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ABSTRACT

The report discusses the nature and effectiveness, with mildly handicapped students, of the heuristic approach, an alternative to the behavioral technique that promotes opportunities for the child to explore materials and take an active role in problem solving. Theoretical support for the approach is cited for use with learning disabled and mildly retarded students. Two studies are reported, involving learning disabled and educable mentally handicapped elementary students. Findings support the use of heuristic methods as an alternative approach in language arts instruction for mildly handicapped students. The heuristic method is seen as one way to broaden the repertoire of special education teachers. Approximately one-half of the document is composed of heuristic lessons keyed to objectives in the Brigance Diagnostic Inventory of Basic Skills for the following areas (sample subtopics in parentheses): reading readiness skills (letter recognition, knowledge of body parts); word recognition (sight words, abbreviations, contractions, common signs); word analysis (initial consonant sounds, rhyming words); oral reading and comprehension; and language arts (capitalization, punctuation, spelling). (CL)

HEURISTIC METHODS FOR THE MILDLY HANDICAPPED

RESEARCH REPORT

AND

MANUAL FOR TEACHING LANGUAGE ARTS AND READING

Final Report

Heuristic Learning Project
U.S. Department of Education Project No. 023CH10083
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Heuristic Methods for the Mildly Handicapped

Over the past decade, disenchantment with etiological and "correlated disability" approaches to teaching exceptional children led to a search for more effective methods. The alternative approaches receiving strongest support have been the behavioral. Behavioral techniqus, specifically task analysis and behavior modification, have become widely adopted as integral components of the technology of special education. Despite the obvious contributions of these techniques, however, additional alternatives require examination if we are to meet the expanding needs of handicapped individuals. Such alternatives would not replace behavioral methodologies, but rather broaden educational practices to better serve the handicapped.

One viable alternative is the heuristic approach, a structured methodology designed to give the child more control in the learning situation; to foster more active problem solving, to provide immediate feedback in a nonjudgmental way, and hence to produce both achievement and enjoyment of learning. This article (a) provides a rationale for alternatives to behavioral approaches; (b) describes the heuristic approach as one alternative; (c) argues its potential utility with the mildly handicapped; and presents the results of studies undertaken to evaluate the efficacy of heuristic methods for achieving language arts objectives with learning disabled and educable mentally handicapped students.

The Need for Alternatives

Despite the demonstrated utility of behavioral approaches, several factors support the development of alternative methods of teaching mildly handicapped individuals. These factors include the limitations of behavioral techniques and needs of individual teachers and children.

Behavior modification, with its emphasis on extrinsic reinforcers to change behavior, has been criticized as possibly preventing handicapped children from achieving a major goal: becoming independent of others (MacMillan & Forness, 1971). Observations that mentally handicapped youngsters fail to reason and generate abstract ideas may be attributable to highly structured environments which emphasize slow pacing, rote methods, and dependence on external guidance (e.g., see Smith, 1967).

Similar concerns have been expressed with regard to task analysis, which is a product of the operant conditioning branch of learning theory (Smead, 1977). Ewing and Brecht (1977) noted that the legitimacy of task analysis has not been determined through research, and that much of the research reported has been criticized for methodological reasons. Smead (1977) questioned the assumptions on which task analysis is based. There is no evidence, for example, of the existence of natural hierarchical sequences of learning skills that can be replicated by task analysis. Moreover, the assumptions that learning occurs in small, discrete steps and that manipulation

of the task is the best way to promote learning have not been validated.

Factors related to the teacher, child, and curriculum also point to the need for alternatives to behavioral approaches. With regard to teacher characteristics, as teacher trainers we have encountered unfavorable attitudes toward behavioral approaches among trainees whose teaching philosophies are humanistic. These prospective teachers of the handicapped object to the behavioral conception of children as automatons, as passive responders rather than active seekers of information. Some authors (e.g., Steward, Goodman, & Hammond, 1976) recommend as a solution the developing of positive attitudes in special education teachers toward behavior modification. Another solution might be to offer alternative approaches for improving classroom learning and behavior. This would be particularly important for teacher trainees whose philosophies of education would reduce their effective use of behavioral techniques. Finally, the wide range of individual differences existing within the learning disabled and mildly retarded populations may require that teachers master several strategies in order to provide the most appropriate instructional match for each child.

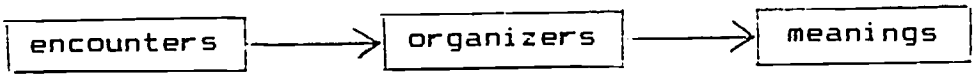
Heuristic Approaches as One Alternative

One alternative to behavioral approaches that has potential for use with learning disabled children is the heuristic method, based on Suchman's (1966, 1977) theory of

heuristic learning. This section will briefly describe heuristic theory and methodology.

Heuristic Theory and Method

According to Suchman (1977), heuristic learning is a fundamental process by which experience is transformed into meaning. The learner derives meaning through the interaction of his "encounters," or unorganized sensory experiences, and his "organizers," cognitive tools which include concepts, prior encounters, and previously acquired meanings.



The learner spontaneously creates meaning out of encounters based on his organizers. For example, a child encountering a tulip for the first time may relate to it his previous concept of "flower" and thereby derive the meaningful idea that the tulip, like other flowers, should be sweet-smelling and delicate to the touch. Motivation for heuristic learning is intrinsic, but selective; that is, learning does not occur with every encounter. Optimal conditions for the child's engagement in the heuristic process include a low-pressure, accepting environment which permits reflection, and discrepancy in encounters that activates natural motivation for equilibrium and competence.

Suchman proposes that heuristic learning is pervasive and powerful, and that teaching can succeed only to the degree that

heuristic learning is allowed to function optimally. Teachers can encourage such learning by presenting encounters in such a way that children are motivated to apply their organizers to derive new meanings. Heuristic methods are intended to actively engage the learner in self-motivated problem solving. In contrast, didactic approaches consistent with behavioral theory attempt to promote learning by "feeding in" meaning.

To construct methods that promote heuristic learning, the following conditions must be provided:

1. The child is in control.
2. The situation is nonevaluative on the teacher's part.
3. The teacher listens, accepts all responses, and responds immediately to the child with appropriate feedback.

Corresponding steps to be followed in a heuristic method include:

1. The teacher provides a "messing around" stage in which the child interacts freely with given materials (encounter).
2. The teacher responds to the child's actions (child is in control and applying organizers).
3. The teacher poses problems to facilitate the acquisition of meaning.
4. The child poses his/her own problems.

A sample application of the heuristic approach to teaching letter recognition follows.

1. *Encountering stage; simple exploration.* The child plays with 3-dimensional letters that can be placed on an

easel.

2. *Teacher responds.* The teacher names any letter that the child places on the easel, turning the letter to its correct orientation (if the child, for example, has placed it upside-down). As he tries each letter, the child finds that each has a name and, with self-controlled repetition, begins to associate each letter with its name. The child also discovers that he or she is in control; he or she can "make" the teacher say something by placing a letter on the easel. The child can review forgotten letter names by repeatedly placing the letter on the easel and is free to physically sort the stimuli in personally meaningful ways (e.g., those mastered, those needing review, and those unmastered). The learner also controls the time between stimuli presentation.

