since EEC instructors reported an increase in the
math and reading skills of students when using an ILS (Moon, 1993),
then perhaps the problem was not in gains but in the transfer of
learning to a vocational classroom.   Relating transfer of learning to
the ILS, it appeared there must be a bridge and mediation between what
basic skills instruction a student learns on the ILS and application of
that knowledge in the vocational training program.

In the transfer of learning it also appeared that the cognitivist
and constructivist methods were more effective.   One of the most
effective means for the transfer of learning was that there be

similarities between the learning context and real life application. The effective means for more powerful transfer of learning included: 1) learners could generalize from one situation to another and know why the generalization was important, as well as see an internal benefit from the generalization; 2) learners could generalize by doing a variety of tasks including hands-on learning and by doing similar tasks; 3) learners could discover concepts themselves rather than being told the concept; 4) the behavioristic rote memorization and teaching to tests did not automatically equate to transfer; and 5) similarities between the learning context and real life was critical to transfer. Furthermore, in order to transfer learning from training to daily practice, learners must be provided systematic planning in providing for the transfer, and they must have the knowledge that there is a commitment to use what they have learned.

The learning style review helped in making the determination of which instrument to use. In this review the Myers-Briggs Type Indicator instrument appeared to be the most appropriate for this research study as it was observed that it had relation to reading and writing aptitudes along with psychomotor tasks and abstraction and was reported as having high validity.

Accountability in school systems had been the buzzword for this decade. Educators, parents, politicians, and business persons wanted assessment scores to be higher, but they also found that the behavioristic style of assessment with one correct answer did not correlate with the cognitivist and constructivist classroom of the educational reform movement. Therefore, they were saying that assessment also had to change; it had to match the learning reform in many of the present school systems. This meant that assessment had to change from standardized multiple-choice assessments to ones that assessed a student's performance in the way they were taught. This meant changing from standardized tests to performance assessments utilizing the concepts of the cognitivist and constructivist learning

theories. This last statement shed light on this particular study in that a standardized test was used to assess the experimental group which used a more cognitivist, constructivist approach using contextualized learning. The research indicated that the behavioristic standardized achievement assessment probably would not give a true picture of those students in the experimental group.

Finally, research was conducted on data gathering tools in order to determine how to add validity and reliability to the qualitative portion of this study. From this review, the techniques of contact summary sheets, coding, memoing, site analysis forms, interim site studies, and preparing attitudinal surveys according to suggested criteria will be used for this study. Information was also gathered on interviewing to determine the most appropriate interview structure for this type of research. The semi-structured response was selected because of its flexibility in exploring the importance of variables but yet still remaining consistent and somewhat standardized.

CHAPTER III

METHODOLOGY

The purpose of this chapter is to provide a review of the planning
and methods used to conduct the research study. The research design,
population and sample selection, data collection procedures, data
analysis, and instrumentation will be addressed.

Research Design

Both a quantitative and qualitative approach was used in this
study because some of the data could best be described through
descriptive techniques using numbers, but the data which dealt with
attitudes and perceptions could best be described qualitatively.

The quantitative research design used was a quasi-experimental,
pre-test, post-test non-equivalent control group as described by
Campbell and Stanley (1963). This design involves experimental and
control groups who are given both a pre- and post-test, but the groups
are not randomly sampled. Campbell and Stanley diagram the design as
represented below:

$$O_1 \quad X \quad O_2$$

$$O_3 \qquad O_4$$

Since the control and experimental groups in this study did not
have pre-experimental sampling equivalence but constituted naturally
assembled collections such as classrooms, this design was selected.
Campbell and Stanley (1963) stated that this was one of the most
widespread experimental designs in educational research. This design
controls the main effects of history, maturation, testing, and
instrumentation. However, they also noted that the matching of the
subjects pre-test scores was not advised in this type of study as it

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sometimes insured the occurrence of unwanted regression effects; therefore, matching of the subjects pre-test scores was not done. Underwood (1994) also referenced McGuigan (1990) by explaining this non-equivalent control group design allowed the study to be applied to everyday situations.

Research subjects were administered a pre- and post-achievement test to measure math and reading levels at the beginning and end of the academic year. Reactive arrangements relating to external validity were limited because these test administrations were a normal occurrence for every school year, and, therefore, the subjects did not have additional test anxiety as this was the expectation for all students every year. Results from the tests were used to analyze if there was a significant difference on the dependent variable (achievement test) between the experimental group (contextual instruction) and the control group (traditional, computer-assisted instruction).

Subjects were also administered a personality-type indicator assessment as it related to learning styles. The purpose of this assessment was to determine if subjects with a specific learning style performed better in either mode of basic skills instruction, specifically in either a contextual or computer-assisted mode.

The study also followed a qualitative research methodology concerning attitudinal questions. A phenomenological methodology outlined by Tesch (1988) was used. According to Tesch, phenomenological research was the exploring of the relationship between consciousness or awareness and personal construction of one's world; this research, therefore, lent itself to the extrapolation of the relevant and indirectly-related variables. Because of this, extraneous and contextual variables were identified through a semi-structured interview format in which instructors of the identified programs were interviewed and a random sample of the students. The interview progressed from indirect to more direct questions in order to gain

insight into how the respondents felt about their current EEC approach and to see if they envisioned another way which might be better and if satisfaction with the present system was sufficient. All quotations were actual data, organized and presented to illustrate the interpretations made.

In order to help determine if there were differences in attitudes concerning the traditional or experimental modes of instruction for EECs, a survey using a likert scale was given to students in the two groups. The students identified if they were male or female and high school or adult. This survey asked for responses ranging from strongly agree to strongly disagree. The tallying of the responses should indicate the total group's preference for a mode of instruction (traditional or contextual) and also the sub-group's preference: male, female, adult, or high school.

Population and Sample Selection

The population for this study included students enrolled in Oklahoma's vocational-technical area schools. The population was somewhat more limited to those sites which had an Education Enhancement Center (EEC). There were 29 area vo-tech districts which had EECs, but several of the districts had more than one campus. Therefore, there were a total of 54 EEC sites located in Oklahoma's vocational system. The Oklahoma Department of Vocational-Technical Education reported the census for FY95 to be 14,321 students enrolled in area vocational-technical schools.

Four vo-techs were selected for the sample; two were in the control group (traditional EEC) and two in the experimental group (contextual instruction for EEC subjects). The sample selection was based upon the following criteria:

1) The vo-tech had an EEC.

2) The vo-techs had several training programs in common.

3) The sites gave a pre- and post-achievement test in math
   and reading.

4) Two of the vo-techs fit the criteria for the control group:

   a) Students left the vocational class to attend the EEC
      for a certain amount of time each week.

   b) An integrated learning system or other computer-
      assisted instruction was the primary instructional
      technique used for math and reading basic skills
      instruction.

   c) Instruction was primarily focused on basic skills
      improvement but was not directly linked to the
      vocational training program for most of the time.

5) Two of the vo-techs fit the criteria for the experimental
   group:

   a) The EEC instructors went to the vocational
      classroom at least part of the time and worked
      with the training instructors in identifying
      what was to be taught.

   b) Math and reading instruction was directly linked to
      the vocational training program.

Based upon these criteria the schools selected for the control group were Caddo-Kiowa AVTS at Fort Cobb and O.T. Autry AVTS at Enid. The experimental group included Central Tech at Drumright and Pioneer Technology Center in Ponca City.

Since these sites did not all have the same training programs, an examination of each school's offerings was compiled; from this compilation the vocational training programs that all four sites had in common included: health science technology, automotive technology, business/computer technology, electronics, and welding. Therefore, the subjects enrolled in these five programs at the four sites were the ones selected for the study if their achievement pre-test scores indicated they would need basic skills instruction.

Instrumentation

This study employed several forms of instrumentation. Two standardized assessments were used which included the Myers-Briggs Type Indicator and the Test of Adult Basic Education. A survey was designed for students not being interviewed along with interview questions for instructors and 24 students.

Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) was used to assess personality type/learning style preference in order to help determine if there were any correlations between the students' basic skills achievement gains and personality types as related to the experimental and control groups. This instrument was selected because of its high face validity (Claxton & Murrell, 1987) and because it met the following conditions of the study: 1) no time restraints in administering the test with 25 to 40 minutes being the standard length of time, 2) an estimated reading level of seventh to eighth grade, and 3) appropriateness for both high school and adult populations (Myers & McCaulley, 1985).

The internal consistency reliability of the MBTI was based on split-half scores (Willis, 1984). The reliability remained stable up to 25 omissions for Form G. The reliability stabilized for persons 20 years and older but was lower for younger respondents. Willis noted that reliability scores were acceptable for adult samples, and for younger respondents, they were adequate. The validity of the MBTI was determined by the demonstration of the relationships and outcomes of psychological types predicted by Jung (Smith, 1992).

The MBTI Form G was used in this study. This form was the standard form used and had 126 forced-choice items in which the respondents had to select a preference on four dichotomous scales, including extraversion-introversion, sensing-intuition, thinking-feeling, and judging-perceiving (Rojewski & Holder, 1990). This

selection resulted in the formulation of a four-letter combination, such as INTP.

Test of Adult Basic Education

The Test of Adult Basic Education (TABE) provided information on proficiency in the basic skills of reading, mathematics, and language. The language portion was omitted from administration for this project; this omission did not affect the scores for the reading and math portions. TABE identifies weaknesses and establishes levels of instruction for those persons interested in vocational-technical training, general literacy, or self-improvement study (Kapes & Mastie, 1988).

TABE yielded objective mastery information for skills usually learned at grades 2 through 12 and provided grade equivalent scores as well as percentiles and scale scores. This norm-referenced assessment came in two forms, Form 5 and Form 6. Form 5 was used for the pre-test and Form 6 for the post-test. The two forms had high validity for retesting the same student; the examinee was expected to obtain the same scale score regardless of form or level (Test of Adult Basic Education Norms Book, 1987).

Also, in the Norms Book it stated that the scale score was the basic score for Forms 5 and 6. Norm-reference information was obtained on the normative sample by converting scale scores to derived scores, which were grade equivalents and reference group percentile ranks and stanines. Furthermore, it explained that the norm groups included adult basic education enrollees, adult offenders in adult correctional facilities, juvenile offenders in juvenile correctional facilities, and vocational-technical school enrollees.

Semi-Structured Interview

The purpose of the semi-structured interview was to elicit responses from the teachers and selected students concerning their

attitude about the EEC. Semi-structured questions were devised in order for the teacher and student respondents to address each question from their perspective and also to have consistency through standardized questions. The semi-structured format was used in order for the respondents to elaborate, clarify, or add additional items to consider. All but one of the instructors in the selected training programs and three high school and three adult students from each school were selected randomly to be interviewed. The interviews were recorded and then typed.

The interview questions were constructed in terms of what the literature review said about construct, contextual and internal validity, and generalizability. Therefore, the interview questions were minimal and preplanned. The number of questions was 11, and the time limit was approximately 30 minutes; the questions asked were preplanned to correlate with the attitudinal research objectives for this project. Memoing, coding, interim site studies, and a combination of a contact summary sheet and site analysis forms were completed.

The semi-structured interview questions were open-ended, thus allowing for probing and clarification of answers. This form was also used because the answers could have a direct relationship on the hypotheses. For this study a five-part interview schedule was used. In Part I, teacher respondents were asked questions related to how their students were scheduled into the EEC and if and how their instruction reinforced what the students learned in the EEC. Part II explored ways they thought the EEC was beneficial; it also was phrased to give them the latitude to say that they felt it was not beneficial. In Part III the interviewees listed items liked and disliked about the EEC. Part IV described the two concepts of an EEC--the traditional approach using an ILS and the contextual approach; it then asked the respondents which they would prefer. Part V gave the respondents an opportunity to reflect on how they thought an ideal EEC would be envisioned; this question provided an opportunity for the respondents

to include variables not previously considered and to give possible outliers.

For the students a five-part interview schedule was also used. Part I explained how they used the EEC services. In Part II students were asked about the relevance of the EEC instruction to their training program; Part III related questions to help determine what was and was not liked about the EEC. In Part IV the two EEC approaches were explained, and the students were asked which they might prefer. The last section, Part V, had the students respond to attitudinal preferences concerning the EEC.

Survey

The survey was a series of predetermined questions in which the majority could be answered using a five-scale likert rating concerning attitudes about the EEC. The survey was designed to help gain qualitative information on the research objectives and questions related to attitude.

It also was designed according to the suggestions supplied in the review of literature. These included beginning with a few nonthreatening questions, grouping items into logical sections, not placing important items at the end, numbering the items, keeping the survey short, and making it easy to complete. A guaranteed anonymity statement was also included at the top of the form. All questions were checked to ascertain if they avoided Berdie, Anderson, and Niebuhs' (1986) caution of not using more than one adverb or adjective, avoiding general adjectives, adverbs, vaguely defined words, double negatives, hypothetical questions, and making sure the respondent would know whether to answer by using facts or opinions.

Three surveys were designed for the various populations, but all tried to capture the same or very similar data. Different forms were needed for the experimental and control group. An additional form was used for the one experimental group that had second year students who

had been exposed to both modes of instruction--the control method the previous year and the experimental method during the research project year.

Data Collection Procedures

The collection of the data began in the fall of 1994. The vocational-technical schools selected for the study were first contacted by telephone, and the research study was explained along with the procedures for data collection, interviewing of the vocational teachers in all of the selected programs and randomly selected students, and the time frame for the project. This was followed by a letter detailing the specifics of the study.

The researcher then scheduled a time via telephone conversation with vo-tech personnel to visit the site in order to collect achievement pre-test scores, administer the personality assessment, have respondents complete the demographic sheets, do interviews, and administer attitudinal questionnaires. A time in the fall of 1994 was scheduled for all sites. While at the site the researcher with the help of vo-tech personnel administered the Myers-Briggs Type Indicator (MBTI), had respondents complete the demographic sheet and questionnaires, completed all student interviews and several teacher interviews, and either collected the results of the pre-TABE achievement assessment results or made provisions for the sites to send them to the researcher.

Next, the researcher began completing the Data Collection Forms by using the demographic sheets and pre-TABE results. For data analysis purposes all males at each site were recorded on one sheet with females on another; gender was then sub-divided by age classification with either all high school or all adult students on separate sheets. The researcher then completed the pre-math and pre-reading grade level column. When the researcher completed scoring the MBTI, these results were added.

After these first site visits, the Contact Summary Sheets were completed for each site, along with the Memoing Form and the Interim Site Forms. The results of the Interim Site Forms were used to schedule another site visit in order to gain or clarify further information, to interview the instructors not contacted during the first site visit, and to have those instructors complete the questionnaire. The next site visits were scheduled via telephone with appropriate vo-tech personnel.

By the summer of 1994 all of the post-math and post-reading achievement scores had been mailed to the researcher. The grade level results of these tests were recorded on the Data Collection Form with the gains columns completed at that time.

Data Analysis

Quantitative Data

After the data were collected, the computerized program SYSTAT (System for Statistics) was used to perform two 2x2x2 analysis of covariance (ANCOVA). An alpha level of .05 was used to determine statistical significance. The configuration for the ANCOVA follows:

Reading Basic Skills

	Gender	Age
Control Group (Traditional: Computer- Assisted Instruction)	Male	High School
		Adult
	Female	High School
		Adult
Experimental (Contextual Learning)	Male	High School
		Adult
	Female	High School
		Adult

Math Basic Skills

	Gender	Age
Control Group (Traditional: Computer- Assisted Instruction)	Male	High School
		Adult
	Female	High School
		Adult
Experimental (Contextual Learning)	Male	High School
		Adult
	Female	High School
		Adult

The dependent variable in one analysis was the math posttest and in another analysis the reading posttest. The math and reading pretests were covaried on their respective posttests to compensate for individual preknowledge math and reading differences. Van Dalen (1979) said that in an ANCOVA the dependent variable scores are adjusted in order to remove the effects of the uncontrolled source of variation represented by the covariate. Shavelson (1988) further explained that the ANCOVA was a very powerful test of the null hypothesis because it statistically removed predictable individual differences among treatment populations; this, then, becomes a more powerful test because it gives a more precise estimate of experimental error than many other analyses. The ANCOVA is often used in pretest/posttest nonequivalent control group designs (McGuigan, 1990).

Statistical analyses were performed on the basic skills gains in both reading and math for the various personality/learning styles in each group. Then, an Analysis of Covariance was performed to determine if any of the 16 personality types/learning styles as assessed by the Myers-Briggs Type Inventory indicated significance in either mode of basic skills instruction. Significance at the .05 level could be found if the between group variance was considerably greater than the within group variance (Shavelson, 1988).

The mean squares were used to calculate the F ratios by which the tenability of the null hypothesis was assessed (Van Dalen, 1979). Therefore, if the F ratio was significant at the .05 level according to a tabled value, then there was an indication that the use of certain instructional methodologies might lead to more reading or math gains for various personality/learning style types. If significance is indicated, a post hoc test should be used to determine where the differences occurred (Shavelson, 1988).

Qualitative: Interviews

The recorded interviews were typed and read, re-read, and analyzed in order to verify consistency of the subjects whenever possible. Then, the data were arranged according to themes and trends running through the narratives. The themes and trends were made apparent by the use of several data reduction techniques. Most of these techniques, except for coding, were completed when a set of day's interviews were collected. This meant that all of the student interview data reduction was completed after the first site visit, along with many of the instructors. After the second site visit, the data reduction sheets were completed. Coding was only done after all of the interviews were completed as suggested by Oppenheim (1966): 1) one data reduction technique used was the Contact Summary Sheet (Appendix K); 2) there was one form used for each site; 3) this sheet was completed when all of the interviews for the day's site visit had been typed and read and reread; 4) with this reading and rereading themes were discerned and recorded on the form along with the number favoring and opposing the theme; and 5) from the reading, hypotheses or speculations were analyzed to see if they could be categorized with one already drawn or if it were a new one. Those hypotheses or speculations already drawn were listed under themes, but new speculations went under their own category. Another item listed on

this form included an area that needed to be clarified or raised in another site visit.

