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ABSTRACT

This pre-post quasi-experimental study was conducted in a public school 5th grade class to determine the effects of video-taped instruction in teaching analysis and pattern finding skills. Methodology included guidelines from Cognitive Behavior Modification, Suggestopedia, and Guilford's Structure of Intellect Model within the Kaufman and Kaufman Sequential vs. Simultaneous Dichotomy. Elements of simultaneous and sequential learning, modeling, and self-monitoring were foundation components of "The Patterns and Systems Training." The hypothesis was to determine if improved cognitive skills to create higher-order thinking skill would facilitate reading improvement. Standardized cognitive skills tests were administered pre- and post-training to determine if improved simultaneous and sequencing skill would generalize to improved reading capability measured on the district's nationally standardized academic achievement tests. Gains at significant levels were obtained by the video-taped "Patterns and Systems Training" group in the Reading and Math subtests on the Science Research Associates (SRA, 1985) standardized tests. Contains 112 references, and 4 tables and 4 figures of data. (Author/RS)

Video-Taped Instruction Creates Listening and Visual Memory Integration For Higher Reading and Math Scores

By Jan Erland

Abstract

This pre-post Quasi-Experimental study was conducted in a public school 5th grade class to determine the effects of video-taped instruction in teaching analysis and pattern finding skills. Methodology included guidelines from Cognitive Behavior Modification, Suggestopedia, and Guilford's Structure of Intellect Model within the Kaufman and Kaufman Sequential vs. Simultaneous Dichotomy. Elements of simultaneous and sequential learning, modeling, and self-monitoring were foundation components of *The Patterns and Systems Training*. The hypotheses was to determine if improved cognitive skills to create higher-order thinking skill would facilitate reading improvement. Standardized cognitive skills tests were administered pre- and post-training to determine if improved simultaneous and sequencing skill would generalize to improved reading capability measured on the district's nationally standardized academic achievement tests. Gains at significant levels were obtained by the video-taped *Patterns and Systems Training* group in the Reading and Math subtests on the Science Research Associates (SRA, 1985) standardized tests.

A great demand exists for the teaching of higher-order thinking skills so students can excel in science, mathematics and comprehend complex reading information. Higher-order thinking skills depend upon specific cognitive underpinnings Often, these foundation levels of higher levels of memory and cognition are missing. (Hessler, G., 1982; Woodcock, R. W., 1978; Meeker, M. N., 1969; Guilford, J. P., 1967). Let's consider the findings of the National Assessment of Educational Progress (NAEP) testing in 1986 and 1988 (Mullis, V. S., Owen, E. H. & Phillips, G. W., 1990):

More than one-quarter of all 13 year-olds were unable to add, subtract, multiply and divide using whole numbers or solve one-step math problems.

Nearly 94 percent of high school seniors were unable to solve multi-step math problems or use basic algebra.

Almost 60 percent of high school seniors were unable to understand and summarize complicated reading material written above the 5th grade level.

In addition to problems with academic learning, students lack higher-order thinking skill needed for advanced academic levels. When teachers attempt to teach problem-solving skills, they are often faced with students who lack the information processing capabilities to think at advanced levels (Baker, P., 1991).

This study was undertaken to determine whether video- and auditory-tape instruction of cognitive skills training could enhance higher-order thinking skill leading to improved reading academic achievement scores in a classroom setting. It was hypothesized that the Experimental group receiving the cognitive training would significantly improve their cognitive processing skills, resulting in improved reading performance as measured by a standardized achievement test. This study would determine if improved cognitive skills results obtained in a private, carefully controlled setting in an earlier published report (Erland, J. K., 1989a), could be replicated in a typical 5th-grade classroom, using the same videoed life-size characters and a video monitor in place of the teacher, to improve reading scores.

Therefore, this paper is to propose that deficient underlying mental abilities can be identified and improved through pattern-detection and sequencing systems (analytical skill) training, hereafter referred to as *Patterns and Systems Training.* It can be asked, after identifying weak cognitive information processing areas, and improving them, can reading comprehension improve? Additionally, these abilities can be isolated and evaluated to determine their impact on higher order thinking skills. If we do this, mathematics, science, written language and computer skills will become easier to teach and learn (Guilford, J. P., 1988; Meeker, M. N., 1991, 1969).

When students lack an adequate foundation of mental skills, little progress can be made teaching higher-order thinking skills (Ruggerio, V., 1988; Sternberg, R. J., 1985; Woodcock, R. W., 1978; Meeker, M. N., 1991, 1969). Field testing in public-school classrooms reveals that many children have at least one deficient primary information processing avenue (Innovative Learning Systems, Inc. 1988-1990). Usually a student is either a visual or auditory learner, but seldom both. Higher-order thinking skills require the integration of both operable visual and auditory pathways using kinesthetic methods (Feuerstein, R., 1988; Hessler, G., 1982; Woodcock, R. W., 1978). It would appear logical to consider retraining weaker learning pathways (Feuerstein, R., 1988; Meeker, M. N., 1991, 1969).

Theoretical Background of Video Cognitive Skills Training

The combination of the following four well-known theories were incorporated in the procedures in this study:

1. Guilford's Structure of Intellect (Guilford, J. P., 1967)
2. Cognitive Behavior Modification, CBM (Meichenbaum, D., 1977)
3. Suggestopedia (Lozanov, G., 1978)
4. Simultaneous vs. Sequential Dichotomy (Kaufman, A. & Kaufman, N., 1983).

Principles from the following four theories were incorporated into the procedures:

Structure of Intellect Model (Guilford, J. P., 1967).

J. P. Guilford identified 150 different intellectual abilities and formed a model of working intelligence. These abilities are divided into content categories of intelligence operations. The Structure-of-Intellect Model is divided into five contents: Visual, Auditory, Symbolic, Semantic and Behavioral. The outcome products are divided into six categories of: Units, Classes, Relations, Systems, Transformations, and Implications. The five mental operations are: Evaluation, Convergent Production, Divergent Production, Memory, and Cognition. The model was designed to bring about the transfer of interlocking mental skills to applied learning.

Dr. Guilford received a number of honorary recognition's for this model. The American Psychological Association granted him *The Distinguished Scientific Contribution Award* in 1964, and its first *Richardson Creativity Award* in 1966. Another award was *The Distinguished Scholar Award* from The National Association for Gifted Children, and *The Gold Medal* from The American Psychological Foundation in 1983.

His psychology graduate student at the University of Southern California, Mary Meeker (1969), designed a cognitive skills retraining program now widely implemented in U.S. and Japanese public school systems (Guilford, J. P., 1984). This was among the first research in intelligence improvement applied to practical learning.

Cognitive Behavior Modification (CBM).

CBM was developed with the theoretical input of several prominent psychologists. In 1977, Donald Meichenbaum combined the theories of Jean Piaget's *Theory of Intelligence*, (1950), B. F. Skinner's *Theory of Behavior Modification*, (1953), and Albert Bandura's *Social Learning Theory* (1971) into a working model. Cognitive training includes modeling and self-instructional, self-monitoring techniques by means of private speech rehearsal (Armbruster, B. B.,1983). This instruction is based upon the interactive, reciprocal nature of the thoughts, feelings and behaviors of one's own thought processes (McDaniel, E. & Lawrence, C., 1990; Meichenbaum, D., 1977).