3. *Teacher poses problem.* The teacher introduces a game: "See if you can make me say 'D' by placing it on the easel." If the child selects letter A, the teacher merely says: "'A.' See if you can make me say 'D.'" A typical session might produce the following interaction:

Teacher: "See if you can make me say 'B' by putting the letter B on the easel.

Child: Places the letter P on the easel, but upside-down.

Teacher: Places the P in proper orientation and says, "'P.' See if you can make me say 'B.'"

Child: Places the letter C on the easel.

Teacher: "'C.' See if you can make me say 'B.'"

Child: Places the letter B on the easel.

Teacher: "'B.' You made me say 'B.' Now see if you can make me say 'P.'"

In this third step, the child attempts to match the letter with its name in the absence of external pressure to be "right" or "wrong."

4. *Learner generates own problems.* As the child masters the "game," he begins to make up problems to be solved, for example, by placing letters in combination on the easel. The teacher responds by naming all letters selected or by pronouncing the word if a word is produced. The last step seems to occur spontaneously with normal children, but is not required if the instructional objective can be met by Step 3.

Letter sounds, sound combinations, words, sentences, geometric figures, colors, animal names, number recognition, and basic number facts can be taught in a similar manner. Sight words and sentences can be introduced, for example, with the teacher offering to write any word that the child says. The teacher then poses the problem, "See if you can make me say ----- by pointing to it." Selecting from his new collection of word cards, the child can make the teacher say what he places on the easel. When the child is ready, the teacher introduces sentences based on the word cards: "See if you can make me say 'The dog is black.'" If some words are missing (e.g., "the"), the teacher writes them to form additional cards. In the next

step, the teacher will say any *sentence* that the child forms on the easel with the word cards. The teacher reads precisely what is placed on the easel.

Applications to the Mildly Handicapped

This section examines the theoretical and empirical support for use of heuristic approaches with learning disabled and educable mentally handicapped learners.

Theoretical Support

Recent literature on the application of Piaget's cognitive-developmental theory to learning disabilities and mental retardation, and theories concerning effects of noncognitive variables on learning provide theoretical support for the efficacy of the heuristic approach with mildly handicapped students.

Cognitive-developmental theory. Serious interest in alternatives to behavioral approaches for learning disabled children has been demonstrated recently by the April 1981 issue (Reid, 1981) of *Topics in Learning and Learning Disabilities* devoted to applications of Piagetian theory to learning disabilities. Suchman's approach to heuristic leaning is highly compatible with Piaget's cogntive-developmental theory, and both offer similar teaching implications. Piaget describes cognitive development as a stage-sequential process based on the interaction between the organism (child) and environment from infancy to adolescence. Suchman's theory describes a similar interactive process between the organism and

environment (the encounter) but within a single learning incident. Both theories are comparable in their explanations of motivation and in their implications for instruction. Comparative analysis of Suchman's theory described earlier and Piaget's as applied to learning disabled students (Gallagher & Quandt, 1981; Moses, 1981) suggests the following guidelines for instruction:

1. Begin with an *"encounter"* or *"messing around"* stage that permits the child to interact with the materials before a problem is posed. Present concrete materials that permit children to experience and impose many kinds of change.
2. Allow the children to *set goals* before they deal with transformations.
3. Present problems that involve *puzzling* transformations. Create situations that stimulate children to infer and reason spontaneously.
4. *Accept* children's methods of problem solving, even if they lead to failure.
5. Create a nonthreatening, *nonexternally evaluating* atmosphere. Avoid praise, criticism, or other announcements that label children's responses, since external evaluation reinforces dependence on a controlling environment.
6. Require children to anticipate, *predict* results of their actions, observe outcomes, compare their

hypothesized outcomes with results.

7. Be *responsive* to the child, who is in the driver's seat. Listen, accept all responses, and respond with appropriate feedback.
8. Permit the use and creation of *alternative strategies.*

Although no specific teaching methods are described, proponents of Piaget's developmental approach as applied to the mentally retarded (Iano, 1971; Klein & Safford, 1977; Zigler, 1967) suggest that this approach enables the teacher to view retarded children in terms of normal developmental stages achieved at a slower rate. Hence, the mildly retarded can be expected to perform according to their mental ages. The implication for educators is that methods applied to "normal" youngsters can be used effectively with mildly retarded students of similar mental age. Iano (1971) noted that educators too often *assume* that the mentally retarded have deficiencies in learning rate, retention, and the ability to generalize and abstract. As a result, teachers emphasize great amounts of repetition, structure, concrete presentation, and slow, step-by-step introduction of new material. He asks whether the retarded child's failure to reason and problem solve is due to inability to understand or is a result of teaching emphasis on the rote and mechanical.

Noncognitive variables and learning. The developmental

view suggests that if mentally retarded children perform less well than their mental age expectancy, the low performance is due to experience with chronic failure and consequent low motivation to achieve (Zigler, 1967). Studies investigating the motivational sets of mildly retarded (MacMillan, 1970, 1971; MacMillan & Keogh, 1971) and learning disabled youngsters (Keogh, Cahill, & MacMillan, 1972) and theories of learned helplessness as a factor in learning disabilities (Canino, 1981; Sabatino, Miller, & Schmidt, 1981) suggest that a history of failure may depress achievement motivation in mildly handicapped students. One teaching implication that can be drawn from this literature is that instruction in an environment free from external judgment and accompanying pressure, as provided by heuristic methods, may facilitate such children's achievement.

The heuristic approach is also compatible with Torgesen's (1977) description of learing disabled children as inactive learners whose passivity may be related to individual differences in metavariables or cumulative experiences at home or school. The inactive learner theory suggests that learning disabled children do not employ active strategies in task situations for motivational reasons or failure to recognize the need. Within a heuristic framework, providing a task that encourages and challenges children to use active strategies may help learning disabled children become active learners.

Empirical Support

While some attention in the mildly handicapped literature has been given to Piaget's and Suchman's work, no empirical research appears to be available that directly tests the use of their methods with such students. Reid (1981) and Moses (1981) present a coherent argument for application of such principles as those listed on pages 8 and 9 to the instruction of learning disabled children. In her popular text on learning disabilities, Lerner (1976) cited Suchman's work as a method for teaching such children. Neither of these works, however, offers evidence supporting the efficacy of these nonbehavioral approaches for handicapped children.

In sum, there exists a pragmatic and theoretical rationale for evaluating use of heuristic techniques with learning disabled and mildly retarded students. Individual differences among mildly handicapped populations encourage the development of a variety of teaching strategies to meet individual needs. Moreover, developmental and learned helplessness theories suggest that the mildly handicapped can learn through more normalized methods but have acquired low motivation due to failure experiences. Heuristic methods, with their emphasis on internal motivation and problem solving activated by a challenging task, teacher reponsiveness, and a nonexternally evaluating atmosphere, have potential for promoting academic learning, problem solving, task motivation, and learning enjoyment in children who have had a history of failure. Although the literature suggests that heuristic approaches be

used with the mildly handicapped, no empirical studies are available which examine the efficacy of such techniques with this population. The remaining sections describe two studies designed to evaluate the utility of heuristic methods with learning disabled and mildly retarded elementary-age students.