Those items needing clarification or needing to be raised were also transposed onto the Interim Site Summary Form (Appendix M). This form contained the names of people needing to be contacted for clarification or elaboration and the exact question(s) to ask them.

In order to be able to analyze the data for possible outliers or for what appeared to be extremes or divergent thinking and for insight and further explanations, the Memoing Form (Appendix L) was completed. This had one item per page. When all of the interviews were completed, a tally of similar responses was put at the bottom of the sheet to indicate how many others might have the same thought.

Coding was the last data reduction technique used. This aided in reducing the bulk of interview information into categories which could be better interpreted. Coding was accomplished by first taking a representative sample of 25 percent of the instructors' interviews, equally divided between control and experimental groups, and 25 percent of the student interviews, also equally divided. For each of the interviews, the text of the question was put at the top of one page and then each of the representative sample responses were coded on that page. This process was repeated until all of the questions were listed on separate pages with corresponding responses from the sample. The next step was to take the rest of the entire interview questions and whenever possible categorize them under those listed from the representative sample. Since the number of interviewees was relatively small, compromises had to be made by combining categories when similar in content. Classification numbers were given for each respondent and put beside the categories they selected. By doing this it could be determined how many males, females, high school, and adult students and teachers responded in alike fashion. The last two digits assigned referred to a particular respondent so that the researcher could refer back to any interview if more clarification were needed.

Two letters were used at the beginning of the classification numbers to denote whether the respondent was a teacher or student and from the control or experimental group.

A frequency distribution was first used on the coded items which included the frequency, gender, age, and the classification of teacher or student and control or experimental group for each response. Next, an analysis was performed on the relationship between control and experimental group with those being subdivided into age, gender, and teacher or student.

Qualitative: Surveys

Three surveys were developed. When two were developed, similar questions were asked of the two groups; the questions were not identical as the question pertained to the instructional mode used by the group. When the surveys were collected, a Survey Tally Sheet (Appendix N) was completed. On this a survey question was written at the top of a page with space left to tally the likert scale of *strongly agree* to *strongly disagree* for both the group's total and each of the sub-groups (adult, high school, male, and female.)

A third survey was developed for one of the contextual learning groups which had been instructed by the traditional EEC method the year prior to the research year. These surveys were also tallied using a Survey Tally Sheet.

CHAPTER IV

PRESENTATION OF FINDINGS

Introduction

The purpose of this study was to analyze and evaluate the differences of 1) reading and math basic skills gains and 2) teacher and student attitudinal dispositions towards the two modes of instruction being used in Oklahoma's vocational-technical schools' Education Enhancement Centers: a behavioristic, integrated learning system approach and a contextual, cognitivist approach. Furthermore, it analyzed the relationship of personality type to basic skills gains in the two modes of instruction.

Adult and high school students' gain scores in math and reading were analyzed, along with interviewing and surveying teachers and students in five vocational programs in four area vocational-technical schools (AVTS). Two of the AVTSs used a learning lab with an integrated learning system as the primary means to teach the basic skills, and two used a contextual approach where the EEC instructors related the reading or math instruction to what was being taught in the vocational program.

The basic skills gain scores were evaluated by gathering pre-and post-Test of Adult Basic Education math and reading scores from students in electronics, auto technology, business technology, health science technology, and welding. Responses from student surveys in those same classes were analyzed to detect attitudinal disposition differences related to both modes of instruction. Qualitative measures were also used to investigate responses from the teachers and 24 students in those programs by using a semi-structured interview format.

The Myers-Briggs Type Indicator was used to appraise if there was a relationship between personality type and basic skills gains in either mode of instruction.

In this chapter, the first section will present a description of the sample. A statistical and qualitative analysis will be given in the second section. The findings will comprise the third section.

Description of the Sample

A purposive sample of 297 students enrolled in five training programs in four AVTSs who took a pre- and post-achievement test comprised the sample. Two of the AVTSs selected had an Educational Enhancement Center (EEC) which used a traditional computerized integrated learning system as the primary method of teaching math and reading basic skills. In the other two AVTSs the EEC personnel worked with the vocational instructors to contextualize the math and reading skills to the vocational program. The five programs selected were automotive technology, business technology, electronics, health science technology, and welding.

Table I depicts the distribution of demographic information for students who took a pre- and post-mathematics basic skills test in the traditional EEC where students learned the math basic skills via an integrated learning machine (the control group). The composition of the 85 students included 42 (49%) high school students and 43 (51%) adults. The distribution of the group's gender equated to 42 (49%) male and 43 (51%) female. In crossing age and gender the composition was 22 (25%) high school males, 20 (24%) high school females, 20 (24%) adult males, and 23 (27%) adult females.

As revealed in Table I business technology was the largest group tested with 34 (40%) students. In descending numerical order the other groups were health science technology with 19 (22%), welding with 15 (18%), automotive technology with 14 (16%), and electronics with 3 (4%). One teacher stated that the electronics number was small due to

Table I

Distribution of Demographic Information

Of Traditional Education Enhancement Center Students

Tested in Math Basic Skills

By Frequency and Percent

N = 85

Variable		Frequency		Percentage
VOCATIONAL PROGRAM TYPE				
Allied Health Technology		19		22%
Automotive Technology		14		16
Business Technology		34		40
Electronics		3		4
Welding		<u>15</u>		<u>18</u>
	Total	85	Total	100
AGE				
High School		42		49
Adult		<u>43</u>		<u>51</u>
	Total	85	Total	100
GENDER				
Female		43		51
Male		<u>42</u>		<u>49</u>
	Total	85	Total	100
AGE ACCORDING TO GENDER				
High School Female		20		24
High School Male		22		25
Adult Female		23		27
Adult Male		<u>20</u>		<u>24</u>
	Total	85	Total	100

the fact that most electronics classes required a fairly high math and reading score prerequisite; therefore, most electronic students needed little basic skills' remediation.

The demographics of students enrolled in a traditional EEC and pre- and posttested in reading basic skills is reported in Table II. Some of the students were the same as in the math section, but there were some students who only needed reading remediation; therefore, the groups in Table I and II have some but not all students in common.

In this group of 42, there were 24 (57%) high school and 18 (43%) adult students. Of these, 29 (69%) were male and 13 (31%) were female. The crossing of age and gender resulted in the following: 15 (36%) high school males, 9 (21%) high school females, 14 (33%) adult males, and 4 (10%) adult females.

Automotive technology, the largest group, had 17 (41%) students. Welding had 11 (26%), business technology 9 (22%), and health science technology 5 (11%). There were no students in electronics who were pre- and post-assessed in reading. One electronics teacher explained that the written material in this course was at a reading level equivalent to the twelfth grade or higher, and if students needed reading remediation, this should have been done before the students enrolled in the program.

The experimental groups were composed of students who received math and reading basic skill instruction in an applied, contextual mode; the EEC instructor applied the basic skills application to what the students were learning in their vocational program. If an integrated learning system (ILS) were used to help teach some math or reading concept, the EEC instructor then bridged the concept learned on the ILS to a practical application of that concept in the classroom.

Table III depicts the composition of the students enrolled in the two AVTSs using the contextual approach who were pre- and posttested in math basic skills. In this group 201 were assessed; 183 (91%) were

Table II

Distribution of Demographic Information

Of Traditional Education Enhancement Center Students

Tested in Reading Basic Skills

By Frequency and Percent

N = 42

Variable		Frequency		Percentage
VOCATIONAL PROGRAM TYPE				
Allied Health Technology		5		11%
Automotive Technology		17		41
Business Technology		9		22
Electronics		0		0
Welding		11		26
	Total	42	Total	100
AGE				
High School		24		57
Adult		18		43
	Total	42	Total	100
GENDER				
Female		13		31
Male		29		69
	Total	42	Total	100
AGE ACCORDING TO GENDER				
High School Female		9		21
High School Male		15		36
Adult Female		4		10
Adult Male		14		33
	Total	42	Total	100

Table III

Distribution of Demographic Information

Of Students In Contextual Mode

Tested in Math Basic Skills

By Frequency and Percent

N = 201

Variable		Frequency	Percentage
VOCATIONAL PROGRAM TYPE			
Allied Health Technology		41	20%
Automotive Technology		80	40
Business Technology		32	16
Electronics		11	6
Welding		37	18
	Total	201	Total 100
AGE			
High School		183	91
Adult		18	9
	Total	201	Total 100
GENDER			
Female		68	34
Male		133	66
	Total	201	Total 100
AGE ACCORDING TO GENDER			
High School Female		56	28
High School Male		127	63
Adult Female		12	6
Adult Male		6	3
	Total	201	Total 100

high school students and 18 (9%) were adults. The males outnumbered the females by having 133 (66%) while the females numbered 68 (34%).

Automotive technology comprised the largest group in Table III with 80 (40%) students. Health science technology was next with 41 (20%) students; welding comprised 37 (18%) students. Business technology followed closely with 32 (16%) students, and electronics had the smallest group with 11 (6%) students.

Crossing age and gender resulted in 127 (63%) high school males and 56 (28%) high school females. This same crossing for adults included 6 (3%) adult males and 12 (6%) adult females.

In Table IV the experimental group demographics tabulated 176 total reading examinees. The students in this group were similar but not identical to those in the experimental math group because some students needed only math or reading enhancement and not both.

The total population was composed of 166 (94%) high school and 10 (6%) adult students. Gender was categorized as 120 males (68%) and 56 (32%) females. The crossing of age and gender included 114 (65%) high school male, 52 (30%) high school female, 6 (3%) adult male, and 4 (2%) adult female students.

Automotive technology had the largest number of students with 66 (37%). This was followed by health science technology, 37 (21%) students; welding, 37 (21%); business technology, 24 (14%); and electronics, 12 (7%).

Table V depicts the distribution of personality types in both the control and experimental groups as indicated by the Myers-Briggs Type Indicator. Table VI illustrates the types by decreasing percentage order. In the group which used the ILS (control group) over half (58.5%) of the 58 personality types were in four groups (ESTJ (22.4%); ISTJ (15.5%), ISFJ (10.3%), and ISTP (10.3%). Four groups comprised 27.5%; these were ISFP (8.6%), ESTP (6.9%), ESFJ (6.9%), and ENFP (5.1%). Four groups comprised only 14% of the types; these all were 3.5% of the population and included ENTP, ESFJ, INTJ, and INFP.

Table IV

Distribution of Demographic Information

Of Students in Contextual Mode

Tested in Reading Basic Skills

By Frequency and Percent

N = 176

Variable	Frequency	Percentage
VOCATIONAL PROGRAM TYPE		
Allied Health Technology	37	21%
Automotive Technology	66	37
Business Technology	24	14
Electronics	12	7
Welding	<u>37</u>	<u>21</u>
Total	176	Total 100
AGE		
High School	166	94
Adult	<u>10</u>	<u>6</u>
Total	176	Total 100
GENDER		
Female	56	32
Male	<u>120</u>	<u>68</u>
Total	176	Total 100
AGE ACCORDING TO GENDER		
High School Female	52	30
High School Male	114	65
Adult Female	4	2
Adult Male	<u>6</u>	<u>3</u>
Total	176	Total 100

Table V

Distribution of Participants' Personality Types

By Traditional and Experimental Group

And by Frequency and Percent

N = 255

Type of Personality	Traditional (ILS) N = 58		Experimental (Contextual) N = 197	
	Frequency	Percentage	Frequency	Percentage
ISTP	6	10.3	29	14.7
ISTJ	9	15.5	22	11.2
ISFJ	6	10.3	9	4.6
INTJ	2	3.5	2	1.0
INFJ	0	0	2	1.0
INFP	2	3.5	4	2.0
INTP	0	0	11	5.6
ISFP	5	8.6	6	3.1
ESTP	4	6.9	27	13.7
ESTJ	13	22.4	22	11.2
ESFJ	2	3.5	10	5.1
ENTJ	0	0	4	2.0
ENFJ	0	0	4	2.0
ENFP	3	5.1	12	6.1
ENTP	2	3.5	18	9.1
ESFP	4	6.9	15	7.6
TOTAL	58	100.00	197	100.00

Table VI

Composition of Control and Experimental Groups

By Personality Type and by Number and Percent

In Decreasing Percentage Order

N = 255

Control Group			Experimental Group	
Type	Percentage		Type	Percentage
ESTJ	22.4		ISTP	14.7
ISTJ	15.5		ESTP	13.7
ISTP	10.3		ESTJ	11.2
ISFJ	10.3		ISTJ	11.2
ISFP	8.6		ENTP	9.1
ESTP	6.9		ESFP	7.6
ESFP	6.9		ENFP	6.1
ENFP	5.1		INTP	5.6
ENTP	3.5		ESFJ	5.1
ESFJ	3.5		ISFJ	4.6
INTJ	3.5		ISFP	3.1
INFP	3.5		INFP	2.0
INTP	0		ENTJ	2.0
ENTJ	0		ENFJ	2.0
ENFJ	0		INFJ	1.0
INFJ	0		INTJ	1.0

The personality distribution for the experimental contextual group had five personality types forming 59.9%. These were ISTP (14.7%), ESTP (13.7%), ESTJ (11.2%), ISTJ (11.2%), and ENTP (9.1%). Four groups comprised 24.4% and included ESFP (7.6%), ENFP (6.1%), INTP (5.1%), and ESFJ (5.1%). Those showing less than 5% of the population were ISFJ (4.6%),ISFP (3.1%), INFP (2.0%), ENTJ (2.0%), ENFJ (2.0%), INTJ (1.0%) and INFJ (1.0%).

The sample for a portion of the qualitative research portion, depicted in Table VII, included 24 students and 29 teachers who were interviewed through a semi-structured interview format. The 24 students interviewed included 12 in the experimental group and 12 in the control group. Each group had 6 high school students and 6 adults. The delineation for those in both the control and experimental groups included 3 high school females, 3 adult females, 3 high school males, and 3 adult males. The teachers interviewed in the control group included 4 automotive technology, 7 business technology, 2 electronics, 1 health science technology, and 2 welding instructors. For the experimental group 3 automotive technology, 3 business technology, 2 electronics, 3 health science technology, and 2 welding instructors were interviewed.

A survey was given to a total of 325 student respondents and is depicted in Table VIII. Those surveyed in the control group totaled 128 which included the following delineation: 75 high school, 53 adult, 55 male, and 73 female respondents. For the experimental group, the total 197 respondents included 174 high school, 23 adult, 119 male, and 78 female students.

Another survey was given to second year students in one of the experimental sites. At that vo-tech those 38 students surveyed went to an EEC learning lab the previous year and received basic skills instruction on an ILS; however, during the research project year, the vo-tech changed procedures and reorganized to present basic skills instruction through contextual methodologies. Therefore, those 30 high

Table VII

Demographics of Participants Interviewed

N = 53

Group	Control	Experimental
Semi-Structured Interview:		
Students:	12	12
High School	6	6
Adult	6	6
Male	6	6
Female	6	6
Teachers:	16	13

Demographics of Teachers Interviewed

Teachers	Control	Experimental
Automotive Technology	4	3
Business Technology	7	3
Electronics	2	2
Health Science Tech	1	3
Welding	2	2

Table VIII

Distribution of Demographic Information

Of Students Responding To Surveys

N = 325

Group	Control (N=128)	Experimental (N=197)
High School	75	174
Adults	53	23
Male	55	119
Female	73	78

Survey Demographics for Second-Year Experimental Students

Having Been Taught By Both Instructional Methods

N = 38

High School	30
Adult	8
Male	25
Female	13

school and 8 adult students of whom 25 were male and 13 female completed a survey on which method they preferred.

Statistical and Qualitative Analyses

Statistical Analyses

Statistical analyses were completed for the following: math gain scores, reading gain scores, Analysis of Covariance (ANCOVA) for math and reading gain scores, and an ANCOVA and the mean gain scores by personality types. The results of these are summarized in the information that follows and are depicted in the following tables.

Table IX depicts the math pretest, posttest, mean, and gain scores for both groups. Then, it subdivides both groups using the same statistical analyses for the following sub-groups: adults and high school students, males and females, adult male, adult female, high school male, and high school female. Overall, the math pretest scores were comparable in all of the sub-groups except the adult male and adult female groups which, in turn, made a difference in the adult and female categories; the male category possibly did not show as great a difference due to the small number of adult males as compared to high school males. All of the sub-groups showed gains, but the experimental group consistently had higher gains in every category except adult and adult female. The control group overall gained one half of a year's growth or more (female, .754; adult, .702; high school male, .595; and adult female, 1.083) except for the categories of male (.490), high school (.491), high school female (.375), and adult male (.375). The overall gain of the control group was .623.

The experimental group, overall, scored consistently closer to a one year grade level increase than did the control group. The overall experimental group indicated a one year plus growth (1.054). The adult group (.617) and the female (.798) scored below the one year's growth but was still above a one half year's growth. The only group with negative growth was the adult female (-.400). It should be noted that

Table IX

Comparison of PreTest and PostTest

Math Score Means of Groups and Sub-Groups

Group	Control	Experimental
Total Group		
N	85	201
Pretest Mean Score	7.386	7.846
Posttest Mean Score	8.009	8.900
Gain Score	.623	1.054
Male		
N	42	133
Pretest Mean Score	7.436	7.606
Posttest Mean Score	7.926	8.791
Gain Score	.490	1.185
Female		
N	43	68
Pretest Mean Score	7.337	8.315
Posttest Mean Score	8.091	9.113
Gain Score	.754	.798
Adult		
N	43	18
Pretest Mean Score	6.884	8.489
Posttest Mean Score	7.586	9.106
Gain Score	.702	.617
High School		
N	42	183
Pretest Mean Score	7.952	7.783
Posttest Mean Score	8.443	8.880
Gain	.491	1.097
High School Male		
N	22	127
Pretest Mean Score	7.850	7.594
Posttest Mean Score	8.445	8.710
Gain	.595	1.116
High School Female		
N	20	56
Pretest Mean Score	8.065	8.209
Posttest Mean Score	8.440	9.264
Gain	.375	1.055
Adult Male		
N	20	6
Pretest Mean Score	6.980	7.850
Posttest Mean Score	7.355	10.500
Gain	.375	2.650
Adult Female		
N	23	12
Pretest Mean Score	6.704	8.808
Posttest Mean Score	7.787	8.408
Gain	1.083	-.400

this group had the highest pretest score and that in both the control and experimental groups, the sub-group which had the highest pretest mean score also had the lowest mean gain (control group, high school female, prescore, 8.065, gain, .375; experimental group, adult female, prescore, 8.808, gain, -.400). Statistical regression may be a factor in this finding.