Suggestopedia (Lozanov, G., 1978).

Suggestopedia is an accelerated learning pedagogy for students in elementary school to adult learning. The comprehensive methodology using the principle of suggestion can be applied to any curriculum and be used at any grade level. The instruction was originally designed to intensively teach foreign languages (Alderson, J., 1993). Other applications include reading, math, and language instruction, typing, and high school science classes (Palmer, L., 1990).

Suggestopedic procedures include initial physical relaxation along with accelerative learning techniques which include memorization with rhythm and vocal intonation, role playing, guided imagery, and suggestive principles.

Simultaneous versus Sequential processing (Kaufman, A. & Kaufman, N., 1983)

Simultaneous processing involves imagery, or wholistic gestalt specialization. Information is seen or heard as one entity. Sequential processing involves learning information step-wise, a foundational component of reading comprehension, spelling, mathematics, grammar, following oral directions, and instructional procedures. Paivio (1986) contended that the dual-processing system of speaking (sequential processing) and nonverbal imagery (simultaneous processing) is the underlying foundation for memory and thinking. When combined into whole-brain thinking, these two brain functions allow rapid learning to occur (Kaufman, A. & Kaufman, N., 1983).

In general, researchers have found that students often perform poorly on sequencing ability tests (Erland, J. K., 1989b; Kaufman, A. & Kaufman, N., 1983). Teachers echo this concern about their students' inability to follow in-class verbal directions (Baker, P., 1991), which usually are given in an auditory, step-by-step (sequential) format (Baker, H. & Leland, B., 1935, 1967).

This encoding-decoding and memory expansion bridge may be absent with traditional methods of teaching (see figure 1) (Erland, J. K., 1989a; Sternberg, R. J., 1985; Woodcock, R. J., 1978; Johnson, D. L. & Myklebust, H. R., 1967). With students' visual and listening memory levels remaining in a static position, encoding-decoding ability suffers (Kamhi, A. G. & Catts, H. W., 1989). Critical thinking does not result, and therefore test-taking ability does not improve.

Even if problem areas are identified through standardized testing, the question still remains, can cognitive deficiencies be addressed and remediated in the classroom? Will elevated cognitive skills generalize to improved academic proficiency in Reading?

Method

Overview

This pre-post Quasi-Experimental study was implemented in a 5th grade public school classroom. A Control group was randomly selected from one of four of the teacher's previous academic years, teaching the same grade at the same school.

The instruction was conducted with teacher assisted video-taped- and audio-tape technology. Elements of simultaneous and sequential learning, encoding and decoding, modeling and self-monitoring were foundation components of the applied techniques. Cognitive skills tests were administered pre-post training for inter-analysis with the district's nationally standardized academic achievement tests.

An intra-analysis of seven remedial and learning disabled students (RD/LD), within the class of 20 students, was also performed. These seven RD/LD students had qualified for special reading and learning disability programs according to state funding guidelines.

Subjects

Experimental Group. A fifth-grade class of 20 students (12 males and 8 females) from a low-to-middle income, small, midwestern farming community (pop. 15,200) was selected for the study. The teacher described this class as being typically average in ability with several learning and behavioral problems that were assigned to her because of her teaching experience. The mean Grade Equivalent at entry for the class was 5.58. Included in this class were seven RD/LD students. Their ages ranged from 10 to 12, with a mean age of 11.4. There were 18 Caucasian students and two Hispanics. Few of their parents had formal education beyond high school.

Control Group. Other SRA achievement test scores, of fifth-graders from the teacher's previous year's class at the same school, were available for further analysis by the district. The randomly selected Control group consisted of 18 fifth-grade students, including one learning disabled (LD) student. This single student could not establish comparative purposes of the RD/LDs in the Experimental group. The SRA mean Grade Equivalent at entry was 6.64.

The Control group received individualized cognitive testing. However, only ten of the eighteen students in the Home Base Class were available for the testing. Both pre- and post-cognitive skills tests were administered individually to each of the ten students.

A published report (Erland, J. K., 1989a) of 40 experimentals and 40 controls tested with the same cognitive tests, and implementing the training, revealed that no significant cognitive skills gains were made by the Control group. Since this earlier report had delineated cognitive gains with longitudinal benefits when the same training was applied in a small, private setting, it was suggested that cognitive skills gains may generalize to reading improvement in a classroom setting. Therefore, it was predicted that the Experimental training group's reading subtest scores on the Science Research Associates Standardized Achievement Testing (SRA, 1985) would exhibit greater gains than the Control group.

Learning/Reading Disabled Group. An intra set of seven Reading (RD) and Learning Disabled (LD) students was intra-analyzed. This set included four males and three females, all Anglo-Saxon. The mean age for the seven students was 11.7 years. None had repeated grades, and all had received remedial services for two previous years.

Materials/Instruments Used

The Mental Foundation Requirements-

Focus cognitive areas were:

visual sequential memory (Meeker, M. N., 1991, 1969; Hessler, G., 1982; Reid, D. K. & Hresko, W. P., 1981)
auditory sequential memory (Meeker, M. N., 1991, 1969; Hessler, G., 1982; Reid, D. K. & Hresko, W. P., 1981)
visual and auditory closure for details (Kamhi, A. G. & Catts, H. W., 1989; Hammill, D. D., 1985)
symbolic and figural content (Meeker, M. N., 1991, 1969; Rumelhart, D. E. & McClelland, J., 1986)
auditory and visual memory for words (Hammill, D. D., 1985; Kirk, S. A. & Chalfant, J. C., 1984)
classifying information (Meeker, M. N., 1991, 1969; Kamhi, A. G. & Catts, H. W., 1989; Sternberg, R. J., 1985)
encoding and decoding information (Kamhi, A. G. & Catts, H. W., 1989; Sternberg, R. J., 1985)
spatial and directionality skills (Gardner, H., 1993; Meeker, M. N., 1991, 1969; Hessler, G., 1982; Hammill, D. D., 1985)

Cognitive Tests. Several standardized cognitive subtests from two different batteries were selected on the basis of their reliability factor, and Woodcock's 1978 Hierarchy Theory (see figure 1), to measure each student's abilities (Hessler, G., 1982; Woodcock, R. W., 1978) Four subtests were selected from the DTLA-2 (Hammill, D. D., 1985), and four subtests were chosen from the Woodcock Johnson Psycho-Educational Battery-1 (Woodcock, R. W. & Johnson, M. B., 1977). These instruments were designed to measure perceptual processing in visual and auditory sequential memory and visual simultaneous memory (Kaufman, A. & Kaufman, N., 1983; Hessler, G., 1982).

Insert figure 1 here

Five subtests were selected to measure *successive processing*, and three subtests were selected to measure *simultaneous processing* (Kaufman, A. & Kaufman, N., 1983; Hessler, G., 1982; Woodcock, R. W., 1978).