Study 1: Heuristic Approaches and the Learning Disabled

The theoretical literature suggests that heuristic methods have potential for promoting academic learning, problem solving, task motivation, and learning enjoyment in mildly handicapped children. A possible consequence may be improved academic self descriptions. The purpose of Study 1 was to evaluate teaching strategies that follow the heuristic learning model for teaching language arts and reading objectives to learning disabled elementary-age children. Because the intent of the study was to demonstrate the efficacy of heuristic methods as a viable alternative to (not a replacement for) behavioral techniques, the null hypothesis was proposed. Specifically, it was hypothesized that there would be no differences between learning disabled children taught by heuristic techniques and matched peers taught by conventional behavioral techniques on (a) number of IEP objectives achieved; (b) measures of problem solving ability, task motivation, and academic self descriptions; and (c) observed enjoyment of the learning situation.

Method

Subjects. Fifteen pairs of learning disabled children, matched on IQ and reading level, were selected from three special education resource rooms in two elementary schools within a mid-size Southwestern district with a large Hispanic population. One member of each pair was assigned to the heuristic group, the other member to the traditional treatment

based on scheduling conveniences which appeared to be random. Chronological age for the total group ranged from 92 to 152 months (mean = 124.07; standard deviation = 17.92). Total group IQ scores ranged from 74 to 108 (mean = 93.90; standard deviation = 8.55). Reading level ranged from grade equivalents of 1.4 to 5.2 (mean = 3.1; standard deviation = 1.17). Comparability of experimental and control groups was verified by *t*-tests indicating no significant differences ($p>.05$) between groups on chronological age, IQ, or reading level. There were 5 girls and 10 boys in the experimental group; 4 girls and 11 boys in the control. Ten of the experimental and 7 of the control children were of Hispanic descent; the remaining 13 participants were Anglo.

Instruments. All participants were pre- and post-tested on the Coloured Progressive Matrices, Brigance Diagnostic Inventory of Basic Skills, the Puzzle Preference Task, and the Academic Self-Descriptive Inventory. The Coloured Progressive Matrices test (Raven, 1962) was employed as a measure of problem solving ability. As this test is a commonly used standardized measure, it will not be described here.

The Brigance Diagnostic Inventory of Basic Skills (Brigance, 1977) is a criterion-referenced inventory of hierarchically sequenced objectives in readiness, reading, language arts, and math for kindergarten to sixth grade. It was adopted by the participating school district as the means for pre- and post-assessment in all special education

classrooms and for determining IEP objectives. The Brigance was used in this study to determine reading levels for matching of subjects, reading and language arts objectives for treatment sessions, and number of objectives met after treatment was completed.

The Puzzle Preference Task (Harter & Zigler, 1974) is a measure of preference for challenging tasks, a component of effectance motivation. In this task, the subject is presented with three sets of the same puzzle, each with a different number of pieces removed. The subject is asked to choose which of the three he or she would like to complete. Preference for a challenging task is measured by the degree to which the subject chooses the more difficult puzzles (i.e., the ones with the most pieces removed). The task was developed for use with mildly retarded children. In order to increase the ceiling level to accommodate learning disabled students, the task was modified to include a fourth difficulty level.

The materials employed were four copies of each of three puzzles from the age-graded Playskool series (Scooby Doo, Yogi Bear, and Yabba Dabba Doo). The puzzles each contain fourteen or fifteen pieces. Difficulty level was defined in terms of the number of puzzle pieces removed from the puzzle (four, seven, ten, or all). The score on each of the three trials was the difficulty level (one through four) of the puzzle chosen. The possible range for total scores was three to twelve.

The Academic Self-Descriptive Inventory (Muller & Nelson,

1981) is a group test designed to assess children's self-concept, self-esteem, and self-ideal in reading, language arts, and mathematics. The eighteen items are composed of stick-figure illustrations that do not require reading. In each illustration, one or more children are portrayed as academically more successful or less successful. The tester reads a brief story about the illustration and asks the child to indicate three things: whom he is most like (self-concept), how he feels about being the way he described himself (self-esteem), and who in the picture he wants to try to be (self-ideal). In this study, only the reading and language arts sections were used, producing six scores, each with a range of zero (low) to six (high): reading self-concept, self-esteem, and self-ideal, and language arts self-concept, self-esteem, and self-ideal.

Procedures. Three project staff who were experienced teachers and trained in heuristic methods served as the experimental teachers for one semester (4 weeks pre- and post-testing; 11 weeks instruction). The project teachers took over language arts and reading instruction for the experimental students, meeting with each student for the time prescribed by the IEP (approximately one hour per day per student).

The experimental treatment consisted of activities and materials developed according to the guidelines listed on pages 8 and 9 and designed to meet the students' language arts and reading objectives as outlined on their IEPs. The traditional

treatment consisted of the three regularly-assigned special education teachers' accustomed instructional methods. Pre-treatment observations and daily logs maintained by the control teachers indicated that these methods consisted mainly of basal reader-workbook, Monterey, and token-reinforcement approaches. Experimental and control teachers recorded the amount of instructional time spent in individual, small group, and seatwork activities.

All subjects were pre- and post-tested on the Raven's, Puzzle Preference, and Academic Self-Descriptive Inventory by the experimental teachers. Control teachers pre- and post-tested all participants on the Brigance Diagnostic Inventory to first determine language arts and reading objectives and then to evaluate the number of objectives actually met. At the end of the treatment session, the experimental teachers interviewed each child in their group regarding the child's perceptions of the learning experience.

A media technician videotaped a teaching session for each of the experimental and control children at three points in time over the semester: weeks three, seven, and eleven. Two doctoral students unfamiliar with the study served as videotape raters. The raters recorded behaviors on a 29-item observation schedule using a time-sampling technique in which they observed for twenty seconds and recorded for ten seconds. Each of the ninety tapes were fifteen minutes long, and each 15-minute tape was divided into thirty observation-recording intervals. A

20-10 audio pulse tape played simultaneously with the videotape was used to indicate observation and recording intervals. Rating categories were:

1. Type of activity: one-on-one instruction, independent working, group work (with teacher focusing within the group on the target or another child).
2. Child behavior: level of motivation, enjoyment, and attention to task (high, medium, or low); creativity (showing intellectual inventiveness in pursuing a learning goal); type of interaction with the teacher (on or off task); and type of interaction with any peers (on or off task).
3. Teacher behavior: type of questioning (yes/no, open, inference); explanation/demonstration; choice (teacher permits the child to select or gives the child some control); type of response to the child (social reinforcement, correctness feedback, giving the answer, helping, repeating, no response).

Interrater reliability was established during training sessions (Pearson r = .98).

Results and Discussion

t-tests conducted on all pretest variables produced no significant differences between heuristic (E) and traditional (C) groups, verifying initial comparability of the two groups. The groups did not differ in the number of hours of individual instruction during treatment (E mean = 6.27 hours; C = 7.60),

as reported by teachers on their daily logs. However, *t*-tests did reveal significant differences ($p<.01$) in the number of instructional hours in small groups (E mean = 10.47; C = 3.07) and in seatwork (E mean = 4.93; C = 9.80).

Group data. Separate one-way analyses of covariance were conducted for each dependent measure including number of objectives reached, using pre-test scores and hours of group, individual, and seatwork instruction as the covariates. Results indicated no significant differences between experimental and control groups on any dependent measure. The F for only one variable, Language Ideal Self, approached significance ($p = .0546$), favoring the heuristic treatment. These group data suggest that heuristic methods may be at least as effective as traditional behavioral methods.