Table X contains scores for the reading portion of the analysis. The reading pretest, posttest, mean and gain scores are included for the control and experimental groups. The pretest scores indicated almost a year's growth for the experimental group. However, the adult male control group was approximately a year higher than the experimental group. It should be noted, however, that the experimental adult male group had gains much higher than the other groups which possibly could be due to reactive arrangements, especially during the pretest administration.

For the control group the overall gain score was .559. This group had inconsistent gains ranging from a negative -.115 (female) to a high of 1.164 (adult male). Six of the eight sub-groups had at least a half year's gain with only the high school (.145) and female (-.115) having less.

The experimental group consistently had higher gains than the control group; all of this group had more than half a year's growth gain with four being above a one year's gain. The adult male group (3.767) inflated the adult group (2.43) some, but the small number, only six, of the adult male decreased the impact.

Table XI contains the Analysis of Covariance of posttest scores in math for both the control and experimental groups; the pretest score was used as the covariate. The ANCOVA was used to isolate the effect, if any occurred, that the treatment variable (basic skills teaching methodology) had on the dependent variable (math achievement test scores). A statistical significance of .01 was computed which

Table X

Comparison of PreTest and PostTest

Reading Mean Scores of Groups and Sub-Groups

Group	Control	Experimental
Total Group		
N	42	176
Pretest Mean Score	7.429	8.369
Posttest Mean Score	7.988	9.353
Gain Score	.559	.984
High School		
N	24	166
Pretest Mean Score	7.288	8.436
Posttest Mean Score	7.433	9.333
Gain Score	.145	.897
Adult		
N	18	10
Pretest Mean Score	7.617	7.250
Posttest Mean Score	8.728	9.680
Gain Score	1.111	2.430
Male		
N	29	120
Pretest Mean Score	7.376	8.161
Posttest Mean Score	8.238	9.133
Gain Score	.862	.972
Female		
N	13	56
Pretest Mean Score	7.546	8.814
Posttest Mean Score	7.431	9.823
Gain	-.115	1.009
High School Male		
N	15	114
Pretest Mean Score	7.300	8.241
Posttest Mean Score	7.880	9.067
Gain	.580	.826
High School Female		
N	9	52
Pretest Mean Score	7.267	8.863
Posttest Mean Score	6.689	9.917
Gain	.578	1.054
Adult Male		
N	14	6
Pretest Mean Score	7.457	6.633
Posttest Mean Score	8.621	10.400
Gain	1.164	3.767
Adult Female		
N	4	4
Pretest Mean Score	8.175	8.175
Posttest Mean Score	9.100	8.600
Gain	.925	.425

Table XI

Analysis of Covariance Summary Table

For Math Basic Skills Scores

Source of Variation	SS	df	MS	F	P
Ind. Variable	19.071	1	19.071	7.177	.01
MathPre	695.038	1	695.038	261.558	
Error	752.015	283	2.657		

Table XII

Analysis of Covariance Summary Table

For Reading Basic Skills Scores

Source of Variation	SS	df	MS	F	P
Ind. Variable	13.594	1	13.594	4.536	.03
ReadPre	577.283	1	577.283	192.631	
Error	644.320	215	2.997		

indicated that the contextual methodology did have an effect on the math achievement scores.

Table XII shows the Analysis of Covariance of postest scores in reading using pretest scores as the covariate. The treatment variable (basic skills teaching methodology) did have an effect on the dependent variable (reading achievement test scores); the contextual approach appeared to be significant at an .03 significance level.

Table XIII contains statistics which help answer the question, "Does a student's learning style affect math gains in either mode of instruction?" The observations included that the control group had the most math gains in the personality types: ISFP (1.84 gain), INFP (1.20), INTJ (1.15), and ENFP (.87). All of the *I* introverted subgroups, except three, almost made a mean gain of 1; however, the *E* (extroverted) subgroup had no score above 1.00 with the highest mean gain score for the *E* sub-group being .867 for the ENFP. One *E* subgroup in the control group even had a negative gain (ENTP, -.10)

For the experimental group the highest mean gain score was made in the *E* subgroup and that was ENTJ (1.53). ENFP had the third highest mean gain with 1.37. Two of the *I* subgroups had mean gain scores ranging in the top four; INFP had the second highest mean gain score with 1.45 and INTP had the fourth highest with 1.21. All of the experimental *E* subgroups, except 3, had mean gain scores above 1.00 while only three of the *I* experimental subgroups had scores above 1.00.

Table XIV represents the reading mean gains by personality type for both the control and experimental group. These gains were more diverse, according to personality type, than the math gain scores. For the control group the four highest scores were equally divided between the *E* and *I* subgroups, but the *I* sub-group had three groups tie for first place (INFP, INTJ, and ISTP all had 1.50 gains). However, four of the *I* subgroup's mean scores were above 1.00 with only one of the *E*'s being above (INTJ, 1.50; ISTP, 1.50; INFP, 1.50; ISFJ, 1.00; and

Table XIII

Math Gains By Personality Type

| Type | Control | | Experimental | |
| | N = 56 | | N = 176 | |
	# in group	Gain	# in group	Gain
ENFJ	0	0	4	1.150
ENFP	3	.867	10	1.370
ENTJ	0	0	4	1.525
ENTP	2	-.100	17	.318
ESFJ	2	.650	10	.790
ESFP	4	.600	13	1.162
ESTJ	12	.750	20	.690
ESTP	4	.550	25	1.088
INFJ	0	0	2	.950
INFP	2	1.200	4	1.450
INTJ	2	1.150	2	.300
INTP	0	0	8	1.213
ISFJ	6	.650	8	.263
ISFP	5	1.840	5	.160
ISTJ	8	.588	18	1.089
ISTP	6	.583	26	.538

Table XIV

Reading Gains By Personality Type

Type	Control		Experimental	
	N = 26		N = 159	
	# in group	Average Gain	# in group	Average Gain
ENFJ	0	0	4	1.475
ENFP	0	0	8	.800
ENTJ	0	0	4	1.000
ENTP	0	0	12	.542
ESFJ	1	1.30	9	.811
ESFP	0	0	10	.470
ESTJ	8	.638	18	1.033
ESTP	2	.800	25	1.064
INFJ	0	0	1	.500
INFP	1	1.500	3	1.233
INTJ	1	1.500	1	1.600
INTP	0	0	10	1.230
ISFJ	2	1.000	5	1.440
ISFP	2	.550	5	1.520
ISTJ	5	.600	19	.979
ISTP	4	1.500	25	.112

ESFJ, 1.3. The highest four scores for the experimental group were all in the subgroup *I* except one (INTJ, 1.60; ISFP, 1.52; ENFJ, 1.48; and ISFJ, 1.44). All of the *I* experimental subgroup, except three, had reading mean gains above 1.00.

Table XV represents an Analysis of Covariance (ANCOVA) of posttest mean scores on a math achievement test by the 16 personality types for the control group (EECs utilizing a lab concept with an integrated learning machine) and the experimental group (EECs utilizing a contextual methodology). An ANCOVA was used to isolate differences, if any existed, on the dependent variable (math skills) by the independent variable treatment (personality type and treatment). No statistical difference was found indicating that any differences in the math achievement scores of varying personality types of the experimental and control groups could have been due to factors other than personality type as related to the instructional methodology treatment variable.

Table XVI depicts the results of an Analysis of Covariance (ANCOVA). This examined a comparison of the 16 personality styles on a reading achievement test using a reading pre-test as the covariate. No significant differences were found on the dependent variable (reading skills) by the independent variable (personality type and treatment). This indicates that other factors could have been involved in the differences of the reading achievement scores other than personality type.

<div align="center">Qualitative Analyses</div>

Semi-Structured Interview

From the coding process used for the semi-structured teacher and student interviews eight major themes emerged. Tables XVII-XXIV depict the theme with the number favoring and opposing in both the control and experimental groups. Students were further categorized as being male or female and adult or high school age. One emergent theme (Table

Table XV

Analysis of Covariance Summary Table

For PostTest Scores By Personality Types

On a Math Achievement Test

Source of Variation	SS	df	MS	F	P
Style	33.301	15	2.220	1.251	0.236
ReadPre	560.850	1	560.850	316.060	
Error	381.518	215	1.775		

Table XVI

Analysis of Covariance Summary Table

For PostTest Scores By Personality Types

On a Reading Achievement Test

Source of Variation	SS	df	MS	F	P
Style	21.572	15	1.438	0.569	0.895
ReadPre	531.738	1	531.738	210.427	
Error	424.526	168	2.527		

XVII) was that the EEC instruction helped the students in the training program. All of the experimental group respondents replied affirmatively to this. One male high school student who had been instructed in an EEC lab program with an integrated learning system the previous year but who had the EEC instructor come to his training program during the research project year said, "There is no comparison as to which way is best as far as helping me in the classroom. Learning to read by reading Shakespeare on the computer didn't do anything for me. This year she (the EEC person) helped me a lot. She worked with me so I could learn the material much better...I also did much better on my tests...I hated going to the EEC last year because I couldn't see how learning about Shakespeare on the computer could ever help in trans tech--and it didn't."

Although the experimental group agreed the EEC instruction did help, the control group had mixed responses. The majority of the males did not agree; however, an equal number agreed and disagreed about the EEC helping in the categories of female, adult, and high school students. One female adult in the control group replied that what was learned in the EEC not only helped her get her GED, but also the math instruction helped her in accounting. Another control group student, a high school female, said, "I've always had a hard time in math, but I've learned some things on the computer in the EEC...It's helped me." However, one high school male in the control group responded, "It (the EEC) really doesn't help. I'm paying my money to learn about health. Just because some standardized test says I can't read at a tenth grade level doesn't mean that computer will help me raise that score...I hate going to the EEC, so I don't try. I never have problems in my vo-tech class; I always make a good grade. But, still I have to go...I never felt it was fair to have to go or that it helped me."

Table XVII

Semi-Structured Interview Themes

Theme One

Theme One: What is learned in the EEC helps the students

in their training program.

	Control	Experimental
Those Agreeing with Theme One:		
Students:		
Male	2	6
Female	3	6
High School	3	6
Adults	3	6
Instructors:	10	14
Those Disagreeing with Theme One:		
Students:		
Male	4	0
Female	3	0
High School	3	0
Adults	3	0
Instructors:	5	0

The majority of teachers affirmatively responded that the EEC instruction helped students in the training program. Many of the teachers in the control group responded in a similar fashion as the following teacher's remarks, "If nothing else, the students (who go to the EEC) are learning basic skills that will help them in life. Also, the math skills seem to help in my program. I do wish the computer problems had more relevance to my program, but still, overall, it does seem to help in some areas."

However, one representative response from a control group teacher who did not feel the EEC instruction helped in the training program said, "Many of my students hate going there...They say the material is too elementary. I feel they waste their time going, and it would be far better for them to stay in my class and work on their material."

The experimental group of instructors all felt that the EEC person helped their students in the training program. One teacher who had sent students to the EEC lab the previous year but who now had the EEC person in the classroom replied, "I like this way so much better primarily because of the direct correlation of the basic skills to my program. It is so much better to have the students learn math from someone in the classroom relating math to my class than for them to go to the lab where I don't know specifically what they are working on...I wouldn't change back to the students' going to the learning lab for anything."

The second emergent theme (Table XVIII) was that students either did not or would not like leaving their training program to go to an EEC lab setting. In the control group male respondents in both the adult and high school sub-groups agreed that their preference was to remain in the training program, but the female group was more divisive in their rating with the majority of high school females agreeing with the males. However, the adult female sub-group disagreed (2 to 1) claiming their preference for going to an EEC lab instead of remaining

Table XVIII

Semi-Structured Interview Themes

Theme Two

Theme Two: Students do not like leaving their training program

to go to an EEC lab setting.

Theme Number Two	Control	Experimental
Those Agreeing with Theme Two:		
Students:		
Male	4	5
Female	3	5
High School	4	5
Adults	3	5
Instructors:	11	10
Those Disagreeing with Theme Two:		
Students:		
Male	2	1
Female	3	1
High School	2	1
Adults	3	1
Instructors:	5	3

in the classroom. In the experimental group the group majority (10 to 2) agreed that they preferred to remain in the classroom.

One adult male in the control group stating that remaining in the training program was the better of the two options said that although his math scores had increased on the TABE Test and he felt that part of that was due to his working on the integrated learning system, he felt his math test score would have improved without the ILS simply because his teacher made the math relevant to him. He further replied that when he was in high school he could not understand the importance of fractions, but now when something had to be three-eighths of an inch in order to fit whatever he was making, then he said he learned quickly the importance of fractions. "I feel that if I just had to go to the EEC and work on the computer, I wonder if my math scores would of (sic) gotten better. I think it had more to do with my needing the knowledge so I learned my math and not because the computer was so great, but I'm not sure."

One high school student from the control group said he preferred going to the lab because he got out of class. When further probed about his being in the training program because he was training for a career, he responded, "No, I just wanted to work on cars..I don't like school anyway, but at the vo-tech I at least get to work with my hands and move around."

An adult female in the control group felt the EEC was very beneficial and preferred going to the EEC lab rather than remaining in class. She said, "I always had so much trouble with math when I was in high school. Now, I understand it, and I feel that what I learned in the EEC and on the computer helped me with this. I truly think it's great to have such a nice place to go and to be able to learn in quiet but also to have someone there to help you."

The majority of responses from the experimental group affirmatively replied that they would not like leaving their program to attend an EEC lab; they preferred having their math contextualized to

the training program. One high school respondent said, "I didn't come
to the vo-tech to have classes like at my high school--that's what I
see that lab to be. I don't want no one (sic) or anything teaching me
about something I'm not interested in. I came here to learn about
welding, and I don't want to leave this class to learn about math...I
like my vo-tech class, and I don't mind learning math when it's about
welding."

Overall, the instructors felt that the students preferred staying
in the vocational training area; however, three replied that the EEC
lab aesthetically was appealing to students, and some students,
therefore, preferred leaving the sometimes noisy training environment
to be in a setting more conducive to academic learning. Other teachers
disagreed; one said, "Vocational students are mainly kinesthetic,
tactile learners, and they want to be in the training classroom where
they can actively be involved in their learning and not have to leave
the classroom to go to a lab where they have to sit still and punch
buttons on a computer for their only activity. That's punishment
instead of learning for these students."

The most divergent responses centered on the concept that the
math and reading instruction had relevance to the training program
(Table XIX). The divergence was created by seven affirmative student
responses from the control group ranging from statements where
respondents felt that the EEC instruction helped them extensively in
their training program to responses such as the following adult male:
"I guess it helped some if I had to say one way or another...There sure
must be a better way, though, because it's so boring working my math on
the computer." Another student, a female adult, in the control group
summarized by saying: "I do feel it helped me alot. I increased my
scores in both math and reading, and I really feel this helped me in my
business class."

Table XIX

Semi-Structured Interview Themes

Theme Three

Theme Three: The math and/or reading instruction in the EEC did have relevance to the student's training program, but the control group instructors wanted the ILS instruction to relate more to their program.

Theme Number Three	Control	Experimental
Those Agreeing with Theme Three:		
Students:		
Male	3	5
Female	4	6
High School	3	5
Adults	4	6
Instructors:	11	13
Those Disagreeing with Theme Three:		
Students:		
Male	3	1
Female	2	0
High School	3	1
Adults	2	0
Instructors:	5	0

The five control group students who felt the EEC instruction had little relevance to their training program were fairly adamant about "the EEC is just a waste of time," according to one respondent. The other responses ranged from, "No, it didn't help; how can pushing buttons on a computer help me with cars. I never tried with math in the EEC; when I was supposed to choose a right answer, I just pushed any button. Then, the computer would finally show me the right answer, and the next time it came up I knew what letter to punch...I didn't learn math; I just learned to punch B or C or whatever."

All of the experimental group felt that the EEC instruction had relevance to their training program although their responses were somewhat divergent also. One high school male respondent articulated his strong affirmation of the EEC person being in the classroom by saying, "He really helped me. I never understood how to divide fractions, but he explained this and showed me how and when to do this in welding...The math problems were related to welding and not to someone making a pie or whatever like my math books in school. I wasn't interested in pie making so I could care less what one-fourth of one-half was. I was only interested in eating the pie. But when he showed me that one-fourth of one-half of the pipe needed to be cut and then welded, I was able to see that...I finally understood fractions because he related it to welding."

However, another experimental group student was not quite as defensive of the relevance but still felt there was some; this high school female student said, "Although I can now understand math better because of her being in my class, I wish I had more time with her and probably could have done even better."

The instructors in both groups overall felt the EEC instruction was relevant to their training program. Eleven of the control group and all of the experimental group agreed the EEC instruction had relevance to their program; only five in the control group felt it did not. However, again the group's responses were somewhat divergent,

especially control group instructors. One control group instructor replied, "I definitely feel the things the students learn in the EEC are relevant to my class. At the beginning of the year, the EEC instructor and I discuss what math the student should know. Then, the student goes to the EEC and learns the concept. Whenever I get to that concept in my teaching, it helps greatly that the student has already learned that." Another somewhat less enthusiastic control group teacher said, "If my students work on fractions, and it has no relevance to my class, they don't like it. Students will come back to my class and say, 'I don't care how many miles are in a square block.' However, they say they don't like going to the EEC, and they say it's not relevant, but they still seem to improve in classwork related to math, so there must be some relevance. I do wish the problems and instruction were tied more closely to my class though."