The five subtests measuring *successive processing* were: DTLA-2 No. 4 (Memory For Unrelated Word Sequences); WDJ No. 3 (Auditory Memory For Sentences); WDJ No. 10 Number Reversals); DTLA-2 No. 11 (Memory For Letter Sequences); and DTLA-2 No. 3 (Following Oral Directions).

figure 1

LEVEL OF PROCESSING	SUCCESSIVE	SIMULTANEOUS
Conceptual		
	TCS Test of Cognitive Skills Battery	
	DTLA #3 Oral Directions	DTLA #3 Oral Directions
Symbolic	WJ #10 Number Reversals	WJ #10 Number Reversals
	DTLA #11 Letter Sequences	DTLA #11 Letter Sequences
	WJ #3 Memory for Sentences	
Memory	DTLA #4 Word Series, Nouns	DTLA #4 Word Series, Nouns
		WJ #2 Spatial Relations
		WJ #7 Visual Matching
Perceptual		DTLA #10 Word Fragments

TCS = Test Cognitive Skills, Sullivan, Clark, and Tiegs, 1981
Based upon the California Maturity Scales
DTLA-2 = Detroit Tests of Learning Aptitude, Hammill, 1985
WJ = Woodcock Johnson Psycho-Educational Cognitive Skills Battery, Woodcock and Johnson, 1978, 1989

Based upon Johnson & Myklebust's information processing hierarchy theory (1967), and adapted from Woodcock's level of processing theory (1978).

The three subtests measuring *simultaneous processing* were: DTLA-2 No. 10 (Visual Closure Word Fragments); WDJ No. 7 (Visual Speed Number Match); and WDJ No. 2 (Visual Memory For Spatial Designs).

The WDJ *simultaneous processing* subtests No. 2 & No. 7, and the *successive processing* subtests No. 3 & No. 10 are computed in clusters of two subtests each. Therefore, the eight subsets are reported as six.

At the conclusion of the twelve-week treatment period, the same cognitive tests were re-administered to the students. Post-testing procedures identical to the pre-treatment testing were administered and evaluated by the investigator who had a Masters Degree in Special Education, and qualified in assessment and evaluation. All of the eight subtests were administered individually.

Woodcock-Johnson Psycho-Educational Battery (1977, 1978), Cognitive tests Part I, Based upon Woodcock's Level of Processing, 1978 (figure 1)

Two Subtest Clusters:

2 &7 (Visual Speed) Reliability .91, with over 4000 subjects

3 & 10 (Auditory Memory). Reliability .90. with over 4000 subjects

The Detroit Tests of Learning Aptitude-2, Hammill 1985, subtests:

	Reliability, Ages 16/17	Validity, Ages 16/17
3 (Oral Directions)	86	74
4 (Unrelated Word Series)	90	66
10 (Word Fragments)	97	53
11 (Letter Sequences)	92	63

Achievement Tests. To obtain an academic achievement comparison with the cognitive testing, pre- and post-treatment scores on the standardized Science Research Associates tests (SRA, 1985) were analyzed. The subtests included Reading, Language Arts, Math, Science, Reference Materials and Social Studies.

At the end of the previous grade (fourth), each child received routine SRA testing, which served as the pre-test. At the conclusion of fifth grade and the twelve weeks of training, the SRA achievement tests were re-administered to serve as post-test comparisons. The classroom teacher administered these achievement tests, which then were scored and interpreted by the SRA company.

Other Materials Used

Workbook Lessons. Each student received a copy of the Mem-ExSpan's ***The Bridge To Achievement (BTA)*** (Erland, J. K., 1994, 1991, 1988, 1986, 1985, 1981) lesson for each day and a personal folder for daily work. ***The Bridge To Achievement*** implements simultaneous and sequential instruction directed at training J. P. Guilford's (1967) primary cognitive abilities. The teacher implemented video and audio tapes corresponding to the workbook lessons in teaching the daily assignments. [1]

Stimulus figures. Life-size wooden figures were video- and audio-taped as models for the teaching lesson. This teaching tool was within a Suggestopedia design framework (Lozanov, G., 1978). Three males and two females models, in varying age ranges, and speaking with a variety of vocal qualities, were featured for the students (Erland, J. K., 1989c).

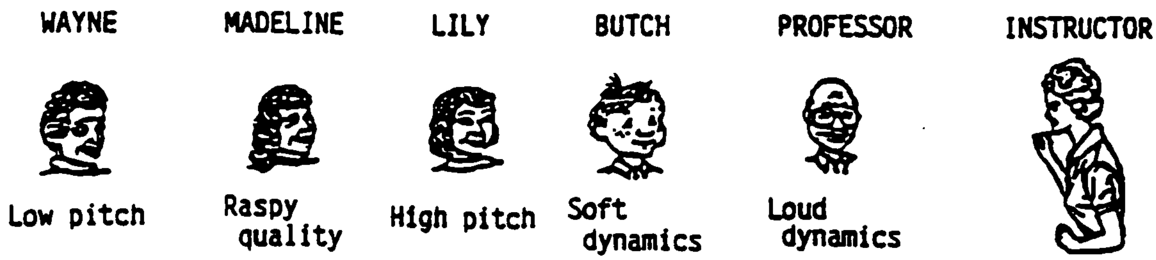
Insert figure 2 here

The students were to imitate and recite with the characters while pretending they were actors auditioning for parts in television commercials. Reciting in a variety of voices ranging from low, to squeaky and high created interest in the lesson and memory rehearsal process (Erland, J. K., 1992). Like television viewing, the training added an entertainment factor to the lessons (Postman, N., 1985).

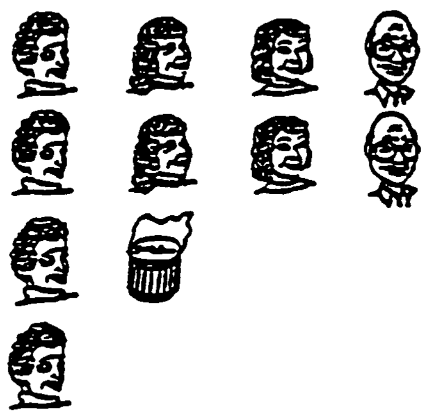
[1] Due to time constraints, *The Bridge To Achievement* Spelling lessons were not used.

figure 2

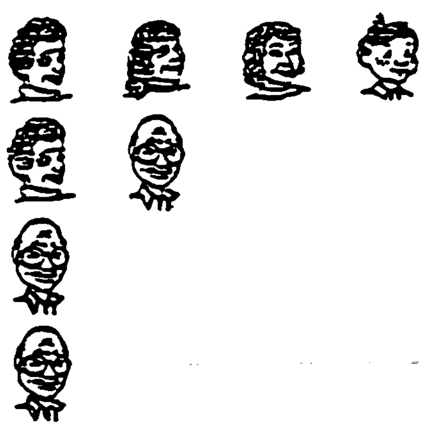
These characters do the speaking in each lesson:



TYPICAL CHARACTER REPETITION ORDER



- repetition 1 (Wayne, Madeline, Lily, Professor)
- repetition 2 (Wayne, Madeline, Lily, Professor)
- repetition 3 (Wayne, drum)
- repetition 4 (Wayne)



- repetition 1 (directions) (Wayne, Madeline, Lily, Butch)
- repetition 2 (encoding) (Wayne, Professor)
- repetition 3 (code) (Professor)
- repetition 4 (code) (Professor)

- repetition 1 (Madeline)
- repetition 2 (Wayne)
- repetition 3 (Lily)

The life-size videotaped figures were used as class models for the following reasons:

I. The variety of vocal intonation including pitch variations, tonal changes and sound dynamics in the characters' voices was designed to enhance visual and auditory memory (Gilmor, T., Madaule, L. P. & Thompson, B., 1988; Render, G. F. & Anderson, L. D., 1986; Lozanov, G., 1978).

