ANALYSIS OF FACTORS REPORTED IN THE RESEARCH LITERATURE THAT AFFECT THE EFFECTIVENESS AND EFFICIENCY OF SELF-INSTRUCTIONAL STRATEGIES

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by

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ABSTRACT

ANALYSIS OF FACTORS REPORTED IN THE RESEARCH LITERATURE THAT AFFECT THE EFFECTIVENESS AND EFFICIENCY OF SELF-INSTRUCTIONAL STRATEGIES

By

Vicky L. Rutherford

There is a need for alternative systems of instruction if the American educational system is to be able to meet current educational demands of the society. Given the array of individual student needs, demands, and constraints, self-instructional systems (such as distance learning, computer learning, and individual learning systems) appear to offer a significant potential as alternative instructional systems. The purpose of this study, then, is three-fold: to identify selected factors which appear to impact the efficiency and effectiveness of self-instructional systems, as found in the research literature; to analyze this data in an effort to summarize the current state of self-instructional systems as represented in the research literature; and to identify relationships which appear to exist among factors or combinations of factors affecting self-instructional systems.

The researcher conducted an integrative review using the Integrative Review Research Method. This research method required that the researcher analyze data collected from existing research studies for the purpose of integrating the findings.

The research findings included the following:

1. The representation of self-instructional strategies included strategies within the individualized learning system (44.63% of the studies); strategies within the computer learning system (29.21% of the studies found); and strategies within the distance learning (26.17% of the studies).

2. The following strategies reported positively impact student achievement: CAI, expert systems, self-teaching workbook, and individualized instruction.
3. Learning environment was a significant factor for each of the three self-instructional system (distance learning, individual learning, and computer learning system). Specific learner characteristics were significant in each of the learning systems.
4. The following student support services were reportedly offered: telephone office hours for faculty teaching the course (86%), study guides (75%), individualized feedback from faculty (75%), and phone calls initiated by faculty (70%).
5. The factors learning environment, teacher/teaching process, learning material, and the learner are supported for inclusion in a self-instructional system.

The researcher concludes by proposing an idealized model of self-instruction. The self-instruction model provides five factors and conditions which can serve the instructional developer as a guide when making decisions about what to incorporate in a self-instructional module.

TO

Herbert and Juanita Fortune

my parents,

and the rest of the clan,

David, Carol, Tony, Wanda, Ian,

Christa, Danielle, and Noel.

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CHAPTER ONE

Introduction

Dubsky (1985) observed that "[a] major consequence of current and future societal change is the placement of intensified demands upon individuals " (p. 144). Educational institutions are faced with the dilemma of providing educationally sound programming during a time plagued with constantly-changing educational demands. Dubsky further states that "[e]ducational excellence is that which motivates and challenges the individual to personal limits in school and life. It is the provision of many, varied opportunities for success " (p. 144). Self-instructional strategies are used within a multitude of diverse educational systems, such as individual learning, computer learning, and distance learning. Because of this diversity among educational settings, the purpose of this study is to present an analysis of the factors reported to impact the effectiveness of self-instructional strategies across these diverse settings.

Statement of the Problem

The advent and widespread use of technology in the U.S. has had a significant impact on all phases of our society. Typical of comments made by technological prognosticators is that of Johnston and his colleagues (1987) : "Technology will introduce change and turbulence into every industry and every job" (p. 37). The very nature of work and its demands on the workforce are in a constant state of transition. As a result,"...[i]ndustry is demanding a more skilled and technologically competent workforce..."(Office of Technology Assessment,1988, pp. 171-172). According to Johnson et al.: "...the necessity for constant learning and constant adaptation by workers will be a certain outgrowth of technological innovation" (p. 37).

In order to prepare its citizenry to address the transitional nature of today's society, our educational system must itself undergo change. According to a study conducted by the Hudson Institute (1988), "...the public schools are simply not producing enough functionally literate graduates, let alone graduates with skills tailored to the technologies of the 1990's and beyond..." (p. 70).

American educational institutions are faced with a two-fold problem. Not only must they develop strategies to overcome current deficiencies, but they must also project future educational demands and develop a plan to address these demands. The Office of Technology Assessment (1988) reports"...[t]he most profound question facing American society today is whether its institutions can adapt to a world that has changed more dramatically in the past 30 years than in the preceding 30 decades. Our Schools are assigned the monumental task of arming young people to compete in this changing world..." (p. 201) . If this new educational system is to be effective in its charge to arm "young people to compete in this changing world," then the goal of educational programs must be to develop and to support learners that will exhibit flexibility and adaptability. These learners must be flexible enough to recognize occasions which require new skill and capable of adapting current skills to meet these constantly evolving demands.

As a result of the transitional nature of today's society, the types of skills required by business and industry are changing to include such skills as, "an ability to translate complex problems into solvable ones, an ability to absorb complex and often inconsistent information quickly" (Office of Technology Assessment,1986, p. 127). Many attempts have been made to identify or describe this changing set of job skills. It has been suggested that new workers must possess..."skills in working with people in groups, in

self-education, in coping with ambiguity, and in coping with too much or too little information..." (Office of Technology Assessment, 1988, p. 48).

A portion of the new workforce has been able to exhibit a flexibility which has enabled them to adapt to new job demands. "More and more people...are finding that they have to continue to study after they finish their full-time schooling in order to gain the extra qualifications and expertise that they need to survive..." (Percival et al., 1988, p. 170). Moreover,there are a number of segments of our society which are struggling to survive. One of those segments which has found itself notably ill-prepared for dealing with the current economic state of affairs are the "... many minority workers...who continue to suffer disadvantages in education and training that may prevent them from moving into the new jobs that are becoming available " (Opportunity 2000, 1988, p. 9). According to reports from the Census Bureau, "...black adults are completing college at only half the rate of white adults. And the U.S. Hispanic population is completing college at less than half the rate of blacks " (Opportunity 2000, 1988, p. 15).

The following is a statement from the Office of Technology Assessment (1986):
"To help provide the skilled workforce that American industries need to maintain competitiveness in the world economy, the [job training] program[s] will have to reach many more displaced workers, and emphasize training - particularly basic skills training - more strongly " (p. 20). According to Gunawardena (1988), many students..."find it difficult to travel to an institution of higher learning...[because] they are constrained by factors related to the pressure of work or family" (p. 91). Furthermore, in a research report on distance education, Nankwenya (1975) states that many students who enroll in distance education courses, for example, do so because..."they have no other alternative" (p. 203).

Purpose of the Study

A contention that led to this research is that one avenue through which we might reach, not only displaced workers, but all students who find it difficult to attend traditional classes, is by the use of self-instructional systems, such as distance learning, computer learning, and individual learning systems. Percival and Ellington (1988) suggest that there is a current trend "...towards a more student - centred approach to learning, a shift that is manifesting itself in a steady increase in the use of individualized learning in all its various forms " (p. 169).

According to Sharma (1986), "conventional methods of imparting instruction are inadequate..." (p. 2). He further justifies this criticism by stating that the "uniform methods of teaching" that are present in conventional education systems do not allow for nor adjust to differences which exist among learners. A contention of this research is that one avenue through which part of the training needs of displaced workers may be met is through the use of self-instructional material. Flammer (1987) hypothesizes that "the fourth revolution [in world education] will occur when we individualize instruction on a mass basis, when we adequately accommodate individual differences in learners, and when learning becomes interactive for each learner" (p. 268).

Furthermore, the Office of Technology Assessment (1986) suggests the development of "a system of education designed to provide the economy with the skills needed to prosper in the emerging world economy..."(p. 126). They further state that such an educational system should have the following objectives: "the development of a system that could allow all citizens to discover and enjoy the potential of their own intelligence, to have practical access to all knowledge, and to understand and celebrate the accomplishments of the human mind and spirit " (p. 126).

One goal of education, according to Deatsman (1971) "...is to produce individuals capable of continuing self-education " (p. 67). He further suggests that the use of independent study in colleges "...might contribute to the development of one's ability for self-education" (p. 67).

Bloom (1984) , commenting on several studies comparing three kinds of instruction (conventional instruction, mastery learning, and tutoring), concludes that "...[t]he tutoring process demonstrates that *most* of the students do have the potential to reach [a] high level of learning" (p. 4). He further recommends that researchers "...seek ways of accomplishing this under more practical and realistic conditions than the one-to-one tutoring, which is too costly for most societies to bear on a large scale" (p. 4).

In recent years, educational programming in higher education has been directed toward making "...college credit more accessible to people wherever they may live or work or whatever their particular life circumstances" (Brown, et al, 1973, p. 1). Brown and his colleagues (1973) report that accessibility currently implies "...reaching students where they are at physically and educationally" (p. 1) . Deatsman (1971) shares the observation that " [i]n recent years independent study has become increasingly common in American schools and colleges as a variety of instructional methods have been adopted which replace attendance of conventional classes with individual self-instruction" (p. 64) .

Donald Ely and his co-authors have indicated that there is currently a trend to use distance education (an example of a self-instructional system) as an educational delivery system. They point to the fact that "interest in this aspect of educational technology has been stimulated in part by concerns over equity in the face of shortages of qualified elementary and secondary school teachers. Where a sufficient supply of teachers is unavailable or

where there are unusually high turnover rates, as in rural or inner city districts, student opportunity to learn is diminished"(Educational Media and Technology Yearbook: The Year in Review,1988, p. 10).

Wood (1988) contends that "...while traditional methods will continue to play a valuable role in developing certain types of skills at key periods in the working life of individuals, they cannot, on their own, cope with the growing volume and variety of present and future training needs " (p. 9) . There is a need for alternative systems of instruction if the American educational system is to be able to meet current educational demands of the society. Given the array of individual student needs, demands, and constraints, self-instructional systems appear to offer a significant potential as alternative instructional systems. In addition, Ross (1984) found that "[c]ompared to classroom lectures, the adaptation provided [by computer-assisted-instruction] can be tailored to the needs of each individual rather than being restricted to the normative characteristics of a class of students" (p. 42). Therefore, self-instructional systems, such as individual learning, computer learning, and distance learning systems, should be considered seriously as possible instructional alternatives.

The purpose of this study, then, is three - fold: to identify selected factors which appear to impact the efficiency and effectiveness of self - instructional systems, as found in the research literature; to analyze this data in an effort to summarize the current state of self-instructional systems as represented in the research literature; and to identify relationships which appear to exist among factors or combinations of factors affecting self-instructional systems.

Need for the study

The research literature reveals many research studies which have addressed a wide variety of issues relating to self- instruction. However, no studies were found which identified the range of particular factors in support of the proposed research, that have an impact on the effectiveness and efficiency of self-instruction. In this study, effectiveness is defined as the degree to which a desired outcome is produced. Efficiency is defined as the degree to which a desired effect is achieved with the least use of the resources available.

According to Green (1967), one goal of research should be to assess "...the relative effectiveness of the various components of [an instructional] system" (p. 85). Green justifies this recommendation, stating that it is necessary "...to determine whether certain combinations of components of the system are in effect carrying the brunt of the instructional burden, while others are contributing little" (p. 85). Ault and others (1989) have recommended that researchers should conduct (a)..."more studies comparing the effectiveness and efficiency of instructional strategies," (b)..." investigations of the specific variables of single strategies to identify the most efficient use of each procedure," and (c)..." research to determine which strategy is best to use with given types of students and skills "(p. 346).

This researcher has reviewed the literature through several sources, including: Educational Resources Information Center (ERIC), searched for the period 1979 through 1990; the Comprehensive Dissertation Index, manually searched for the period 1979 through 1988; the Dissertation Abstracts database, electronically searched for the period 1950 through 1990; and other relevant books, journals and documents, not found in these data bases, were also searched. None of these searches gave evidence of any comprehensive gathering

of research identifying and analyzing factors impacting the effectiveness and efficiency of self-instructional systems.

Relevance to the Field of Educational Technology

It is a given that, if the field of educational technology is to continue to grow and develop, there must continue to be a link between research conducted in the area of instructional technology and the professional activities of practitioners in the field. The research on self-instruction and its related factors are scattered throughout the literature and is not easily accessed by practitioners in the field. In the opinion of this researcher, it is necessary for developers to integrate research and practice. Moffett (1983, p. 169) contends that "...[i]nstructional development is itself a research process, insofar as it seeks to find the most effective instructional alternatives for a given and specific set of circumstances." This study,then, is an attempt to present valid research data relating to self-instruction in a more manageable and less scattered format. The researcher would hope that by so doing, practitioners would more readily review research findings, assess the state of their current practices in light of these results, and, finally, either make adjustments in their current practices or develop a list of considerations to evaluate in terms of current practices.

Theoretical and Conceptual Foundations

Learning Theories

The problem of providing instruction for the individual has been approached in many ways. Unwin and McAleese (1978) state that "[t]here is no one way or one procedure that can make available the variety of learning conditions necessary to accommodate all individuals. A multiplicity of approaches must be made available and in a multiplicity of

ways " (p. 391). The development of self-instructional systems appears to reflect the influence of both behavioral and cognitive learning theory.

Behaviorist Theory of Learning. According to the behaviorist's viewpoint, the learner is "...a passive recipient of environmental stimulation" (Saettler, 1990, p. 318). Since the learner is perceived as "...playing a very passive role in the learning process" (Dubin & Okun, 1973, p. 16), behaviorists focus on external behavior and emphasize the need to manipulate instructional material (Saettler, 1990). Behaviorists, therefore, view media as reinforcement and as "...displacing the teacher in many instructional situations" (Saettler, 1990, p. 286).

The strict behaviorist "...avoids any speculation about what is going on in the mind" (Dubin & Okun, 1973, p. 4). The neo-behaviorist, on the otherhand, "...consider[s] what happens between the input of stimuli and the output of responses in terms of mediational processes" (Dubin & Okun, 1973, p.4).

The behaviorist view of learning implies such activities as "...making careful analyses of desired behaviors,...employing appropriate schedules of reinforcement,...utilizing knowledge of results as reinforcement and specifying terminal behaviors..." (Dubin & Okun, 1973, pp. 16-17). These implications "...emphasize, for the most part, the relationship between the operants (responses) and stimuli (reinforcers)" (p. 17).

Cognitivist Theory of Learning. The cognitivist maintains a "...concern for man's ability to transform stimuli, process information and represent external events internally in the form of cognitive structure" (Dubin & Okun, 1973, p. 14). According to this viewpoint, the learner is "...active, constructive, and problem-solving" (Saettler, 1990, p. 318). The

learner, therefore, "...becomes an active participant in the process of acquiring and using knowledge" (p. 14).

Cognitivists emphasize "...how learners use their knowledge and constructions to understand what they are taught" (Saettler, 1990, p. 319). Because of this position, "...cognitive structure of the individual is considered to be of paramount importance for learning" (Dubin & Okun, 1973, p. 4). They also emphasize "...the need to appraise or anticipate what cognitive structures or understandings learners bring to the instructional situation" (p. 319).

The cognitivist view of learning implies activities such as "...analyzing the types of errors made, using knowledge of results as feedback, assessing the complexity of the learner's cognitive structure, and linking new information to the learner's existing knowledge system" (Dubin & Okun, 1973, p. 17). These implications "...stress the operations which the learner performs on the stimuli which he encodes" (Dubin & Okun, 1973, p. 17).

Three Models of Teaching

Several theorists have proposed models of teaching which reflect either a behavioral or a cognitive perspective. Three such models have been identified by the researcher which attempt to further explain the variety of approaches taken by educators involved in self-instruction. The model reflecting the behaviorist's viewpoint is Rothkopf's model for written instruction. Two models reflecting the cognitivist's viewpoint include Bruner's discovery learning model, and Rogers model for facilitation.

Rothkopf's Model for Written Instruction. Rothkopf's model is a product of the behaviorist's philosophy of education. Rothkopf recognized the importance of the part that the learner plays in the learning situation. He suggested that "...teaching plays a certain

role, but what a student learns is ultimately determined by his own activities." (Baath, 1979, p. 28).

He was particularly concerned about the part that various characteristics of written text play in instruction. He identifies three teaching-relevant characteristics of text: content, representation, and form. Content refers to the completeness, accuracy, goal guidance of the text and the extent to which unrelated material is included. Representation refers to the choice of words, exposition, and text organization and sequencing. Form refers to the grammatical structure and complexity of the text. According to Rothkopf, the teacher defines the learning of objectives (or accepts objectives determined by a higher authority), he chooses text material, and he tries to facilitate and control the students' processing of this material" (Baath, 1979, p. 33).