The experimental group instructors said they knew what the EEC person was working on because the person was in their classroom teaching or had discussed with the teacher what was to be taught. One teacher summarized by saying, "I would not be enthusiastic about going back to where students left my class to go to an EEC lab. My area is so technical any more. There is so much to do that if what the EEC people do is not directly related to my program, it is a waste of time. It's useless to learn something on a computer and not apply it, and that's what my students used to do. The students cannot transfer the material unless it makes sense to them; it must be relevant and be able to be applied to the real world. That's why our present system is so much better. The math the EEC person teaches relates directly to my program; there's relevance. The students like this approach much better and so do I; they just don't complain like they used to when they had to go."

Another theme (Table XX) was that students would prefer having the EEC instructor in their classroom rather than going to a lab and that the instruction would be more beneficial. Four of the male,

Table XX

Semi-Structured Interview Themes

Theme Four

Theme Four: Students and instructors would prefer having the EEC

instructor in their classroom rather than going

to a lab.

Theme Number Four	Control	Experimental
Those Agreeing with Theme Four:		
Students:		
Male	4	6
Female	4	5
High School	4	5
Adults	4	6
Instructors:	9	12
	(3 combination of lab and classroom)	
Those Disagreeing with Theme Four:		
Students:		
Male	2	0
Female	2	1
High School	2	1
Adults	2	0
Instructors:	4	1

female, high school and adult control students agreed while two in each group disagreed. All males and adults in the experimental group were unanimous in agreeing with this theme while one female high school student disagreed. Nine of the control group instructors agreed and four disagreed, while three felt that a combination of students going to a lab setting and having the instructor relate the specific material to their program would be beneficial. All except one of the experimental group instructors felt that students would like it better and benefit more if the EEC person used a contextual learning method.

One representative response from a high school control group student was, "I think I would like it if the EEC person were in the classroom, especially if she helped everyone--that way I wouldn't feel singled out when I had to go to the EEC. Sometimes I feel like a dummy because everyone knows you only go there if you didn't score high enough on that one test...I would really like it better if the person related math to my program. Even though I got out of class, and I liked that, I think it would be better if the person came to my class." Another high school student response included, "I went to the EEC last year, and, believe me, this way is much better. It's not as boring, and it really helps when the stuff I learn is about my vo-tech class."

Some instructors felt a combination of approaches might be best, but most overall felt the EEC instruction being in the classroom was the most beneficial. A mixed-approach was identified as the most effective by the following control group instructor: "Although I've been pleased with the EEC, and I believe they do a wonderful job, I feel that if a combination lab and direct EEC teacher instruction in the classroom were used, it might be even better because the student's learning style would be more appropriately accommodated. For example, if a student learned best through an individualized, private approach without much group involvement, the computerized approach would be better, but for those students needing interaction and more oral explanation, the EEC instructor being in the classroom would be

better...Also, if the EEC lab material were related more directly to my program it would be better."

Another control group instructor who identified the EEC instructor being in the classroom as the better approach replied, "The concept of the EEC is good. However, the problem is when they (the students) are pulled out of my program to work on basic skills in the EEC, then they become behind in my program. So, if the EEC person came to my classroom and helped them explain concepts pertaining to what they were working on, I think it would be best. I would rather have a person teaching and talking to the student to find out what the student's problem is so they can get right to the heart of the problem and help the student rather than him floundering around on the computer and maybe being helped and maybe not."

Another theme (Table XXI) that was an outlier and, therefore, not anticipated in the questioning, was that the computerized basic skill instruction was boring, too repetitive, not challenging, and an embarrassment when students had to go to the EEC. Although not everyone responded to this because there was no direct question, 7 of the 12 control group students discussed this, along with 3 of the experimental group students who had used the ILS the previous year; 12 of the teachers also responded. Two of the 7 control group students also responded conversely to this by saying they felt the computerized program was very challenging.

One control group student responded that the computer program was too easy and not challenging and also that the post-test was a joke. Another adult male control group student said, "The computer is so elementary. I had to go because I was low in some math areas, but I went for several weeks before I started working on the low areas. Then when I got to those areas, I felt like I was in elementary school all over again. The material wasn't challenging, just very boring. If I learned something, I had to do it over and over...The problems weren't related to an adult's level; they never challenged me."

Table XXI

Semi-Structured Interview Themes

Theme Five

Theme Five: The lab setting is boring, not challenging, and an

embarrassment when students have to go.

Theme Number Five	Control	Experimental
Those Agreeing with Theme Five:		
Students:		
Male	4	2
Female	2	1
High School	5	3
Adults	1	0
No Response	4	
Instructors:	7	5
No Response	9	8
Those Disagreeing with Theme Five:		
Students:		
Male	1	0
Female	1	0
High School	1	0
Adults	1	0
Instructors:	0	0

However, one control group student did attest that the ILS
material was challenging. This female high school student said, "The
EEC people were really helpful, and I learned how to read better
because the computer made it easy for me to learn. I get frustrated
when someone tries to help me with reading, but I could set my pace
with the computer, and it kept me challenged yet it also was easy
enough for me to understand."

One of the experimental group instructors who had been involved
with both EEC methods felt that the material on the ILS did not involve
the student in the learning and the material she had seen on the ILS
was too simplistic. She said, " I observed my students working on the
ILS. I knew their capabilities and, therefore, knew many weren't being
challenged. The material was too elementary and not related to their
interests. It was also too repetitive. Today's students are exposed
to multimedia concepts, and the ILS is too unidimensional. It doesn't
involve the students interactively, and it doesn't pose critical
thinking problems. Until instructional media is better designed to fit
the needs of our students, it's really a waste of their time. I tried
to observe with an open-mind, but I just walked away feeling that the
students were learning so little and applying even less...I feel so
fortunate that we have moved away from that method and that our
excellent EEC person is helping our students contextually in the
classroom. If the other vo-techs would go to this approach, I assure
you they would never return to the lab setting again." Another
experimental teacher who had been involved with both methods said, "My
students hated to go to the EEC lab, and I didn't like their going
either. They felt they were singled out. Because they hated it, they
told me they didn't try. Therefore, it was a waste of our time. I
would never want to send my students to a lab again. Having the EEC
person in the class helping the students get their questions answered
immediately is far better than learning something on a computer that
had little relevance to my program."

Table XXII

Semi-Structured Interview Themes

Theme Six

Theme Six: When students go to a lab setting, many vocational training teachers do not know specifically what the student is learning, but when the EEC person is in the classroom or contextually relates the material, the teacher and EEC personnel work together on the student's assignments.

Theme Number Six	Control	Experimental
Those Agreeing with Theme Six:		
Students:	NA	NA
Male		
Female		
High School		
Adults		
Instructors:	12	13
Those Disagreeing with Theme Six:		
Students:	NA	NA
Male		
Female		
High School		
Adults		
Instructors:	4	0

Another theme that emerged was discussed by several instructors. This theme (Table XXII) involved the concept that when students went to a lab setting, many of the vocational training teachers did not know specifically what the student was learning, but when the EEC person was in the classroom or relating the material in a contextual manner, the teacher and EEC personnel worked together on student assignments. The majority of the control group instructors said they did not know directly what the student was working on when the student went to the learning lab. Usually the teacher worked with the EEC instructor at the beginning of the school to target specific math and reading concepts to teach, and then they were given printouts either weekly or monthly indicating what areas the students had completed and their progress. Two indicated they went with their students to the lab so they would know what they worked on, but very seldom did the control group teacher collaboratively design a learning experience for the student; in fact, only one indicated that this happened, but rarely. The antithesis was true for the experimental group instructors; most of them worked together on a student plan so that what the EEC instructor was teaching related to what was being taught in the classroom; much collaboration was developed between the vocational teacher and the EEC person in the experimental group. One of the experimental group teachers said, "That is the beauty of this way of doing the EEC. Before when my students went to the EEC, I really didn't know what they were doing. I felt it was probably good that they were being helped in math, but now when I have the EEC person in my class, I know exactly what the students are doing. When a student has a learning problem related to my class, I work with the EEC person to devise a plan to help the student, and then the EEC person works with the student individually on the plan. It's great."

A similar theme (Table XXIII) emerged involving the transference of learning; most control group instructors did not directly apply the knowledge the students learned on an ILS back to the classroom, but the

Table XXIII

Semi-Structured Interview Themes

Theme Seven

Theme Seven: Most instructors do not apply directly the
              knowledge learned on an integrated learning
              system back to the classroom, but they do
              when the EEC person helps students in the
              vocational training program.

Theme Number Seven	Control	Experimental
Those Agreeing with Theme Seven:		
Students:	NA	NA
Male		
Female		
High School		
Adults		
Instructors:	10	13
Those Disagreeing with Theme Seven:		
Students:	NA	NA
Male		
Female		
High School		
Adults		
Instructors:	6	0

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experimental group instructors did apply what the EEC instructor taught. One control group teacher said, "I feel the information is indirectly applied; by this I mean that students learn something on the computer in the EEC lab; I may not directly teach a lesson involving that material but eventually they will usually use the math they learn in the EEC...I really thinks this helps them. I don't feel they transfer all that they learn on the computer because I have to work sometimes to get them to see how a concept relates to my program, but it still helps that they've learned the concept--and yes, sometimes they learn something on the computer and forget it when we go over it in class, but still it usually makes it easier for me to transfer that knowledge to my class...If they had the EEC person to teach them the math concept while we were using it in my class, this would even be better."

An experimental group teacher addressing this same theme felt that students could easily transfer the instruction of the EEC person because it had relevance to his program. He said, "Sure, the student can transfer the knowledge that she (the EEC person) teaches because it relates directly to my program. If a student knows that math is related to my program, he will try harder to understand it...The material must be relevant for my students to want to know it."

One last theme (Table XXIV) was that almost everyone in both the control and experimental groups felt that the EEC was beneficial. One control group instructor summarized by saying, "I feel the EEC lab is very helpful to our students. I feel that when they learn math it helps in their everyday living skills and not just in my class. The EEC people are great and are always willing to go that extra mile."

Survey

Three surveys were given to the students in the selected programs; two of them tried to gather similar data but from the two groups--control and experimental. The third survey was given only to

Table XXIV

Semi-Structured Interview Themes

Theme Eight

Theme Eight: Most of the instructors and students feel

that the EEC is beneficial.

Theme Number Eight	Control	Experimental
Those Agreeing with Theme Eight:		
Students:		
Male	4	6
Female	4	6
High School	4	6
Adults	4	6
Instructors:	12	13
Those Disagreeing with Theme Eight:		
Students:		
Male	2	0
Female	2	0
High School	2	0
Adults	2	0
Instructors:	4	

Table XXV

Survey Responses

Question One

Statement on Survey:

Traditional Group: I like going to the EEC.
Experimental Group: I like having the EEC person help me.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group

N=128

	SA #	SA %	A #	A %	U #	U %	D #	D %	SD #	SD %
Total	6	5%	54	42%	17	13%	37	29%	14	11%
HS	5	4%	23	18%	13	10%	20	16%	14	11%
Adult	1	1%	31	24%	4	3%	17	13%	0	0%
Male	2	2%	18	14%	5	4%	20	16%	10	8%
Female	4	3%	36	28%	12	10%	17	13%	4	3%

Experimental Group

N=197

	SA #	SA %	A #	A %	U #	U %	D #	D %	SD #	SD %
Total	14	7%	126	64%	10	5%	43	22%	4	2%
HS	12	6%	107	54%	10	5%	41	21%	4	2%
Adult	2	1%	19	10%	0	0%	2	1%	0	0%
Male	3	2%	67	34%	8	4%	38	19%	3	2%
Female	11	5%	59	30%	2	1%	5	3%	1	0%

those students at one site who had experienced going to an EEC lab the previous year but during the research year the EEC person went to the classroom. The survey used the legend SA for strongly agree, A for agree, U for undecided, D for disagree and SD for strongly disagree.

The first question asked of the control group was just an introductory question about whether the students liked going to the EEC (Table XXV). The breakdown of the 128 responses were as follows: 6, strongly agree; 54, agree; 17, undecided; 37, disagree; and 14, strongly disagree. Although most agreed with this response (47%) those who did not agree were fairly substantial (40%), and 13% were undecided. The majority of the adults (32) and females (40) agreed, but the majority of the high school students (34) and males (30) were not in agreement.

The similar question asked of the experimental group was whether they liked having the EEC person in the classroom to contextually explain math or reading by relating it to their training program (Table XXV). The affirmative response of 71% saying they did like this was very substantial over the 24% who disagreed and the 5% undecided. Unlike the control group the high school students (119) and males (70) were in agreement.

The second question for the control group was almost identical to the experimental group's question; both referred to whether the students felt the EEC person was of help to them (Table XXVI). In the control group 60% felt the EEC person did help the students while 30% disagreed and 10% were undecided. The high school category (22%) and the male category (23%) were the primary ones in disagreement. In the experimental group 74% felt they were helpful but 23% disagreed and 3% were undecided. The males in disagreement were 15%, and the high school category was 22%.

The third question concerned whether the students felt the EEC personnel were always willing to help them (Table XXVII). Eleven percent of the control group (14) and 25% (49) of the experimental

Table XXVI

Survey Responses

Question Two

Statement on Survey:

      Traditional Group: I feel the EEC person is of great help
                            to me.

      Experimental Group: I feel the EEC person is of great help
                            to me.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group
N=128

	SA #	SA %	A #	A %	U #	U %	D #	D %	SD #	SD %
Total	6	5%	71	55%	12	10%	31	24%	8	6%
HS	2	2%	37	29%	8	6%	20	16%	8	6%
Adult	4	3%	34	26%	4	3%	11	9%	0	0%
Male	3	2%	15	11%	7	5%	22	17%	8	6%
Female	3	2%	56	44%	5	4%	9	7%	0	0%

Experimental Group
N=197

	SA #	SA %	A #	A %	U #	U %	D #	D %	SD #	SD %
Total	30	15%	116	59%	6	3%	37	19%	8	4%
HS	22	11%	104	53%	6	3%	35	18%	7	4%
Adult	8	4%	12	6%	0	0%	2	1%	1	0%
Male	12	6%	74	38%	4	2%	23	12%	6	3%
Female	18	9%	42	21%	2	1%	14	7%	2	1%

Table XXVII

Survey Responses

Question Three

Statement on Survey:

Traditional Group: I feel the EEC people are always willing
to help me.

Experimental Group: I feel the EEC people are always
willing to help me.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group

N=128

	SA		A		U		D		SD	
	#	%	#	%	#	%	#	%	#	%
Total	14	11%	79	62%	22	17%	7	5%	6	5%
HS	8	6%	44	34%	11	9%	6	5%	6	5%
Adult	6	5%	35	27%	11	9%	1	1%	0	0%
Male	4	3%	28	22%	15	12%	4	3%	4	3%
Female	10	8%	51	40%	7	5%	3	2%	2	2%

Experimental Group

N=197

	SA		A		U		D		SD	
Total	49	25%	116	59%	13	6%	15	8%	4	2%
HS	40	20%	104	53%	13	6%	14	7%	3	2%
Adult	9	5%	12	6%	0	0%	1	1%	1	1%
Male	20	10%	76	38%	9	4%	10	5%	4	2%
Female	29	15%	40	21%	4	2%	5	3%	0	0%

Table XXVIII

Survey Responses

Question Four

Statement on Survey:

    Traditional Group: I feel the math and reading instruction provided me by the EEC person has helped me in my vocational training program.

    Experimental Group: I feel the math and reading instruction by the EEC personnel helps me in my training program.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group

N=128

	SA		A		U		D		SD	
	#	%	#	%	#	%	#	%	#	%
Total	8	6%	42	33%	13	10%	52	41%	13	10%
HS	4	3%	17	13%	5	4%	41	32%	8	6%
Adult	4	3%	25	20%	8	6%	11	9%	5	4%
Male	2	1%	18	14%	9	7%	16	13%	10	8%
Female	6	5%	24	19%	4	3%	36	28%	3	2%

Experimental Group

N=197

	SA		A		U		D		SD	
Total	93	47%	75	38%	14	7%	10	5%	5	3%
HS	87	44%	62	31%	12	6%	8	4%	5	3%
Adult	6	3%	13	7%	2	1%	2	1%	0	0%
Male	51	26%	48	24%	9	5%	7	4%	4	2%
Female	42	21%	27	14%	5	2%	3	1%	1	1%

control group strongly agreed with this statement. Those checking agreed included 79 (62%) of the control group and 116 (59%) of the experimental. Therefore, a total of 73% of the control and 84% of the experimental agreed. Those disagreeing included 13 (10%) of the control group and 19 (10%) of the experimental group. Twenty-two (17%) were undecided in the control group while only 13 (6%) were in the experimental group.

Another question related to how the students felt about how the math and reading instruction provided by the EEC person helped them in their training program (Table XXVIII). In the control group 50 (39%) students agreed the EEC instructor did help, 65 (51%) disagreed, and 13 (10%) were undecided. For this question the majority of respondents disagreeing were high school students (49 disagreeing to 21 agreeing). More of the adults agreed (29 to 16). Male respondents disagreeing totaled 26 with 20 agreeing. The experimental group responding to strongly agree included 93 (47%) with 75 (38%) responding to agree for a total of 85% agreeing. Only 15 (8%) disagreed with 14 (7%) being undecided. Of those disagreeing there were 8 or less in each sub-group. One other question related to whether the students felt it was worth their time to go to the EEC (control group) or whether it was worth their time to have the EEC person help by contextually relating the material (experimental group). Table XXIX gives the responses. For the control group 42% (53 students) agreed but 53% (68 students) disagreed. The adult and female sub-groups were equally divided in their agreement, but the high school and male sub-groups had more disagreeing than agreeing. Overwhelmingly the experimental group felt it was worth their time with 182 (92%) responding affirmatively. Only five or fewer respondents in any of the sub-groups disagreed.

Table XXX depicts how students feel about either going to a lab or remaining in class and being helped by an EEC person. The question asked of the control group was whether they felt it would be better if the EEC person came to their class rather than going to the EEC lab.

Table XXIX

Survey Responses

Question Five

Statement on Survey:

Traditional Group: I do feel it was worth my time to go to the EEC.