Individual data. Child-by-child data were analyzed to determine actual numbers of children for whom heuristic and behavioral methods could be described as successful. Results indicated no significant differences between groups. Taking as criterion for success in achievement the meeting of 75% of IEP specified language arts and reading objectives, it was found that 10 of the 15 experimental and 10 of the 15 control children reached criterion.

Experimental teachers who administered the Puzzle Preference task seriously questioned its validity as a measure of effectance motivation for learning disabled children, as many of the children appeared bored by the puzzles. A

cumulative index of success was therefore developed that eliminated consideration of this task. The cumulative index consisted of demonstrating two of the following: (a) pre-post gain on the Self-Descriptive Inventory total score; (b) pre-post gain on the Coloured Progressive Matrices percentile score; and (c) at least 75% of objectives met. On this cumulative index, 9 of the 15 experimental and 8 of the control children demonstrated success. Chi square analyses indicated that sex, ethnicity, age (>/=124.06; <124.06), IQ (>/=90; <90), or teacher were unrelated to success measured by the cumulative index. Analyses of group data suggest that heuristic approaches in language arts and reading instruction may be at least as beneficial as traditional behavioral methods with learning disabled children. Child-by-child analyses, however, indicate that heuristic methods may not be effective for all learning disabled children; the same holds true for behavioral techniques.

Videotape data. The frequency of each of the 29 rating categories was tabulated for each child's three taped sessions and converted to percent of occurrence over number of rated intervals. These frequency percentages were averaged over the three taped sessions, and *t*-tests (Table 1) were conducted to determine any differences between experimental and control groups. During taping, teachers generally worked individualy with the target child. Results indicated that experimental and control children expressed similar levels of motivation,

enjoyment, and attention. The groups did not differ in amount of creative and on task behavior. Significant differences occurred only in teacher behavior, specifically the types of questions asked and types of responses made to the child. Experimental teachers asked fewer open questions (requiring a word, phrase, or statement) and more questions requiring inference (going beyond the information given). Experimental teachers also gave more opportunities for the child to make choices. Control teachers tended to give more social reinforcement ("good," "well done") and correctness feedback ("right," "wrong") and to supply the correct answer when the child failed to respond or responded inadequately. Experimental teachers more often repeated their questions as well as the child's responses.

[Insert Table 1 about here]

In general, analyses of videotapes corroborated test data indicating that heuristic and behavioral teaching methods were equally effective in fostering motivation, enjoyment, attention to task, and creative responses in learning disabled children. Videotape data also confirmed that while outcomes were similar for the two groups, instructional methods were different. Experimental teachers gave more control to the child, required more inferential thinking, and offered fewer evaluative comments. Control teachers gave more social and correctness feedback, consistent with behavioral approaches.

Children's perceptions of heuristic teaching. Brief

questionnaires administered by experimental teachers after completion of the treatment session indicated that experimental children (87%) generally perceived heuristic methods as different from previous learning experiences. When asked "In what way were the things we did this semester different from those you'd done before," nine children answered with reference to specific content or activities ("we learned antonyms here;" "we read and talked about stories here;" "we did more workbooks in the other class"). Three children said that the heuristic teachers gave more explanation and required them to "work hard" or "work harder." Only one child noted the absence of external reinforcers ("stickers"), though all had been in token economy programs. One child also noted the lack of opportunity in heuristic situations to compete with others.

When asked what, if anything, they liked about the heuristic semester's activities, eight cited reading and talking about stories, answering questions about stories, and drawing pictures to answer questions. Two children referred to learning about endings, compound words and contractions, and the dictionary. Finally, when asked what they did not like, four children pointed to independent thinking ("having to think about answers on my own;" "having to write on my own"). Three stated that they found it difficult to adjust in the beginning but later came to like the approach. Three described specific activities or materials that they did not like. Four, perhaps insecure about offering criticisms, reported liking "everything."

Study 2: Heuristic Approaches and the Educable Mentally Handicapped

The second study examined the efficacy of heuristic methods for teaching language arts and reading to educable mentally handicapped children (EMH) in self-contained special education classrooms. Again, no differences were hypothesized between EMH children taught by heuristic techniques and matched peers taught by traditional behavioral methods on number of objectives achieved, problem solving, task motivation and enjoyment, and academic self descriptions.

Method.

Subjects. Children who participated in Study 2 were labeled EMH by the school district (20 children) or scored in the EMH range on an individual intelligence measure (10 children). Fifteen pairs matched on IQ were selected from eight self-contained special education classrooms in four elementary schools within the same district that participated in Study 1. One member of each pair was assigned to the heuristic group, the other member to the traditional behavioral treatment again based on scheduling conveniences which appeared to be random. Chronological age for the whole group ranged from 73 to 161 months (mean = 127.14; standard deviation = 21.11); IQ scores ranged from 40 to 76 (mean = 63.18; standard deviation = 9.76). There were 7 girls and 8 boys in the experimental group; 3 girls and 12 boys in the control. Ten of the experimental and 12 of the control children were Hispanic.

Three of the experimental and two of the control were black; the remaining children, two experimental and one control, were Anglo. During the third week of instruction, one experimental child (Anglo female) moved to another city, reducing the total number of subjects to 29. Because data were analyzed by matched pairs, scores for the attrited child's pair (Black female) were omitted from the analyses.

Procedures. All subjects were pre- and post-tested by the three experimental teachers from Study 1 on the Coloured Progressive Matrices, Puzzle Preference task, and Academic Self-Descriptive Inventory. Control teachers administered the Brigance pretest; experimental teachers the posttest. Treatment procedures were essentially a replication of those described for Study 1, with the exception that the EMH children's IEP objectives tended to be on lower-level readiness activities for language arts and reading. Study 2 was conducted over one semester (5 weeks pre- and post-testing; 9 weeks instruction). Daily logs were again maintained by all teachers for every child, describing specific methods and indicating the approximate amount of instructional time spent in individual, small group, and seatwork activities. Three 15-minute videotapes were taken of each child in a typical (heuristic or control) instructional session (weeks two, six, and eight). Each videotape was rated by the same raters as for Study 1. Experimental teachers administered post-treatment interviews to the experimental children regarding their

perceptions of the heuristic activities.

Results and Discussion

As for Study 1, *t*-tests on all pretest variables produced no significant differences between heuristic and behavioral groups, verifying their initial comparability. While the groups did not differ significantly in number of instructional hours in small groups (E mean = 2.50; C = 3.50), *t*-tests indicated significant differences ($p<.01$) in number of hours of individual instruction (E mean = 9.79; C = 4.07) and seatwork (E mean = 1.64; C = 6.71) as reported by teachers on their daily logs.

Group data. Separate one-way analyses of covariance were conducted for each dependent measure with pre-test scores and hours of group, individual, and seatwork instruction as covariates. Significant differences were found between groups on two subtests of the Self-Descriptive Inventory favoring the control group: Reading-Self Concept (adjusted mean E = 3.66, C = 5.34; F =4.42; $p<.05$); and Language Self-Ideal (adjusted mean E = 5.14, C = 6.00; F = 4.35; $p<.05$). A third significant difference was found indicating that experimental subjects attained more of their IEP objectives than did control subjects (adjusted mean E = 5.50, C = 3.35; F = 4.97; $p<.05$) with pretest scores and instructional hours held constant. The group data suggest that traditional behavioral methods may be more effective than heuristic methods in improving aspects of mildly retarded children's academic self descriptions, while

heuristic techniques may be more effective than behavioral in meeting language arts and reading objectives.