Bruner's Discovery Learning Model. Bruner's model reflects a cognitivist's view of education. Bruner suggests that teaching should "...primarily be directed towards helping the students to gain an insight into the structure of a field of knowledge - its basic concepts and principles as well as their interrelationships (Baath, 1979, p. 62). The teacher's role, then, is to "...plan the lessons in such a way that they are concentrated on essential problems..." and to "...present the material needed as a basis for the students' problem-solving" (Baath, 1979, p. 62).

One primary goal of the teacher in this model is to decrease the degree of dependence that students feel toward the teacher. This model recommends that "[c]orrective feedback should be given in such a way that the student will not remain dependent on the teacher's help longer than necessary. Eventually, the student has to take over the corrective function himself" (Baath, 1979, p. 63).

In this model, the learning objectives and the individual strategies to attain those objectives are learner-dependent. It is noted that "...teaching goals can be specified only in a fairly broad outline and can be attained in partly different ways by different students participating in the same course" (Baath, 1979, p. 62).

Rogers Model for Facilitation of Learning. Rogers' model embodies a humanistic view of education. In this model, the teacher plays a supportive, secondary role. This model suggests that "...the teacher's attitude should be non-directive. His principle teaching task is to provide resources for the student's learning - including himself" (Baath, 1979, p. 73). The learner, on the otherhand, has a primary role in the learning situation: " he chooses his goals [perhaps within certain frames], takes the responsibility for the learning process, and evaluates his own learning work and its results" (Baath, 1979, p. 73). In this model, because each learner orchestrates his/her own learning "...the learning goals must be allowed to vary considerably between different students of the same course" (Baath, 1979, p. 72).

Characteristics of Self-Instruction

Gagne and his colleagues (1988, p. 297) suggest that an "...array of educational methods" have been used to individualize instruction. Among the methods noted were (pp.297-298):

1. Independent study plan, in which there is agreement between a student and a teacher on only the most general level of stated objectives...
2. Self-directed study, which may involve agreement on specific objectives but with no restrictions upon how the student learns...
3. Learner-centered programs, in which students decide a great deal for themselves within broadly defined areas...

4. Self-pacing, in which learners work at their own rates, but upon objectives set by the teacher and required of all students...
5. Student-determined instruction, providing for student judgment in (several areas such as) selection of objectives,...selection of materials,...selection of a schedule.

Despite the array of self-instructional strategies in use, it appears that some commonalities exist among three factors present in all of the methods : the learner, the teacher, the materials.

The learner and the teacher work collaboratively. The learner assumes some measure of responsibility for his/her instruction. The learner may be required to make decisions concerning what to learn, the best way to learn the material, and when he/she has learned the prescribed materials.

According to Gagne and others (1988), "[i]ndividualized instruction depends to a lesser degree on the teacher's function as provider of information; more stress is placed on counseling, evaluating, monitoring, and diagnosing " (p. 315). The teacher often serves in a supportive role. The activities of the teacher are orchestrated, in large measure, in response to the activities of the learner.

Instructional materials designed to meet the individual needs of each student are characteristically different from traditional classroom instruction. Gagne and his colleagues (1988, p. 315) suggest the following differences exist:

1. Modules are usually more distinctly self-instructional...;
2. The materials [themselves] do more direct teaching...;
3. Some systems provide alternative materials and media for each objective.

The materials used in systems of self-instruction are designed to support the instructional requirements of the learner. They are designed to provide, in some measure, the direction and instruction which would be provided by the classroom teacher during traditional instruction.

This researcher investigated existing self-instructional systems searching for evidence of the impact of their respective component parts on student learning. This researcher also reviewed findings from studies reporting the impact of self-instructional strategies . The anticipated product of such a research strategy are recommendations concerning: (1) the set of component parts required for self-instructional systems; and (2) the interrelationships among these component parts for given learning tasks.

The purpose of this study , then, is to investigate evidence found in the research literature documenting the effectiveness and efficiency of selected self-instructional strategies, as to their reported effect on the several component parts of selected self-instructional systems -- including, learner, design, environment, and support.

Research Methodology

The Integrative Review Research Method is one of several research review techniques. This research technique enables the researcher to "...accurately summarize research as it is reported" (Bangert-Drowns, 1986, p. 396) and to "...systematically attempt to relate study features or treatment characteristics to the study outcomes" (p.398). This review technique provides a procedure through which the researcher may explore diversity among study outcomes. For the researcher who may "...primarily want to describe a body of literature..." this research technique enables him/her to answer such questions as "...What does available research say about treatment X's effects?" (Bangert-Drowns, 1986, p. 396).

It also is designed to provide answers such as to whether "[d]iversity in study outcomes...is due to subtle differences in setting, subjects,...or researcher" (Bangert-Drowns, 1986, p. 388).

Issues for Self-Instructional Strategies

Educational researchers are continually battling with the multi-faceted problem of the effectiveness and efficiency of instructional strategies and educational systems. One issue in this question of effectiveness and efficiency of strategies and systems is the issue of the effect of combining two or more educational strategies. For example, Dukeshire (1966) examined the effect of supplementing the lecture method with a self-teaching workbook. The results showed achievement gains for the group receiving lecture instruction supplemented with the self-teaching workbook. She suggests that researchers consider combining other educational methods.

A second issue is the need for researchers to identify lesson characteristics which have universal student appeal and effectiveness. Brown and his colleagues (1973) investigated the responsiveness of selected adult learner characteristics (such as level of education, enjoyment of educational TV, past academic achievement) to multimedia instructional programs (such as broadcast TV, audio cassette, and textual materials). These programs were designed for an open university system which is a subset of the distance learning system. Results of their study suggest that before lessons are designed and produced, educators need to consider the nature of the target population, such as their background and interests. They recommend that researchers conduct further study "...to identify the key lesson characteristics, as well as the key learner characteristics, which promise to have universal appeal and effectiveness" (Brown, et al., 1973, p. 3).

Another issue is the problem of establishing the most appropriate role of the teacher or facilitator in individualized instruction. Green (1967) suggests that " [t]he most important consideration in any plan for individualized instruction...is finding ways to free the teacher from the sole responsibility for presentation of 'basic instruction', without sacrifice of quality " (p. 82). He recommends that researchers develop and evaluate multi-media instructional systems "...to determine the extent to which such systems can function independently of the classroom teacher and to determine how the teacher can most effectively support the system (or how the system can support the teacher)" (p. 85).

Finally, some researchers recommend that educators develop improved strategies by combining techniques from existing strategies. Moin (1986) conducted a meta-analysis of the various techniques used in calculus instruction at the college level. The studies were divided into four categories of instruction:

1. self-paced mastery learning;
2. formative evaluation/feedback remediation;
3. computer-assisted-instruction; and
4. innovative teaching strategies.

Self-paced mastery learning was used as an alternative to traditional instruction. The remaining three categories of instruction were used to supplement traditional instruction.

After statistically comparing study results, Moin concluded that it was difficult to determine which of the four methods of instruction was the "best" method. Moin proposed that the "best strategy" should be one which is a combination of the four methods studied.

In an attempt to address issues such as these, perhaps researchers should adopt research techniques which would allow one to look across a variety of instructional strategies and

systems. In the opinion of this researcher, the Integrative Review Research Method is one such research technique which will allow this kind of research activity.

Definition of Terms

A. Artificial intelligence - "simulation of the characteristics and cognitive functions of the human brain using 'intelligent' computer systems such as the fifth-generation computers currently being developed" (Percival and Ellington, 1988, p. 181).

B. Computer Assisted (aided) Instruction - " use of a computer as an integral part of an instructional system, the learner generally engaging in two-way interaction with the computer via a terminal" (Percival and Ellington,1988, p. 187).

C. Correspondence educating processes - ..."the unique set of teaching - learning strategies employed when the learner is at a geographical distance from the teacher in the educating processes of a system" (Sims,1982, p. 116).

D. Distance education - "the teaching and learning process in which a significant proportion of the teaching is conducted by someone removed in space and/or time from the learner" (Sharma,1986, p. 4).

E. Educational system - a set of interacting elements (i.e., the learner, the instructional material, the learning environment, and the teacher or teaching process) for accomplishing a specific educational purpose or goal.

F. Effectiveness - the degree to which a desired outcome is produced.

G. Efficiency- the degree to which a desired effect is achieved with the least use of the resources available.

H. Expert systems - "highly sophisticated computer programme in a specific domain that combines formal reasoning with expert knowledge" (Glossary of Educational Technology Terms, p. 46).

I. Independent Study - "an activity in which pupils, carrying on their studies without the requirement of formal classes, consult periodically with one or more staff members for direction and assistance and, frequently, work towards the completion of individual study projects" (Glossary of Educational Technology Terms, p. 57).

J. Individualized instruction, teaching, learning - "the tailoring of instruction, teaching or learning to meet the needs of the individual learner rather than the learning group as a whole" (Percival and Ellington, 1988, p. 203).

K. Learner control - " the degree to which a learner can direct his or her own learning process" (Milheim,1988, p. 1).

L. Learning effectiveness - "enhancing the mastery and retention of facts, concepts, and relationships" (K.A.Smith,1987, p. 274).

M. Learning environment - the physical setting in which learning takes place.

N. Open learning - "a system which removes administrative and educational constraints that interfere with learning opportunities" (Wood,1988, p. 1) (for example, distance education, home study)

O. Programmed Instruction - " a general term for instruction or learning that takes place in a systematic, highly-structured manner, generally, in a step-by-step fashion with feedback taking place between steps" (Ellington and Harris, 1986, p. 133).

P. Relevancy- "a fitness for or appropriateness to the situation" (Webster's Seventh New Collegiate Dictionary).

Q. Self-instruction - "An instructional technique which involves the use, by students, of instructional materials.so that the students can learn either without teacher

intervention or with a minimum of teacher guidance" (Glossary of Educational Technology Terms, p. 98)

R. Self-instruction module - "a packet which contains information and questions related to the topic. A student was to complete this packet without the assistance of a teacher by reading, answering questions, and checking his own answers (Freeland,1983, p. 5).

S. Self-instructional strategy - a general approach to the problem of providing instruction to individuals which seeks to eliminate the need for direct teacher intervention.

T. Strategy - a general approach to a particular problem or situation which provides an overall framework for subordinate procedures in the solution to the problem.

U. Structure - the arrangement of the elements making up a system.

V. Support system - the interaction of related elements or means to facilitate the student's learning.

W. System - the interaction of related elements combined to accomplish a specific purpose or goal.

X. Technique - a specific or identifiable process which can be followed to achieve a specific objective.

Research Questions

Broad Question. The broad question this research attempted to answer is the following:

> What factors reported in the research literature affect the effectiveness and efficiency of self-instructional strategies and how do those factors relate?

The concept of self-instruction is generally discussed in reference to its use within a specific educational strategy, such as programmed instruction, computer-assisted-instruction, and correspondence study. It appears that proponents of a particular educational strategy, such as programmed instruction, conduct research studies evaluating the efficiency and/or the effectiveness of educational techniques as they relate to that specific educational strategy. Furthermore, the focus of their concern when looking at other techniques within educational strategies appears to be centered on evaluating these techniques and strategies in terms of those techniques used within their self-instructional strategy of interest. Data from this research question may permit the researcher to look across particular educational systems at factors identified as having an impact on the efficiency or effectiveness of their respective self-instructional strategies. After identifying factors which impact either the efficiency or effectiveness of self-instructional strategies, the researcher attempted to identify any relationships which appear to exist between or among these factors.

Specific Questions. In order to answer the broad research question, the researcher developed a set of specific questions.

Question 1: How many distinct self - instructional strategies are there mentioned in the literature, and how often are they mentioned?

The research on self-instructional strategies tends to be reported as it relates to a specific educational system. Data from this research question will be used first, to attempt to identify self-instructional strategies reported in the literature about single educational systems, and second, to compare these reports across educational systems.

Question 2: How do self - instructional strategies compare in terms of effectiveness and efficiency?

As mentioned earlier, researchers have conducted studies in which the use of strategies and techniques across educational systems were compared. The response to this research question is designed to compile the results of these findings.

Question 3: What effect does the manipulation of factors (variables) have on self - instructional strategies?

This research question is important for several reasons. First of all, it identifies factors or variables which may impact the effectiveness or the efficiency of self-instructional strategies -- including teacher/teaching process, learning environment, and learner characteristics. Second, it attempts to present findings of the reported effects of these factors across various educational systems.

Question 4: What system of educational support is necessary for effective application of self - instructional strategies?

This research question is important because it addresses the issue of providing educational support -- or specific resources -- which may be an essential element in the success of a self-instructional strategy (for example, Are specific skills, or facilities required ?) .

Question 5: What combination(s) of factors drawn from the literature are supported for their inclusion in an idealized self-instructional system?

This research question, first, examines single factors which reportedly impact the effectiveness and/or the efficiency of self-instructional strategies in search of relationships which appear to exist. Second, the resulting combinations were evaluated for possible inclusion in a model of self-instruction. The response to this question was designed to synthesize data collected in answer to earlier research questions.

Limitation

Concentration in this study was on the search for and analysis of those factors which impact the effectiveness and efficiency of self-instructional strategies, as reported in the research literature. There was no attempt to validate their possible combination through empirical research.

Delimitation of the Study

Due to the extensive nature of research studies available and the researcher's personal interest on the topic of self-instruction, selection of studies for this project were restricted to those studies which involve practices and strategies used in postsecondary educational settings.

Organization of the Study

This study is organized into five chapters. Chapter One presents a general overview of the entire study. Chapter Two includes a review of the research literature in several key areas. In Chapter Three, the research method used for this study is discussed in detail. In Chapter Four, the researcher presents the research findings in narrative form , as well as as in charts. Chapter Five concludes with a summary of the findings, recommendations for a proposed model of self-instruction as indicated by the literature, and suggestions for further research.

Summary

The advent and widespread use of technology in the U.S. has had a significant impact on all phases of our society. In order to prepare its citizenry to address the transitional nature of today's society, our educational system must itself undergo change. Educational institutions are faced with the dilemma of providing educationally sound programming during a time plagued with constantly-changing educational demands. Learners today must be flexible enough to recognize occasions which require new skill and capable of adapting current skills to meet these constantly evolving demands.

There is a need for alternative systems of instruction if the American educational system is to be able to meet current educational demands of the society. Given the array of individual student needs, demands, and constraints, self-instructional systems (such as distance learning, computer learning, and individual learning systems) appear to offer a significant potential as alternative instructional systems. The purpose of this study, then, is three-fold:

to identify selected factors which appear to impact the efficiency and effectiveness of self-instructional systems, as found in the research literature; to analyze this data in an effort to summarize the current state of self-instructional systems as represented in the research literature; and to identify relationships which appear to exist among factors or combinations of factors affecting self-instructional systems.

Self-instructional strategies are used within a multitude of diverse educational systems, such as individual learning, computer learning, and distance learning. Because of this diversity among educational settings, the purpose of this study is to present an analysis of the factors reported to impact the effectiveness of self-instructional strategies across these diverse settings. Despite the array of self-instructional strategies in use, it appears that some commonalities exist among three factors present in all of the methods: the learner, the teacher, and the material. The learner and the teacher work collaboratively. The learner assumes some measure of responsibility for his/her instruction. The learner may be required to make decisions concerning what to learn, the best way to learn the material, and when he/she has learned the prescribed materials. The teacher often serves in a supportive role. The activities of the teacher are orchestrated, in large measure, in response to the activities of the learner. Self-instructional materials designed to meet the individual need of each student are characteristically different from traditional classroom instruction. The materials used in systems of self-instruction are designed to support the instructional requirements of the learner. They are designed to provide, in some measure, the direction and instruction which would be provided by the classroom teacher during traditional instruction.

Educational researchers are continually battling with the multifaceted problem of the effectiveness and efficiency of instructional strategies and educational systems. One issue in this question of effectiveness and efficiency of strategies and systems is the issue of the

effect of combining two or more educational strategies. A second issue is the need for researchers to identify characteristics which have universal student appeal and effectiveness. Another issue is the problem of establishing the most appropriate role of the teacher or facilitator in individualized instruction.

The researcher conducted an integrative review of the literature using the Integrative Review Research Method. This research method required that the researcher analyze data collected from existing research studies for the purpose of integrating the findings. The study was guided by the following research questions:

1. What is the range of self-instructional strategies presented in the literature?
2. How do self-instructional strategies compare in terms of effectiveness and efficiency?
3. What effect does the manipulation of factors (variables) have on self-instructional strategies?
4. What are the educational support systems necessary for effective application of self-instructional strategies?
5. What combinations(s) of factors drawn from the literature are supported for their inclusion in an idealized self-instructional system?