Experimental Group: I do feel it was worth my time to have the EEC person in the class.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group

N=128

| | SA | | A | | U | | D | | SD | |
	#	%	#	%	#	%	#	%	#	%
Total	1	1%	52	41%	7	5%	35	27%	33	26%
HS	1	1%	26	20%	6	5%	14	11%	28	21%
Adult	0	0%	26	20%	1	1%	21	16%	5	4%
Male	1	1%	17	13%	4	3%	13	10%	20	16%
Female	0	0%	35	27%	3	2%	22	17%	13	10%

Experimental Group

N=197

Total	48	24%	134	68%	6	3%	7	4%	2	1%
HS	41	21%	121	61%	5	3%	5	3%	2	1%
Adult	7	3%	13	7%	1	0%	2	1%	0	0%
Male	28	14%	83	42%	2	1%	4	2%	2	1%
Female	20	10%	51	26%	4	2%	3	2%	0	0%

Tables do not equal 100% due to rounding.

Table XXX

Survey Responses

Question Six

Statement on Survey:

Traditional Group: I feel it would be better if the EEC
                    personnel came to my vocational
                    program and helped me rather than
                    my going to the EEC.

Experimental Group: I would prefer going to a learning lab
                     outside the classroom rather than
                     have the EEC person come to my
                     classroom.

SA=Strongly Agree
A=Agree
U=Undecided
D=Disagree
SD=Strongly Disagree

Control Group

N=128

	SA		A		U		D		SD	
	#	%	#	%	#	%	#	%	#	%
Total	8	6%	33	26%	50	39%	32	25%	5	4%
HS	3	2%	12	10%	46	36%	11	9%	3	2%
Adult	5	4%	21	16%	4	3%	21	16%	2	2%
Male	5	4%	17	13%	14	11%	18	14%	1	1%
Female	3	2%	16	13%	36	28%	14	11%	4	3%

Experimental Group

N=197

	SA		A		U		D		SD	
Total	4	2%	15	8%	20	10%	130	66%	28	14%
HS	3	2%	12	6%	19	10%	120	61%	20	10%
Adult	1	0%	3	2%	1	0%	10	5%	8	4%
Male	1	0%	9	5%	7	4%	82	42%	20	10%
Female	3	2%	6	3%	13	6%	48	24%	8	4%

More responded that they would prefer the EEC person coming to their class with 41 students (32%) agreeing and 37 (29%) disagreeing. For the adults 26 agreed and 23 disagreed; the high school students had 15 agreeing and 14 disagreeing, but 46 were undecided. For the male sub-group 22 agreed and 19 disagreed with 14 being undecided. The majority of females (36) were undecided with 19 agreeing and 18 disagreeing.

Table XXX also shows the experimental group's response to whether they would prefer going to a lab outside the classroom rather than having the EEC person coming to their classroom. The majority said that they would not like to go to a lab (158 students, 80%) while 19 (10%) felt they would rather go to a lab. Twenty (11%) were undecided. All of the sub-group categories strongly favored not going to a learning lab.

Additional Survey. An additional survey was given to a portion of the experimental group students; these 38 students had gone to an EEC lab and used an ILS the previous year but were taught the basic skills contextually during the research project year. Table XXXI shows theresults of this survey. The overwhelming response was that these students preferred the EEC person relating the math or reading to their program (34, yes; 4, no) rather than their going to an EEC lab to receive help on their math or reading basic skills by using an ILS.

Examination of the Null Hypotheses/Questions

The data in this study used questions to guide the study. These questions, now stated as null hypotheses for the quantitative statistics, will be examined. The first null hypothesis to be tested was H_o: there are no differences in math basic skills scores among high school or adult students using either computer-aided instruction or contextual learning-based instruction. This hypothesis was rejected as an ANCOVA was performed that demonstrated statistical significance which indicates that with contextual learning-based instruction students should have increased math basic skills gains.

Table XXXI

Results of Survey

Given to Second Year Students

In the Experimental Group

N = 38

Statement	Number of Responses
1. I liked going to the EEC last year.	yes <u>5</u> no <u>33</u>

For the following the respondents either marked A or B and the number
of results are listed in the column at the right:

2.

   a. I liked going to the EEC lab better
      than the EEC personnel coming to
      my classroom.   <u>4</u>

   b. I like the EEC personnel coming to
      my classroom better than going
      to the EEC lab.   <u>34</u>

3.

   a. I would prefer going back to the EEC lab.   <u>4</u>

   b. I would prefer the EEC person staying
      in the classroom.   <u>34</u>

4.

   a. I liked working on the computer best
      to learn about math or reading.   <u>5</u>

   b. I prefer having a learning consultant
      (EEC person) explain math or reading
      to me instead of working math or
      reading on the computer.   <u>33</u>

A second null hypothesis was H_o: there are no differences in reading basic skills scores among high school or adult students using either computer-aided or contextual learning-based instruction. This hypothesis was also rejected as there was statistical significance between the two instructional modes using an ANCOVA with a reading pretest as a covariate.

The third null hypothesis, H_o: there are no differences in math or reading gains due to a person's learning style, failed to be rejected. Based on the analysis of the data from this study, the researcher failed to reject this null hypothesis in relation to the effect of instructional methodologies on personality styles.

The questions which guided the study will be used to examine the qualitative portion of the study. One question asked was whether instructors preferred the EEC personnel to use computer-aided instruction or contextual, learning-based instruction when teaching basic skills. It was surmised from the qualitative data that the instructors overall seemed to favor the contextual learning-based approach. Table XVII revealed that the teachers felt the students did not like to leave their training program to go to an EEC lab. Although most teachers felt that no matter which approach was used, the EEC was beneficial and had relevance to their program, Table XX supports that the majority of instructors would prefer having the EEC instructor in their class contextually relating the material rather than the students going to a learning lab.

In relation to the question concerning whether students preferred to use computer-aided instruction or contextual learning-based instruction, it appears that, overall, the students also prefer contextual instruction. Several data as reported in the following tables support this: Tables XVII, XX, XXI, XXVIII, XXIX, and XXX. These tables indicate overall that students do not like going to a learning lab, they believe the material is too simplistic, and if they

had a choice, the majority would choose to have the EEC person come to their class rather than going to a learning lab.

The next question relating to whether males have a preference for either mode of instruction was answered affirmatively that they do; they seem to prefer contextual instruction. The majority of males do not like to leave their training program to go to an EEC lab (Table XVIII); males would prefer having an EEC instructor in the classroom rather than going to a lab (Table XX); the lab setting is boring and unchallenging (Table XXI); almost double the males felt that it was not worth their time to go to the EEC (Table XXIX); the majority felt it would be better if the EEC person came to the class rather than their going to an EEC lab (Table XXX).

It was more difficult to detect a strong female preference for either mode of instruction. Table XVIII had equally mixed responses from this group concerning their liking to leave their training program to go to the EEC; the majority liked having the EEC instructor in the class (Table XX). Although most liked going (Table XXV), the females were equally divided on whether they felt it was worth their time to go (XXIX). Because of the divisiveness of the responses, it was not able to detect a strong preference.

The results were inconclusive for another group, the adults. They were equally divided on whether they liked to leave their program to go to the EEC (Table XVIII), whether they thought the computer-aided instruction was boring and not challenging (Table XXI), and whether they felt it was worth their time to go (Table XXIX). However, they responded in the majority as to having a preference of having the EEC instructor in the classroom rather than going to a learning lab (Table XVIII), but, overall, they liked going to the EEC.

The high school students did have a clearly defined preference for instructional methodologies when learning the basic skills. Overwhelmingly, they stated clearly they did not like leaving their training program to go to a learning lab (Table XVIII), they felt the

computer material was boring (Table XXI), and those in the control group did not like going to the EEC but those in the experimental group did like having the EEC person help them in their class (Table XXV), and the majority did not feel it was worth their time to go to a learning lab (Table XXIX).

Summary of Findings

In summary, data collected for the study revealed the following:

1. There were differences in math basic skills test scores with those utilizing contextual-based learning scoring higher than those using computer-assisted instruction.

2. There were differences in reading basic skills test scores with those utilizing contextual-based learning scoring higher than those using computer-assisted instruction.

3. There was not a statistical difference in the basic skills gains for the various personality styles.

4. Instructors preferred the EEC instructor to use the contextual approach when teaching the basic skills rather than having the students go to a learning lab and use computer-assisted instruction.

5. Students preferred to receive basic skills instruction through the contextual learning-based modality rather than through the computer-assisted mode.

6. Males preferred contextually learning the basic skills rather than through computer-assisted instruction in a learning lab.

7. Females did not have a preference for either learning their basic skills contextually or by computer-assisted instruction.

8. Adults did not have a clearly defined preference for either learning their basic skills contextually or by computer-assisted instruction.

9. High school students preferred to receive basic skills instruction contextually rather than through computer-assisted instruction.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to examine two different instructional methodologies--one using a behavioristic style with the use of an integrated learning machine and one using a cognitivist, contextual mode--to determine if there were differences in students' math and reading basic skills gains for students enrolled in Oklahoma vocational technical schools' Education Enhancement Centers (EEC) and to determine if there were differences in students' and teachers' attitudes concerning these modes of instruction. Another part of the study attempted to determine if students' personality/learning styles had an effect on the reading and math gains in either mode of instruction.

A review of literature revealed that the educational arena had been based upon the behavioristic learning theory for several years, but because employers needed students to have the ability to think critically and solve problems, educators were moving towards cognitivist and constructivist learning theories where contextual learning was emphasized. The review also examined the theory of integrated learning systems (ILS) utilized in the majority of the EECs in Oklahoma and found their basic learning premise was behavioristic. Furthermore, the review indicated that students' learning styles were varied and that students' ability to benefit from various forms of instruction could be correlated to their learning style.

As a result of the review there appeared to be a need to examine the two instructional modes to see if the teaching methodology impacted

students' reading and math basic skills scores. Most of the EECs use the traditional method to teach the basic skills by having students leave their training program to attend a lab setting where usually students use an ILS as the basis for basic skills instruction with an EEC instructor in the lab to help the students with any difficulties experienced in learning the concept on the ILS. A few other EECs are using a more contextual approach where the instruction of basic skills is tied directly to the training program.

Nine major research questions guided the study. They are as follows:

1. Will the students make more reading score gains using computer-aided instruction or contextual learning-based instruction?

2. Will the students make more math score gains using computer-aided instruction or contextual, learning-based instruction?

3. Do the instructors prefer the EEC personnel to use computer-aided instruction or contextual, learning-based instruction when teaching the basic skills?

4. Do the students prefer the EEC personnel to use computer-aided instruction or contextual, learning-based instruction when teaching the basic skills?

5. Do males have a preference for either computer-aided instruction or contextual, learning-based instruction?

6. Do females have a preference for either computer-aided instruction or contextual, learning-based instruction?

7. Do adults have a preference for either computer-aided instruction or contextual, learning-based instruction when learning the basic skills?

8. Do high school students have a preference for either computer-aided instruction or contextual, learning-based instruction when learning the basic skills?

9. Does a student's learning style affect math and reading gains in either of the two instructional modalities?

The study involved the collection of quantitative data for the math and reading basic skills gain scores and the personality/learning style gains and qualitative data for attitudinal preferences of the population and its various entities. Data for the quantitative portion were collected using the Test of Adult Basic Education in which students were pretested with Form 5 at the beginning of the study in the areas of math and reading; posttest scores using Form 6 were collected at the end of the study. The Myers-Briggs Type Indicator, Form G, was also used to identify the students' personality/learning styles.

For the qualitative portion, two major research tools were used. One was a semi-structured interview used with the instructors in the selected programs and randomly selected students. The other tool, a survey, was also given to students in the selected programs in order to determine their attitudinal preference for the two modes of instruction.

The subjects for this study were adult and high school students enrolled in five training programs in four vocational-technical schools. The programs included automotive technology, business technology, electronics, health science technology, and welding. The vo-techs included Central, Caddo-Kiowa, O. T. Autry, and Pioneer Area Vocational Schools.

<div align="center">Results of the Study</div>

An analysis of the quantitative data revealed the following findings:

1. Students who were taught the basic skills by an EEC instructor who contextually related the math instruction to the vocational training program had significantly higher gains than students who went to an EEC lab and used an ILS as the basic method of math instruction.

2. Students who were taught reading basic skills through a contextual approach related to their training program had significantly higher gains than students who were taught reading basic skills via an ILS.

3. There is no statistical difference in the reading or math gains based on personality/learning styles for either the contextual or traditional ILS instructional approach.

The results for the qualitative portion included:

1. Teachers did seem to have a preference for the contextual-related methodology. Although most felt the EEC was beneficial no matter which method was used, most supported the concept that the better methodology would be for the EEC instructor to contextually relate the math or reading to the vocational training program.

2. Students seemed, overall, to prefer having the EEC person come to their class to contextually related the math or reading instruction rather than receive instruction through an ILS.

3. Males' attitudes towards going to an EEC lab and using an ILS overall were negative. They would prefer to have the basic skills instruction contextually taught by having the EEC instructor come to the classroom.

4. A decisive female attitude concerning the EEC was more difficult to detect in the female population. Most of them liked going to an EEC lab; however, the majority responding either affirmatively or negatively seemed to prefer having the EEC instructor come to the training program and teach the basic skills in context of their training program. It is noted, however, that the majority were undecided about this.

5. There was not a definitive attitude for the adult population concerning the EEC. Overall, they liked going to an EEC lab, but their preference was to have the EEC instructor come to the classroom and contextually relate the basic skills instruction.

6. The high school students appeared to have a clearly defined attitudinal preference. They did not like going to an EEC lab to use a computer, which they felt was too simplistic, in teaching their basic skills. They definitely preferred the EEC person to come to their classroom to relate the basic skills instruction to their vocational training program.

Conclusions

Based on this study, the following conclusions were derived:

1. Based on the finding that there was a significant difference in math and reading basic skills gains for students enrolled in vocational programs when a contextual instructional methodology was used, it is concluded that math and reading basic skills instruction should be taught in a contextual, cognitivist manner rather than the behavioral ILS method.

2. Since no statistical significance was found in students' personality/learning styles and basic skills math or reading gains, it can be concluded that these two instructional methodologies do not appear to have a significant impact on any particular personality/learning style.

3. It was found that the attitude towards the traditional method of vocational students' learning their math and reading basic skills in an EEC lab setting using an ILS was mixed, but that, if given a choice, the students' preference would be for the EEC person to go to their classroom to contextually relate their basic skills instruction to their vocational program. Therefore, it can be concluded that students prefer a contextual, cognitivist approach to a behaviorist approach in learning the basic skills.

4. The study indicated there was a gender and age attitudinal variance concerning the EEC lab and the use of an ILS. Females and adults seem to overall enjoy going to the learning lab; however, males and high school students did not enjoy leaving their vocational

training program to attend a lab session. All genders and ages, however, did prefer, if given a choice of the two instructional modes, the EEC person going to their classroom to relate the basic skills to their vocational training program instead of learning basic skills through the use of the ILS. Therefore, it can be concluded that the attitudinal preference of males and females and high school and adult students is to have basic skills instruction taught through a contextual, cognitivist approach.

5. Attitudinal differences do exist with instructors concerning the basic skills instructional methodologies. Most feel the EEC instruction is helpful no matter what method is used; however, they feel that the better method would be the contextual one with the EEC instructor relating math or reading to their training program. It is concluded that teachers do prefer the contextual method of basic skills instruction.

Recommendations

An end result for vocational education in Oklahoma is for students to be competently training in vocational training skills and to have appropriate math and reading basic skills to support them in being gainfully employed and considered by the employer as being a valued employee. If this result is to be achieved, vocational-technical school staffs need to constantly examine their instructional methods and adapt them to meet the increasing technological and other changing demands of the workplace.

First, it is recommended that vocational-technical school staff examine the learning theory being used at their site. If this theory is behavioristic, it is recommended that the site examine the benefits of a cognitivist or constructivist theory to see if this might be more appropriate in training workers for the present and future workplace demands.

Second, in teaching the basic skills of math and reading, it is recommended that school staff survey their students' and instructors' attitudes concerning going to a lab and using an ILS as the instructional method. If, as indicated by this study, their students and instructors would prefer the EEC person relating the basic skills instruction to the vocational program instead of using the generic-not-vocationally related ILS, it is recommended that they change to a contextually-based basic skills instructional methodology.

The third recommendation is that if an ILS is to be used as the primary tool for the instruction of basic skills, then the school staff needs to devise a system where the knowledge learned on the ILS is bridged back to the vocational training program. For there to be transference of knowledge from the ILS to the training program, it is further recommended that the vocational instructor know specifically what the student is working on while in the EEC lab and prepare a contextual and preferably a hands-on lesson relating the ILS instruction to the training program.

A final recommendation is for vocational school staff to use the vehicle of staff development to learn more about learning theories and how these apply to vocational instruction. By gaining more knowledge of a cognitivist or constructivist learning theory, instructors may adopt what is learned to their classroom in order for students to be better prepared for the workforce, especially in areas which current employers are stating that employees have weak skills, such as critical thinking and problem solving. The literature reported that the behavioristic approach simply does not lend itself to fostering these types of skills.

Recommendations for Further Research

The findings of this study indicate that students' basic skills scores appear to increase when a contextual, cognitivist instructional methodology is used. Furthermore, the attitudes of both the

instructors and students indicate a preference for this type of basic skills instruction. The findings of this study would be enhanced by the following:

1. In order to see if the contextual, cognitivist or constructivist learning theory would lead to an increased competence in student training and in interpersonal and critical thinking skills of vocational students, further research needs to be conducted comparing a behavioristic instructional approach to a cognitivist or constructivist approach in the teaching of vocational training skills.

2. According to the review of literature, retention and transference of learning are difficult to gage. Further research could be done in this area to compare instructional modes in the teaching of basic skills to determine if either mode had a significant effect on students' retaining and transferring knowledge.