2. The lineup of faces chunked, in sequence, the bits of information to be learned. The video screen featured one large face at a time. Thus, the continuous rehearsal rotations of the various faces produced sequential analytical skills instruction (Erland, J. K., 1989a). This format created a recursive, rehearsal paradigm (Hofstadter, D. F., 1989; Erland, J. K., 1980).

The characters became an important tool in portraying both simultaneous components and analytical sequence components (Erland, J. K., 1989a), thus creating a simultaneous - sequential partnership teaching method (Kaufman, A. & Kaufman, N., 1983). The shift between the two systems were designed to form visual and auditory integration, the basis for comprehension ability (Kamhi, A. G. & Catts, H. W., 1989; Rumelhart, D. E. & McClelland, J. L., 1986).

3. The animated, vocal characters were non human, nonauthorative figures were implemented to reduce the stress surrounding the intensive rehearsal procedures. They were given personal identities (Bandura, A., 1971) to heighten the emotional arousal, motivation and attention of the learner. Suggestopedia demonstrates that learning is accelerated under this condition (Lozanov, G., 1978).

4. Because of their special identities, the characters qualified as motivating models (Hall, V., 1983; Bandura, A., 1971).

5. The figures created a point of focus, attention and concentration, all which are requirements of Social Learning Theory (Kaplan, J. S., 1991; Bandura, A., 1971). The faces formed a gestalt framework on the video screen and became a simultaneous memory aspect (Erland, J. K., 1989a).

6. Because they were non human wooden characters, the possibility of distracting facial movements or expressions was eliminated. Only the mouths of the figures moved with syllabized speech. The large solid videoed figures were implemented to improve visual closure, which is visual processing in a whole-pattern formation (Paivio, A., 1986; Kirk, S. A. & Chalfant, J. C., 1984), a fundamental requirement for reading (Kamhi, A. G. & Catts, H. W., 1989; Coles, G., 1987).

7. The videoed character format was selected as part of the Suggestopedic design to create a warm, close, stimulating environment conducive to learning and memory training (Erland, J. K., l992; Cormier, S., 1986; Shuster, D. H. & Gritton, C. E., 1986; Lozanov, G., 1978).

Video-Taped Recordings.

Video-taped recordings of the lessons using the characters were played for the class-training exercises. The various wooden faces, acting in a progression format, modeled the exercise segments. Each character impersonator was filmed separately in succession (Erland, J. K., 1992, 1989a).

Therefore, as the figures recited individually in rotation, the learning segment cycled both vocally and visually. The videoed action included several formats that were tailored to the lesson context and content.

Audio-Tape Recordings.

The same lessons and formats had accompanying audio-tapes for auxiliary classroom use. The letter sequence warm-ups (Rumelhart, D. E. & McClelland, J. L, 1986), and the Latin root cool-downs (Gardner, H., 1993b; Sternberg, R. J., 1985; Devine, T. G., 1982) were implemented with audio-tape instruction.

Academic Content

The video- audio-tapes included sequenced instruction from ***The Bridge To Achievement*** (Mem-ExSpan, 1981, 1985, 1986, 1988) in the following areas:

Sight words and reading comprehension (Deschant, E. V. 1991; Cairney, T., 1990; Kamhi, A. G. & Catts, H. W., 1989; Just, M. & Carpenter, P. A., 1987; Rumelhart, D. E., & McClelland, J. L., 1986; Armbruster, B. B., 1983)
Spelling words and non related letter sequences (Deschant, E. V., 1991; Downing, P., Lima, S. & Noonan, M., 1992; Rumelhart, D. E., & McClelland, J. L., 1986)
Vocabulary and Latin root words (Gardner, H., 1993b; Sternberg, R. J., 1985; Devine, T., 1982)
Math computation (Gardner, H. 1993b; Sternberg, R. J., 1985; Kline, M., 1985; Reid, D. K., & Hresko, W. P., 1981)
Grammar and syntax (Kess, J. F., 1992; Kamhi & Catts, 1989; Goodman, K. 1987)
Numerical digit spans (Kline, M., 1985; Hessler, 1982; Woodcock, 1978)
Following oral directions (Simpson, Greg B.,1991; Hammill, 1985; Erway, E. A., 1984; Devine, T. E., 1982)
Following figural sequences (Jackendoff, R. S.,1992; Schiffer, S. & Steele, S.,1988; Meeker, 1991, 1969)
Following symbolic sequences (Hoffman, R. R. & Palermo, D. S., 1991; Dinsmore, J., 1991; Meeker, M., 1991, 1969)
Spatial and directionality skills (Meeker, M., 1991, 1969; Margolis, H., 1987; Hessler, 1982)
Poetry repetition (Gardner, H., 1993; Simpson, G. B., 1991; Hessler, 1982; Hammill, 1985)

Training Schedule

The students used ***The Bridge To Achievement*** (Erland, J. K., 1994, 1989, 1988, 1986, 1985, 1981) Lessons 2-40, for twelve weeks, of one semester. The spring semester was selected to maintain program continuity because there were fewer holiday interruptions.

The students were scheduled to train during the first 30 minutes of the morning, four times weekly. This constituted two hours of training per week, for twelve weeks or a total of 24 hours. The training was performed in the home-room class at the time the teacher normally took daily roll and lunch collections. This was found to be an effective time to apply memory and higher-order thinking skills training.

The mental stimulation was designed to accelerate the learning process for the remainder of the day. Suggestopedic physical and mental relaxation techniques (Lozanov, G., 1978) were not applied in this training. Not only were there time constraints, but the emphasis was to activate, stimulate and engage the learner with the early morning mental stimulation training.

Training Procedures

The study was designed to minimize teacher instruction and initial teacher training. The teacher implemented the exercises using the instructional manual, auditory and video-tapes. The teacher's role was to maintain classroom discipline and structure, introduce each lesson with its procedures, lead the self-affirmations, and then teach the higher-order thinking skills lessons (Erland, J. K., 1994).

Students were seated with their desks continuously touching in four horizontal parallel rows facing the video monitor. Based upon the individualized pre-training cognitive testing, and unbeknownst to them, students were paired high and low visual, high and low auditory.

Before beginning the work session, the entire group recited two self-affirmations, which are positive statements designed to motivate and encourage participatory learning for each individual student (Bower, G., 1987; Meichenbaum, D., 1977). Examples of the statements are: "learning is fun," "I believe in myself and my abilities," "I like to work hard," and "I feel good when my work is done."

The students were encouraged to show positive enthusiasm and support for one another as motivating and attentional factors (Schuster, D. H. & Gritton, C. E., 1986; Bandura, A., 1971) that increase the retention of learned material. Discipline and structure were maintained throughout each lesson. The students maintained rapt attention with no visiting among them.

Following the self-affirmations, each daily training session began with two five-minute "Warm-Up" lessons. The exercises were designed to incorporate various visual and auditory processing skills that influence word recognition (Kamhi, A. G. & Catts, H. W., 1989; Rumelhart, D. E. & McClelland, J. L., 1986).

Drill and Practice Defined: Traditionally, drill and practice is repeated out-put trials by the student. It forms rote learning through speaking or writing. In former years, students routinely learned spelling words and math facts through rote drill. With *Patterns and Systems Training*, the out-put trials are created by the puppet models on video-tape, and are treated as the rehearsal practice of mental encoding-decoding games.