CHAPTER TWO

Review of the Literature

Introduction

The literature review section of a dissertation whose main research data is collected from the literature, differs from the literature review section of a dissertation using more traditional research methods. The principal role of the literature review, when using the Integrative Review Research Method as does this research, is to provide definitional information about the topic, comments from experts in the field concerning the topic, and support for doing the research . The purpose,then, of this review of the literature is to provide foundational information about : (1) the nature of self-instructional systems ; and (2) self-instructional strategies commonly in use within those self-instructional systems. The self-instructional systems discussed are: computer learning, individual learning, and distance learning systems. Much of the other research, that would usually be found in this chapter, will instead be reported and analyzed in Chapter Four.

Self-instruction is an area which is specifically designed to address the individual needs of learners. In their attempts to address the needs of some learners to take part in instruction from a distance, educators have developed self-instruction, which may be categorized into three systems: computer learning, individualized learning, and distance learning systems.

Computer Learning System

The main feature of instruction in the computer learning system is the computer. In this system of instruction, the learner must interact (almost exclusively) with the computer in order to complete the learning activity. In this learning system, the main question to be answered is: How shall instruction be adjusted so that the learner can (in fact) learn with the aid of the computer ? Major self-instructional strategies commonly found in this system are:

- computer-assisted-instruction, and
- expert systems .

Computer-Assisted-Instruction

Computer-assisted-instruction (CAI) is " an instructional technique based on the two-way interaction of a learner and a computer with the objective of human learning and retention" (Glossary of Educational Technology Terms, p. 29). In CAI, as distinguished from computer-managed-instruction (CMI), the computer is integral in the direct instruction of the student. In CMI, on the otherhand, the computer is integral in recordkeeping activities.

Applications of computers in education have become a popular strategy. "CAI [computer-assisted-instruction] is...used frequently to assess the student's achievement and prescribe the next instruction" (Ahn, 1988, p. 26). McNeil (1989) conducted a meta-analysis of interactive video instruction (a variation of CAI) which revealed that most content taught was a combination of factual/conceptual learning, psychomotor skills, problem-solving, and rule/principle learning. Most studies employed a combination of learner, program, and guided control strategies for making decisions regarding sequencing of content. Despite the researcher's attempt to synthesize across both instructional design variables and

methodological variables, the researcher was unable to propose a model (composed of instructional design and methodological variables) which could explain reported differences in achievement effect.

Ahn (1988) further states that computer-assisted-instruction provides advantages to both the learner and the teacher. CAI offers four advantages to students: (1) " ...it provides more sensory interaction, thereby attracting students' attention"; (2) "...CAI provides individual tutoring at the student's own pace and schedule..."; (3) "...CAI provides a good deal of drill and practice"; and (4) "...CAI provides prompt and immediate feedback" (Ahn, pp. 26-28).

CAI offers three advantages for teachers: (1) "...CAI releases teachers from routine work and course preparation"; (2) "...CAI maintains student's detail records and activities"; and (3) "...CAI requires...no limit to class size" (Ahn, pp. 28-29).

Expert Systems

An expert system is defined as a "highly sophisticated computer programme in a specific domain that combines formal reasoning with expert knowledge" (Glossary of Educational Technology Terms, p. 46). According to Lippert (1988), an expert system characteristically "...uses symbolic processing, is easily modified to include new rules, searches by using 'heuristics', can respond to questions asking for explanations like 'why' and 'how', [and whose] input/output reflects 'skilled activity' such as reasoning" (p. 8).

Lippert (1988) further states that expert systems have the following advantages: "...1) unbiased solutions, 2) problems solved where no procedure exists, 3) unstructured problems, do-able, 4) cost effectiveness when no human expertise exists, or is scarce,

expensive or not readily accessible" (p. 9). However, expert systems are limited in that they "...do poorly when analogy, intuition, common sense or mathematical applications are needed" (p. 9).

Expert systems have been used in educational activities such as "finding and prescribing remedies for malfunctions..., designing actions and strategies..., [and] diagnosing and advising student behaviors/needs" (Lippert, 1988, p. 9). The current interest in the use of expert systems in self-instruction appears to be motivated by the potential for expert systems to provide support to users. This support may take several forms. First, expert systems may support student use of the expert system by providing personalized feedback as to the accuracy of student response on exercises. Second, based upon these responses, the expert system may then refer students to additional readings, follow-up exercises, or introduce the next module. Perhaps the greatest potential for student support using expert systems technology is the assessment capability of such systems. The assessment capability of expert systems could potentially transform student assessment into a more proactive, interactive, and continuous element within a self-instructional system.

These systems could potentially conduct an initial educational assessment on each user. This data would then be used to answer such questions as: (1) Where should instruction begin for this particular student ?; (2) Which readings or exercises will help fill the gaps in this student's knowledge base as evidenced by current performance ?; and (3) Based on current student performance, what is the next step -- further instruction, additional exercises, or supplementary readings?

Individual Learning System

After reviewing the studies included in this system, the researcher concluded that the key feature of instruction in the individual learning system is the individual student. In this learning system, it appears that the specific conditions of the learner (i.e., aptitude, interest, learning rate, style of learning) drive the learning process.

Self-instructional strategies in this system include:

- independent study,
- individualized instruction, and
- programmed instruction.

Individualized Instruction

The concept individualized instruction has been defined in many different ways. "In the 1960s and early 1970s the term *individualized instruction* became associated with the promise of programmed learning "(Further Education Unit,1989, p. 3). Currently definitions for individualized instruction range from "...a process by which the student proceeds at his/her own rate through a prescribed set of materials to reach predetermined goals, to a process in which the student is free to select his/her own means of achieving self-designed objectives " (Dubsky,1985, p. 28). In this study, individualized instruction is defined as "the tailoring of instruction...to meet the needs of the individual learner rather than the learning group as a whole" (Percival and Ellington, 1988, p. 203).

Individualized instruction has been categorized by this researcher as a subset of the self-instructional system, individual learning. This system also includes the self-instructional strategies independent study and programmed instruction. The researcher, therefore,

wanted a definition for individualized instruction which would not include the strategies independent study and programmed instruction.

Programmed Instruction

Programmed instruction is defined as "a general term for instruction or learning that takes place in a systematic, highly-structured manner, generally, in a step-by-step fashion with feedback taking place between steps" (Ellington and Harris, 1986, p. 133). Programmed instruction, according to Lumsdaine and Glaser (1960), "...represent some form of variation on what can be called the tutorial or Socratic method of teaching" (p. 5). Programmed instruction has the following three important properties (Lumsdaine and Glaser, 1960, p. 6):

- "...continuous active student response is required, providing explicit practice and testing of each step of what is to be learned...";
- "...a basis is provided for informing the student with minimal delay whether each response he makes is correct leading him directly or indirectly to correction of his errors..."; and
- "...the students proceed on an individual basis at his own rate."

In programmed instruction, the teaching materials play a major role in the learning process. According to Unwin and McAleese (1978), "[s]everal machines were constructed with the purpose of giving individual learners step-by-step self-paced reinforcement" (p. 637). Unwin and McAleese (1978) further state that these machines were designed to ensure that:

- items were individually presented,
- the learner could move only after making a response,
- the learner is given the correct answer after making his/her response, and
- the learner follows the learning plan prescribed by the author of the lesson.

Advocates of learning machines suggest that these machines have some attractive features to users - "...people enjoy pressing buttons and the bulk of what has to be learned can be hidden so that learners do not feel that the size of the task is beyond them" (Unwin & McAleese, 1978, p. 637).

Proponents of programmed instruction suggest that this strategy is a valued self-instructional strategy because it "...enables the student to work individually at a rate which will enable him to acquire maximum knowledge within the limitations of his natural endowments" (Dukeshire, 1966, p. 18). Critics, however, report that programmed instruction has a major disadvantage: "[p]rogrammed material moves at a very slow pace, but it does allow the student to learn by himself at a rate which will permit him to absorb all the knowledge set forth in the material" (Dukeshire, 1966, p. 40).

Independent Study

Independent study is "an activity in which pupils, carrying on their studies without the requirement of formal classes, consult periodically with one or more staff members for direction and assistance and, frequently, work towards the completion of individual study projects" (Glossary of Educational Technology Terms, p. 57). According to Hein (1979), independent study requires two conditions : "the placement of responsibility and the selection of methodology "(p. 11). The teacher plays a major role in independent instruction . The student is given the responsibility of selecting from among several learning options for those options which match his/her learning style and which will help him achieve the specified educational objectives (Hein, 1979). In this system the teacher plays a more supportive role; "...the teacher uses herself to create an atmosphere conducive to learning, provides direction, acts as a resource, crystallizes important principles and helps students make generalizations " (Hein, 1979, p. 12).

Independent study is a self-instructional strategy designed to provide the structural framework within which a student will work in the completion of a course of study. It is assumed that this goal is accomplished either in the absence of a teacher or with limited intervention of a teacher . The materials themselves assume the responsibility for structuring learning rather than the live teacher assuming this responsibility as is the case in more traditional strategies, such as lecture or discussion strategies .

Distance Learning System

The key feature of instruction in the distance learning system is the distance that separates the learner from the instructor. The primary issue is the following: How shall we adjust instruction to compensate for the physical separation of learner and instructor ?
The self-instructional strategies in the distance learning system include:

- distance education,
- correspondence study,
- home study,
-open education, and
-self-study.

Distance Education

The primary characterizing feature of the distance learning system is the fact that the learner and the teacher are physically separated. Because of this, "[d]istant learners are placed in a unique situation in which neither fellow students nor teachers are present to clarify, discuss, or provide feedback "(Gunawardena,1988, p. 83).

Students who enroll in such courses are characterized as those students who "...find it difficult to travel to an institution of higher learning or...are constrained by factors related to the pressure of work or family "(Gunawardena,1988, p. 91). These students are further characterized as those who "...prefer to work entirely at their own pace and privately and are not willing to have to attend regular tutorials" and others "...who benefit from the advantages of both distance-study and face-to-face sessions "(Gunawardena,1988, p. 91). From the students' perspective "...distance education denotes that the learner is removed from the physical presence of a teacher, whether or not he studies in private or as a member of a group "(Nankwenya,1975, p. 203).

The design of the material is a crucial factor in the distance educational strategy. "A distance study course has the clear purpose of inducing the student to learn by guiding him or her throughout the material " (Gunawardena,1988, p. 91). The use of the study guide has been suggested as a means of achieving this purpose.(Gunawardena,1988). A study guide is especially recommended for use in systems which incorporate a multi-media approach. The distance educational strategy has reportedly incorporated the use of open-television broadcast, videocassettes, computers and cable television.

Many researchers have sought to determine which components or combination of components students perceive as valuable in their pursuit of instruction. Gunawardena (1988) conducted a survey of educators from 49 postsecondary institutions within the U.S. This study included three institution types in the sample: two-year colleges, four-year colleges, and consortia (specific groups of institutions responsible for professional continuing education). Instruction was delivered through television, videocassette, computer, radio, and correspondence text. These educators reported the most popular media among students were television and videocassettes (i.e., two video technologies).

Educators at two year colleges and consortia report the order of student preferences, as follows:

1 - television,

2 - videocassettes, and

3 - computers.

Educators at four year colleges feel that students appreciate correspondence text as much as television. Educators at postsecondary institutions perceive that students like electronic media - television, videocassettes, computers and television/video conferencing - more than the other media.

Open television broadcast has become a popular medium because it can provide access to a large number of students; however, a major disadvantage is that this medium only permits one-way communication. "Videocassettes are a very versatile distribution medium where learners have access to videocassette recorders in their own homes, as they provide for flexibility of use and student control over the medium "(Gunawardena,1988, p. 107). Computers have begun to be used as a means through which the teacher and student communicate with each other. "Although two-way cable systems using fiber optics offer unique instructional possibilities, such links to student homes will not be possible in the immediate future "(Gunawardena,1988, p. 110).

Many students taking courses in distance learning systems have experienced feelings of isolation. In an effort to address this issue, courses in distance education focus on providing adequate support services for its students. These support services may include services such as the use of tutors, conferences, or seminars.

In some distance education courses, tutors are assigned to work with students. Harris (1975) conducted a study of 569 correspondence tutors in Great Britain. The percentage responses of the tutors to specific tasks are as follows:

(1) to contact students who are behind (66%);

(2) to give special attention to commendation and encouragement (90%);

(3) to interpret the course (90%); and

(4) to give special attention to those academically weak (60%).

Personal contact with tutors may be provided by the written word, telephone, recorded audiocassettes, and most recently, by the computer.

In other courses, group activities are planned for participants. Those students who require face-to-face contact as a component of distance education have options available to them such as "...conferences, seminars, week-end schools, summer schools, holiday workshops, and the like" (Lamacraft,1975, p. 46).

Open Learning

The term open learning is often associated with distance learning. According to Wood, this has occurred due to the removal of requirements concerning student attendance at institutions providing open learning courses. Open learning is viewed as "... a system which removes administrative and educational constraints that interfere with learning opportunities "(Wood, 1988, p. 9).

Open learning has three main features (Wood,1988): " (1)...based on the needs and circumstances of individual students...; (2)...solution orientated, aiming to identify and overcome barriers to access and to learning on an individual basis; (3)...concerned

with how people learn and with what is possible, appropriate or cost-effective for people to learn in certain ways " (p. 11).

The open learning strategy attempts to overcome barriers to access and learning in many different ways. First of all, "material and teachers are available on demand to allow flexible timing and access" (Wood,1988, p. 11). Second, often current course offerings are redesigned to produce courses which follow a non-traditional learning approach (Wood, 1988). For example, a course which is offered at a fixed location with fixed starting and finishing dates may be revised to reflect a non-traditional learning approach. Students taking the new course may have the flexibility to choose the place of instruction (e.g., at home), the method of instruction (e.g., individualized instruction), or the length of time for instruction (e.g., self-paced). Institutions which follow such an approach include: The Open University (Great Britain), Nova University (United States), and Holland College (Canada).

In the open learning strategy, the educational materials play a crucial role. First, the material should promote independent learning among students using the material. "...[O]pen learning units should be as free standing as possible and should act as triggers to lead students to the kind of experience that is not only possible but also necessary if open learning is to achieve its full potential "(Wood,1988, p. 40). Second, the open learning strategy must be designed to provide assessment of student competency. According to Wood, an open learning strategy should "...be able to identify the particular competencies of the student prior to starting a programme to ensure that new ground is covered "(p. 11).

Proponents of the open learning strategy recognize the significance of providing both counseling and tutorial support for students. Because of this trend, "...there has been a

gradual shift from using the term open learning to supported self-study " (Further Education Unit,1989, p. 3).

In its attempt to provide an almost endless number of educational possibilities, the open learning strategy may possess a serious flaw for some potential users. "The menu could become so vast and complex that a potential learner could be frightened away before sampling it "(Wood,1988, p. 43).

Correspondence or Home Study

Correspondence or home study instructional strategies are said to be related to distance learning system. (Further Education Unit,1989, p. 3) states that "[c]orrespondence colleges have been in existence for several decades and they pioneered the use of *distance learning*. Harris (1975) further states that "[t]he expression 'distance education' has been introduced on the educational scene to denote what has been popularly referred to as correspondence education for a long time "(p. 203). Correspondence (home) study has been used to address the issue of increasing student access despite limited human and physical resources (West,1961).

Correspondence study has been described as a form of self-teaching . Self-teaching is defined as "...the approach in which the students independently follow an instructional packet..." (Segan,1980, p. 30). In correspondence study "...the student's share of activity is high and the instructor's share is low..." (Nankwenya,1975, p. 205). "...[T]he instructor serves as a consultant to answer a question if it is initiated by the student" (Segan,1980, p. 30).

The teacher is a crucial element in correspondence study. According to Wood (1988), "...in correspondence teaching it is the teacher who controls the learning process" (p. 12). However, the teacher's significance is due to the part he or she plays in the development of the materials. Some say that the correspondence teacher has less control than a traditional classroom teacher since he or she works "...in association with the writer of the lesson notes, who has pre-determined many of the vital factors in the educational situation "(Lamacraft,1975, p. 46).

The design of instructional material is an important element in the correspondence study strategy. "In at least the broadest sense, one purpose for using programmed instruction...is to provide certain aspects of instruction to students in the absence of the teacher responsible for the flow of that instruction " (Green,1967, p. 5).

There is some controversy about the impact of teacher intervention in the correspondence study strategy. Green (1967) states that "[t]here is some evidence...that the presence of, and interaction with, an on-the-spot teacher may not be so vital with adult learners..." (p. 6).

Summary

Chapter Two describes three self-instructional systems (computer learning, individual learning, and distance learning systems) and the self-instructional strategies commonly in use within these systems. The main feature of instruction in the computer learning system is the computer. In this system of instruction, the learner must interact (almost exclusively) with the computer in order to complete the learning activity. The self-instructional strategies in use in the computer learning system included computer-assisted-instruction and expert systems.