Individual data. Child-by-child data were analyzed to determine the number of children in each group who achieved success according to three criteria. Ten of fourteen experimental and two of fourteen control children met the criterion for success in achievement (meeting at least 75% of language arts and reading objectives). Half of the experimental and half of the control subjects met the cumulative index of success developed in Study 1. When achieving a pre-post gain on the Puzzle Preference Task was added to the cumulative index, with success defined as meeting three of the four criteria, the seven experimental subjects who met criterion on the initial cumulative index retained their position, as compared with four of the seven controls. Chi-square analysis, however, indicated that this difference was not significant. Additional chi square analyses again indicated that sex, ethnicity, age (>/=127.14; <127.14), IQ (>/=63.18; <63.18), or teacher were not related to success measured by either cumulative index.

Videotape data. Table 2 indicates *t*-test results comparing experimental and control groups on frequency percentages of behavior categories rated on the videotapes. Significant differences between groups were found with regard to type of activity, child behaviors, and teacher behaviors. During videotaping, all experimental teachers were engaged in

one-on-one instruction with the target child, while control teachers tended to give independent seatwork assignments. Within this context, children taught by heuristic methods demonstrated significantly more often than their control counterparts high levels of attention to task and significantly fewer frequencies of medium and low attention. Experimental children also spent more time than control children in on-task activity with their teachers. Finally, the experimental groups exhibited higher frequencies of creative behavior in the learning situation.

[Insert Table 2 about here]

With the EMH sample, experimental teachers used more open type questions than control teachers and gave the children more opportunities to make choices. Control teachers again employed more social reinforcement and less repetition of their own questions and children's responses.

Findings based on the videotape data must be interpreted in light of differences between experimental and control groups in type of activity occurring during videotaped sessions. Control children's lower attention to task and less frequent on-task interactions with the teacher were probably due more to the greater frequency of independent seatwork rather than to differences in instructional technique.

Children's perceptions. Responding to the post-treatment questionnaire, over half (54%) of the experimental children said that activities during the heuristic semester were

different from those done before. The differences they noted, as well as their likes and dislikes, referred only to specific activities and materials (e.g., "puzzles;" "videotaping") with little or no explanation.

Summary and Conclusions

Individual differences in teaching and learning styles support the need for teachers of the mildly handicapped to have a broad repertoire of instructional techniques. The heuristic approach, with its emphasis on active problem solving, teacher responsiveness, and a nonevaluative atmosphere, is theoretically supported as a viable addition to behavioral approaches for mildly retarded and learning disabled children. The intent of the present investigation was to evaluate the efficacy of heuristic methods for achieving language arts and reading objectives with such students in the elementary grades. The investigative approach was to compare matched groups of children taught by heuristic and behavioral techniques on (a) measures of self-description, problem solving, and task motivation; (b) number of IEP objectives attained; and (c) observational ratings of motivation, enjoyment, attention to task, and creativity, averaged over three videotaped sessions.

Pre-treatment observations and videotape data provided validation of differences in instructional method between experimental and control teachers. Despite differences in teaching methods, no significant differences between groups were found on any of the dependent variables for the learning

disabled sample. Child-by-child data indicated that two-thirds of the experimental and two-thirds of the control children met at least 75% of their language arts and reading objectives. Learning disabled children in the experimental group appeared to perceive a difference between heuristic and previously experienced instructional techniques. The fact that over a fourth of the children criticized the heuristic approach for requiring independent thinking suggests that heuristic methods may be useful in promoting such behavior in learning disabled children.

Group data for the educable mentally handicapped sample indicated that behavioral methods were more effective than heuristic techniques for improving reading self-concept (how children describe themselves in reading achievement) and language self-ideal (how they would like to be in language arts achievement). One explanation for this finding is that retarded children's social and academic histories may foster a tendency to be more outer-directed and more motivated to seek social than intrinsic reinforcement (e.g., Zigler, 1967, 1971). The social reinforcement of behavioral techniques in this study may have more succesfully promoted positive self descriptions with regard to language arts and reading achievement.

Heuristic techniques, on the other hand, appeared to be more effective than behavioral methods for the EMH sample in meeting language arts and reading objectives. Child-by-child analyses corroborated this finding in that 71% of the

experimental and 14% of the control children achieved at least 75% of their objectives in these areas. Videotape data further indicated that children in the heuristic group displayed more creativity than their control counterparts in pursuing learning goals. Although most of the experimental children in the EMH sample perceived heuristic training to be different from previous instructional experiences, they did not clearly articulate the nature of the difference.

Data for both learning disabled and EMH samples produced no significant relationships between demographic variables (sex, ethnicity, IQ, age, and teacher) and success in achievement or a cumulative index of achievement and affective behavior. The failure to find relationships may have been a consequence of small sample sizes. Heuristic and behavioral methods differ theoretically in terms of amount of independent thinking, analysis, and internal motivation required. Hence, other variables which might be considered in predicitng success with heuristic or behavioral methods include cognitive style (e.g., field independence-dependence) and motivational set (e.g., locus of control).

Taken together, the findings on learning disabled and educable mentally retarded children suggest that heuristic methods may constitute a viable alternative approach to language arts instruction for the mildly handicapped. Heuristic alternatives should not replace behavioral methodologies, but rather broaden the instructional repertoires

of special education teachers. Neither heuristic nor behavioral methods may be equally effective for *all* mildly handicapped children. A means for predicting the best method for a given child would save valuable instructional time. Prior to large scale application of heuristic methods with learning disabled and EMH children, the present study should be replicated with larger samples. A replication of the findings would give stronger support to the validity of heuristic methods for mildly handicapped students and help further the goal of meeting indivicual needs.

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Table 1

Mean Frequency of Teaching-Learning Behaviors (in percent)--LD Sample

Category	Experimental	Control	t
Activity			
One-on-one	75.04	84.09	0.78
Independent	0.67	1.56	0.95
Group			
Target	19.33	11.33	-0.83
Nontarget	4.98	3.60	-0.51
Child			
Motivation			
High	3.09	1.91	-0.35
Medium	93.51	96.27	0.68
Low	3.33	1.91	-0.54
Enjoyment			
High	1.56	1.29	-0.34
Medium	93.36	96.33	-0.01
Low	2.00	2.27	0.11
Attention to task			
High	89.51	87.58	-0.34
Medium	9.76	12.16	0.46
Low	0.51	0.29	-0.40
Creativity	4.18	0.36	-1.26
Interaction with teacher			
On task	96.84	97.29	0.25
Off task	2.02	1.71	-0.25
Interaction with peer			
On task	1.04	0.16	-1.53
Off task	0.07	0.20	0.84
Teacher			
Questioning			
Yes-no	10.78	11.38	0.25
Open	57.02	76.69	3.62**
Inference	7.98	1.18	-3.25**
Explanation/Demonstration	10.38	12.47	1.51
Choice	9.04	1.66	-3.30**
Response			
Social Reinforcement	0.33	20.22	8.38**
Correct/Incorrect	3.56	25.40	5.94**
Giving Answer	5.20	9.73	2.11*
Helping	17.64	20.24	0.59
Repeating	44.93	28.51	-2.84**
No Response	2.20	4.04	0.75