3. Since many of the EECs use the ILS, further research could compare how they might be used more effectively. For example, a comparison could be made concerning the students' reading and math gains without bridging the ILS instruction back to the vocational program and another made with an instructor knowing specifically what the student is learning on the ILS and then designing a hands-on application of that information related to the vocational training program and comparing gains and retention results at the end of a year.

4. Since the Myers Briggs Type Indicator suggests occupational preferences for the various personality types, further research could be done to compare the personality type, occupational goal, academic grade in a training program, and job performance when placed on a job to see if a correlation exists between personality/learning style and performance in class and at work.

The researcher holds the opinion that findings from the above recommendations would provide information that would assist vocational teachers in their efforts to prepare students for the workplace. Since vocational educators are confronted with the problem of employers being

concerned about their employees not having sufficient basic skills, more effective methods for teaching basic skills must be found. Workforce needs have changed in the past thirty years. For the United States to remain globally competitive, vocational students of today must not only have the technical skills of a trade but also should be able to perform the math calculations and read the technical information relevant for effective job functioning. Without these necessary skills, this nation's employees will not be prepared to help their employer be successful. It is hoped that the results of this study will promote further study in this area as it indicated that a cognitivist approach to teaching the basic skills appeared to be a more effective method than the behaviorist method. With the necessity of employees needing to know basic skills before entering the workforce, further research should help pave the way for discovering more effective strategies and methods for teaching the basic skills and should address education's responsibility in helping to prepare a better prepared workforce.

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APPENDIXES

Appendix A

Institutional Review Board Study

Approval Form

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 04-07-95   **IRB#:** ED-95-065

Proposal Title: THE EFFECTS OF CONTEXTUAL, LEARNING-BASED
INSTRUCTION AND COMPUTER-ASSISTED INSTRUCTION IN SELECTED
VOCATIONAL COURSES ON BASIC SKILLS

Principal Investigator(s): Garry Bice, Janet Cox

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT
NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A
CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD
APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR
APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval
are as follows:

Signature: Date: April 11, 1995

Chair of Institutional Review Board

Appendix B

Initial Confirmation Letter

To Participating Institutions

2101 N. Ash
Ponca City, OK 74601
September 19, 1994

Dr. Orb Hulsey
Caddo-Kiowa AVTS
P. O. Box 190
Fort Cobb, OK 73038

Dear Dr. Hulsey:

Thank you for agreeing to help with the research concerning
the math and reading gains students make in the Education
Enhancement Center. Your assistance and the assistance of
your staff is greatly appreciated.

As per our telephone conversation, I plan to be at your
site on October 11 to administer the Myers-Briggs Type
Indicator and a survey to students in electronics, welding,
automotive technology, business technology, and health
science technology. I also plan to do a semi-structured
interview with randomly selected students and the
instructors in the above identified programs. I will
probably need to return at least one other time to complete
the interviews.

I have contacted Twila Green, and she has kindly agreed to
help me with the arrangements for administering the tests
and interviews. She will also help with providing me pre-
and posttest TABE scores. She will be making the
arrangements with the teachers; she has been very
cooperative and her help is greatly appreciated.

Thank you again for your help and for letting your staff
assist. If you have questions or need more information,
please contact me at 405-762-8336.

Sincerely,

Janet Cox
Assistant Superintendent

Appendix C

Thank You Letter

To Participating Institutions

2101 N. Ash
Ponca City, OK 74604
June 6, 1995

Mr. Phil Waul
Central Oklahoma AVTS
3 C T Circle
Drumright, OK 74030

Dear Phil:

I want to thank you for allowing me to visit your school
and assess, survey, and interview your students for my
dissertation project. I also interviewed some of your
teachers.

Everyone was extremely helpful and cooperative. I
especially commend you on your students' behavior and
performance. They were wonderful.

Special thanks go to Nancy Miller. I know you realize how
wonderful she is. I would just like to add that from my
observation, the students truly respected and liked her.
Her organizational skills benefitted my project immensely
and made everything run smoothly. You truly have an
extremely valuable employee in Nancy in that she not only
is organized but also is cooperative, helpful, and highly
efficient.

I only have one small portion of the project left to do. I
still have to interview a few of your teachers. I will be
contacting you later to discuss the arrangements for these
interviews.

Again, thank you for your help and your school's
participation in this project.

Sincerely,

Janet Cox
Assistant Superintendent
Pioneer Technology Center

Appendix D

Demographic Sheet

Demographic Sheet

Please complete the following information:

1. Your name: _____

2. The last four digits of your telephone number:_____

2. Please check which vo-tech you attend:

_____Caddo-Kiowa (Fort Cobb)   ____Central (Drumright)

_____O. T. Autry (Enid)   ____Pioneer (Ponca City)

4. Please check the appropriate response:

_____I am a high school student   ____I am an adult student

5. Please check the appropriate response:

_____I am a female   ____I am a male

6. Please check which class you are enrolled in:

____Allied Health   _____Business/Office

____Automotive   _____Electronics

____Welding

7. Please check if you are a morning or afternoon student:

____I attend the vo-tech in the morning.

____I attend the vo-tech in the afternoon.

____I attend the vo-tech both morning and afternoon.

Appendix E

Student Surveys

Given To Traditional EEC Students

(The Control Group)

Student Survey

Traditional EECs

This is an opportunity to tell us what you like and what you would like
to change about the Education Enhancement Center. This information
will be kept completely confidential. Only the researcher will see
your results; this survey will be mixed with many others and put into
an envelope with only one person ever seeing the results. This person
will not be a teacher at your school. No specific reference will be
made about specific answers to these questions so no one will be able
to determine who completed this survey. Therefore, feel free to
explain your opinion. Thank you for your help in completing this
survey.

Directions: Please check the appropriate space:

_____Adult   _____Male

_____High School   _____Female

Directions: Please place a check in the box which most appropriately
matches how you feel.

EEC = Education Enhancement Center

Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. I like going to the EEC.					
2. I feel the EEC person is of great help to me.					
3. I feel the EEC people are always willing to help me.					
4. I feel the math and reading instruction provided me by the EEC person helps me in my vocational training program.					
5. I do feel it was worth my time to go to the EEC.					

Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
6. I would prefer going to a learning lab outside the classroom rather than have the EEC person come to my classroom.					

Appendix F

Student Surveys

Given to Experimental Group

Student Survey

Contextual EECs

This is an opportunity to tell us what you like and what you would like to change about the Education Enhancement Center. This information will be kept completely confidential. Only the researcher will see your results; this survey will be mixed with many others and put into an envelope with only one person ever seeing the results. This person will not be a teacher at your school. No specific reference will be made about specific answers to these questions so no one will be able to determine who completed this survey. Therefore, feel free to explain your opinion. Thank you for your help in completing this survey.

Directions: Please check the appropriate space:

_____Adult   _____Male

_____High School   _____Female

Directions: Please place a check in the box which most appropriately matches how you feel.

EEC = Education Enhancement Center

Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. I like having the EEC person help me.					
2. I feel the EEC person is of great help to me.					
3. I feel the EEC people are always willing to help me.					
4. I feel the math and reading instruction provided me by the EEC person helps me in my vocational training program.					
5. I do feel it was worth my time to have the EEC person in the class.					

Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
6. I would prefer going to a learning lab outside the classroom rather than have the EEC person come to my classroom.					

Appendix G

Student Surveys Given

To Students Exposed To Both

EEC Instructional Methods

Survey For Second-Year Student

Anonymity Statement: These surveys are kept extremely confidential.
No one but the research person will see the results. No information
regarding any specific survey will ever be provided to anyone. These
surveys will be tallied, and no one will ever know any one person's
individual response.

Directions:

I. Please check the appropriate space:

    A.   _____Male   B.   _____Adult student

         _____Female   _____High school student

    C. Please circle the appropriate response:

        1. I went to the Education Enhancement Center
            last year (even if for one day.   yes   no

        2. I liked going to the Education Enhancement
            Center last year.   yes   no

II. Pioneer Technology Center made some changes this year. We would
like your reaction to the changes in order for us to determine if we
need to keep things as they are or to change back to what we had last
year. Last year, if our students needed help with math, reading, or
other help in their training program, they left the classroom and went
to the Education Enhancement Center. This year, the Education
Enhancement Center (EEC) personnel are going to the classroom instead
of the students' going to the EEC. Please answer the questions below
so that we will know which you prefer. Thank you!

    Directions: Please check the response that best describes how
you feel:

    A.
    _____ I liked going to the Education Enhancement Center better
          than the Education Enhancement Center personnel coming to
          my classroom.

    _____ I like the Education Enhancement Center personnel coming to
          my classroom better than going to the Education Enhancement
          Center.

    B.

    _____I would prefer my going back to the Education Enhancement
          Center.

    _____I would prefer the Education Enhancement Center personnel
          staying in the classroom.

    C.

    _____ I liked working on the computer best to learn about math or
          reading.

    _____ I prefer having a learning consultant explain math or
          reading to me instead of working math or reading on the
          computer.

Appendix H

Semi-Structured Interview Questions

For Instructors

Teachers' Semi-Structured Interview Questions

Hello. My name is Ms. Cox. I am working on my dissertation from OSU. My topic concerns the Education Enhancement Center. Mainly I am here to learn about students' and teachers' attitudes towards the EEC. I would like to tape our conversation if that is all right. I assure you that this information will be kept strictly confidential. No one will ever hear the tape but me, and I will never pass along any information that a particular person said.

I am interviewing students and teachers from four vo-techs and from five programs. The only way I will identify what anyone said is that the person is either male or female, in a control or experimental group, or either a high school or adult student or instructor. Therefore, what you say today will be kept absolutely confidential, and no one will ever know who said what. I would just like your honest opinion. Does that sound all right? Do you have any questions?

This will be a semi-structured interview; that simply means that I have certain questions to ask in all of the interviews I do but that all my statements other than the list of questions do not have to be standardized in all of the interviews. This does not affect your answers at all. Please feel free to answer how you feel.

The first question is to gather an idea of how your students use the Education Enhancement Center (EEC).

School:_____   Name: _____

Program:_____   Date: _____

I. Knowledge and Depth of Use of EEC

   A. Please explain how your students use the Educational
       Enhancement Center Services.

   B. Do you know what assignments your students are working on in
       the EEC?

       For example, do you know if they are working on the division
       of fractions or just that they are working on math?

   C. If you know the specific content of what each of your
       students do in the EEC, please explain the process of how
       the EEC instructor keeps you informed.

   D:
    1) Do you and the EEC instructor work together on the content
        of the student's assignment in the EEC?

    2) If so, do you reinforce what is learned in the EEC?

    3) How?
                          OR

    4) If not, how do you reinforce what is being taught in the EEC?

II. The next few questions will relate to how you feel about the EEC--
your attitude about the concept of the EEC. This is certainly not
directed towards persons working in the EEC. It is just to gain an
idea of how you feel about the concept of the EEC as it is used in your
school.

A. Do you feel the EEC is beneficial?
   How and/or how not?

B. Please describe your attitude towards the EEC.

C. Do you feel your students enjoy either going to the EEC
   (traditional) or working with the EEC person (control
   group).

III. In order to get an idea of what you think is presently working
best and not working in you school in regards to the EEC, would you
please tell about two areas you would keep as is and two you would
change.

A. First, let's start with an explanation of two areas you would
   not change. What really works for you and you students in
   regard to the EEC.

B. Would you please explain two areas you would like to change.

IV. In order to let you reflect on how you would like an ideal EEC to
be for you and your students, let me first briefly explain two schools
of thought on the concept of the EEC. Then, I will ask you what you
have and do not have and what you like and do not like about these.
Then, in the last question, I will ask you to put everything together
to conceptualize what you think an ideal EEC should be.

A. One concept of an EEC is to have a resource room where
   students are pulled out of class and go to the EEC to work
   on math, reading, or curricula, etc. In this concept with
   what we are learning about how students learn and about the
   transference of learning, the following should be in place:

1. The teacher and EEC person should plan together what the
   student will be doing by looking at what curriculum content
   the student is working on in class and the math, reading,
   or other areas related to the training program's
   curriculum.

Question 1: Is this being done at your school?

2. Relevance of material is essential if the student is to learn
   the material.

Question 2: a. Is the material that the students are learning
              relevant to his/her success in your training
              program?

         b. Is the relevance explained to the student? If so,
            by whom (the EEC person or the instructor)?

3. For transference of learning the instructor should reinforce
   what is learned in the EEC back in the classroom.

Question 3: Do you feel this is being accomplished? If so,
            please explain how?

4. Again, for transfer of learning to take place, the material
   should be presented in an applied manner.

Question 4:
         a. Is the material on the ILS related back to your
            program?

   b. If not, does the EEC person relate this to your
     program. How?

   c. Do either/both you and/or the EEC instructor relay the
     material learned on the ILS in a contextual, hands-on
     application.

  B. The other concept is for the EEC person to go to the
classroom and directly relate the material to the training program.
The same stands should be in place:

  1. Does the instructor know what the EEC person and the student
   are working on?

  2. Is this related to the training program's curriculum? Is
   this relevant?

  3. Is the relevance of why the content needs to be learned
   explained? If so, by whom?

  4. Does the instructor reinforce what the EEC person teaches?

  5. Is the material presented in an applied, hands-on teaching
   manner?

  C. In knowing about these two concepts--the students going to
   the EEC or the EEC person going to the classroom, which do
   you feel you would prefer? Why?

   Which do you feel your students would enjoy more? Why?

   In which do you feel the students would make the greatest
   gains in math or reading? In which do you feel transfer of
   learning would be the greatest?

   In which do you feel there would be more relevance to what
   you are teaching?

   Do you feel that what the students are learning in the EEC
   should be relevant to your material?

  V. I realize you do not have much time to think about this, but
   would you describe what you think an ideal EEC should be.

Thank you for your time. You've been very helpful. I want to assure
you again that this information will be kept confidential. Thanks
again!

Appendix I

Semi-Structured Interview Questions

For Students

Student Semi-Structured Interview Questions

Hello. My name is Ms. Cox. I am working on my dissertation from OSU.
My topic concerns the Education Enhancement Center. Mainly I am here
to learn about students' attitudes towards the EEC. I would like to
tape our conversation if that is all right. I assure you that this
information will be kept strictly confidential. No one will ever hear
the tape but me, and I will never pass along any information that a
particular student said.

I am interviewing students from four vo-techs and from five programs.
The only way I will identify what any student said is that the student
is either male or female, high school or adult, or in a control or
experimental group. Therefore, what you say today will be kept
absolutely confidential, and no one will ever know who said what. I
would just like your honest opinion. Does that sound all right? Do
you have any questions?

This will be a semi-structured interview; that simply means that I have
certain questions to ask in all of the interviews I do but that all my
statements other than the list of questions do not have to be
standardized in all of the interviews. This does not affect your
answers at all. Please feel free to answer how you feel.

The first question is to gather an idea of how you use the Education
Enhancement Center (EEC).

I. Use of the EEC

1. Please explain how you use the EEC services. How often do you go,
what do you work on (math, reading, etc.), and do you use an integrated
learning machine--a computer--to learn your math or reading skills? Or
if the EEC person comes to your class to help, explain how the EEC
person works with you on math, reading, etc.

2. Please explain how the EEC personnel help you. What specifically
does she/he do?

3. Does it bother you to have the EEC person help you?

II. Relevance To Program

4. Do you feel what you learn by the EEC personnel helps you in your
training program? Please   explain.

     Does the EEC person relate the material you are working on to
your training program?

     Is the math or reading you learn related to your training
program?

5. How might the EEC personnel help you more in your training program?

III. Like/Dislike of EEC

6. Please explain what you like about the EEC.

7. Please explain what you do not like about the EEC.

IV. Two Concepts of EEC

8. (Use the appropriate question depending on whether at an
experimental or control site.)

A.   In some schools the EEC is in another location and students leave the classroom to attend. They learn reading or math usually on a computer, and the EEC personnel help them when they do not understand something. The reading or math may or may not be related to your training program, but the students learn the concept of--let's say-- division of fractions.

B.   In some schools the EEC personnel go to the training program. There may or may not be a lab with computers but usually the EEC teacher goes to the classroom to help the student.s   EEC personnel work with the students on math and reading as related to their training program. If the EEC person uses the computer in the lab, the EEC personnel relate that lessons back to the student's training program.

Do you think you would prefer the way the EEC is now or this other way? Why?

V. Attitude of EEC

9. Please describe your attitude towards the EEC in your school.

10. (Ask the appropriate question below depending on whether this is a control or experimental site.)

Do you like going to the EEC?

Do you like the EEC personnel to work with you in your training program?

11. Next, I am going to ask what you would keep the same about the EEC and what you would change.

First, what would you want to stay the same and not change about the EEC?

Second, what would you want to change?

Thank you for your time. You've been very helpful. I want to assure you again that this information will be kept confidential. Thanks again!

Appendix J

Data Collection Form

DATA COLLECTION FORM

Name of School: _____   H.S./Adult____   Male/Female_____
Program:_____

Student Name	Pre-Math	Post-Math	Gains	Pre-Reading	Post-Reading	Gains	Myers Briggs

Appendix K

Contact Summary Sheets

Contact Summary Sheet

Contact Site: _____

Date Visited Site: _____

I. Interview Summary

A. List the people interviewed

B. List a theme and list the antithesis, if one, for the above
interviewed people and also list how many favored and how many opposed.

    1. Theme:

    2. Antithesis to Theme 1:

    3. Theme:

    4. Antithesis to above theme:

    5. Theme:

    6. Antithesis to above theme:

C. Which research questions were addressed.

D. If any research questions were omitted explain why.

E. List any new hypotheses or speculations.

F. List any issues that need to be clarified or raised in another visit.

Appendix L

Memoing Form

Memoing Form

Directions: List below one conceptual analysis of some aspect of the
data set; this can include an insight, theme, puzzle, a category, an
emerging explanation, a striking event, etc. Do a separate insight for
each one and consecutively number them; place the theme/insight number
below:

Theme or Concept Number: _____

Possible quote(s) to use favoring above:

Summary of respondents:
(Coding to use: 1=experimental group 2=control 3=adult 4=hs
                   5=male   6=female 7=instructor 8=student
Those agreeing with above:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Those disagreeing:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Possible opposition quote(s) to use:

Appendix M

Interim Site Summary Forms

Interim Site Summary Form

Site:_____

Date to return for visit:_____

Directions: List below the people who need to be contacted for more
information, clarification, or a more detailed statement concerning an
issue. List the question to specifically ask each person.