The key feature of instruction in the individual learning system is the individual student. In this learning system, it appears that the specific conditions of the learner (eg., aptitude, interest, learning rate, style of learning) drive the learning process. The strategies in use in the individual learning system included independent study, individualized instruction, and programmed instruction.

The key feature of instruction in the distance learning system is the distance that separates the learner from the instructor. The primary issue in this learning system is: How shall we compensate for the physical separation between learner and instructor? The following five strategies are included in the distance learning system: distance education, correspondence study, home study, open education, and self-study.

CHAPTER THREE

Design of the Study

Introduction

Cooper (1982) reports that because researchers find it difficult to "...keep abreast of primary data reports except within a few specializations...[they] rely heavily on integrative research reviews to define the state of knowledge " (p. 291). An integrative review has been defined as "...the synthesis of separate empirical findings into a coherent whole" (Cooper,1982, p. 291). Jackson (1980) describes a good research review as one which "...explore[s] the reasons for the differences in the results and determine[s] what the body of research, taken as a whole, reveals and does not reveal about the topic " (p. 439). In addition, Cooper (1982) states that researchers "...should (a) describe all the operational variations that were considered concept-relevant, and (b) report all variations in study methods that were related to study outcomes" (p. 294) .

The research literature on self-instruction is scattered among the specific literatures of self-instructional methods or strategies, self-instructional programs or courses of study, and self-instructional systems. The goal of this study is : (1) to analyze research findings looking for similarities, differences, and conflicting information among the data about self-instructional strategies; and (2) to suggest an idealized model of self-instruction based upon these findings. The Integrative Review Research Method appears to be the most appropriate research procedure to accomplish this goal. The procedures of this method are explained in detail later in this chapter.

Research Questions

Broad Question

What factors reported in the research literature affect the effectiveness and efficiency of self-instructional strategies and how do those factors relate?

This research question is an attempt to look across particular educational systems, such as individual learning, computer learning, and distance learning systems, at factors identified as having an impact on the efficiency or effectiveness of selected self-instructional strategies. After identifying factors which impact either the efficiency or effectiveness of self-instructional strategies, the researcher will then attempt to identify any relationships which appear to exist between or among these factors.

Specific Questions

Question 1: How many distinct self-instructional strategies are there mentioned in the literature, and how often are they mentioned?

Responses to this research question attempted to identify self-instructional strategies reported in the literature about a single educational system, and to compare these reports across educational systems.

Question 2: How do self-instructional strategies compare in terms of effectiveness and efficiency?

As mentioned earlier, researchers have conducted studies in which they compared the use of strategies and techniques across educational systems. This research question seeks to compile the results of their findings.

> Question 3: What effect does the manipulation of particular factors (variables) have on self -instructional strategies?

Responses to this question identified factors or variables which impacted the effectiveness or the efficiency of self-instructional strategies. Examples of such variables were: teacher/teaching process, learning environment, and learner characteristics . Responses also provided findings of the reported effects of these factors across various educational systems.

> Question 4: What system of educational support is necessary for effective application of self-instructional strategies?

This research question addressed the issue of educational support -- or specific resources -- which may be an essential element in the success of a self-instructional strategy.

> Question 5: What combination(s) of factors drawn from the literature on self-instructional strategies are supported for their inclusion in an idealized self-instructional system?

This research question considered combinations of single factors which reportedly impact the effectiveness and/or the efficiency of self-instructional strategies in search of relationships which appear to exist. The resulting combination(s) were evaluated for possible inclusion in an idealized model of self-instruction.

Research Design

The researcher conducted an integrative review using the Integrative Review Research Method. This research method required that the researcher analyze data collected from existing research studies for the purpose of integrating the findings.

This researcher followed a five-step procedure (Ault ,1989):

1. The researcher identified relevant research studies using several sources, including : ERIC and Comprehensive Dissertation Abstracts databases; and other bibliographic references included in individual journal articles, reviews,books or monographs. Combinations of several relevant descriptors guided the search for relevant studies.

2. Relevant studies were reviewed. These studies were coded minimally, in terms of the following independent and dependent variables:

   independent variables:

   - *learner characteristics
   - *content area
   - *self-instructional strategy
   - *learning environment

   dependent variables:

   - *effectiveness
   - *efficiency

3. For each of the identified variables, the researcher reported its purported effect on self- instructional systems. Furthermore, the measures of effectiveness and efficiency used in the individual studies were reported.

4. The researcher summarized findings in terms of similarities and differences across the many self-instructional systems.

5. The researcher drew conclusions from the study, and made recommendations for future research. The procedures are operationalized in later sections of the chapter.

Areas of the Literature Searched

The following broad areas of the literature were searched:

- instruction
- learning
- learning strategies
- teaching strategies

Selection Procedures

Literature Search Procedures

Phase One. First, using the Bibliographical Research Service (BRS) Information Retrieval System, an on-line search was conducted of research studies in Dissertation Abstracts International for the period 1950 - 1990. Sixteen descriptors were used in the search. Each descriptor was paired with the descriptors effectiveness or efficiency, for example.

programmed instruction and efficiency and effectiveness
open education and efficiency and effectiveness
etc.

The descriptors used in the search included:

1. programmed instruction

2. computer-assisted-instruction
3. artificial intelligence
4. expert systems
5. individualized instruction
6. correspondence study
7. discovery learning
8. distance education
9. home study
10. lifelong learning
11. open education
12. self-teaching
13. independent study
14. individual study
15. effectiveness
16. efficiency

Next, an on-line search was conducted of research studies included in ERIC (Educational Resources Information Center). The dates for this search included 1966 (the beginning date for the ERIC database system) through June, 1990.

Fifteen descriptors were used in the search. Fifteen, rather than sixteen descriptors were used because the descriptor "self-teaching" could only be searched using the descriptor "independent study." As in the previous search, each pair of descriptors included a single self-instructional area, plus the variables efficiency or effectiveness.

Phase Two. To begin Phase Two, the researcher further restricted the inclusion criteria by using an additional pair of descriptors - postsecondary or adult(s).

A second on-line search was conducted of research studies in Dissertation Abstracts International for the period 1950 - 1990. The following descriptors were used:

programmed instruction
computer-assisted-instruction
artificial intelligence
expert systems
individualized instruction
correspondence study
home study
discovery learning
distance education
lifelong learning
open education
self-teaching
independent study
individual study
effectiveness
efficiency
adult
postsecondary

Next, using the ERIC System, a search was conducted combining each descriptor with effectiveness, efficiency, adult, and postsecondary. Then, the researcher manually

searched the computer listing of studies from ERIC looking for studies which might have appeared more than once. Duplicate studies were identified and only listed with one self-instructional strategy. The instructional strategy that was the focus of the study determined the self-instructional strategy with which the duplicate study was listed.

Phase Three. During Phase Three of the search for potentially relevant studies, the researcher reviewed either the titles of studies or the abstracts of studies selected during Phase Two. Only studies which met one or more of the following criteria were selected for further review:

1. studies which compared two or more self-instructional strategies;
2. studies which compared two or more self-instructional systems;
3. studies which investigated the impact of a single self-instructional strategy;
4. studies which investigated the impact of a single self-instructional system;
5. studies which compared a self-instructional strategy against a traditional strategy; and
6. studies in which self-instructional strategies are combined with other strategies.

Coding Procedures

Initially, each selected study was coded in terms of one or more of the following eight variables:

learner characteristic: This variable was used to collect identifying information about the subjects involved in the study. This data would include such things as age, sex of subjects, or any other special distinguishing feature, such as the fact that subjects were remedial students.

content area: This variable includes such information as subject matter, or learning task to be evaluated.

effects: This variable included information concerning the results of the study, both expected and unexpected results.

self-instructional strategy: This variable was used to identify the specific self-instructional strategy (strategies) used in the study.

learning environment: This variable was used to record information about the nature of the educational setting in the study. This data included such information as the presence or absence of a tutor; the physical location of the educational activity, such as in the student's home; and study deterrents and facilitators.

effectiveness: Here information was collected concerning the specific measures used to gage the degree to which the self-instructional strategy achieved a desired goal, such as increasing student achievement.

efficiency: This variable included information concerning the specific measures used to gage the degree to which the self-instructional strategy successfully achieved its desired goal using the smallest amount of resources, such as the amount of time used for student learning. In some instances, researchers provided the formulas used to calculate efficiency.

Then, the data collected using the above-listed variables were further coded as indicated in Appendix A.

Data Analysis

The data were analyzed using a three-stage process. First, the purported effects of each identified variable on self-instructional strategies were summarized.

Second, the research findings were evaluated in light of conditions such as the presence of discrepancies among results, or the lack of sufficient information included in the studies. Third, the researcher identified factors which appeared to impact either the effectiveness or the efficiency of a self-instructional strategy or self-instructional system.

Finally, the researcher identified relationships which appeared to exist between and among these factors. These relationships included such findings as the following:

1. similarities within and across self-instructional systems,
2. similarities within and across programs using self-instructional strategies.
3. differences within and across self-instructional systems,
4. differences within and across programs using self-instructional strategies.
5. conflicting evidence within and across self-instructional systems.

Research findings were presented in a narrative format, as well as in tables.

Summary

Chapter 3 began with an overview of the research design for this study, an integrative review. An integrative review has been defined as "...the synthesis of separate empirical findings into a coherent whole" (Cooper, 1982, p. 291). The research literature on self-instruction is scattered among the specific literatures on self-instructional methods or strategies, self-instructional programs or courses of study, and self-instructional systems. The goal of this study is (1) to analyze research findings looking for similarities,

differences, and conflicting information among the data about self-instructional strategies; and (2) to suggest an idealized model of self-instruction based upon these findings. The integrative review research method appears to be the most appropriate research procedure to accomplish this goal.

Analysis of the data included several steps. First, the available studies were sampled for possible inclusion. Second, the researcher read the studies and coded the data that was collected. Included in this chapter is a detailed account of the procedures used to select the studies and to code the data. Finally, the findings were interpreted in light of certain restrictions, such as the presence of discrepancies among results, or the lack of sufficient information included in the studies.

CHAPTER FOUR

Analysis and Findings

Introduction

In this chapter the research findings are presented for each of the research questions. These data are presented in both narrative and tabular formats.

The purpose of this study was (a) to identify and analyze data from the research literature about selected self-instructional strategies as found in three self-instructional systems; (b) to summarize the findings concerning the effectiveness and efficiency of these self-instructional strategies; and (c) to identify relationships which appear to exist among the individual component parts of the three self-instructional systems.

Data Collection and Analysis

Procedures for data collection and analysis were completed using several steps. To begin data collection, relevant research studies were identified using several sources. Second, the relevant studies were then reviewed and coded minimally in terms of specified independent and dependent variables . Third, the purported effect of each identified variable on self-instructional strategies were reported. Fourth, the findings were summarized in terms of similarities and differences across the three self-instructional systems investigated: distance learning, computer learning, and individual learning systems. Finally, conclusions were drawn and recommendations for further research were suggested.

The data were analyzed in terms of the specific research questions of this study as presented in the following sections: Range of Self-Instructional Strategies, Effectiveness/Efficiency Comparison of Self-Instructional Strategies, Manipulation of Variables, Support for Self-Instructional Systems, and Combined Factors For Idealized Self-Instructional System.

Range of Self-Instructional Strategies

Responses to research question #1 attempted to identify self-instructional strategies reported in the literature about a single educational system, and to compare these reports across educational systems in terms of their occurrences.

> Question #1: How many distinct self-instructional strategies are there mentioned in the literature, and how often are they mentioned?

The researcher conducted searches of the ERIC (Educational Resources Information Center) database and the Dissertation Abstracts International database. The titles or abstracts of the studies were reviewed to determine the studies which met one of the following criteria:

1. studies which compared two or more self-instructional strategies;
2. studies which compared two or more self-instructional systems;
3. studies which investigated the impact of a single self-instructional strategy;
4. studies which investigated the impact of a single self-instructional system;
5. studies which compared a self-instructional strategy against a traditional strategy; and
6. studies in which self-instructional strategies are combined with other strategies.

Overall, the largest number of studies were found using the ERIC database (n=250) when compared to the studies found using the Dissertation Abstracts database (n=178). Of the studies found using the ERIC system (see Table 1), the largest percentage of self-instructional strategies were found in the distance learning system (40.4%), followed by individual learning system (31.6%), and computer learning system (28%). The largest system, the distance learning system (40.4%) yielded studies using the following three self-instructional strategies:

- distance education (20.8%),
- correspondence (home) study (12.8%),
- open education (6.8%), and self-teaching (0%).

The individual learning system (31.6%) yielded studies using the following three strategies:

- individualized instruction (14%),
- independent (individual) study (9.2%), and
- programmed instruction (8.4%).

In the computer learning system, the self-instructional strategies in greatest use was computer-assisted-instruction (27.6%), followed by expert system (0.4%). In Table 1 the range is also expressed as the number of studies found for specific strategies.

Of the studies found using the Dissertation Abstracts system (see Table 2), the system individual learning yielded the highest percentage of studies (62.9%), followed by the computer learning system (30.9%), and the distance learning system (6.2%). The largest system, the individual learning system (62.9%) yielded studies using the following four self-instructional strategies:

- individualized instruction (38.2%),
- programmed instruction (18.5%), and
- independent (individual) study (6.2%).

Table 1

Range of Self-Instructional Strategies Found Using ERIC Database

Strategies By System	% of Studies	# of Studies
Distance Learning System	40.4%	101
Distance education	20.8%	52
Correspondence (home) study	12.8%	32
Open education	6.8%	17
Self-teaching	0%	0
Individual Learning System	31.6%	79
Individualized instruction	14%	35
Independent (individual) study	9.2%	23
Programmed instruction	8.4%	21
Computer Learning System	28%	70
Computer-assisted-instruction	27.6%	69
Expert systems	0.4%	1

The second largest system, computer learning system (30.9%) yielded studies using the following two self-instructional strategies:

- computer-assisted-instruction (29.2%), and
- expert system (1.7%).

Finally, the distance leaning system (6.2%) yielded studies using the following four self-instructional strategies:

- distance education (2.2%),
- correspondence study (1.1%),
- home study (1.1%),
- self-teaching (1.1%), and
- open education (0.6%).

The three self-instructional systems (distance learning, computer learning, individual learning) are more equally represented in the ERIC system (40.4%, 28%, 31.6%, respectively) than in the Dissertation Abstracts system (6.2%, 30.9%, 62.9%, respectively) as illustrated in Table 3.

Effectiveness/ Efficiency Comparisons of Self-Instructional Strategies

Data collected in response to the following research question, addresses the issue of which self-instructional strategies were found to be effective or efficient.

> Question #2: How do self-instructional strategies compare in terms of effectiveness and efficiency?

The majority of the strategies compared did not indicate significant differences in effectiveness or efficiency among strategies (see Table 4). Pipko (1980) reports no significant difference in performance on the written exams was found among the three instructional groups (programmed instruction vs lecture vs programmed instruction plus lecture). No particular combination of year in class (first year vs second year) and type of instruction (Programmed instruction vs lecture vs programmed instruction plus lecture) interacted to result in significantly higher performances for students in any one of the instructional groups.

Table 2

Range of Self-Instructional Strategies Found Using Dissertation Abstracts International Database

Strategies By System	% of Studies	# of Studies
Individual Learning System	62.9%	112
Individualized instruction	38.2%	68
Programmed instruction	18.5%	33
Independent (individual) study	6.2%	11
Computer Learning System	30.9%	55
Computer-assisted-instruction	29.2%	52
Expert system	1.7%	3
Distance Learning System	6.2%	11
Distance education	2.2%	4
Correspondence study	1.1%	2
Home study	1.1%	2
Open education	0.6%	1
Self-teaching	1.1%	2

Table 3

Range of Self-Instructional Strategies Found Across the Research Literature

	Database Searched	
System	**ERIC (1966-1990)**	**Dissertation Abstracts International (1950-1990)**
Distance Learning	40.4% (101)	6.2% (11)
Computer Learning	28% (70)	30.9% (55)
Individual Learning	31.6% (79)	62.9% (112)
TOTAL	n=250	n=178

Deatsman (1971) reports that the experimental treatment (independent learning vs conventional lecture classes) did not result in a difference between the groups in efficiency of time usage. Stipe (1987) reports no significant differences between the two teaching methods (lecture-discussion/ independent learning module) as a means of stimulating self-directedness in the freshmen class in a two year nursing program. Green (1967) reports that mean test scores were not significantly different between experimental (correspondence - programmed text and broadcast video tapes) and control (classroom instruction with adjunct instructor and programmed text and broadcast videotapes).