*$p < .05$
**$p < .01$

Table 2

Mean Frequency of Teaching-Learning Behaviors (in percent)--EMH Sample

Category	Experimental	Control	t
Activity			
One-on-one	100.00	25.57	-7.60**
Independent	0.00	64.60	5.44**
Group			
Target	0.00	7.07	1.52
Nontarget	0.00	6.50	1.49
Child			
Motivation			
High	19.88	12.02	-1.02
Medium	76.17	72.02	-0.46
Low	2.95	14.00	2.05
Enjoyment			
High	9.52	3.10	-1.35
Medium	87.90	84.45	-0.50
Low	2.60	12.21	1.70
Attention to task			
High	87.76	60.95	-3.42**
Medium	11.10	24.74	2.62*
Low	1.12	14.12	3.02**
Creativity	5.90	0.00	3.20**
Interaction with teacher			
On task	97.21	45.45	-4.91**
Off task	1.50	7.43	1.85
Interaction with peer			
On task	0.00	0.88	2.47*
Off task	0.00	0.90	1.95
Teacher			
Questioning			
Yes-no	7.33	3.02	-1.82
Open	58.42	21.69	-3.67*
Inference	4.00	0.14	-1.86
Explanation/Demonstration	8.83	4.02	-2.24
Choice	29.93	0.55	-5.79**
Response			
Social Reinforcement	0.07	9.71	2.30*
Correct/Incorrect	4.12	7.02	0.85
Giving Answer	7.60	3.29	-1.91
Helping	14.48	7.24	-1.87
Repeating	59.79	8.05	-9.78**
No Response	0.90	2.60	1.61

*$p < .05$
**$p < .01$

HEURISTIC METHODS FOR THE MILDLY HANDICAPPED

MANUAL FOR TEACHING LANGUAGE ARTS AND READING

Heuristic Learning Project
U.S. Department of Education Project No. 023CH10083
New Mexico State University
Department of Educational Specialties
Special Education Component

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Purpose

The wide range of individual differences within the mildly handicapped population provides support for the development of alternatives to current diagnostic remedial, behavioral, and task analytic teaching methods. The purpose of this project, funded by the Office of Special Education and Rehabilitative Services, Field Initiated Research, (Project No. 023CH10083) was to develop and evaluate teaching strategies for mildly retarded and learning disabled elementary-age children that follow a heuristic learning model. Heuristic teaching methods, based on the work of Suchman and Piaget, are designed to place the child in control of the learning situation, to foster active problem solving, to provide immediate feedback in a nonevaluative way, and hence to increase both achievement and enjoyment of learning. It was hypothesized that there would be no differences between mildly handicapped children taught by heuristic techniques and matched peers taught by conventional behavioral techniques on number of IEP objectives achieved, problem solving ability, task motivation, academic self-concept, and enjoyment of the learning situation.

Procedures

Procedures included both qualitative-descriptive and quantitative methods of research. For the first phase, 15 pairs of learning disabled children, matched on IQ and reading level, were selected from three resource rooms. One member of each pair was assigned to the heuristic group, the other to the control. Children in the heuristic group were instructed by trained project staff in

individual or small group situations on their language arts objectives for an average of one hour per day over one semester (9 weeks). The control children were instructed by their regularly assigned special education teachers over an equivalent time period using their accustomed instructional method (primarily basal reader/ workbook method with token reinforcement, Monterey and Distar programs).

All subjects were pre- and post-tested on a measure of problem-solving ability (Ravens Colored Progressive Matrices), a measure of effectance motivation (Puzzle Preference Task), and an inventory of academic self-concept (Academic Self-descriptive Inventory). Children's enjoyment of the learning situation and creativity of responses were evaluated through use of videotapes of selected sessions rated by trained observers. Achievement gains were assessed by the number of IEP objectives accomplished. The second phase was a replication of the first with 28 children who were either formally labeled educable mentally handicapped (EMH) or who scored in the EMH range.

Findings

Pre-treatment observations and videotape data provided validation of differences in instructional method between experimental and control teachers. Despite differences in teaching methods, no significant differences between groups were found on any of the dependent variables for the learning disabled sample. Child-by-child data indicated that two-thirds of the experimental and two-thirds of the control children met at least 75% of their language arts and reading objectives.

Group data for the educable mentally handicapped sample indicated that behavioral methods were more effective than heuristic techniques for improving reading self-concept (how children describe themselves in reading achievement) and language ideal self (how they would like to be in language arts achievement). One explanation for this finding is that retarded children's social and academic histories may foster a tendency to be more outer-directed and more motivated to seek social than intrinsic reinforcement. The social reinforcement of behavioral techniques in this study may have more successfully promoted positive self descriptions with regard to language arts and reading achievement.

Heuristic techniques, on the other hand, appeared to be more effective than behavioral methods for the EMH sample in meeting language arts and reading objectives. Child-by-child analyses corroborated this finding in that 71% of the experimental and 14% of the control children achieved at least 75% of their objectives in these areas. Videotape data further indicated that children in the heuristic group displayed more creativity than their control counterparts in pursuing learning goals.

Implications and Benefits

The results suggest that heuristic methods constitute a viable alternative approach to the teaching of language arts objectives to the mildly handicapped. The heuristic alternative should not replace behavioral methodologies, but rather broaden the repertoire of special education teachers to meet children's individual needs.

CONTENTS

I. INTRODUCTION

The New Mexico State University Heuristic Learning Project staff developed specific methods and materials to facilitate heuristic learning. The Final Report of the project's work with special education, elementary level students in the Las Cruces Public Schools demonstrates that the methods and materials were successful. The report also discusses the background for heuristic learning and presents eight guidelines for creating heuristic methods and materials. The project's heuristic learning model was designed to place the student in control of the learning situation and to foster active problem solving. The eight guidelines for heuristic lessons were as follows:

1. Begin with an "encounter" or "messing around" stage that permits the child to interact with the materials before a problem is posed. Present concrete materials that permit children to experience and impose many kinds of change.

2. Allow the children to set goals before they deal with transformations.

3. Present problems that involve puzzling transformations. Create situations that stimulate children to infer and reason spontaneously.

4. Accept children's methods of problem-solving, even if they lead to failure.

5. Create a nonthreatening, nonexternally evaluating atmosphere. Avoid praise, criticism, or other announcements that label children's responses, since external evaluation reinforces dependence on a controlling environment.

6. Require children to anticipate, predict results of their actions, observe outcomes, compare their hypothesized outcome with results.

7. Be responsive to the child, who is in the driver's seat. Listen, accept all responses, and respond with appropriate feedback.

8. Permit use or creation of alternative strategies.

Project staff developed specific lessons for the fields of reading and language arts. During the project's field research, staff followed the Brigance Diagnostic Inventory of Basic Skills (Brigance, 1977) and the lessons presented here are keyed to the Brigance. Each lesson lists a corresponding Brigance objective number, which may be helpful to teachers. After reading these lessons, teachers will presumably think of many ideas and modifications of their own for the objectives presented here and for other objectives.