A. Person To Contact: _____

     Item To Address:

B. Person to Contact: _____

     Item To Address:

C. Person To Contact: _____

     Item To Address:

D. Person To Contact: _____

     Item To Address:

Appendix N

Survey Tally Sheet

Survey Tally Sheet

Survey Question:

Directions: Tally the responses for each of the following groups.

I. Strongly Agree:
    Adult:

    High School:

    Male:

    Female:

    Total:

II. Agree:
     Adult:

     High School:

     Male:

     Female:

     Total:

III. Uncertain:
      Adult:

      High School:

      Male:

      Female:

      Total:

IV. **Disagree:**
     Adult:

     High School:

     Male:

     Female:

V. **Strongly Disagree**
    Adult:

    High School:

    Male:

    Female:

    Total:

Appendix O

Descriptions of the Sixteen Personality

Types as Measured by the Myers-Briggs

Type Indicator

(Reprinted with permission from Dr. Terry Underwood)

Extraverted Thinking with Sensing (ESTJ)

ESTJ people use their thinking to run as much of the world as may be theirs to run. They like to organize projects and then act to get things done. Reliance on thinking makes them logical, analytical, objectively critical, and not likely to be convinced by anything but reasoning. They tend to focus on the job, not the people behind the job.

They like to organize facts, situations, and operations related to a project, and make systematic effort to reach their objectives on schedule. They have little patience with confusion or inefficiency, and can be tough when the situation calls for toughness.

They think conduct should be ruled by logic, and govern their own behavior accordingly. They live by a definite set of rules that embody their basic judgments about the world. Any change in their ways requires a deliberate change in their rules.

They like jobs where the results of their work are immediate, visible, and tangible. They have a natural bent for business, industry, production, and construction. They enjoy administration where they can set goals, make decisions, and give the necessary orders. Getting things done is their strong suit.

Like other decisive types, ESTJs run the risk of deciding too quickly before they have fully examined the situation. They need to stop and listen to the other person's viewpoint, especially with people who are not in a position to talk back. This is seldom easy for them , but if they do not take time to understand, they may judge too quickly, without enough facts or enough regard for what other people may think or feel.

ESTJs may need to work at taking feeling values into account. They may rely so much on their logical approach that they overlook feeling values-what they care about and what other people care about. If feeling values are ignored too much, they may build up pressure and find expression in inappropriate ways. Although ESTJs are naturally good at seeing what is illogical and inconsistent, they may need to develop the art of appreciation. One positive way to exercise their feeling is to appreciate other peoples's merits and ideas. ESTJs who make it a rule to mention what they like, not merely what needs correcting, find the results worthwhile both in their work and in their private lives.

Extraverted Thinking with Intuition (ENTJ)

ENTJ people use their thinking to run as much of the world as may be theirs to run. They enjoy executive action and long-range planning. Reliance on thinking makes them logical, analytical, objectively critica, and not convinced by anything but reasoning. They tend to focus on the ideas, not the person behind the ideas.

They like to think ahead, organize plans, situations, and operations related to a project, and make a systematic effort to reach their objectives on schedule. They have little patience with confusion or inefficiency, and can be tough when the situation calls for toughness.

They think conduct should be ruled by logic, and govern their own behavior accordingly. They live by a definite set of rules that embody their basic judgements about the world. Any change in their ways requires a deliberate change in their rules.

They are mainly interested in seeing the possibilities beyond what is present , obvious, or know. Intuition heightens their intellectual interest, curiosity for new ideas, tolerance for theory, and taste for complex problems.

ENTJs are seldom content in jobs that make no demand upon their intuition. They are stimulated by problems and are often found in executive jobs where they can find and implement new solutions. Because their interest is in the big picture, they may overlook the importance of certain details. Since ENTJs tend to team up with like-minded intuitives who may also underestimate the realities of a situation, they usually need a person around with good common sense to bring up overlooked facts and take care of important details.

Like other decisive types, ENTJs run the risk of deciding too quickly before they have fully examined the situation. They need to stop and listen to the other person's viewpoint, especially with people who are not in a position to talk back. This is seldom easy for them, but if they do not take time to understand, they may judge too quickly, without enough facts or enough regard for what other people think or feel.

ENTJs may need to work at taking feeling values into account. Relying so much on their logical approach, they may overlook feeling values-what they care about and what other people care about. If feeling values are ignored too much, they may build up pressure and find expression in inappropriate ways. Although ENTJs are naturally good at seeing what is illogical and inconsistent, they may need to develop the art of appreciation. One positive way to exercise their feeling is through appreciation of other people's merits and ideas. ENTJs who learn to make it a rule to mention what they like, not merely what needs correcting, find the results worthwhile both in their work and in their private lives.

Extraverted Feeling with Sensing (ESFJ)

People with ESFJ preferences radiate sympathy and fellowship. They concern themselves chiefly with the people around them and place high value on harmonious human contacts. They are friendly, tactful, and sympathetic. They are persevering, conscientious, orderly even in small matters, and inclined to expect others to be the same. They are particularly warmed by approval and sensitive to indifference. Much of their pleasure and satisfaction comes from the warmth of feeling of people around them. ESFJs tend to concentrate on the admirable qualities of other people and are loyal to respected persons, institutions, or causes, sometimes to the point of idealizing whatever they admire.

They have the gift of finding value in other people's opinions. Even when these opinions are in conflict, they have faith that harmony can somehow be achieved and they often manage to bring it about. To achieve harmony, they are ready to agree with other's opinions within reasonable limits. They need to be careful, however, that they don't concentrate so much on the viewpoints of others that they lose sight of their own.

They are mainly interested in the realities perceived by their five senses, so they become practical, realistic, and down-to-earth. They take great interest in the unique differences in each experience. ESFJs appreciate and enjoy their possessions. They enjoy variety but can adapt well to routine.

ESFJs are at their best in jobs that deal with people and in situations where cooperation can be brought about through good will. They are found in jobs such as teaching, preaching, and selling
Their compassion and awareness of physical conditions often attracts them to health professions where they can provide warmth, comfort, and patient caring. They are less likely to be happy in work demanding mastery of abstract ideas or impersonal analysis. They think best when talking with people, and enjoy communicating. They have to make a special effort to be brief and businesslike and not let sociability slow them down on the job.

They like to base their plans and decisions upon known facts and on their personal values. While liking to have matters decided or settled, they do not necessarily want to make all the decisions themselves. They run some risk of jumping to conclusions before they understand a situation. If they have not taken time to gain first-hand knowledge about a person or situation, their actions may not have the helpful results they intended. For example, ESFJs beginning a new project or job may do things they assume should be done, instead of taking the time to find out what is really wanted or needed. They have many definite "shoulds" and "should nots," and may express these freely.

ESFJs find it especially hard to admit the truth about problems with people or things they care about. If they fail to face disagreeable facts, or refuse to look at criticism that hurts, they will try to ignore their problems instead of searching for solutions.

Extraverted Feeling with Intuition (ENFJ)

People with ENFJ preferences radiate sympathy and fellowship. They concern themselves chiefly with the people around them and place high value on harmonious human contacts. They are friendly, tactful, and sympathetic. They are persevering, conscientious, and orderly even in small matters, and inclined to expect others to be the same. ENFJs are particularly warmed by approval and are sensitive to indifference. Much of their pleasure and satisfaction comes from the warmth of feeling of people around them. ENFJs tend to concentrate on the admirable qualities of other people and are loyal to respected persons, institutions, or causes, sometimes to the point of idealizing whatever they admire.

They have the gift of being able to see value in other peoples's opinions. Even when opinions are in conflict, they have faith that harmony can somehow be achieved, and they often manage to bring it about. To bring harmony, they are ready to agree with other opinions within reasonable limits. They need to be careful, however, not to concentrate so much on the viewpoints of others that they lose sight of their own.

They are mainly interested in seeing the possibilities beyond what is present, obvious, or known. Intuition heightens their insight, vision, and curiosity for new ideas. They tend to be interested in books and are moderately tolerant of theory. They are likely to have a gift of expression, but may use it in speaking to audiences rather than in writing. They think best when talking with people.

They are best in jobs that deal with people, and in situations that require building cooperation. ENFJs are found in jobs such as teaching, preaching, counseling, and selling. They may be less happy in work demanding factual accuracy, such as accounting, unless they find a personal meaning to their work. They have to make special

effort to be brief and businesslike and not let sociability slow them
down on the job.

They base their decisions on their personal values. While they like to
have matters decided or settled, they do not necessarily want to make
all the decisions themselves. ENFJs run the risk of jumping to
conclusions before they understand a situation. If they have not taken
the time to gain first-hand knowledge about a person or situation,
their actions may not have the helpful results they intended. For
example, ENFJs beginning a new project or job may do things they assume
should be done, instead of taking time to find out what is really
wanted or needed. They have many definite "shoulds" and "should nots,"
and may express these freely.

ENFJs find is especially hard to admit the truth about problems with
people or things they care about. If they fail to face disagreeable
facts, or refuse to look at criticism that hurts, they will ignore
their problems instead of searching for solutions.

<div align="center">Extraverted Sensing with Thinking (ESTP)</div>

People with ESTP preferences are friendly, adaptable realists. They
rely on what they see, hear, and know first-hand. They good-naturedly
accept and use the facts around them, whatever these are. They look
for a satisfying solution instead of trying to impose any "should" or
"must" of their own. They are sure a satisfying solution will turn up
once they have grasped all the facts.

They solve problems by being adaptable, and often can get others to
adapt, too. People generally like them well enough to consider any
compromise they suggest. They are unprejudiced, open-minded, and
tolerant of most everyone-including themselves. They take things as
they are and thus may be very good at easing a tense situation and
pulling conflicting factions together.

They are actively curious about objects, scenery, activities, food,
people, or anything new presented to their senses. Their expert
abilities in using their senses may show in: (a) a continuous ability
to see the need of the moment and turn easily to meet it, (b) the
ability to absorb, apply, and remember great numbers of facts, (c) an
artistic taste and judgment, or (d) the handling of tools and
materials.

With their focus on the current situation and realistic acceptance of
what exists, they can be gifted problem solvers. Because they are not
necessarily bound by a need to follow standard procedures or preferred
methods, they are often able to see ways of achieving a goal by "using"
the existing rules, systems, or circumstances in new ways, rather than
allowing them to be roadblocks.

They make their decisions by using the logical analysis of thinking
rather than the more personal values of feeling. Their thinking
enables them to crack down when the situation calls for toughness, and
also helps them grasp underlying principles. They learn more from
first-hand experience than from study or reading, and are more
effective in actual situations than on written tests. Abstract ideas
and theories are not likely to be trusted by ESTPs until they have been
tested in experience. They may have to work harder than other types to
achieve in school, but can do so when they see the relevance.

ESTPs do best in careers needing realism, action, and adaptability.
Examples are engineering, police work, credit investigation, marketing,

health technologies, constructions, production,
recreation, food services, and many kinds of troubleshooting.

ESTPs are strong in the art of living, they get a lot of fun out of
life, which makes them good company. They enjoy their material
possessions and take time to acquire them. They find much enjoyment in
good food, clothes, music, and art. They enjoy physical exercise and
sports, and usually are good at these.

How effective they are depends on how much judgment they acquire. They
may need to develop their thinking so that they can use their
principles to provide standards for their behavior, and direction and
purpose in their lives. If their judgment is not developed enough to
give them any character or stick-to-it-iveness, they are in danger of
adapting mainly to their own love of a good time.

<center>Extraverted Sensing with Feeling (ESFP)</center>

ESFP people are friendly, adaptable realists. They rely on what they
can see, hear, and know first-hand. They good-naturedly accept and use
the facts around them, whatever these are. They look for a satisfying
solution instead of trying to impose any"should' or "must" of their
own. They are sure that a solution will turn up once they have grasped
all of the facts.

They solve problems by being adaptable, and often can get others to
adapt, too. People generally like them well enough to consider any
compromise they suggest. They are unprejudiced, open-minded, and
tolerant of most everyone-including themselves. They take things as
they are and thus may be very good at easing a tense situation and
pulling conflicting factions together.

With their focus on the current situation and realistic acceptance of
what exists, they can be gifted problem solvers. Because they are not
necessarily bound by a need to follow standard procedures or preferred
methods, they are often able to see ways of achieving a goal by "using"
the existing rules, systems, or circumstances in new ways, rather than
allowing them to be roadblocks.

They are actively curious about people, activities, food, objects,
scenery, or anything new presented to their senses. Their expert
abilities in using their senses may show in: (a) a continuous ability
to see the need of the moment and turn easily to meet it, (b) the
skillful handling of people and conflicts, (c) the ability to absorb,
apply, and remember great numbers or facts, or (d) an artistic taste
and judgment.

They make their decisions by using the personal values of feeling
rather than the logical analysis of thinking. Their feeling makes them
tactful, sympathetic, interested in people, and especially good
at handling human contacts. They may be too easy in matters of
discipline. They learn far more from first-hand experience than from
books, and do better in actual situations than on written
tests. Abstract ideas and theories are not likely to be trusted by
ESFPs until they have been tested in experience. They have to work
harder than other types to achieve in school, but can do so when they
see the relevance.

ESFPs do best in careers needing realism, action, and adaptability.
Examples are health services, sales, design, transportation,
entertainment, secretarial or office work, food services, supervising
work groups, machine operations, and many kinds of troubleshooting.

ESFPs are strong in the art of living. They get a lot of fun out of life, which makes them good company. They enjoy their material possessions and take time to acquire and care for them. They find much enjoyment in good food, clothes, music, and art. They enjoy physical exercise and sports, and are usually good at these.

How effective they are depends on how much judgment they acquire. They may need to develop their feeling so that they can use their values to provide standards for behavior, and direction and purpose in their lives. If their judgment is not developed enough to give them any character or stick-to-it-iveness, they are in danger of adapting mainly to their own love of a good time.

Extraverted Intuition with Thinking (ENTP)

People with ENTP preferences are ingenious innovators who always see new possibilities and new ways of doing things. They have a lot of imagination and initiative for starting projects and a lot of impulsive energy for carrying them out. They are sure of the worth of their inspirations and tireless with the problems involved. They are stimulated by difficulties and most ingenious in solving them. They enjoy feeling competent in a variety of areas and value this in others as well.

They are extremely perceptive about the attitudes of other people, and can use this knowledge to win support for their projects. They aim to understand rather than to judge people.

Their energy comes from a succession of new interests and their world is full of possible projects. They may be interested in so many different things that they have difficulty focusing. Their thinking can help them select projects by supplying some analysis and constructive criticism of their inspirations, and thus add depth to the insights supplied by their intuition. Their use of thinking also makes ENTPs rather objective in their approach to their current project and to the people in their lives.

ENTPs are not likely to stay in any occupation that does not provide new challenges. With talent, they can be inventors, scientists, journalists, troubleshooters, marketers, promoters, computer analysts, or almost anything that interests them to be.

A difficulty for people with ENTP preferences is that they hate uninspired routine and find it remarkably hard to apply themselves to the sometimes necessary detail unconnected with any major interest. Worse yet, they may get board with their own projects as soon as the major problems have been solved or the initial challenge has been met. They need to learn to follow through, but are happiest and most effective in jobs that permit one project after another, with somebody else taking over as soon as the situation is well in hand.

Because ENTPs are always being drawn to the exciting challenges of new possibilities, it is essential that they develop their judgment. If their judgement is underdeveloped, they may commit themselves to ill-chosen projects, fail to finish anything, and squander their inspirations on uncompleted tasks.

Extraverted Intuition with Feeling (ENFP)

People with ENFP preferences are enthusiastic innovators, always seeing
new possibilities and new ways of doing things. They have a lot of
imagination and initiative for starting projects, and a lot of
impulsive energy for carrying them out. They are stimulated by
difficulties and are most ingenious in solving them. ENFPs can get so
interested in their newest project that they have time for little else.
Their energy comes from a succession of new enthusiasms and their world
is full of possible projects. Their enthusiasm gets other people
interested too.

They see so many possible projects that they sometimes have difficulty
picking those with the greatest potential. Their feeling can be useful
at this point to help select projects by weighing the values of each.
Their feeling judgment can also add depth to the insights supplied by
their intuition.

The ENFP's feeling preference shows in a concern for people. They are
skillful in handling people and often have remarkable insight into the
possibilities and development of others.
They are extremely perceptive about the attitudes of others, aiming to
understand rather than judge people. They are much drawn to
counseling, and can be inspired and inspiring teachers, particularly
where they have freedom to innovate. With talent, they can succeed in
almost any field that captures their interest-art, journalism, science,
advertising, sales, the ministry, advertising, sales, or writing, for
example.

A difficulty for ENFPs is that they hate uninspired routine and find it
remarkably hard to apply themselves to sometimes necessary detail
unconnected with any major interest. Worse yet, they may get bored
with their own projects as soon as the main problems have been solved
or the initial challenge has been met. They may need to learn to
follow through and finish what they have begun, but are happiest and
most effective in jobs that permit one project after another, with
somebody else taking over as soon as the situation is well in hand.

Because ENFPs are always being drawn to the exciting challenges of new
possibilities, it is essential that they develop their feeling
judgment. If their judgment is underdeveloped, they may commit
themselves to ill-chosen projects, fail to finish anything, and
squander their inspirations by not completing their tasks.

Introverted Thinking with Sensing (ISTP)

People with ISTP preferences use their thinking to look for the
principles underlying the sensory information that comes into
awareness. As result, they are logical, analytical, and objectively
critical. They are not likely to be convinced by anything but
reasoning based on solid facts.

While they like to organize facts and data, they prefer not to organize
situations or people unless they must for the sake of their work. They
can be intensely but quietly curious. Socially they may
be rather shy except with their best friends. They sometimes become so
absorbed with one of their interests that they can ignore or lose track
of external circumstances.