In a few instances, although the results favored one self-instructional strategy over another, differences were not statistically significant as seen in Table 4. McLaughlin (1981) reports greater overall relative effectiveness of computerized discovery instruction compared to computerized programmed instruction. No consistent differences were found among the three different variations of Discovery Instruction.

Tobin (1986) conducted a study comparing vocabulary instruction using CAI versus individualized laboratory instruction. For the experimental group, vocabulary instruction was provided using the computer. A teacher was present during the class period to act as facilitator if students needed clarification on procedures or if they encountered problems using the computer. For the control group, vocabulary instruction was provided during an individualized laboratory period with the aid of printed materials. A teacher was also present to provide clarification, if needed. Tobin reports that CAI was a better method than individualized lab instruction for teaching vocabulary. No significant differences were found among subjects taught under the different instructional methods (CAI vs Individualized laboratory instruction).

The bottom section of Table 4 presents instances in which the self-instructional strategy did produce significantly different results among groups. Prater (1987) conducted a study in which instruction was provided using an expert system combined with concept instruction. The component concept instruction included factors used in making decisions about learning disabled classifications as well as a presentation of examples, non-examples, and definitions. Prater reports that subjects in the experimental group (expert system plus concept instruction) scored statistically and educationally significantly better on the posttest than those in the control group (expert system only).

Garza (1986) reports a negative correlation between percentage use of lecture and performance of students (from a particular medical technology program) on certification exam; positive correlation between percentage use of individualized instruction and exam scores.

Williams (1986) reports significant differences between minorities using CAI as the method of instruction versus minorities using tutoring or independent study. There were significant differences in achievement scores between minorities using computer-assisted-instruction as a method of instruction and minorities using tutoring or independent study.

Dukeshire (1966) reports that lecture plus self-teaching workbook group scored higher than lecture only group. Findings revealed higher final exam scores for lecture and self-teaching workbook group than for lecture-only group. More knowledge was acquired when lecture plus self-teaching workbook method was used than when lecture-only method was used.

Hein (1979) reports the total sample (Individualized instruction : choice of learning options vs no choice) achieved a significant pre- to posttest gain. The No Choice group made greater overall test score gains than Choice. In this study , a relationship was found to exist between students' posttest mean score achievement and their grade point average and evaluation of the module.

Table 4

Comparison of Self-Instructional Strategies

Findings	Effect	Strategies Compared
No difference		
		- Programmed instruction vs lecture vs combination programmed instruction and lecture (Pipko, 1980) Independent learning vs conventional lecture (Deatsman,1971, Stipe, 1987) -TV correspondence vs traditional classroom instruction (Green, 1967)
No significant difference	-CAI more effective, but not significantly -4 variations of computerized discovery instuction more effective,but not significantly	- *CAI vs individualized laboratory instruction (Tobin, 1986) - Computerized programmed instruction vs *4 variations of computerized discovery instruction (McLaughlin, 1981)
Significance difference	-CAI significantly more effective for minorities	- #CAI (minorities) vs tutoring vs independent study (Williams, 1986)
	-Lecture with self-teaching workbook significantly more effective	- Lecture vs #lecture with self-teaching workbook (Dukeshire, 1966)
	-Expert sys.+concept instruction significantly more effective	Expert system vs #expert system plus concept instruction (Prater, 1987)
	-Individualized instruction significantly more effective	- #Individualized instruction vs traditional lecture Garza, 1986)
	-Individualized instruction(no choice) significantly more effective	- Individualized instruction (choice of learning option) vs #individualized instruction (no choice) (Hein, 1979)

Manipulation of Variables

The literature was searched for studies demonstrating the effects of manipulating variables of the learning environment, teacher/teaching process, instructional material, and learner, in order to respond to the following research question:

> Question #3: What effect does manipulation of selected factors (variables) have on self-instructional strategies?

Learning Environment

Table 5 is a summary of the research findings for the variable "learning environment." Baird (1985) reports that subjects who worked alone at the computer seemed to have more stable correlation between their final reasoning ability and their post-treatment hypothesizing skills (.59 &.64) than subjects who worked in three member groups (.25 & -.27). This study (CAI individual vs CAI three member groups) produced no support for the effectiveness of cooperative learning groups of three members in promoting hypothesizing skills among all learners. When subjects were asked to rate the software, subjects indicated a strong dislike for this program. The study also reported that cooperative group learning and color simulations are more effective than individual interaction and computer text in elevating attitude toward program being used.

In a study by Zulick (1976) (comparing conventional class group and individual television viewing with and without response sheets) revealed no overall significant difference in attitude toward television instruction among the four groups. (However, students learning in isolated carrels had a more negative attitude toward TV instruction when using the response sheets). Students in a conventional class situation without response sheets had a

significantly more negative attitude toward television instruction. There is no evidence, based on this study(conventional class group, individual television viewing, with and without response sheets), that the size of the class (conventional group or individual) has a significant effect on achievement when the same televised lessons were presented.

Table 5

Learning Environment

Findings	Strategies Compared	Effect
No significant difference	CAI (indiv.) vs CAI (grp) (Baird, 1985)	Cooperative group learning + color simulations more effective than indiv. interaction + computer text for elevating attitude toward program
	Conventional TV vs Indiv. TV (with and without response sheets) (Zulick, 1976)	Individual TV (with response sheets) = higher negative attitude
		Class viewing without response sheet = higher negative attitude
Significant difference	Interactive video instruction (IV) (McNeil, 1989)	IV instruction beneficial for both indiv. and grp. instruction
	Team assisted individualization (TAI) vs individualization (Emley, 1986)	TAI = higher completion rates
		TAI = greater arithmetic achievement
	Self-instruction vs cooperative learning (Segan, 1980)	Higher performance of cooperative learning group than self-instruction group

In the studies reviewed by McNeil (1989), interactive video instruction (IV) was found to be beneficial for individual and group instruction. McNeil reports that IV instruction could be expected to increase student achievement from the 50th to the 69.2nd percentile. According to McNeil, "[m]ean effects were greater for group instruction but were not significant" (p. 44).

Emley (1986) conducted a study comparing individualized instruction and team assisted individualization (TAI). TAI is a process in which student small group interaction is added to the individualized process. Both groups had identical worksheets. Students working in small groups "...helped each other with problems, discussed word problems, compared and checked answers" (p. 87). Emley reports that the effect of team assisted individualization on arithmetic achievement was significant ($p<.033$). Arithmetic achievement was significantly higher with team assisted individualization than with individualized instruction. Course completion rates with team assisted individualization were significantly higher than that of individualized instruction.

Segan (1980) reports that the cooperative learning group scored (performed) significantly better than the self-instruction group.

Teacher/Teaching Process

A summary of the research findings for the variable "teacher/teaching process" is provided in Table 6. In the studies he reviewed, McNeil (1989) reports interactive video instruction was usually employed as a replacement for traditional instruction. Outcomes for studies employing the same teacher for interactive video instruction groups and control groups were not significantly different from studies employing different teachers. McNeil further

reports that the lowest achievement effect was for interactive video instruction studies employing learner control of review and practice.

In the review of studies by Aiello (1981) (lecture, audio-tutorial, CAI, Programmed instruction, personalized system of instruction, combination approach), self-pacing of instruction for the entire class yielded higher effect sizes than daily pacing. Self-initiated testing yielded higher effect sizes than the absence of flexibility. Allowing student choice among instructional delivery systems yielded higher effect sizes, than where uniform delivery systems were required.

Moin (1986) reports that self-paced mastery learning had the largest effect size.In this study, Moin compared self-paced mastery learning (used as an alternative to traditional instruction) to formative evaluation/feedback remediation, CAI, and innovative teaching strategies (all of which were used to supplement traditional instruction).

Hein (1979) reports the Choice (individualized instruction with choice of learning options) used the learning options provided in the module, but their individual selections did not result in higher test scores than No Choice.

Material

Table 7 contains a summary of research findings for the variable "material." In a study conducted by Gunawardena (1988) information was synthesized from two sources: an extensive review of the literature and survey results of 49 postsecondary educational institutions in the U.S. These educators,according to the study, perceived television as an effective delivery medium for a variety of subject areas. Postsecondary educators ranked the following technologies as effective means for providing instruction:

Table 6

Teacher/teaching process

Condition	Strategies Compared	Findings
Same teacher vs different teacher	Interactive video instruction (McNeil, 1989)	No significant differences
Course-length self-pacing vs daily self-pacing	Lecture vs audio-tutorial vs CAI vs programmes instruction vs personalized sys. of instruction vs combination approach (Aiello, 1981)	Higher effect sizes for course-length self-pacing
Self-initiated vs flexible testing schedule	Lecture vs audio-tutorial vs CAI vs programmes instruction vs personalized sys. of instruction vs combination approach (Aiello, 1981)	Higher effect sizes for self-initiated testing schedule
Student choice vs uniform (no choice) of instructional delivery sys.	Lecture vs audio-tutorial vs CAI vs programmes instruction vs personalized sys. of instruction vs combination approach (Aiello, 1981)	Higher effect sizes for student choice of instructional delivery sys.
Presence vs absence of mastery learning	Lecture vs audio-tutorial vs CAI vs programmes instruction vs personalized sys. of instruction vs combination approach (Aiello, 1981)	Largest effect sizes for presence of mastery learning
Choice vs no choice of leaning options	Individualized instruction (Hein, 1979)	Higher test scores for no choice of learning options
Learner control vs no control of review & practice	Interactive video instruction (McNeil, 1989)	Lowest effect for learner control of review & practice
Use of self-paced mastery learning	Self-paced mastery learning vs formative eval/feedback remediation vs CAI vs innovative teaching strategies (Moin, 1986)	Largest effect for use of self-paced mastery learning

1 - Broadcast television (including open-broadcast, cable, and ITFS deliveries);

2 - videocassettes;

3 - video conferencing;

4 - computers; and

5 - videodisc.

Note that of the five media, broadcast TV was perceived as the most effective.

Furthermore, a study by Zulick (1976) (conventional classroom group, individual television viewing, with and without response sheets) failed to produce a significant difference in achievement regardless of whether the students used or did not use the response sheets when receiving the same televised lesson in the conventional or the individualized class situations. All subjects in the four groups (conventional class group, individual group television viewing, with and without response sheets) acquired a high level of achievement during this experiment using televised instruction.

Table 7

Material

Condition	Strategies Compared	Findings
Broadcast TV as a delivery medium	Distance education (Gunawardena, 1988)	Perceived as most effective of 5 media
Response sheet vs no response sheet	TV correspondence vs traditional TV (Zulick, 1976)	No significant difference
Learner interest in course content	4 TV formats (Brown, et al., 1973b)	Straightforward, little entertainment preferred

In a study by Brown and his colleagues (1973a) comparing four television formats, when the course content was intrinsically interesting to the learner, a straightforward, low entertainment value format was preferred.

Learner

Value/Goals. Brown and his colleagues (1973a) conducted a study of instruction utilizing an open learning strategy in which four television formats were compared. All learners preferred real-life settings, positive themes, documentary approaches, and some identification of instructional goals. This study and others concerned with values and goals are summarized in Table 8.

In a study by Deatsman (1971) comparing independent learning with conventional lecture classes, most subjects favored independent study. Most subjects agreed that they benefitted from more individual help (provided by the proctors) in the group study sessions than was available in lecture classes. 10 out of 13 favoring study sessions reported they were benefitted by more individualized help in the study sessions than in lecture.

In a study conducted by Stubbs (1984) looking at home study with a computer lab component, many preconceived notions were retained after module completion. Many subjects preferred interaction.

Perception of Relevance. There appears to be much interest in assessing the perceptions of students regarding their success while receiving instruction (see Table 9) . Participants according to Camacho-Dungca (1987) (in distance education course in Micronesia) report a gain in course content knowledge as well as experiential knowledge through attending a first time experimental course that is delivered at a distance.

In a study by Brown et al (1973a) comparing four television formats, in many instances, the subjects learned more than they thought they had and some had difficulty accepting the fact that they could learn and enjoy the activity at the same time.

Table 8

Learner: Values

Condition	Strategy Compared	Value
Learner preference	4 TV Formats (Brown, et al., 1973a)	- real-life settings - positive themes - documentary approaches - identification of instructional goals
Learner preference	Independent learning vs lecture (Deatsman, 1971)	Independent study
Major benefit	Same as above (Deatsman, 1971)	Individualized help in study sessions
Learner preference	Home study with computer lab (Stubbs, 1984)	Interaction

According to a study by Baird (1985) comparing CAI (Individual) with CAI (three member group), changes in subject's (teachers) perception of their own success and ratings of the program they used may be influenced by both mode of presentation and whether peer support was involved. Cooperative group learning and color simulations are more effective than individual interaction and computer text in elevating perceived success in the use of the computer.

In a study by Deatsman (1971) comparing independent learning and conventional lecture classes, all but one subject felt they made better use of their time in the group study sessions than in lecture classes. Most subjects agreed that they were able to concentrate better and were less bored in group study sessions than in lecture classes. Most subjects agreed that they enjoyed learning at their individual paces; that time went by more quickly;

Table 9

Learner : Perception of Relevance

Condition	Strategy Compared	Findings
Attending distance course	Distance education (Camacho-Dungca, 1987)	Gain in course content knowledge
Learning with TV instruction	4 TV formats (open learning) (Brown, et al., 1973a)	- Subjects learned more than expected - Subjects did not expect to enjoy while learning
Cooperative group learning and color simulation	CAI (indiv.) vs CAI (grp.) (Baird, 1985)	More effective to change student perception of success
Independent learning	Independent learning vs lecture (Deatsman, 1971)	- Made better use of time - Better able to concentrate - Less bored - enjoyed learning - time went faster
Low vs High level students	TV Correspondence vs traditional TV instruction (Green, 1967)	"Learned about the same" (TV correspondence) - 14% Low - 61% High Would have learned "some more" - 50% Low Would have learned "much more" - 11% Low
Completing self-instructional computer module	Home study with computer lab (Stubbs, 1984)	50% of subjects needed assistance from peer or teacher
Participants culturally different from educational institution	Distance education (Camacho-Dungca, 1987)	Participation and flow of discussion inhibited

and that learning was easier in the group study sessions than in lecture classes. 13 out of 15 experimental subjects (independent learning) preferred study sessions to classes. All 13 subjects felt they made better use of their time in the study sessions than in lecture.

In a study by Green (1967) comparing correspondence(experimental) programmed text and broadcast video tapes with classroom instruction (adjunct instructor with programmed text and broadcast video tapes) 14% of the low group and 61% of the high group felt they learned "about the same" in correspondence setting. 50% of the low group felt they would have learned "some more" and 11% in the low group felt they would have learned "much more" in the classroom.

Stubbs (1984) reports although the computer module was designed as self-instructional, about 50% of the subjects needed assistance from peers or the facilitator in order to follow all instructions.

Camacho-Dungca (1987) reports that participation and flow of discussion (of distance education students in Micronesia) was inhibited because of the course requirements for students to interact with their instructor through television. Micronesians have an oral tradition which requires face-to-face interactions between teacher and student.

Interest. In a study by Brown et al. (1973b) (looking at the responsiveness of certain adult characteristics to multimedia instructional programs designed for an open university system), general interest in the overall lesson was related to the degree to which learners found material useful (see Table 10). Interest ratings for reading materials used for the Accounting lessons was significantly related to how much time was spent reading for the Accounting lesson and to student achievement in Accounting.

Time. The question of time (see Table 10) has been of interest to some researchers. Hein (1979) reported differences in activity time and time for test-taking. In this study (Hein, 1979) comparing individualized instruction (with and without choice of learning options), the time spent studying (that is, activity time) by No Choice (X= 90.20 minutes) was significantly greater than that of Choice (X= 48 minutes). The time spent taking the posttest by Choice (X= 29.00 minutes), however, was significantly greater than that of No Choice (X= 16.60 minutes).

In a study by Green (1967) comparing correspondence (experimental) (Programmed text and broadcast videotapes) and classroom instruction (adjunct instructor, Programmed text and broadcast videotapes), high and middle level experimental subjects required no more time to work the exercises than control subjects at those levels; the low experimental group, however, averaged 68 minutes longer per session than the low control group.

Emley (1986) considered differences in completion rates. In this study, Emley compared team assisted individualization with individualized instruction course completion rates, and found that team assisted individualization completion rates were significantly higher than that of individualized instruction (83% , 54% respectively).

While the Choice group in a study conducted by Hein (1979) did not spend as much time completing a module, the No Choice group demonstrated that investing more time completing all testing and study activities not only resulted in significantly greater test score gains, but also higher post test mean scores than did the Choice group.