Frequently, this manual refers to two games: the "Make Me Say" Game and the Chili Game. The former often needs to be adapted for specific lessons, hence discussion of the application of the "Make Me Say" Game appears in several cases. On the other hand, the Chili Game can be used the same way for many different lessons. Therefore, the Chili Game is described in detail in only one part of this manual.

Teachers can readily adapt many of the lessons here to a bilingual situation. This manual uses the term she to refer to the teacher and he to refer to the student. No discrimination is intended; all project teachers of experimental and control students were women.

II. READING READINESS SKILLS

Ability to Copy Shapes: Sample Lesson

Grade Level: 1, also appropriate for Kindergarten

Number of Students: 1 or small groups

Lesson Length: About 20 minutes

Brigance Objective: I 3

Method: Heuristic

Materials: Large sheet of drawing paper and pencil or crayon

Procedure: Before class the teacher prepares large cards with pictures of shapes on them,  ,  , and  , for example. The teacher introduces the lesson by saying that they are going to practice drawing shapes and shows the cards with pictures of shapes to the student. The teacher encourages the student to look at the cards and try various ways to draw the shapes, the "messing around" stage. The student begins to attempt to draw the shapes and works on various procedures on his own and compares the results with the cards. If the student cannot seem to start alone, the teacher might offer to draw any shape the student requests or the teacher might demonstrate two or three possible methods of drawing one shape,  , and  as examples of methods for drawing the triangle.

Observation: Some students enjoy the freedom of this method and are delighted to "mess around" and try various ways of drawing shapes.

Knowledge of Body Parts: Sample Lesson

Grade Level: K-1

Number of Students: 1 or small groups

Lesson Length: 15-30 minutes

Brigance Objective: I 7

Method: Heuristic with "Make Me Say" Game

Materials: Picture or pictures of a person or a doll.

Procedure: The teacher shows the picture of a person to the student and explains to him that they will learn about parts of the body. The student then looks at the picture and "messes around" looking at the various parts of the body. Frequently, the student automatically begins to name some body parts, such as arms, legs, and mouth. If the student does not begin to identify parts by himself, the teacher can use the "Make Me Say" Game. First she offers, "Any body part you point to I will say." After a few minutes of that activity, she asks the student to make her say _____ by pointing to the requested part; for example, she asks the student to make her say "arm." If the student points to an arm, the teacher then says, "Arm, you made me say arm," and then requests identification of another part in the same manner as before. If the student points to a different part from the one requested, the teacher says that part and then says, "Now see if you can make me say arm." If the student requests help or becomes frustrated, the teacher provides assistance. The game continues until the student has identified all the body parts which are part of his learning objective for that day.

Observation: Students enjoy this lesson but sometimes need to review parts another day. A child who knows where his ankle is one day, may have forgotten by the next week.

Variation: Students might use their own bodies for this lesson or pictures of animals. Looking at various pictures of animals, students may generalize, or be encouraged by the teacher to generalize, about anatomy of people and animals.

Letter Recognition: Sample Lesson Number 1

Grade Level: K-1, also appropriate for grades 2-4 for students who have not yet learned to recognize letters.

Number of Students: Individual

Lesson Length: 15-30 minutes

Brigance Objectives: I 19 and 20

Method: Heuristic, "Make Me Say" Game

Materials: Letter cards or pieces of wood cut into shapes of letters

Procedure: The teacher spreads in front of the student all 26 letters or a smaller group of letters. If the student is not already familiar with the letters, the teacher explains what they are. The teacher encourages the student to look at the letters and "mess around" with them. After a brief "messing around" stage, the teacher introduces the "Make Me Say" Game. The teacher explains to the student that any letter the student points to the teacher will say. For example, if the student points to C, the teacher will say "C." Then the teacher says, "See if you can make me say 'B'." If the student points to B, the teacher says, " 'B,' you made me say 'B'." If the student points to D, the teacher says, " 'D,' you made me say 'D,' now see if you can make me say 'B'." The game continues. Unless the student becomes frustrated, the teacher does not tell the student which letter is the requested letter.

Observation: Many students, especially in the K-4 level, enjoy this game and like to control the teacher. During the game, the teacher poses the problems for the student. In the following lesson the student generates his own problems.

Variation: The student could reverse the "Make Me Say" Game and play the role of the teacher. The teacher might purposely make a few

Variation (Cont'd): mistakes for the student to catch. If the student misses the mistakes, the teacher might ask him to look again.

Letter Recognition: Sample Lesson Number 2

Grade Level: K-1, also appropriate for grades 2-4 for students who have not yet learned to recognize letters.

Number of Students: Individual

Lesson Length: 15-30 minutes

Brigance Objectives:

Method: Heuristic

Materials: Letter cards or pieces of wood cut into shapes of letters

Procedure: The teacher spreads in front of the student all 26 letters or a smaller group of letters. If the student is not already familiar with the letters, the teacher explains what they are. The teacher encourages the student to look at the letters and "mess around" with them. After a brief "messing around" stage, the student usually begins to pick-up and name letters which he recognizes. The student generally chooses the order in which to name the letters, random, alphabetical, letters in his name, or whatever. If the student does not begin to name letters, the teacher can suggest that the student do so and present two or more different suggestions as to how the student might start.

Observation: This procedure can be used without the "Make Me Say" Game and, therefore, provides variety in the heuristic method of learning letters. In this lesson the student generates his own problems.

III. WORD RECOGNITION

Word Recognition and Increase of General Vocabulary: Sample Lesson Number 1

Grade Level: 1-3

Number of Students: 1-to-1 or small groups of 2 to 4

Lesson Length: Approximately 50 minutes

Brigance Objective: II A 1

Method: Heuristic, includes "Make Me Say" Game

Materials: Child's grade level basal text, blank word cards, and a felt pen

Procedure: The teacher introduces the story for the day to the child and asks him to read the story silently. The teacher tells the child, if there is any word he does not know, to point to it and she will tell him the word and write it on a word card. When the child has completed the story silently, the teacher asks him to read it again orally. She follows the same procedure as before for words the child does not know. At the completion of the story, the teacher spreads the cards in front of the student and asks him to make her say a word by handing it to her. Whatever word card the student gives, the teacher says. If it is the word card she asked for, she says it and says, "You made me say _____." Then she asks him to make her say a new word. If the child hands her the wrong card, she simply says the word he gives her and then repeats her first request. The following day the teacher reviews the words by asking the student to use each of the words in a sentence while the teacher writes down the sentences for him. She underlines the story words and has the child read his sentences back to her.

Variation 1: Students sometimes like to switch roles in this "Make Me Say" Game and have the teacher make them say the words.

Variation 2: The teacher and students might prepare a short sentence for each word card. They might personalize sentences for individual students. For example:

Mr. Arturo E. Trujillo is my _____. (father)

My kitten is _____. (brown, black, long, three, new)

Word Recognition and Increase of General Vocabulary: Sample Lesson Number 2

Grade Level: 6, also appropriate for other levels

Number of Students: 2 or small group

Lesson Length: 30-35 minutes

Brigance Objective: II A 1

Method: Heuristic, inquiry

Materials: Words from Sprint Reading Skills Program, First Level, Skills Book 1. (by Arnold D. Schapiro. New York: Scholastic Book Services, c. 1978.) Paper and pencils, plus word cards and felt marker

Procedure: The teacher presents vocabulary words, students read words orally and discuss meaning of words. Then the teacher introduces suffix -ful and students list words which could have -ful added. Students spell words for the teacher who writes them on a sheet of paper.