The daily lessons gradually progressed in complexity during the course of the training (Sulzar-Azaroff, B., 1991; Decker, P. J., 1985). The information chunking procedure began with a series of three items and progressed to ten items (Miller, G. A., 1981, 1956). The students began by rehearsing three unrelated items within the categories of letters, colors, numbers and words, reciting with the video-taped character models. By the end of the twelve-week semester, the students were rehearsing strings of ten items in varying chunked formations (Erland, J. K., 1989c). The objective was to enhance their encoding and decoding processes (Sternberg, R. J., 1985), and their ability to follow complicated step-wise procedures through memory strengthening (Baddeley, A. D., 1986; Kamhi, A. G. & Catts, H. W., 1984; Howard, D., 1983).

Insert figures 3 & 4 here

The exercise drills were specifically designed to switch back and forth between simultaneous and successive processing (Kaufman, A. & Kaufman, N., 1983; Hessler, G., 1982). The purpose was to encompass the entire thinking process and to include all cognitive thinking abilities (Guilford, J. P., 1967). Therefore, students favoring one style of processing over the other (Dunn, R., Dunn, K. & Price, G. E., 1987) soon became engaged in, and were comfortable with, both cognitive styles. Each drill included several sequential properties and several simultaneous properties (Kaufman, A. & Kaufman, N., 1983). This was to activate a synergistic mental cognitive shift (Coles, G., 1987), creating multi-sensory integration (Struppler, A. & Weindl, A. W., 1987; Clark, B., 1986; Reid, D. K. & Hresko, W. P., 1981; Woodcock, R. W., 1978). If an individual can integrate information across modalities academic skills are improved (Kamhi, A. G. & Catts, H. W., 1989; Reid, D. K. & Hresko, W. P., 1981).

A video-taped face and accompanying voice represented each segment of the exercise (Erland, J. K., 1992, 1989a). The students in unison recited with each video character segment, gradually and systematically memorizing the sequence. They repeated the recitations using the voices, as self-talk rehearsal is a CBM guideline (Sulzar-Azaroff, B., 1991; Meichenbaum, D., 1977).

This design was to increase memory span capacity and resilience (Baddeley, A. D., 1993; Howard, D., 1983). As the segments increased in length, the students automatically incorporated the additional information. Both video- and auditory tapes were used for the

figure 3

CONTENT TITLE: Series of Unrelated Words MATERIALS NEEDED: Instruction Sheets

OBJECTIVE: To remember facts and names MEMORY RETAINER LESSON: 6, 7, 8

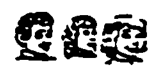
Repetition #	Directions	Time	Purpose And Modality To Improve	T V Mode	Brain Hemisphere
1.	Read series in the manual.	8 Min.	Visual-Sequential Memory		RB-LB
2.	Look at T.V. sequence. Lightly repeat overtly.		Overall Gestalt (faces). Speech-language Area Synthesis Encoding Visualization	Parts 	RB-LB
3.	Focus on segments, memorizing each component.		Analysis Decode Auditory-visual	Parts 	RB-LB
4.	Covertly repeat, absorbing rhythmic beat of segments. Pull into a whole.		Synthesis Auditory-verbal memory	Single Wayne drum 	RB
5.	Repeat covertly entire sentence.		Analysis Auditory-sequential memory	Single Wayne 	LB
6.	Independently repeat sequence.		Synthesis Auditory-sequential memory	T.V. on pause	LB
7.	When all of the members of the groups have recited, all students simultaneously write down on paper the sequence from memory		Visual-Motor Integration, Visual Sequential Memory, Visual Closure, Encoding-Decoding		LB-RB

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figure 4

Memory Retainer Lesson #7

Series of Unrelated Words - Advanced Level

Series of 6 Unrelated Words

1. sky, mode, control, system, one, the
2. prevent, camera, man, extreme, bellows, hello
3. which, need, photograph, probably, can't, its
4. impulse, injure, helped, quiet, value, mental
5. causes, life, annoyance, strain, irritability, feeling
6. percentage, residents, affected, age, intensity, risk
8. select, exposure achieve, most, automatic, why
9. surrounding, police, confederate, problems, amount, demonstrate
10. stereotype, others, themselves, plenty, molasses, zeal
11. human, meat, Eskimo, way, oysters, casual
12. bread, incredible, feats, fueled, reminded, health
13. intrigued, implications, behavior, fast-food, press, went
14. surpass, species, individuals, plenty, environment, message
15. experiments, gourmet, vegetarian, characterize, only, not
16. formation, observers, should, appropriate, prefer, add
17. as, scuba, tennis, thus, admitted, feeling
18. helped, impeccable, railed, bin, selects, smooth
19. doctors, months, and, awkward, pleasant, doesn't
20. purchase, natural, potential, told, thousands, supreme

instruction. The sequential video- or auditory taped action became an exercise of mentally chunking a sequence of cycling patterns (Erland, J. K., 1989c; Simon, H. A., 1979, 1974).

Results

Since the design of the training exercises included the foundation cognitive skills components of reading (Kamhi, A. G. & Catts, H. W., 1989), and previously published positive results of the training (Erland, J. K., 1989a), significant gains on the SRA (1985) *Reading* subtest were predicted.

This Quasi-Experimental design analyzed SRA test scores with fifth grade students as the Experimental group. The teacher's previous years' SRA 5th grade class data, was randomly selected from one of her four previous teaching years, (all classes were taught in the same classroom at the same school) to serve as the Control group.

Cognitive Skills

It was hypothesized that students who received the video-analytic skills training would evidence greater cognitive skills improvement than students who did not receive such training. To test this hypothesis, separate ANCOVAs were calculated, based on raw scores, for DTLA-2 No. 4 (Memory for Unrelated Word Sequences), DTLA-2 No. 3 (Following Oral Directions), DTLA-2 No. 11 (Memory for Letter Sequences), DTLA-2 No. 10 (Visual Memory for Spatial Designs), WDJ No. 2 (Visual Memory for Spatial Designs), and WDJ No. 7 (Visual Speed Number Match), WDJ No. 3 (Auditory Memory for Sentences), and WDJ No. 10 (Number Reversals) (Hammill, D. D., 1985, Woodcock, R. W. & Johnson, M. B., 1977). See figure 1, for the names of these tests, and why they were selected to measure Simultaneous and Successive Processing.

Consistent with predictions, Experimental video-training students evidenced greater improvement than did Control students on all cognitive skills tests: Fs ranged from 4.47, $p < .05$, for DTLA-2 No. 4, to 68.69 for DTLA-2 No. 3, $p < .001$ (all ANCOVAs with 1 and 27 df). Similar results were obtained, even with the correspondingly smaller samples, when normal and Special Needs students' gains were separately analyzed, with the exception that DTLA-2 No. 4 for both groups, and WDJ Nos. 7 and 10 for the Special Needs students no longer reached the .05 level of significance. Results appear in Table 1.