Aptitude. Prater (1987) investigated differences in terms of experienced and inexperienced learners (see Table 11). In this study (comparing expert system only with expert system plus concept instruction), statistical and educational significance were obtained

Table 10

Learner: Interest, Time

Condition	Strategy Compared	Findings
Interest		
General interest in lesson	Distance learning (multi-media) (Brown, et al., 1973b)	Related to degree of usefulness of material
Time		
Activity time	Individualized instruction (choice) vs (no choice) of learning options (Hein, 1979)	No choice group significantly greater than choice group
Test-taking time	Same as above (Hein, 1979)	Choice group significantly greater than no choice group, but no choice had greater test score gains and higher post test mean scores
Activity time	TV Correspondence vs traditional TV instruction (Green, 1967)	- No difference in time required of high and middle level subjects - Low (TV correspondence) averaged 68 minutes longer per session than low (traditional) subjects
Completion rates	Team assisted individualization (TAI) vs individualization (Emley, 1986)	- TAI significantly higher (83%) the indiv. instruction (54%)

across the experienced and inexperienced subjects (when experience level was considered alone) when using an expert system plus concept instruction.

Baird (1985) was interested in a specific aptitude (aptitude for formal reasoning and hypothesizing skills). In his study comparing CAI (individual) with CAI (3 member group), learners with specific aptitudes (formal reasoning and hypothesizing skills) responded differently to each of the four combinations of presentation mode and group size. Students possessing these specific aptitudes appear to benefit more from learning in small groups and learning from color simulations.

Other researchers have considered differences among three ability groups - low, middle, high. In a study conducted by Williams (1986) comparing tutoring, independent study and CAI, the improvements in achievement scores by minorities using CAI appear to be more effective among low-achieving students than it was for students of average achievement. Subjects at the low level were judged to be less successful and less at ease with the experimental treatment than were the others.

Motivation/achievement. Sung (1986) conducted a study to determine factors which influenced student persistence in distance education (see Table 11). The following combinations of factors reported had an effect on persistence:

- 16% of the variance in persistence was due to the student's perceived reasonableness of instructional objectives.
- 21% of the variance was associated with a combination of free time and of study time.

The following factors did not significantly affect persistence: influence of the instructor, and motivational factors.

Table 11

Learner: Aptitude, Motivation (for achievement)

Condition	Strategy Compared	Findings
Aptitude		
Inexperienced vs experienced learners	Expert sys. vs expert sys. + concept instruction (Prater, 1987)	Significant differences between results of experienced and inexperienced subjects
Aptitude for formal reasoning and hypothesizing skills	CAI (indiv.) vs CAI (grp.) (Baird, 1985)	Different responses to the combinations of presentation mode and group size
Minority (low level) vs minority (average level)	CAI vs tutoring vs independent study (Williams, 1986)	CAI more effective for low achieving minority students
Low level vs high & middle (TV correspondence groups)	TV correspondence vs traditional TV instruction (Green, 1967)	Judged to be less successful, less at ease
Motivation		
Student persistence	Distance education (Sung, 1986)	Significant effect: - student's perceived reasonableness of objectives (16% of variance) - combination of free time and study time (21%)
Student persistence	Same as above (Sung, 1986)	No significant effect: - influence of instructor - motivational factors

Other Factors Affecting Learners

Research findings differ when researchers consider such factors as the grade/level, age, or the ethnicity of the student.

Level. Jonas (1982) in a study examining a system which included remedial work plus progress reports and posting test profiles (see Table 12), reports the following findings for the introductory students:

- remedial work was the most interactively significant strategy;
- females performed better than males in all groups;
- attitude did not significantly affect student achievement.

Findings for the advanced group showed that:

- remedial work and GPA were significant contributors to the variance in achievement.
- achievement interacted with Treatment, Sex and GPA to contribute significantly to the variance in achievement.

In a study by Pipko (1980) comparing Programmed Instruction, lecture only and a combination of programmed instruction and lecture, the second year dental students scored higher than first year students regardless of the method of instruction on the clinical exam.

Age. In a study by Tobin (1986) comparing CAI with Individualized lab instruction (see Table 12), no difference was found in achievement between younger and older age groups. However, the older CAI group performed best of all the groups, although not significantly different.

In a study conducted by Brown et al. (1973a) comparing four television formats, older adults preferred some form of on-camera authority figure more than did younger adults. Younger adult learners were generally more responsive to subtle instructional formats (e.g., story-line running through a lesson) than older adults (eg.,authority figure), but there was enough variation in both groups for a substantial amount of overlap.

Table 12

Learner: Level, Age

Condition	Strategy Compared	Findings
Level		
Introductory vs advanced students	Remedial work + progress reports + test profiles (Jonas, 1982)	Introductory students: significantly affected achievement: - remedial work - sex (females only) no significant effect: - attitude Advanced Students: Significantly affected achievement: - remedial work - GPA
First yr. vs second yr. dental students	Programmed instruction vs lecture vs combination programmed instruction + lecture (Pipko, 1980)	Second yr. students outscored first yr. students regardless of method of instruction
Age		
Younger vs older (CAI) groups	CAI vs individualized lab instruction (Tobin, 1986)	No significant difference in achievement, but older CAI group had highest performance
Older vs younger adults	4 TV formats (open learning) (Brown, et al., 1973a)	- Older adults preferred on-camera authority figure - Younger adults preferred subtle instructional formats

Ethnicity. Williams (1986) reports that minority students performed at achievement levels approximating the levels of non-minority students (see Table 13) when using CAI as the medium of instruction. Furthermore, minority students achieved significantly higher

scores when using CAI than were obtained through the use of the other two methods (i.e., tutoring and independent study).

Attitudes. Findings concerning the attitude of the learner using a variety of educational media is varied. In a study by Brown et al. (1973b) looking at reactions of adult students to multimedia instructional programs in an open university system (Table 13) revealed that student attitudes to such programs were (significantly) positively related to the following characteristics:

- level of education
- enjoyment of educational television
- concept of self as a student
- thoughts about future education
- past academic achievement.

Additionally, student attitudes toward audio cassette lesson material were related to initial attitudes toward educational television.

In a study conducted by Brown and his colleagues (1973a) comparing four television formats, attitude outcomes were influenced by the differing television formats.

Support For Self-Instructional Strategies

The research question below addressed the issue of educational support -- or specific resources -- which may be an essential element in the success of a self-instructional strategy.

> Question #4: What system of educational support is necessary for effective application of self-instructional strategies?

Table 13

Learner: Ethnicity, Attitude

Condition	Strategy Compared	Findings
Ethnicity		
Minority vs non-minority students (CAI)	CAI vs individualized lab instruction (Tobin, 1986)	Minority students scored significantly higher using CAI
Attitude		
Toward multi-media programs	Multimedia program (open learning) (Brown, et al., 1973b)	Significantly related to: - level of education - enjoyment of educational TV - concept of self as student - thoughts about future education - past academic achievement
Toward audio cassette lesson material	Same as above (Brown, et al., 1973b)	Related to initial attitudes toward educational TV
Toward TV instruction	4 TV formats (open learning) (Brown, et al., 1973a)	Influenced by different formats

Findings about the use and effectiveness of an educational support system were found in the distance learning literature (i.e., distance education, correspondence/home study, open learning). Gunawardena (1988) conducted a survey in which educators of 49 post secondary institutions answered a series of questions. Percentages of respondents indicating that their institutions reportedly provided the following student support services are as follows:

telephone office hours for faculty teaching the course (86%)

study guides (75%)

individualized feedback from faculty (75%); and

phone calls initiated by faculty (70%)

There was some discrepancy about the reported use and the perceived helpfulness of two student services provided. Although 86% of the institutions report using telephone office hours, only 47% of those institutions perceive telephone office hours to be very helpful. On the other hand, although only 30% of the institutions report using computerized feedback, 64% of the institutions perceive feedback as a very helpful student support service.

These educators were also asked to rate a list of student support services. Results show that these educators perceive the following five services to be the most helpful (in order from highest to lowest ranking) : study guides, individualized feedback from faculty, computerized feedback, telephone calls initiated by faculty, student access to public or college libraries.

Garza (1986) conducted a study of program directors from 156 medical technology programs. These programs employ individualized instruction as one strategy for instruction. This study revealed : (1) a positive correlation between faculty/student ratio and students' mean raw scores on a certification exam; (2) a positive correlation between the provision of stipends and loans by medical technology programs and students' scores on the certification exam.

Combined Factors For Idealized Self-Instructional System

Response to the following research question sought data concerning combinations of single factors which reportedly impacted the effectiveness or the efficiency of self-instructional strategies. The findings for research question five are presented in terms of the following variables: learning environment, teacher/teaching process, learning material, and learner.

Question #5: What combination(s) of factors drawn from the literature are supported for their inclusion in a self-instructional system?

Learning Environment

The variable "learning environment" (see Table 14) had the following reported effects:

1. The highest performance by distance learning students was achieved by students participating in cooperative learning groups.
2. Individual learning students participating in cooperative group learning achieved higher course completion rates and arithmetic achievement.
3. Interactive video instruction was beneficial for both group and individual instruction.

Table 14

Learning Environment Impact

Condition	Strategy Compared	Findings
Use of cooperative learning groups	Self-instruction vs cooperative learning (Segan, 1980)	Highest student performance
Use of team assisted individualization	Team assisted indiv. (TAI) vs individualization (Emley, 1986)	Highest student course completion rates Highest arithmetic achievement
Use of interactive video instruction	Interactive video instruction (IV) (CAI 1)	Beneficial for both indiv. & grp. instruction

Teacher/Teaching Process

The variable "teacher/teaching process" (see Table 15) had the following reported effects:

1. Students receiving individualized instruction obtained higher test scores when they were not permitted to choose among learning options. These subjects performed at a high level when they were required to complete all learning activities within the module.

Table 15

Teacher/Teaching Process Impact

Condition	Strategies Compared	Findings
Self-pacing for entire class vs daily pacing	Lecture vs audio-tutorial vs CAI vs PI vs personalized sys. of instruction vs combination approach (Aiello, 1981)	Highest effect sizes for self-pacing
Self-initiated vs flexible testing testing schedule	same as above (Aiello, 1981)	Highest effect sizes for self-initiated schedule
Student choice vs uniform (no choice) of instructional delivery sys.	same as above (Aiello, 1981)	Highest effect sizes for student choice of instructional delivery system
Presence vs absence of mastery learning	same as above (Aiello, 1981)	Largest effect sizes for presence of mastery learning
Choice vs no choice no of learning options	Indiv. instruction (Hein, 1979)	Highest test scores for choice grp.
Learner control vs no control of review and practice	Interactive video instruction (McNeil, 1989)	Lowest effect sizes for learner control of review and practice

2. Computer learning students attained lowest achievement scores when they (the students) were able to control learning review and practice in the learning process.
3. The greatest (largest) effect was experienced when the following conditions were present when comparisons were made of combinations of learning strategies:
    - self-pacing for the entire length of the course vs daily pacing
    - student choice of the instructional delivery system, and
    - mastery learning.

Learning Material

The variable "learning material" (see Table 16) had the following reported effect:

- Television is perceived as the most effective delivery medium in distance education when compared to five other delivery media.

Learner

The findings for the variable "learner" are further organized according to the specific learner characteristic.

Learner: Value

Distance learning students valued interaction with peers (see Table 17) despite the fact that instruction was primarily individual rather than group instruction.

Learners involved in individual learning preferred independent study to traditional instruction. They particularly valued individualized assistance provided by proctors during group study sessions.

Table 16

Material Impact

Condition	Strategies Compared	Findings
TV as a delivery medium	Distance education (Gunawardena, 1988)	Perceived as most effective medium
Learner interested in course content preferred	4 TV formats (Brown, et al., 1973b)	Straightforward, little entertainment

Table 17

Values Impact

Condition	Strategy Compared	Findings
Distance Learning Sys.		
Learner preference	4 TV Formats (Brown, et al., 1973a)	- real-life settings - positive themes - documentary approaches - identification of instructional goals
Learner preference	Home study with computer lab (Stubbs, 1984)	Interaction
Individual Learning Sys.		
Learner preference	Independent learning vs lecture (Deatsman, 1971)	Independent study
Major benefit	Same as above (Deatsman, 1971)	Individualized help in study sessions

Learner: Perceptions of Relevance

Distance learning students felt they gained course content knowledge with distance courses and TV instruction (see Table 18). Those who did not have perceptions of achievement gains or high gains indicated a preference for instruction with more teacher intervention. Some learners did not expect to enjoy while learning. Some learners indicated a need for assistance form peers or teacher even
during instruction which was self-instructional. Participants of a culture different from the culture of the institution indicated that course participation and flow of discussion was inhibited.

Learners involved in individual learning appear to have the perception that independent study is more effective and more efficient than lecture.

Computer learning students who participated in cooperative group learning while completing a color simulation had a high perception of success.

Learner: Interest

General interest (of distance learners) in the lesson as indicated in Table 19 was related to the usefulness of course materials. Students generally maintained an interest in the distance learning course as long as students perceived the course materials to be useful to course completion.

Table 18

Perception of Relevance Impact

Condition	Strategy Compared	Findings
Distance Learning Sys.		
Attending distance course	Distance education (Camacho-Dungca, 1987)	Gain in course content knowledge
Learning with TV instruction	4 TV formats (open learning) (Brown, et al., 1973a)	- Subjects learned more than expected - Subjects did not expect to enjoy while learning
Learning through TV correspondence of high & low achievement students	TV Correspondence vs traditional TV instruction (Green, 1967)	"Learned about the same" (TV correspondence) - 14% Low - 61% High Would have learned "some more" - 50% Low Would have learned "much more" - 11% Low
Completing self-instructional computer module	Home study with computer lab (Stubbs, 1984)	50% of subjects needed assistance from peer or teacher
Participants culturally different from educational institution	Distance education (Camacho-Dungca, 1987)	Participation and flow of discussion inhibited
Individual Learning Sys.		
Independent learning	Independent learning vs lecture (Deatsman, 1971)	- made better use of time - better able to concentrate - less bored - enjoyed learning - time went faster
Computer Learning Sys.		
Cooperative group learning + color simulation	CAI (indiv.) vs CAI (grp.) (Baird, 1985)	more effective to change student perception of success

Table 19

Interest / Time Impact

Condition	Strategy Compared	Findings
Interest		
Distance Learning Sys.		
General interest in lesson	Distance learning (multi-media) (Brown, et al., 1973b)	Related to degree of usefulness of material
Time		
Individual Learning Sys.		
Activity time	Individualized instruction (choice) vs (no choice) of learning options (Hein, 1979)	No choice group significantly greater than choice group
Test-taking time	Same as above (Hein, 1979)	Choice group significantly greater than no choice group, but no choice had greater test score gains and higher post test mean scores
Completion rates	Team assisted individualization (TAI) vs individualization (Emley, 1986)	Team assisted individualization significantly higher (83%) than individualized instruction (54%)
Distance Learning Sys.		
Activity time	TV Correspondence vs traditional TV instruction (Green, 1967)	- Low (TV correspondence) averaged 68 minutes longer per session than low (traditional) subjects

Learner Time

When individual learning students were given a choice of learning options (see Table 19), a shorter time was required to complete the learning activity, but a greater amount of time to complete test-taking resulting in lower test score gains. Low achieving distance learning students required longer activity time than high and middle achieving students.

Learner: Motivation

Persistence in distance learners was related to student's perceived reasonableness of objectives and free time/study time (see Table 20). Students were more likely to continue with distance learning classes when course objectives were perceived to be reasonable. Student persistence was also related to the degree to which the amount of anticipated free and study time matched the amount of actual study and free time.

Learner: Aptitude

Experienced subjects using an expert system (with concept instruction) (see Table 20) had the highest achievement scores. Subjects who had experience teaching learning disabled students and subjects who had not had prior teaching experience were given instruction on how to classify learning disabled students.

When compared to two other self-instructional strategies (tutoring and independent study). CAI was the most effective strategy for low achieving minority students.

Learner: Age

Student preference of distance learners (see Table 21) for TV format was related to the age of the student (younger vs older adult). Older adults preferred an on-camera authority figure. However, younger aduits preferred a TV format which used a variety of entertainment techniques.

Older adults using CAI obtained higher achievement scores than older adults using individualized lab instruction for vocabulary instruction.