ISTPs are somewhat quiet and reserved, although they can be quite
talkative on a subject where they can apply their great storehouse of

information. In everyday activities they are adaptable, except when one of their ruling principles is violated, at which point they stop adapting. They are good with their hands, and like sports and the outdoors, or anything that provides a wealth of information for their senses.

If ISTPs have developed their powers of observing the world around them, they will have a firm grasp on the realities of any situation, and show a great capacity for the important and unique facts of a situation. They are interested in how and why things work and are likely to be good at applied science, mechanics, or engineering. ISTPs who do not have technical or mechanical interests often use their talents to bring order out of unorganized facts. This ability can find expression in law, economics, marketing, sales, securities, or statistics.

ISTPs may rely so much on the logical approach of thinking that they overlook what other people care about and what they themselves care about. They may decide that something is not important, just because it isn't logical to care about it. If ISTPs always let their thinking suppress their feeling values, their feeling may build up pressure and find expression in inappropriate ways.
Although good at analyzing what is wrong, ISTPs sometimes find it hard to express appreciation. But if they try, they will find it helpful on the job as well as in personal relationships.

ISTP people are in some danger of putting off decisions or failing to follow through. One of their outstanding traits is economy of effort. This trait is an asset if they judge accurately how much effort is needed; then they do what the situation requires without fuss or lost motion. If they cannot judge accurately, or if they just don't bother, then nothing of importance gets done.

Introverted Thinking with Intuition (INTP)

People with INTP preferences use their thinking to find the principles underlying whatever ideas come into their awareness. They rely on thinking to develop these principles and to anticipate consequences. As result, they are logical, analytical, and objectively critical. They are likely to focus more on the ideas than the person behind the ideas.

They organize ideas and knowledge rather than situations or people, unless they must for the sake of their work. In the field of ideas they are intensely curious. Socially, they tend to have a small circle of close friends, and like being with others who enjoy discussing ideas. They can become so absorbed with an idea that they can ignore or lose track of external circumstances.

INTPs are somewhat quiet and reserved, although they can be quite talkative on a subject to which they have given a lot of thought. They are quite adaptable so long as their ruling principles are not violated, at which point they stop adapting. Their main interest lies in seeing possibilities beyond what is present, obvious, or known. They are quick to understand and their intuition heightens their insight, ingenuity, and intellectual curiosity.

Depending on their interests, INTPs are good at pure science, research, mathematics, or engineering; they become scholars, teachers, or abstract thinkers in fields such as economics, philosophy, or psychology. They are more interested in the challenge

of reaching solutions to problems than of seeing the solutions put to practical use.

Unless INTPs develop their perception, they are in danger of gaining too little knowledge and experience in the world. Then their thinking is done in a vacuum and nothing will come of their ideas. Lack of contact with the external world may also lead to problems in making themselves understood. They want to state exact truth, but often make it so complicated that not everyone can follow them. If they can learn to simplify their arguments, their ideas will be more widely understood and accepted.

INTPs may rely so much on logical thinking that they overlook what other people care about and what they themselves care about. They may decide that something is not important, just because it isn't logical to care about it. If INTPs always let their logic suppress their feeling values, their feeling may build up pressure until it is expressed in inappropriate ways

Although they excel at analyzing what is wrong with an idea, it is harder for INTPs to express appreciation. But if they try, they will find it helpful on the job as well as in personal relationships.

Introverted Feeling with Sensing (ISFP)

People with ISFP preferences have a great deal of warmth, but may not show it until they know a person well. They keep their warm side inside, like a fur-lined coat. When they care, they care deeply, but are far more likely to show their feeling by deeds rather than words. They are very faithful to duties and obligations related to things or people they care about.

They take a very personal approach to life, judging everything by their inner ideals and personal values. They stick to their values with passionate conviction, but can be influenced by someone they care deeply about. Although their inner loyalties and ideas govern their lives, ISFPs find these hard to talk about. Their deepest feelings are seldom expressed; their inner tenderness is marked by a quiet reserve.

In everyday activities they are tolerant, open-minded, flexible, and adaptable. If one to their inner loyalties is threatened, though, they will not give an inch. They usually enjoy the present moment, and do not like to spoil it by rushing to get things done. They have little with to impress or dominate. The people they prize the most are those who take the time to understand their values and the goals they are working toward.

They are interested mainly in the realities brought to them by their senses, both inner and outer. They are apt to enjoy fields where taste, discrimination, and a sense of beauty and proportion are important. Many ISFPs have a special nature and a sympathy with animals. They often excel in craftsmanship, and the work of their hands is usually more eloquent than their words.

They are twice as good when working at a job they believe in, since their feeling adds energy to their efforts. They see the needs of the moment and try to meet them. They want their work to contribute to something that matters to them-human understanding, happiness, or health. They want to have a purpose beyond their paycheck, no matter how big the check. They are perfectionists whenever they care deeply about something, and are particularly suited for work that requires both devotion and a large measure of adaptability.

The problem for some ISFPs is that they may feel such a contrast between their inner ideals and their actual accomplishments that they burden themselves with a sense of inadequacy. This can be true even when they are being as effective as others. They take for granted anything they do well and are the most modest of all types, tending to underrate and understand themselves.

It is important for them to find practical ways to express their ideals; otherwise they will keep dreaming of the impossible and accomplish very little. If they find no actions to express their ideals, they can become too sensitive and vulnerable, with dwindling confidence in life and in themselves. Actually, they have much to give and need only to find the spot where they are needed.

Introverted Feeling with Intuition (INFP)

People with INFP preferences have a great deal of warmth, but may not show it until they know a person well. They keep their warm side inside, like a fur-lined coat. They are very faithful to duties and obligations related to ideas or people they care about. They take a very personal approach to life, judging everything by their inner ideals and personal values.

They stick to their ideals with passionate conviction. Although their inner loyalties and ideals govern their lives, they find these hard to talk about. Their deepest feelings are seldom expressed; their inner tenderness is masked by a quiet reserve. In everyday matters they are tolerant, open-minded, understanding, flexible, and adaptable. But if their inner loyalties are threatened, they will not give an inch. Except for their work's sake, INFPs have little wish to impress or dominate. The people they prize the most are those who take the time to understand their values and the goals they are working toward.

Their main interest lies in seeing the possibilities beyond what is present, obvious, or known. They are twice as good when working at a job they believe in, since their feeling puts added energy behind their efforts. They want to contribute to something that matters to them-human understanding, happiness, or health. They want to have a purpose beyond their paycheck, no matter how big the check. They are perfectionists whenever they care deeply about something.

INFPs are curious about new ideas and tend to have insight and long-range vision. Many are interested in books and language and are likely to have a gift of expression; with talent they may be excellent writers. They can be ingenious and persuasive on the subject of the enthusiasms, which are quiet but deep-rooted. They are often attracted to counseling, teaching, literature, art, science, or psychology.

The problem for some INFPs is that they may feel such a contrast between their ideals and their actual accomplishments that they burden themselves with a sense of inadequacy. This can happen even when, objectively, they are being as effective as others. It is important for them to use their intuition to find ways to express their ideals; otherwise they will keep dreaming of the impossible and accomplish very little. If they find no channel for expressing their ideals, INFPs may become overly sensitive and vulnerable, with dwindling confidence in life and in tnemselves.

Introverted Sensing with Thinking (ISTJ)

People with ISTJ preferences are extremely dependable and have a
complete, realistic, and practical respect for the facts. They absorb,
remember, and use any number of facts and are careful about their
accuracy. When they see something needs to be done they accept the
responsibility, often beyond the call of duty. They like everything
clearly stated.

Their private reactions, which seldom show in their faces, are often
vivid and intense. Even when dealing with a crisis they look calm and
composed. Not until you know them very well do you discover that
behind their outer calm they are viewing the situation from an
intensely individual angle. When ISTJs are "on duty" and dealing with
the world, however, their behavior is sound and sensible.

ISTJs are thorough, painstaking, systematic, hard-working, and careful
with particulars and procedures. Their perseverance tends to stabilize
everything with which they are connected. They do not enter into
things impulsively, but once committed, they are very hard to distract
or discourage.

ISTJs often choose careers where their talents for organization and
accuracy are rewarded. Examples are accounting, civil engineering,
law, production, construction, health careers, and office work. They
often move into supervisory and management roles.

If they are in charge of something, their practical judgment and
valuing of procedure makes them consistent and conservative, assembling
the necessary facts to support their evaluations and
decisions. They look for solutions to present problems in the
successes of the past. With time they become masters of even the
smallest elements of their work, but don't give themselves any
special credit for this knowledge.

They may encounter problems if they expect everyone to be as logical
and analytical as they are. They then run the danger of
inappropriately passing judgement on other or overriding less
forceful people. A useful rule is for them to use their thinking to
make decisions about inanimate objects or their own behavior, and to
use their senses to see what really matters to others, so that it
becomes a fact to be respected. They may go to generous lengths to
help.

Another problem may arise if the ISTJ's thinking remains undeveloped.
They may retreat, becoming absorbed with their inner reactions to
sense-impressions, with nothing of value being
produced. They may also tend to be somewhat suspicious of imagination
and intuition, and not take it seriously enough.

Introverted Sensing with Feeling (ISFJ)

People with ISFJ preferences are extremely dependable and devotedly
accept responsibilities beyond the call of duty. They have a complete,
realistic, and practical respect for the facts. When they see from the
facts that something needs to be done, they pause to think about it.
If they decide that action will be helpful, they accept the
responsibility. They can remember and use any number of facts, but
want them all accurate. They like everything clearly stated.

Their private reactions are often vivid and intense, and sometimes quite unpredictable to others. These private reactions seldom show in their faces, and even when dealing with a crisis, they can look calm and composed. Not until you know them very well do you discover that behind their outer calm they are looking at things from an intensely individual angle, often a delightfully humorous one. When ISFJs are "on duty" and dealing with the world, however, their behavior is sound and sensible.

ISFJs are thorough, painstaking, hard-working, and patient with particulars and procedures. They can and will do the "little" things that need to be done to carry a project through to completion. Their perseverance tends to stabilize everything with which they are connected. They do not enter into things impulsively, but once in, they are very hard to distract or discourage. They do not quit unless experience convinces them they are wrong.

ISFJs often choose careers where they can combine their careful observation and their caring for people, as in the health professions. Other fields attractive to ISFJs are teaching, office work, and occupations that provide services or personal care. ISFJs show their feeling preference in their contacts with the world. They are kind, sympathetic, tactful, and genuinely concerned; traits that make them very supportive to persons in need.

Because of their concern for accuracy and organization, ISFJs often move into supervisory roles. If they are in charge of something, their practical judgment and appreciation of what works make them conservative and consistent. They take care to collect the facts necessary to support their evaluations and decisions. As they gain experience, they compare the present problem to past situations.

For an ISFJ, problems may arise if their judgement is not developed. If their feeling preference remains undeveloped, they will not be effective in dealing with the world. They may instead retreat, becoming silently absorbed in their inner reactions to sense-impressions. Then nothing of value is likely to come out. Another potential problem is that they tend to be somewhat suspicious of imagination and intuition and not take it seriously enough.

<div align="center">Introverted Intuition with Thinking (INTJ)</div>

People with INTJ preferences are relentless innovators in thought as well as action. They trust their intuitive insights into the true relationships and meanings of things, regardless of established authority of popularly accepted beliefs. Their faith in their inner vision can move mountains. Problems only stimulate them-the impossible takes a little longer, but not much. They are the most independent of all the types, sometimes to the point of being stubborn. They place a high value on competence-theirown and others'.

Being sure of the worth of their inspirations, INTJs want to see them worked out in practice, applied and accepted by the rest of the world; they are willing to spend any time and effort to that end. They have determination, perseverance, and will drive others almost as hard as they drive themselves. Although their preference is for intuition, they can, when necessary, focus on the details of a project to realize their vision.

INTJs often value and use confidently their intuitive insights in fields such as science, engineering, invention, politics, or

philosophy. The boldness of their intuition may be of immense value in any field, and should not be smothered in a routine job.

Some problems may arise from the INTJ's single-minded concentration of goals. They may see the end so clearly that they fail to look for other things which might conflict with the goal.
Therefore they need to actively seek the viewpoint of others.

INTJs may neglect their feeling values to the point of ignoring other people's feelings and values. If they do, they may be surprised by the bitterness of their opposition. An INTJ's own feeling values have to be reckoned with also, for if too much is suppressed, they may build up pressure and find expression in inappropriate ways. Their feeling needs to be used constructively such as through appreciation of other people. Given their talent for analysis, appreciation may be hard for INTJs, but they will find it helpful on the job as well as in personal relationships.

To be effective, INTJs must develop their thinking to supply needed judgment. If their judgment is underdeveloped, they will be unable to criticize their own inner vision, and will not listen to the opinions of others. They will therefore be unable to shape their inspirations into effective action.

Introverted Intuition with Feeling (INFJ)

People with INFJ preferences are great innovators in the field of ideas. They trust their intuitive insights into the true relationships and meanings of things, regardless of established authority or popularly accepted beliefs. Problems only stimulate them-the impossible takes a little longer, but not much.

They are independent and individualistic, being governed by inspirations that come through intuition. These inspirations seem so valid and important that they sometimes have trouble understanding why everyone does not accept them. Their inner independence is often not conspicuous because INFJs value harmony and fellowship; they work to persuade others to approve of and cooperate with their purposes. They can be great leaders when they devote themselves to carrying out a sound inspiration, attracting followers by their enthusiasm and faith. They lead winning (rather than demanding) acceptance of their ideas.

They are not content in work that satisfies both their intuition and feeling. The possibilities that interest them most concern people. Teaching particularly appeals to them, whether in higher education, or through the arts or the ministry. Their intuition provides insight into the deeper meanings of the subject and they take great satisfaction in aiding the development of individual students.

When their interests lie in technical fields, INFJs may be outstanding in science, or research and development. Intuition suggests new approaches to problems and feeling generates enthusiasm that sparks their energies. Intuition powered by feeling may be of immense value in any field if not smothered in a routine job.

Some problems may result for the INFJ's single-minded devotion to inspirations. They may see the goal so clearly that they fail to look for other things that might conflict with the goal. It is also important that their feeling is developed, since this will supply necessary judgment. If their judgment is underdeveloped, they will be unable to evaluate their own inner vision and will not listen to

feedback from others. Instead of shaping their inspirations into effective action, they may merely try to regulate everything (small matters as well as great ones) according to their own ideas, so that little is accomplished.

Myers and McCaulley (1985)

Appendix P

Directions for the Day

Directions for the Day

I. Demographic Sheets

    Have students complete the demographic sheets.
    When they complete, please take them up and put in the envelope
with their program's name one it.

II. Survey

    Tell students they will fill out the student survey form and that
    it will be completely anonymous information, so please answer how
    you truly feel. Only one person will see the results, and she
    does not work at this school.

III. Have them check either adult or high school student.

IV. Have them check: male or female.

V. Have them complete survey and put in correct envelope when
finished.

VI. While the students are completing the survey, please complete the
class information sheet for the particular class you are helping with.
Give the class info sheet to Janet.

Myers-Briggs Directions

I. Please hand out the Myers-Briggs Test booklets and the answer sheets.

Please explain the following:

1. The Myers-Briggs Personality Type Indicator is not a test. It is a personality-type indicator.

2. In about a week the students will be given information about their personality which should help them in work and in school.

3. There are no "right" or "wrong" answers.

4. You may skip a question if you do not understand it.

5. Read the following verbatim: This is a set of questions for finding out how you like to look at things and to go about deciding things. The questions are not important in themselves but your preferences are because these preferences make people different in a lot of valuable ways--interested in different things, good at different things, and likely to enjoy and succeed in different kinds of work.

6. Read the following verbatim: In taking the test, read one question at a time, with both (or all) its answers, and choose the way you more often feel or act. Don't try to be consistent. If you find a question where you cannot choose, don't mark both answers or flip a coin for it. Skip that question and go on.

7. You may use either pen or pencil in filling these out.

8. The only information you need to fill out on the answer sheet is your name with your last name and then your first name. You do not need to darken the circles under your name.

9. When students finish, please collect the tests and put the answer sheets in the envelope provided.

Appendix Q

Class Information Sheet

Class Information Sheet

School: _____

Class: Welding

Number of students in this class (a.m. and p.m.)

Number of students who took the MBTI and did the survey

    A.M.: _____   p.m.: _____

Please list the students who were absent:

Class: Electronics

Number of students in this class (a.m. and p.m.)

Number of students who took the MBTI and did the survey

    A.M.: _____   p.m.: _____

Please list the students who were absent:

Class: Business & Office

Number of students in this class (a.m. and p.m.)

Number of students who took the MBTI and did the survey

    A.M.: _____   p.m.: _____

Please list the students who were absent:

Class: Allied Health

Number of students in this class (a.m. and p.m.)

Number of students who took the MBTI and did the survey

    A.M.: _____   p.m.: _____

Please list the students who were absent:

Class: Automotive

Number of students in this class (a.m. and p.m.)

Number of students who took the MBTI and did the survey

    A.M.: _____   p.m.: _____

Please list the students who were absent:

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VITA

Janet Cox

Candidate for the Degree of

DOCTOR OF EDUCATION

Thesis: THE EFFECTS OF CONTEXTUAL, LEARNING-BASED INSTRUCTION
      VERSUS COMPUTER-ASSISTED INSTRUCTION ON BASIC SKILLS
      IN SELECTED VOCATIONAL COURSES

Major Field: Occupational and Adult Education

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        English from Northeastern State University in May, 1966;
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        of Central Oklahoma in July 1968; received a Provisional
        Superintendent's Certificate in August 1995; completed
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    Professional Experience: Classroom teacher, Wasco Public
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        1967-1968; Indiahoma Public Schools, OK, 1968-1969; Lawton
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        1974-1979; Job developer for the Single Parent/Displaced
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        Fiscal Agent, OK, 1988-1989; Education Enhancement Center
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