Insert Table 1 here

Table 1

Pre-test and Post-test Raw Scores of Controls (No Training) and Experimentals (Video-training) Groups on Cognitive Skills Tests - 5th Grade Public School Classroom of 20, Ottawa, KS

		Controls (n = 20)				Experimentals (n = 20)			
		Pretest		Posttest		Pretest		Posttest	
Test	**Total Poss. Pts.**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Simultaneous Processing Tests									
DTLA 10	**(39)**	**25.90**	**4.10**	**27.10**	**3.64**	**21.95**	**8.04**	**29.35 ***	**4.89**
WDJ 2	**(74)**	**41.60**	**4.81**	**41.60**	**4.48**	**41.50**	**5.24**	**49.85 @**	**6.65**
WDJ 7	**(30)**	**19.10**	**2.96**	**20.50**	**4.04**	**18.60**	**2.72**	**22.95 +**	**2.61**
Successive Processing Tests									
DTLA 3	**(55)**	**38.30**	**5.52**	**39.50**	**4.35**	**42.40**	**6.26**	**52.10 @**	**3.31**
DTLA 4	**(30)**	**13.70**	**5.17**	**16.40**	**7.63**	**12.45**	**5.06**	**17.50 +**	**4.86**
DTLA 11	**(67)**	**39.60**	**9.81**	**38.80**	**10.86**	**53.60**	**7.37**	**64.30 @**	**5.91**
WDJ 3	**(30)**	**14.80**	**3.91**	**15.20**	**2.97**	**11.90**	**2.25**	**15.35 @**	**2.50**
WDJ 10	**(21)**	**7.10**	**2.92**	**8.30**	**2.63**	**7.95**	**3.61**	**11.50 @**	**2.89**

Note: N = 30. +p < .05; *p < .01. @ p < .001 Significantly different mean gains are based on ANCOVA results with 1 and 27 degrees of freedom.

Academic Skills

It was hypothesized that students who received video-taped *Patterns and Systems Training* would evidence greater reading improvement than students who did not receive such training. To test this hypothesis, students' pretest and posttest percentile scores on the SRA (1985) achievement tests were first converted to standardized, normal curve equivalents ($M = 100$, $SD = 15$), then separate ANCOVAs were calculated for Reading, Mathematics, Language Arts, Social Studies, Science and Reference Skills. Results appear in Table 2. Consistent with the prediction, video-training students evidenced greater reading improvement than did no-training students, $F\ (1, 35) = 10.16$, $p < .003$ (Grade Equivalent, or GE, gains were 3.76 and 1.76 years, respectively).

Although not predicted, a similar pattern was also evident for Mathematics, $F\ (1, 35) = 18.24$, $p < .001$ (GE gains were 3.22 and .95 years, respectively). Between- group differences for Language Arts, Social Studies, Science and Reference Skills did not approach significance.

Because video-training Experimental students' pretest Reading scores were significantly lower than those of no-training Control students, $t\ (36) = 2.32$, $p < .03$, it could be argued that the greater gain of the former was due, at least in part, to regression toward the mean. Two lines of evidence argue against this interpretation, however. First, following a procedure recommended by Oldham (1962) to control for significant preexisting differences, an ANCOVA was computed on Reading scores using the average of pretest and posttest scores, i.e., (pretest + posttest)/2, as the covariate. The between-group difference remained significant, $F\ (1, 35) = 16.19$, $p < .001$.

Second, the lower pretest Reading scores in the video-training versus the no-training group could be due to the greater number of Special Needs students in the former than in the latter (7 versus 1). If this reasoning is correct, then removal of Special Needs students should approximately equate the groups on pretest Reading scores, while the posttest difference should remain significant. Results supported this analysis: When Special Needs students were removed, mean pretest Reading scores for normal students in the Experimental and Control groups no longer significantly differed (standard score pretest $Ms = 104.69$ and 107.35, respectively), $t < 1$. ANCOVA results remained significant, however, $F\ (1, 27) = 7.40$, $p < .01$ (standard score posttest $Ms = 115.54$ and 108.94, respectively).

In contrast, pre-test Reading scores of Special Needs students in the Experimental group averaged significantly lower than those of normal students in the Control group, t (22) = 4.18, $p < .001$ (standard score Ms = 90.43 and 107.35, respectively). Although the average Reading gain made by the former roughly paralleled that made by normal Experimental students (GE gains were 3.09 and 4.12 years, respectively), this gain did not significantly differ from that of the Control group normals (GE gain = 4.12 years), $F (1, 21) = 1.67$, $p > .20$ (standard score posttest Ms = 101.00 and 108.94, respectively).

Table 4 shows a comparison in Grade Equivalent (GE) gains of the Special Needs students with the Experimental and Control groups. The Special Needs students improvement exceeded that made by the Control group.

Interestingly, the standard score gains in Reading and Mathematics for the entire Experimental group were strongly correlated, $r (18) = .67$, $p < .001$, whereas this correlation was not significant in the no-treatment group, $r (16) = .38$, $p > .10$. Although not predicted, this finding is entirely consistent with the suggestion that the shared variance of Reading and Mathematics gains in the former was due to a common cause, i.e., to the video-taped *Patterns and Systems Training*.

One might question the validity of using a randomly selected intact class, from one of the teacher's four previous teaching years, as a Control group. Individual scores from this class on the SRA tests were available.

Composite scores of the teacher's previous four years of teaching fifth grade were available, and Grade Equivalent (GE) Means were tabulated for the subtest scores. Table 3 shows a comparison of the Grade Equivalent Means of the various subtests. This would serve as an indicator for comparison between the teacher's Mean scores and the scores obtained in this study. This would give an indication as to whether there were gains beyond what she routinely achieves.

Table 3 represents the four-year (GE) post-test average, as well as the Experimental group's post-test average, on the respective SRA achievement tests. As can be seen, while the post-test averages for Language Arts, Social Studies, Science or Reference Skills do not differ (-.1, 0, -.1, and .1 years, respectively). However, the Reading and Mathematics averages, the two tests on which substantial gains by the Experimental group were evident, do differ (1.5 and 1.4 years, respectively). Thus, while not definitively solving the intact-group problem, this pattern of findings certainly suggests that the Control group used in this study was representative of prior classes, and was therefore a viable baseline against which gains due to video-taped *Patterns and Systems Training* could be compared.

Insert Tables 2, 3, & 4 here

Table 2

Pre-test and Post-test Standard Scores of Control and Experimental Groups on SRA Achievement Tests

	Controls (n = 18)				Experimentals (n = 20)			
	Pre-test		Post-test		Pre-test		Post-test	
Test	M	SD	M	SD	M	SD	M	SD
R	106.78	9.33	108.06	9.69	99.70	9.41	110.45*	13.79
M	109.67	11.49	106.94	10.25	103.00	8.97	111.95*	15.26
LA	104.17	9.28	108.17	13.07	100.55	8.15	103.55	7.30
So+	105.22	9.86	104.00	7.30	100.58	7.59	104.26	7.49
Sc+	105.22	9.17	104.50	8.73	102.53	12.74	102.53	6.79
RS+	107.11	10.76	105.56	6.67	104.79	6.90	104.58	4.65

Note: N = 38, except where + denotes N = 37. *p < .001. Significantly different mean gains are based on ANCOVA results with 1 and 35 (or 34) degrees of freedom.