Table 20

Aptitude / Motivation (for achievement) Impact

Condition	Strategy Compared	Findings
Aptitude		
Computer Learning Sys.		
Inexperienced vs experienced learners	Expert sys. vs expert sys. + concept instruction (Prater, 1987)	Significant differences between results of experienced and inexperienced subjects
Aptitude for formal reasoning and hypothesizing skills	CAI (indiv.) vs CAI (grp.) (Baird, 1985)	Different responses to the combinations of presentation mode and group size
Combination Learning Sys.		
Minority (low level) vs minority (average level)	CAI vs tutoring vs independent study (Williams, 1986)	CAI more effective for low achieving minority students
Distance Learning Sys.		
Low level vs high & middle (TV correspondence groups)	TV correspondence vs traditional TV instruction (Green, 1967)	Judged to be less successful. less at ease
Motivation		
Distance Learning Sys.		
Student persistence	Distance education (Sung, 1986)	Significant effect: - student's perceived reasonableness of objectives (16% of variance) - combination of free time and study time (21%)

Learner Level

Introductory students (in an individual learning system) were successful using the remedial work strategy (see Table 21); however, females achieved higher scores than males. For advanced students, achievement was related to the remedial work strategy and G.P.A. Second year dental students outscored first year students despite method of instruction.

Table 21

Level / Age Impact

Condition	Strategy Compared	Findings
Level		
Individual Learning Sys.		
Introductory vs advanced students	Remedial work + progress reports + test profiles (Jonas, 1982)	Introductory students: significantly affected achievement: - remedial work - sex (females only) Advanced Students: Significantly affected achievement: - remedial work - GPA
First yr. vs second yr. dental students	Programmed instruction vs lecture vs combination programmed instruction + lecture (Pipko, 1980)	Second yr. students outscored first yr. students regardless of method of instruction
Age		
Combination Learning Sys.		
Younger vs older (CAI) groups	CAI vs individualized lab instruction (Tobin, 1986)	No significant difference in achievement, but older CAI group had highest performance
Distance Learning Sys.		
Older vs younger adults	4 TV formats (open learning) (Brown, et al., 1973a)	- Older adults preferred on-camera authority figure - Younger adults preferred subtle instructional formats

Learner: Attitude

Attitudes of distance learners toward multi-media programs (see Table 22) were found to be related to the level of education, enjoyment of educational television, concept of self as a student, thoughts about future education, and past academic achievement. Student attitudes toward audio cassette lessons were found to be related to initial attitudes toward educational television. Student attitudes toward television instruction were influenced by different television formats.

Learner: Ethnicity

Minority students achieved high results when using CAI than was reported when they used two other strategies (tutoring and independent study) (see Table 22).

Summary

In Chapter Four, the research findings were reported for each research question.

Question #1: What is the range of self-instructional strategies?

Strategies within the individual learning system represented 44.63% of the studies found. Strategies within the computer learning system accounted for 29.21% of the studies found. Strategies within the distance learning system accounted for 26.17% of the studies.

Table 22

Ethnicity / Attitude Impact

Condition	Strategy Compared	Findings
Ethnicity		
Combination Learning Sys. Minority vs non-minority students (CAI)	Tutoring vs independent study vs CAI (Williams, 1989)	Scored significantly higher using CAI
Attitude		
Distance Learning Sys. Toward multi-media programs	Multimedia program (open learning) (Brown, et al., 1973b)	Significantly related to: - level of education - enjoyment of educational TV - concept of self as student - thoughts about future education - past academic achievement
Toward audio cassette lesson material	Same as above (Brown, et al., 1973b)	Related to initial attitudes toward educational TV
Toward TV instruction	4 TV formats (open learning) (Brown, et al., 1973a)	Influenced by different formats

Question #2: How do self-instructional strategies compare in terms of effectiveness and efficiency?

The two strategies within the computer learning system were reported to positively impact student achievement:

- computer-assisted-instruction (especially for minority students)
- expert systems (when used in conjunction with traditional concept instruction)

One distance learning strategy was reported to positively impact student achievement:

- self-teaching workbook (used with lecture)

One individual learning strategy, individualized instruction, was reported to impact student achievement.

Question #3: What effect does the manipulation of factors (variables) have on self-instructional strategies?

The variables selected for study were the learning environment, teacher/teaching process, instructional material, and the learner. Learning environment was a significant factor for each of the three self-instructional systems (distance learning, individual learning, and computer learning system). Teacher/teaching process was a significant factor in strategies in the individual and computer learning systems. Learning material was a significant factor in the distance learning system. Specific learner characteristics were significant in each of the learning systems; however, learner characteristics appeared to more significantly impact strategies in the distance learning system.

Question #4: What system of educational support is necessary for effective application of self-instructional strategies?

Educators from 49 post secondary institutions reportedly provided the following student support services:

telephone office hours for faculty teaching the course (86%)
study guides (75%)
individualized feedback from faculty (75%); and
phone calls initiated by faculty (70%)

Question #5: What combination(s) of factors drawn from the literature are supported for their inclusion in a self-instructional system?

The factors learning environment, teacher/teaching process, learning material, and the learner are supported for inclusion in a self-instructional system.

CHAPTER FIVE

Summary, Conclusions, and Recommendations

Introduction

Chapter Five summarizes research findings and presents conclusions and recommendations for each of the research questions.

The purpose of this study was (a) to identify and analyze data from the research literature about selected self-instructional strategies in use in defined self-instructional systems; (b) to summarize the findings concerning the effectiveness and efficiency of these self-instructional strategies; and (c) to identify relationships which appear to exist among factors or combinations of factors affecting self-instructional systems.

Summary of the Study

Chapter One presents an overview of the issues under investigation and the procedures used to address these issues. One proposed solution to the problem of meeting the educational needs of students who find it difficult to attend traditional classes is to use self-instructional strategies. These self-instructional strategies are categorized within three self-instructional systems, i.e., individual learning, computer learning, and distance learning. More specifically, this study, then, seeks: to identify selected factors which appear to impact the effectiveness and efficiency of selected self-instructional systems; to describe the current state of self-instructional systems in light of this data; and to identify relationships

which appear to exist among factors or combinations of factors affecting self-instructional systems. Because the research on self-instruction and its related factors are scattered throughout the literature, a goal of this study is to present valid research data relating to self-instruction in a more manageable and less-scattered format.

Chapter Two describes three self-instructional systems (computer learning, individual learning, and distance learning systems) and the self-instructional strategies commonly in use within these systems. The main feature of instruction in the computer learning system is the computer. In this system of instruction, the learner must interact (almost exclusively) with the computer in order to complete the learning activity. The self-instructional strategies in use in the computer learning system included computer-assisted-instruction and expert systems. The key feature of instruction in the individual learning system is the individual student. In this learning system, it appears that the specific characteristics of learners (eg., aptitude, interest, learning rate, style of learning) drive the learning process. The strategies categorized under the individual learning system were: independent study, individualized instruction, and programmed instruction. The key feature of instruction in the distance learning system is the distance that separates the learner from the instructor. The primary issue in this learning system is: How shall we compensate for the physical separation between learner and instructor? The following five strategies are included in the distance learning system: distance education, correspondence study, home study, open education, and self-study.

Chapter 3 began with an overview of the research design for this study, an integrative review. An integrative review has been defined as "...the synthesis of separate empirical findings into a coherent whole" (Cooper, 1982, p. 291). Because the goal of this study is (1) to analyze research findings looking for similarities, differences, and conflicting information among the data about self-instructional strategies; and (2) to suggest an

idealized model of self-instruction based upon these findings, the integrative review research method appeared to be the most appropriate research procedure to accomplish that goal.

The plan for analyzing the data included three steps. First, the available studies were sampled for possible inclusion. Second, the researcher read the studies and coded the data that was collected. Included in this chapter is a detailed account of the procedures used to select the studies and to code the data. Finally, the findings were interpreted in light of certain restrictions, such as the presence of discrepancies among results, or the lack of sufficient information included in the studies.

In Chapter Four, the research findings were reported for each research question. The specific findings are presented in conjunction with the conclusions and implications for further research, in the next section, to better show their relationships.

Summary of Findings, Conclusions, and Research Implications

The summary of research findings, conclusions, and implications for further research are presented for each research question.

> Question #1: How many distinct self-instructional strategies are there in the literature and how often are they mentioned?

Findings

In identifying and categorizing the self-instructional strategies reported in the literature, the distinct self-instructional strategies found in the literature and the number of studies for each were:

distance education 56

correspondence and home study	36
open education	18
self-teaching	2
individualized instruction	103
independent and individual study	34
programmed instruction	54
computer-assisted-instruction	121
expert systems	4

Strategies within the individual learning system represented 44.63% of the studies found.

The percentage of studies found for each strategy was:

Individualized instruction	24.07%
Independent (individual) study	7.94%
Programmed instruction	12.62%

Strategies within the computer learning system accounted for 29.21% of the studies found.

Strategies within this system were the following:

Computer-assisted-instruction	28.27%
Expert systems	.93%

Strategies within the distance learning system accounted for 26.17% of the studies found.

The percentage of studies found for each strategy was:

Distance education	13.08%
Correspondence (home) study	8.41%
Open education	4.20%
Self-Teaching	.47%

Conclusions

Conclusions for research question #1 were the following:

1. There is much overlap in the characteristics of self-instructional strategies.
2. Some self-instructional strategies have had considerably more study than others.
3. There is some confusion in the literature concerning how self-instructional strategies are similar and different.

Research Implications

Implications for further research for question #1 were the following:

1. Conduct further study of underrepresented self-instructional strategies, such as self-teaching and expert systems.
2. There appears to be a need to establish broad categories, such as the three learning systems proposed, here to help practitioners distinguish among the wide variety of self-instructional strategies.

Question #2: How do self-instructional strategies compare in terms of effectiveness and efficiency?

Findings

Two strategies within the computer learning system category were reported to positively impact student effectiveness: computer-assisted-instruction (especially for minority students), and expert systems (when used in conjunction with traditional concept instruction). One distance learning system strategy, self-teaching workbook (used with lecture), was reported to positively impact student effectiveness. One individual learning system strategy, individualized instruction, was reported to impact student effectiveness.

Conclusions

Many self-instructional strategies, when compared to other self-instructional strategies were equally as effective. Instructional developers may very well select self-instructional strategies based on ease of use or cost, rather than the individual characteristics of the strategy.

Research Implications

An implication for research for question #2 was the following:

- Conduct further study of self-instructional strategies which were found to be equally as effective to determine what the specific conditions were for each strategy that caused them to compare in effectiveness.

Question #3: What effect does the manipulation of factors (variables) have on self-instructional strategies?

The research findings for this question are organized according to the specific self-instructional system to which they are related. The three specific self-instructional systems are: distance learning, individual learning, and computer learning. Some of the findings will be organized through a fourth category: combination of learning systems. This category includes findings from studies which made comparisons among self-instructional strategies from different learning systems.

Effect of Distance Learning System Factors

Findings

Television is perceived by students and teachers as the most effective delivery medium in distance education. The highest performance was achieved by students participating in

cooperative learning groups that meet periodically. Distance learning students valued interaction with peers.

Students felt they gained course content knowledge through distance courses and TV instruction. Those who did not have perceptions of achievement gains or high gains indicated a preference for instruction with more teacher intervention. Some learners did not expect to enjoy the process while learning through television instruction. Some learners taking self-instruction indicated a need for assistance from peers or teachers. Participants from cultures different from that of the instructional institution indicated that course participation and flow of discussion were inhibited.

General interest of students in the lesson was related to the usefulness of course materials.

Persistence in the course was related to how reasonable the student perceived the course objectives to be and the balance between free time and study time.

The level of student preference for a particular TV instructional format was related to the age of the student (younger vs older adult).

Student attitudes toward multi-media programs were found to be related to the level of education, enjoyment of educational television, concept of self as a student, thoughts about future education, and past academic achievement. Student attitudes toward audio cassette lessons were found to be related to initial attitudes toward educational television. Student attitudes toward television instruction were differentially influenced by the television formats used.

Lower achieving students required longer activity time than high and middle achieving students.

Conclusions

Conclusions for research question #3 were the following:

- Periodic group learning activities should be included in self-instruction.
- Teacher intervention should be optional for students.
- All course material should be clearly marked so that the student can distinguish between (1) those materials necessary for successful course completion, and (2) those materials which are optional or provided as supplementary material in order to increase student interest in self-instruction.
- Make the instruction more realistic in order to increase persistence among students learning through self-instruction.

Research Implication

An implication for further research in the area of distance learning for question #3 was the following:

- conduct further studies to determine the extent to which the use of group learning activities, availability of teacher intervention, and organization of course material impact student performance in distance learning.

Effect of Individual Learning System Factors

Findings

Students receiving individualized instruction obtained higher test scores when they were not permitted to choose certain learning options. For example, in one study subjects performed at a higher level when they were required to complete all learning activities

within the module as contrasted with those having the options to complete only those learning activities they chose.

Students participating in cooperative group learning achieved higher course completion rates and arithmetic achievement .

Learners valued independent study (in general) and valued individualized assistance (specifically). Learners appear to have the perception that independent study is more effective and more efficient than lecture.

Introductory students were successful using the remedial work strategy; however, females achieved higher scores than males. For advanced students, achievement was related to the remedial work strategy and G.P.A. Second year dental students outscored first year students despite method of instruction.

When students were given the opportunity to choose from among available learning activities, the time required to complete the learning module was shorter than for students who were required to complete all learning activities. However, the students who were permitted to choose from among learning activities required a longer amount of time to complete test-taking and had lower test scores than students who completed all learning activities.

Conclusions

- Student participation in decisions concerning the learning process should be limited to those decisions which encourage successful student performance.
- Include group learning activities to encourage students to continue in a particular learning strategy or system which is designed for non-group instruction.

- Design self-instruction so that it includes factors relevant to the age of the student.
- When the amount of available time for instruction is limited, the number of student decisions concerning the learning process should be limited.

Research Implications

Implications for research in the area of individual learning for question #3 were the following:

1. Conduct further study to determine the extent to which the degree of student participation in decision-making affects student performance in the individual learning system.
2. Conduct further study to determine the extent to which the use of group learning activities and the time available for instruction affect student performance in individual learning.

Effect of Computer Learning System Factors

Findings

The lowest achievement scores were attained when students were able to control learning review and practice in the learning process.

Interactive video instruction was beneficial for both group and individual instruction.

Students who participated in cooperative group learning while completing a color simulation had a high perception of success.

Subjects with previous teaching experience had higher achievement scores than did students without prior teaching experience.

Conclusions

- Learner control should be limited to the degree to which it encourages successful student achievement.
- The computer learning system includes strategies which may be used for individual and cooperative group instruction.

Research Implication

An implication for further research in the area of computer learning for question #3 was the following:

- further study should be conducted to determine conditions in which learner control both positively and negatively impact student performance in computer learning.

Effect of Combination of Learning Systems Factors

Findings

The greatest (largest) learning effect was experienced when the following conditions were present :

- self-pacing for the entire length of the course (as opposed to daily pacing),
- student choice of the instructional delivery system, and
- use of mastery learning techniques.

Minority students achieved high results when using CAI. CAI was the most effective strategy for low achieving minority students. Older adults using CAI also obtained high achievement scores.

Conclusions

- Provide students an opportunity to self-pace to encourage student performance.
- Learner - control of selection of delivery systems encourages student performance.
- When designing instruction for minority students and older students, computer-assisted-instruction is suggested.

Research Implications

Implications for research on instruction from a combination of learning systems were the following:

1. Conduct further study of the effects of self-pacing and learner-control of delivery system selection when instruction is provided using strategies from a combination of learning systems.
2. Conduct further study to determine whether other self-instructional strategies are suggested for other categories of students.

Question #4: What system of educational support is necessary for effective application of self-instructional strategies?

Findings

Post secondary institutions reportedly supply the following support services:

- telephone office hours so that students can contact instructors
- individualized written feedback
- study guides for each course
- phone calls to students to provide feedback on assignments

Educators at post secondary institutions suggest the use of additional services:

- computerized feedback
- student access to instructional institution's libraries

Conclusions

Conclusions for research question #4 are the following:

- Students should be provided ready access to instructors for answers to questions and for feedback on performance.
- Interaction with proctors should be limited to low proctor/student ratio.

Research Implication

The following is the implication for further research for question #4:

- conduct further study to determine additional essential elements of an educational support system.

Question #5: What combination(s) of factors drawn from the literature are supported for their inclusion in an idealized self-instructional system?

The findings for research question 5 will be presented according to each of the three self-instructional systems.

Distance Learning System Factors

Findings

The most effective strategy was the use of a self-teaching workbook with lecture. The highest performance was for students working in cooperative learning groups. TV was perceived as the most effective delivery medium as contrasted with videocassette, audiocassette and computer. The following student characteristics significantly impacted student performance:

- value of instruction to them
- perception of relevance of instruction to students

- interest in course materials
- motivation
- age of student
- attitude toward instruction
- time

Conclusions

- There appears to be an advantage to combining a group strategy (lecture) with a self-instructional strategy.
- Distance learning should include some group learning activities.
- Learner characteristics should be accounted for in the design of distance learning.