R = Reading Composite
M = Math Composite
LA = Language Arts Composite
So = Social Studies Composite
Sc = Science Composite
RS = Reference Skills

Table 3

The SRA Grade Equivalent Mean Scores of the Teacher's Former Four Years

	Composite	Reading	Language	Math	Reference	Soc. St.	Science	IQ
Teacher's previous 4 YRS Means	7.5 *	7.5 *	8.0	7.4 *	7.9	7.5	7.0	106
This study 20 Experimentals	8.7 *	9.0 *	7.9	8.8 *	8.0	7.5	6.9	111

* - significant academic variance

Reading and Math Components Results for Control Group and Subset of Experimental Group with *Comparable Pretest Scores*

(Grade Equivalent (G.E.) = 6.6 or higher)

Reading (overall)	G.E. Mean	Post G.E. Mean	Mean Gain
5 Experimentals	7.32	12.04	4.72
18 Controls	6.76	8.42	1.66

Math (overall)	Pre G.E. Mean	Post G.E. Mean	Mean Gain
7 Experimentals	7.19	11.74	4.55
18 Controls	6.82	7.77	0.95

Table 4

Training Improvement Index
A Comparison of Grade Equivalent gains

A Comparison of Reading and Learning Disabled Experimentals
With Normal Experimentals and Controls Who Had No Training

	13 Normal Experimentals	18 Controls	7 RD/LD Experimentals
Composite:	3.90 years gain	1.79 years gain	2.07 years gain
Reading:	4.12 years gain	1.66 years gain	3.09 years gain
Math:	4.09 years gain	.95 years gain	1.59 years gain
Soc Studies:	2.52 years gain	1.10 years gain	1.47 years gain

Note. training n = 13 except where * denotes n = 12 for Social Studies. No training n = 17. All significance tests are 2-tailed.

Discussion

Pre- and post-tests in cognitive skills were administered before and following the treatment. *The Patterns and Systems Training* was designed to teach analytical sequencing and pattern-detection skills, to raise Reading scores. The Results indicate that *The Patterns and Systems Training* resulted in increased academic scores in both Reading and Math, as measured on the Scientific Research Associates (SRA) standardized tests. The other four academic subtests remained flat. Although it was hypothesized that scores in Reading would improve, the improved Math scores came as a surprise.

Enhanced cognitive skills gains were achieved, as indicated by the results of the Experimental and Control Groups reported in Table 1. The cognitive skills data in the present study are further reinforced by the substantial academic gains made by the training group (three to four years for Reading and Mathematics, for example). These were the largest gains reported for any class in the school district that academic year, and were approximately twice those routinely obtained by the same teacher, with fifteen years of experience, in her prior 5th grade classes (see Table 3).

In a previous study, Erland (1989a) reported that a former Control group of 40 subjects evidenced 9-11 points of improvement in auditory and visual memory, whereas the improvement made by the 40 Experimentals ranged from 22-38 points. Substantial cognitive gains were also obtained in three other cognitive skill areas. Most notable was the improvement for the 40 Experimentals in the Following Oral Directions subtest, or integrating visual with auditory information (Ross-Swain, D., 1992; Beyer, B. K., 1987). The Experimentals, including 15 Reading and Learning Disabled, (RD/LDs) obtained 15.67 points improvement on this subtest versus the 2.67 points improvement by the Controls (which also included 15 RD/LDs).

It could be suggested that the novelty effect created student motivation and affected these reading and math achievement gains. The observed gains in cognitive skills improvement in training-group students can be arguably attributed to the extra attention, the novel elements introduced, and change from the routine the cognitive skills training offered, rather than to any unique aspects of the video/audio exercises which incorporated Cognitive Behavior Modification (Meichenbaum, D., 1977) and Suggestopedia principles (Lozanov, G., 1978).

Motivation and attitudinal change cannot readily account for selective gains on the SRA subtests, however. If only motivation was involved, one would have expected large gains similar to those found for reading and mathematics in the other subtests of language arts, science, and reference materials. The two-year gains in language arts and spelling, and the less than one year gain in science, obtained in the present study, were consistent with the teacher's prior experience.

This does not suggest eventual larger gains in these latter areas are not possible, however. *The Patterns and Systems Training* in learning sequences and pattern-detection appears to affect both reading and math positively. It must be explored whether more than one training session, taught in successive years, would increase academic performance beyond the normal one-year growth expectancy in the other tested areas as well.

It seems reasonable that progressive implementation of cognitive skills training over a one- to two-year period would allow the substantial improvements in reading and mathematics to generalize to subject areas in which these skills are foundational. Cognitive retraining may need to focus on obtaining gains in the basic skills areas of math and reading during the first instructional year. Then, after this initial cognitive retraining implementation, the second year can focus on achieving higher gains in science and language arts. Since ***The Bridge To Achievement*** Spelling program (Erland, J. K., 1994) was not implemented due to time constraints, it can be speculated how the addition of the Spelling component would affect the Language Arts subtest on the standardized achievement test.

Information processing is the foundation for the ability to learn (Sternberg, R. J., 1985). Cognitive retraining is necessary to expedite learning at all ages. Therefore, it becomes critical to schedule training into the daily curriculum. Although cognitive and higher-order thinking skills training (Ruggerio, V., 1988b) fits well into Whole-Language curriculums, administrators and textbook companies nevertheless wonder where this training will fit into the daily schedule. A consideration is to offer cognitive retraining equally with musical, art, sporting activities, and social events. With the United States' low ranking among other countries in literacy skills, adequate time frames may have to be made available (Fortune Magazine, September, 1990).

The Learning Disabled students (LDs) in the training group made gains that suggest they can raise their reading and math achievement to a competitive level with average students. Although they did not make the large gains in math that the normal students obtained, the 1 1/2 years G.E. achievement gains made by the LDs are important, and they should not be minimized. It appears cognitive skills training for Learning Disabled students led to comparable, if not greater, achievement test performance on the composite, reading and math than that of normals who received no such training. For reading performance, the RD/LDs exhibited more than one additional year of reading improvement over the controls. This raises very low functioning students in reading and math into an average functioning mode. The cognitive strategies might have been a contributing factor to not only their actual reading ability, but also their overall learning and information processing capability.

This study indicated that an intensive rehearsal format to enhance memory and higher order thinking skills using educational technology can affect both high and low ability learners positively. This suggests that cognitive skills training through video technology is a plausible medium for helping both RD/LD and normal students become more academically competitive. Additional research to further analyze the motivational and learning effects of various types of video instruction is needed.

A published report (Erland, 1989a) indicated that on subtest #18, "Following Oral Directions", on the Detroit Tests of Learning Aptitude (DTLA-1) (Baker & Leland, 1935, 1967), eighty students prior to the study were able to perform less than half of the sequential items correctly. Forty student experimentals and another set of forty student controls scored an average of 14-17 points out of 40. Following analytical skills training in a small group (3-5) private setting, the 40 experimentals improved their ability to follow directions with a mean of 30 out of 40 points, an improvement of 14 points. In contrast, the controls scored 18 points out of 40, or an improvement of 1-2 points. This study indicated that *Patterns and Systems Training* can be helpful in improving individuals' ability to perform step-wise procedures in math, science and computer skills (Erland, J. K., 1989a).

Patterns and Systems Training is directed on inter-sensory integration of visual, auditory, tactile, and kinesthetic modalities (Struppler, A. & Weindl, A. W., 1987; Hessler, G., 1982; Bandura, A., 1971) by learning in a step-by-step Task Analysis fashion (Sulzar-Azaroff, B., 1991; Kaplan, J., 1985). This sequence training, composed of encoding and decoding exercises (Sternberg, R. J., 1985; Kamhi, A. G. & Catts, H. W., 1989), becomes the bridge necessary for reaching higher order critical thinking levels.

This encoding-decoding and memory expansion bridge may be absent with traditional methods of teaching (see figure 2) (Baddeley, A. D., 1986; Erland, J. K., 1989a). With students' visual and listening memory levels remaining in a static position, encoding-decoding ability suffers (Kamhi, A. G. & Catts, H. W., 1989; Hessler, G., 1982). Critical thinking does not result, and therefore test-taking ability does not improve.

Many classrooms routinely apply visual and tactile teaching methods (reading and writing) instead of the inter-modality methods of visual, listening, tactile, and kinesthetic. Auditory processing skill is a requirement for reading comprehension, written expression (Williams, L. V., 1983), math, and science acquisition (Meeker, M. N., 1991, 1969; Woodcock, R. W., 1978; Kaufman, A. & Kaufman, N., 1983; Kirk, S. A. & Chalfant, J. C., 1984).

Visual-tactile (reading and writing) methods are often taught with simultaneous whole-word instruction. This method involved visualizing the entire word as one form, and memorizing spelling or reading words as one entity (Flower, L., 1987; Fernald, G., 1943).

Reading, however, also requires auditory and visual sequencing and phonetic decoding skills, or phonics (Kamhi, A. G. & Catts, H. W., 1989; Rumelhart, D. E. & McClelland, J. L., 1986). The two opposing simultaneous and sequential methods wax and wane with popularity in teaching methodologies.

However, the Orton-Gillingham-Stillman method incorporates visual, auditory, tactile, and kinesthetic language stimuli in teaching reading (Kamhi, A. G. & Catts, H. W., 1984; Gillingham, A. & Stillman, B. W., 1970, 1965). *Patterns and Systems Training* proposes to teach and integrate both simultaneous and successive methods, utilizing all four primary modalities, rapidly switching from one form to the other (Erland, J. K., 1992, 1989a). Underlying cognitive skills can be improved in the process (Meeker, M. N., 1991, 1969; Feuerstein, R., 1988).

Improving cognitive skills can not be approached blindly. Careful assessment and evaluation is necessary (Meeker, M. N., 1991, 1969). Classroom teachers do not routinely assess cognitive skills. Productive in-depth cognitive assessment and evaluation of students is not considered an option, due to insufficient time, and lack of specialized teacher assessment resources. Many classroom teachers often lack the advanced assessment training required to administer cognitive skills tests and evaluations (American Psychological Association, 1990). School psychologists, are overloaded with referrals to test severe cases and cannot devote time to assessing entire classrooms of students. They limit measurement and evaluations to remedial students with intelligence and achievement batteries.

Many districts do not authorize speech therapists, learning disability, or mentally handicapped specialists to administer cognitive testing although they are qualified to measure and evaluate. Although underlying cognitive weaknesses are a plausible explanation for academic skill-deficiency, available cognitive skills data for the average classroom student is limited and often nonexistent.

Cognitive Behavior Modification advocates self-monitoring and self-instruction (Forrest-Pressley, D. L., MacKinnon, G. E. & Waller, T. G., 1985; Armbruster, B. B., 1983; Meichenbaum, D., 1977). Research has indicated that structured drill and practice in a Cognitive Behavior Modification format (Meichenbaum, D., 1977) are compatible with Suggestopedic accelerative learning methods (Erland, J. K., 1989a). These two methods combined form a base for academic and procedural skills learning (McDaniel, E. & Lawrence, C., 1990).

There is a current trend away from curriculum product-based teaching and toward the interactive process of learning (Dickinson, D., 1991). However, drill and practice can now be translated into interactive, cooperative learning. Higher-order thinking skills can be instructed through media applications, such as CD-ROM.

In a recent televised documentary debating the educational process in schools, it was noted that many teachers suffer from "work-fear inertia," an unwillingness to initiate new programs (Mudd, R., 1989). With the current movement of teacher empowerment in the classroom, teachers will be more open to implementing innovative programs. However, unless methodology is easy to implement, with minimal training requirements and immediately evident results, teachers will be slow to add new programs to their curricula. Educational technology, in the form of video and computer programs, can solve this problem (U.S. Congress, Office of Technology Assessment, September, 1989).

The United States suffers a 28.4% drop-out rate (The Heritage Foundation, December 21, 1990), with millions more illiterate adults needing training. Few of these adults ever seek training, and 50% to 75% of those who do sign-up drop out within the first few weeks (Bishop, M., 1991). It is the ever-increasing responsibility of the schools to produce literate individuals at early ages so this problem is prevented. To improve our literacy levels, we must foster student enthusiasm for learning, and dramatically reduce the drop-out rate. Media technology avenues need to be seriously considered as a viable teaching method, not only in school settings, but also in adult learning centers.

When schools consider adding technology to assist in Quality Performance Assessment (QPA) computers are the technology medium considered. They are the most visible, have many software options, and have a learning mystique. An alternative technology for the average classroom is a consideration. Video-taped technology is cost effective and obtains results within a short time frame.

Video-taped training has five major advantages over computerized practice and drill programs:

1. Video technology is cost effective. While only one or two students can use a computer terminal and keyboard at a time, one video monitor can teach thirty or more students at one time.

2. Video-taped training activates and integrates all of the primary senses. It trains auditory-visual sequencing using a variety of voices and faces. These faces appear life-sized on a video monitor. CD-ROM generally provides speakers on smaller screen formats (U.S. Congress, Office of Technology Assessment, November, 1989).

3. Video-taped instruction is time-effective. Several drill and practice segments can be taught in a thirty-minute time frame. This efficiency removes the drudgery in drill and practice sessions for both the students and the teacher (Mecklenburger, J. A., 1990). Conversely, the drill and practice sessions of computer programs are time consuming. Some computer programs may take as much as an hour or more to perform the hand-eye drill and practice session (U. S. Congress, Office of Technology Assessment, September, 1989).

4. Since programs can be transmitted through interactive long-distance learning networks, video-taped instruction is not only cost-effective, but equalizes learning opportunities (U.S. Congress, Office of Technology Assessment, November 1989). Many districts can receive the training simultaneously.

5. Finally, television is accepted readily by learners as they have grown up with this medium (Greenfield, P. M., 1984). Postman (1985) indicates that offering an entertainment world for instructional purposes appeals to students who have grown up utilizing a limited print world.

Conclusion

If cognitive memory and thinking skill foundations can be trained in short, 24-hour time frames, further investigation is needed to find out whether wider applications of video technology with more students can obtain these same benefits. Other comparison groups need to be established to determine the effects of video- and audio-tape instruction.

Effective classroom management and a conducive environment are essential to successful learning. The tight structure and discipline in this study reflected the teacher's professional commitment and fifteen years of teaching experience. Student cooperation and respect for authority were additional factors in the positive results of this study.

Video technology needs further research to examine whether results achieved in this study can be replicated in other learning environments within schools, adult learning centers, business and industry. New teaching concepts and methods that incorporate Cognitive Behavior Modification and Suggestopedia can be explored in a variety of teaching contexts. Parents, teachers, trainers, social service agencies, school and business administrators need to be open and willing to adopt new accelerated learning programs and methods that generate concrete results.

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