Research Implications

Investigate further the effects of the following:

- including group learning activities in instruction within the distance learning system, and
- accounting for learner characteristics in the design of instruction within the distance learning system.

Individual Learning System Factors

Findings

The research literature lends support for the following factors in the individual learning system. The most effective strategy was individualized instruction. Highest performance was achieved when students had no choice of learning options. The following student characteristics significantly impacted student performance:

- value of instruction to students
- perception of relevance of instruction to them
- level of student

- time

Conclusions

Instruction should be individualized for higher impact on student achievement.

- Instruction should permit student choice of learning options for higher positive impact on student performance.
- Accounting for learner characteristics in the design of instruction has limited impact on student performance.

Research Implication

Conduct further study of the effects of various strategies for individualizing instruction on student performance.

Computer Learning System Factors

Findings

The literature lends support for the following factors in the computer learning system:

- CAI and expert systems were the more effective strategies when compared with traditional strategies and other self-instructional strategies.
- Interactive video instruction is a useful strategy in both group and individual learning.
- Students should have limited control of learning review and practice.
- The following student characteristics significantly impacted student performance:
    - perception of relevance of instruction
    - aptitude

Conclusions

Consider strategies in the computer learning system for both individual and group instruction. Limit learner control of review and practice. The following learner

characteristics should be accounted for in the design and delivery of instruction: perception of relevance, and aptitude.

Research Implication

Further investigate the impact of learner control and learner characteristics on student performance in instruction within a computer learning system.

Combination of Learning Systems Factors

Findings

The research literature lends support for the following factors:

- The highest performance was achieved under the following conditions:
  - self-pacing for entire length of course
  - student choice of delivery system
  - presence of mastery learning component
- The following student characteristics significantly impacted student performance:
  - ethnicity
  - aptitude
  - age

Conclusions

When looking across systems:

- student input in the learning process appears important;
- external interventions of performance standards appear to be needed; and
- the following student characteristics should be accounted for in the design and delivery of the instruction: ethnicity, aptitude, and age.

Research Implication

Conduct further studies of the impact of factors such as student input in the learning process and external intervention of performance standards, on student performance in instruction involving more than one educational system.

Idealized Model Of Self-Instruction

The proposed model of self-instruction (below) is a model designed to be used by designers or developers of instruction in conjunction with their instructional development model of choice. The self-instruction model provides direction (based upon expert opinion and findings from the professional literature) to guide their decision-making process. Once the developer has gathered data regarding his/her intended audience, course objectives, and available resources, and determined that he/she would use a self-instructional strategy, then the factors and conditions provided in this model may provide further information to help guide additional decisions concerning the design and development of the proposed self-instruction.

The conditions described after each of the variables listed in the left column of the model below, should not be viewed as generalizing to all cases, and should be adopted with reservations and through careful analysis of the particular instructional development project. To be established as generalizable, a number of these conditions need to be replicated with different populations and modes of presentation. While this model can serve the instructional developer as a guide when making decisions about what to incorporate in a self instructional module, it requires much additional research before many of its conditions can be accepted as generalizable to ID projects using self-instruction.

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Idealized Model of Self-Instruction

Directions: To make use of the research implied by the model, the instructional developer may select one or more of the model categories of interest (i.e.,Differences in Entry Behaviors of Learners, Effects of Age or Strategy Selection, Learner Control vs System Control, Student Working Alone vs In Collaboration, or Time for Completion of Learning Activities), and relate each of its factors and conditions to the instructional developer's specific project.

I. Differences in Entry Behavior of Learners

Factor	Conditions
Learner interest in content	-When learner is already interested in the content, they prefer a more straightforward broadcast TV format, with minimal use of entertainment techniques. -When learner is not initially interested in the content, increased use of entertainment techniques increases interest.
Learner preference in distance learning	Distance learners prefer real life settings, positive themes, documentary TV approaches (as contrasted with entertainment), identification of instructional goals, and group interaction
Student perceptions about distance learning instruction	Students who participated in distance learning, felt that distance learning was a satisfactory method for learning course content knowledge
Student perceptions of learning with TV instruction	-Student felt they learned more than expected with TV instruction and did not expect to enjoy while learning -High achieving students felt that with TV instruction, they learned about the same -Low achieving students felt they could have learned more with teacher-intervention

Student perception of computer based instructional modules	Despite assumption that modules were stand alone, students perceived a need for periodic assistance from peer or teacher
Perceptions of participants toward instruction with a different cultural base	Conflicting customs, such as those governing student/teacher interaction, may prevent students culturally different from those for whom the instruction was designed to participate adequately
General interest of students in distance learning lesson	Student interest is related to degree of perceived usefulness of material to them individually
Low achievement students	Researchers judged low achievement students to be less successful, and less at ease in learning by TV correspondence instruction
Student persistence at tasks in distance learning courses	-Students were more persistent at learning tasks when the course objectives appeared to match their perception of the scope of the course -Students were more persistent at learning tasks when their perceptions of the balance between free and study time matched the actual times
Student attitudes toward multi-media programs	Student attitudes toward multi-media programs were positively related to: level of education, enjoyment of educational TV, concepts of self as student, thoughts about future education, and past academic achievement
Student attitudes toward audio cassette lesson instruction	Student whose initial attitudes toward educational TV was high tended to be favorable toward audio cassette lesson instruction
Student attitudes toward broadcast TV instruction	Student attitudes toward broadcast TV were influenced by different TV formats (e.g., entertainment format vs documentary format)

Values of students toward learning through independent study	Students preferred independent study with individualized help in group study sessions, to traditional instruction
Student perceptions of independent learning instruction	Students felt they made better use of time, were better able to concentrate, were less bored, enjoyed learning more and felt time went faster, than in traditional instruction
Variables affecting student learning in an individual learning system	-Student achievement for introductory students was affected by completing remedial work -The female student was more successful using this system than were males, although both were successful in its use -Student achievement for advanced students was positively affected by completing remedial work -Advanced students with a high GPA consistently achieved better than did students with a lower GPA
Advanced vs. beginning students taking individual learning system instruction	On the occasion of taking the same individual learning system instruction, second year students in the program consistently out-performed first year students regardless of self instructional strategy
Perception of students on affect of group size and presentation mode on learning	Cooperative learning groups in combination with color computer simulation mode perceived that they achieved significantly more than was perceived by individuals in combination with black and white computer text mode
Effect of experience on learning through an expert system strategy	Experienced learners (e.g., those who had previously taught disabled students) performed significantly higher in diagnosing problems of disabled students than did inexperienced learners
Effect of aptitude for skills of formal reasoning and hypothesizing on learning through computer-assisted-instruction	Learners with higher aptitude for skills of formal reasoning and hypothesizing performed significantly better than those of lower skills

II. Effects of Age on Strategy Selection

Factor	Conditions
Preferences of older vs younger adults in distance learning	-Younger adults preferred subtle instructional formats (e.g., use of entertainment to demonstrate content) -Older adults preferred straightforward presentation of the documentary and/or on-camera authority figure presenter mode

III. Learner Control vs System Control

Factor	Conditions
Course-length self-pacing vs daily self-pacing	Students permitted to self-pace for entire length of course, performed better than students permitted to pace each day.
Self-initiated vs flexible testing schedule	When student is able to determine testing schedule, he/she performed better on test
Student choice vs no choice of delivery sys.	When student is given choice of self-instructional delivery system, he/she performed better.
Presence vs absence of mastery learning	When mastery learning strategy is combined with self-instruction strategy. student performance improved
Choice vs no choice of learning options	Students, where learning was prescribed both in activity and activity sequence, performed better than students who selected freely among the same activities.
Learner vs teacher/ machine control of review/practice	When primary review/practice decisions were controlled by teacher, students did better than students that had primary control
Choice of delivery medium in distance learning	Students chose broadcast TV as the more effective teaching medium from among five media

IV. **Student Working Alone vs In Collaboration**

Factor	Conditions
Individual vs group instruction	Individual instruction is preferred for high or middle level students; and/or for students completing familiar tasks. -Group instruction is preferred for students completing novel tasks; and for low level students.
Affect of group size on rate of completion of individual learning system courses	Students who were members of cooperative learning groups had higher completion rates than students working alone

V. **Time for Completion of Learning Activities**

Factor	Conditions
Time required by student to complete TV correspondence instruction activities	Low achieving students in TV correspondence course required longer time to complete activities than higher level students
Activity time requirements of students taking individualized instruction	Students completing all learning activities required more time than students who were permitted to select only those activities they wished
Test-taking time effects on students taking individualized instruction	Students completing all learning activities required shorter test taking time and performed better than students who were permitted to select only those activities they wished

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Discussion of the Idealized Model

Category #1, "Differences in Entry Behavior of Learners," primarily centers on the potential effects of initial learner characteristics, such as learner attitude about, preference for, and perception of, the proposed self-instructional course. This issue is especially critical when a student is involved in a self-instructional learning situation. It is essential to determine student expectations for the proposed course. If the student expectations do not

match actual experiences, then the student will experience feelings of dissonance. When there is dissonance between what the student expects and what he/she actually experiences, then these initial learner characteristics could potentially hinder or negatively impact student performance. An effort, then, should be made by instructional developers to either try to match or transform student expectations for the proposed self-instruction so that they will be congruent with the actual learning experiences. Perhaps clearly and explicitly describing the nature of the prospective learning experience will begin to address this issue.

The second category, "Effects of Age on Strategy Selection," focuses on the effects of the age of the learner. Sometimes the age of potential students in a self-instructional course may impact the instructional developer's selection of an instructional strategy. Age of the student is particularly a factor in strategy selection within the distance learning system.

Category #3, "Learner Control vs System Control," focuses on the desired balance between student and system or teacher decision-making. Research findings appear to indicate that giving students a choice concerning the mechanics of the learning process (for example, What delivery system would I like to use for this course?) may benefit student performance. However, giving students a choice concerning the process of learning (for example, Is there a need to practice this newly acquired skill?) may actually hinder student performance. One explanation may be that students may not have the knowledge or experience base necessary to make sound decisions concerning the best procedures to facilitate learning. On the otherhand, the student is the best judge of matters such as which medium best suits his/her needs, interests, or preferences. Often, student achievement (when using different self-instructional strategies) is not significantly different. These student decisions, then, may have little effect on student performance.

Category #4, "Student Working Alone vs. In Collaboration," focuses on the impact of both individual and group learning in the delivery of self-instruction. Decisions concerning the issue of whether students should work alone or in collaboration with other students depends upon the nature of the self-instructional learning condition.

The final category, "Time for Completion of Learning Activities," is concerned with the issue of time in the delivery of self-instruction. Several conditions are provided in which the impact of this factor is described.

Personal Reflections

First, performance of students learning through self-instruction was positively impacted when they participated in various group learning activities. The researcher found this to be a somewhat surprising finding for instruction which is not designed primarily for group interaction. It seems that it would be beneficial for future researchers to determine whether group activity should be a necessary part of self-instruction or whether this impact of group activity indicates that elements need to be added to self-instruction to fill the gap that is currently being filled by group activity. If group activity should, in fact, be included as an essential element in self-instruction, then perhaps researchers would need to investigate the effects that group learning have on self-instruction.

Second, the findings indicated that certain learner characteristics positively impacted while others negatively impacted student performance when learning through strategies within the three learning systems. It is the opinion of this researcher that it would be helpful to know what the instructional outcome would be when a self-instructional strategy is adjusted to prohibit learner characteristics which have a negative impact on student performance and to enhance those learner characteristics which have positives effects on student performance.

Third, components of educational support were found only among studies from the studies falling in the distance learning system category. Perhaps future researchers might answer questions such as the following: What are the effects of applying similar kinds of support components to strategies within the computer learning systems and the individual learning systems, as well.

Finally, it was interesting that some strategies were significantly more effective for some learners than for others. For example, female students performed significantly better than male students when using a remedial work strategy. Also, low achieving minority students performed significantly better using CAI than the low achieving minority students who were provided instruction using other self-instructional strategies. Perhaps future researchers will be able to explain such phenomena.

Summary

Chapter Five includes a summary of the findings, conclusions, and recommendations for further research. Based on the research studies identified, the percentage of studies for each of the three learning systems were: Individual learning system (44.63%), computer learning system (29.21%), and the distance learning system (26.17%). The strategies found to have the greatest impact on student achievement included computer-assisted-instruction, expert systems, self-teaching, and individualized instruction. Four categories of variables were found to significantly impact student performance. The categories were: learning environment, teacher/teaching process, learning material, and learner. Student support services currently provided are reportedly telephone office hours, study guides, individualized feedback, faculty phone calls.

The following conclusions were drawn:

-There appears to be an advantage to combining a group strategy (lecture) with a self-instructional strategy.

-Distance learning should include some periodic group learning activities.

-Learner characteristics should be accounted for in the design of distance learning.

-Instruction should be individualized for higher impact on student achievement.

-Instruction should permit student choice of learning options for higher positive impact on student performance.

-Consider strategies in the computer learning system for both individual and group instruction.

-Limit learner control of review and practice.

-The following learner characteristics should be accounted for in the design and delivery of instruction: perception of relevance, and aptitude.

-When looking across systems:

- student input in the learning process appears important;
- external interventions of performance standards appear to be needed; and
- the following learner characteristics should be accounted for in the design and delivery of the instruction: ethnicity, aptitude, and age.

The following research implications were suggested:

1. Investigate further the effects of the following:
   - including group learning activities in instruction within the distance learning system, and
   - accounting for learner characteristics in the design of instruction within the distance learning system.
2. Conduct further study of the effects of various strategies for individualizing instruction on student performance.

3. Further investigate the impact of learner control and learner characteristics on student performance in instruction within a computer learning system.
4. Conduct further studies of the impact of factors such as student input in the learning process and external intervention of performance standards, on student performance in instruction involving more than one educational system.

The researcher concludes by proposing an idealized model of self-instruction. The self-instruction model provides five factors (i.e., Differences in Entry Behavior of Learners, Effects of Age on Strategy Selection, Learner Control vs. System Control, Student Working Alone vs. In Collaboration, and Time for Completion of Learning Activities) and conditions which can serve the instructional developer as a guide when making decisions about what to incorporate in a self-instructional module.

APPENDICES

APPENDIX A

CODING SHEET

Appendix A

Coding Sheet

Area Record Dissertation / ERIC / Other

Title:

Author:

Effectiveness: skill taught

Efficiency: instructional time error other

Independent variables:

Dependent variables:

Form of Publication: dissertation master's thesis research report other:

Age of subjects: adult postsecondary

Level: College (1st yr.; 2nd yr.; 3rd yr.; 4th yr.; 5th yr.) Continuing Ed.

Ability Level:

Ethnicity: U.S. BL WH His Asian Am Indian Other
Foreign

Student diagnosis (problem):

Competency (skill/ task):

SI Strategy: PI CAI AI/Expert sys.
Individualized instruction Independent study self-teaching
distance education open education correspondence study
home study

Strategies compared:

SI Instructional System: Distance Learning Individualized Learning
Computer Learning

SI Systems compared:

Evidence of validation:

Type of Analysis:

Sample size:

Reliability:

Selection of subjects:

Possible explanation for results:

Findings:

Conclusions:

Recommendations:

Summary:

Conclusions:

Implications:

Special Notes:

APPENDIX B

STUDIES INCLUDED IN THE RESEARCH

Appendix B

Studies Included in the Research

Aiello, Nancy Carol (1981)

Baird, William E. (1985)

Brown, Robert; Cavert, C.; Craig, J.; Snodgrass, S. (1973a)

Brown, Robert; Cavert, C.; Craig, J.; Snodgrass, S. (1973b)

Camacho-Dungca, Bernadito (1987)

Deatsman, Gary (1971)

Dukeshire, Mabel (1966)

Emley, William (1986)

Garza, Diana (1986)

Green, George (1967)

Gunawardena, Charlotte (1988)

Harris, W.J. (1975)

Hein, Eleanor (1979)

Jonas, Myrtle (1982)

McLaughlin, Brian (1981)

McNeil, Barbara (1989)

Moin, Arifa (1986)

Pipko, Margaret (1980)

Prater, Mary (1987)

Segan, Frances (1980)

Stipe, Denise (1987)

Stubbs, Katherine (1984)

Sung, Nakdon (1986)

Tobin, Walter (1986)

West, LeRoy (1961)

Williams, Randall (1986)

Zulick, John (1976)

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