Observation: Students discussed words which really are not shortened to one word with ending -ful; one student noted stomach full is two words. Together the group observed that when people begin

Observation (Cont'd): communicating on paper (or stone) they draw pictures, then make long words, and then put words together, and then abbreviate and use short hand. One girl on her own decided to get a dictionary to check on current acceptability of "factful" and "talkful." (Heuristic teachers need readily available resource materials.)

Variation: A word list was available. One student suggested they make sentences with the words and try to put more than one of the words in each sentence. Two students then took turns creating sentences. At times, they added suffixes to express the words in the way they wanted. This could also be done as a written exercise for seatwork.

Recognition of Basic Sight Words: Sample Lesson Number 1

Grade Level: 2-6

Number of Students: 2-3

Lesson Length: Approximately 35 minutes or as little as 15 minutes

Brigance Objective: II A 2

Method: Heuristic, inquiry with "Make Me Say" Game and Chili Game as variations.

Materials: Sight vocabulary word cards

Procedure: The teacher allows about five minutes for the "messing around" period during which students will become familiar with as many basic sight vocabulary words as they are able to handle. The teacher encourages the students to play, inquire, and interact with the words and to discover and utilize their unique system of discovery learning without teacher intervention. At the end of the lesson the teacher presents the words on a slide screen for students to recognize and repeat.

Observation: Some students enjoy the freedom of this method and learn well.

Variation 1: For students who have difficulty with this method, the "Make Me Say" Game provides an effective alternative. The teacher explains that she will say the word on any word card a student hands her. Then, for example, she says, "See if you can make me say, 'that'." The game continues as previously described in "Letter Recognition: Sample Lesson Number 1."

Variation 2: The Chili Game, described at the end of this manual, provides an interesting method for learning sight words or

Variation 2 (Cont'd): reviewing them.

Recognition of Basic Sight Words: Sample Lesson Number 2

Grade Level: 6, also appropriate for other levels

Number of Students: 1, could be modified for small groups

Lesson Length: 15-20 minutes

Brigance Objective: II A 2

Method: Heuristic

Materials: Word cards for the sight words to be taught plus a felt pen and some blank word cards

Procedure: Before class the teacher prepares a set of word cards for the 250 basic sight words, which the student has missed either on a pre-test or in classroom reading. The student takes the word cards and moves them around as he chooses, the "messing around" stage. Then the student picks up individual cards and begins to read aloud the words. When the student misses a word, such as reading where for the word card were, the teacher suggests he look again at the word card and at other word cards which are similar, such as which, when, what, want, and where. The student is encouraged to "mess around" with similar word cards and to try to read the words. The teacher reads aloud any word the student requests the teacher to read. Word cards which the student knows are placed in one stack, and word cards which the student needs to study further are kept in another area.

Observation: A student sometimes says he knows the words, when he first sees the set of cards. However, when he starts reading the

Observation (Cont'd): cards, it often becomes clear to the student and the teacher that more work is needed. Students appear to enjoy this lesson and sometimes choose it, when presented with a variety of lessons from which to choose. Students tend to confuse similar words, such as the previously mentioned set.

Variation: During the field phase of the study, some students suggested they make sentences with the words they needed to study. They wrote the sentences and checked them and were confident that it aided their progress. The sentences made the words meaningful to them and were an important part of heuristic learning, since the students suggested the methods for their own learning.

Recognition and Understanding of Direction Words: Sample Lesson

Grade Level: 2-6

Number of Students: 2-3

Lesson Length: Approximately 35 minutes or as little as 15 minutes

Brigance Objective: II A 3

Method: Heuristic, inquiry with "Make Me Say" Game and Chili Game as variations

Materials: Direction words on cards or list

Procedure: The teacher allows about five minutes for students to "mess around" with the direction words and become acquainted with them without teacher intervention. Then the teacher encourages the students to utilize their own methods of discovery learning without intervention from the teacher. When encouraged, students will often suggest their own methods of learning. If they do not, the teacher asks students to write sentences, poems, or stories, using as many words as possible.

Observation: Many students enjoy the freedom of this method.

Variation 1: For students who have difficulty with this method, the "Make Me Say" Game provides useful structure. The teacher explains that she will say any word the student points to on the list or cards. Then, for example, she says, "See if you can make me say, 'open'." The game continues as previously described in "Letter Recognition: Sample Lesson Number 1."

Variation 2: The Chili Game, described at the end of this manual, provides an interesting method for learning direction words or reviewing them.

Recognition and Understanding of Abbreviations: Sample Lesson

Grade Level: 1-6, depending on student's knowledge of abbreviations

Number of Students: 1-to-1 or small groups of 2-4

Lesson Length: Approximately 25-35 minutes

Brigance Objective: II A 4

Method: Heuristic with "Make Me Say" Game

Materials: Word cards (or a list on chart paper) of common abbreviations on the child's level and another stack of cards (or list) with the word each abbreviation represents

Procedure: The teacher shows the student a list of abbreviations (about 10 of the most common ones) and another list of the words they represent. She makes sure each list is properly labeled, ie. abbreviations and words. While pointing to the list of abbreviations, she asks the student to define abbreviations and give rules for forming abbreviations. She has the child check the abbreviations with his definition and rules to determine if his definition and rules account for all abbreviations. During this time the teacher encourages responses with questions, such as, "How are the abbreviations different from the words?" or "How are these two lists different?" She writes down all of the child's responses so she can refer to them later. Next the teacher and student play the "Make Me Say" Game, which is adapted here for abbreviations. The teacher asks the student to make her say a word by pointing to the correct abbreviation on a list. (She might also have the words on cards and have the student hand her the correct card). For example, she might

say, "Can you make me say Mister by pointing to the abbreviation for it?" No matter what abbreviation the student points to or hands her, she says the abbreviation and the word it stands for. If it is not the one asked for, she simply repeats her word after she has said the one the student gave. They continue this process as long as there is interest or until they feel the child has mastered the abbreviations presented.

Observation: Many students enjoy this lesson. Teachers can readily adapt the procedures to individual interests and needs. A group of children offered the following sample definition of abbreviations and explanation of their construction.

Abbreviations

> Abbreviations are parts words. To make an abbreviations you take away the end of the word, or the middle of the word. And then we put the letters we have left together and put the period at the end.

Recognition and Understanding of Contractions: Sample Lesson Number 1

Grade Level: 6, also appropriate for other levels

Number of Students: 1 or group of 2

Lesson Length: 10-20 minutes

Brigance Objective: II A 5

Method: Heuristic

Materials: Word cards for compound words and their matching contractions (explained under Procedures)

Procedure: The teacher presents word cards and explains that the set of cards contains compound words and their contractions, which the students can match. For example:

After students pair word cards, the teacher asks students to explain the general guidelines for forming contractions.

Observations: Students enjoy matching the cards and seem to grasp the concept of how contractions are formed. One student in the study complained at first that he already knew the contractions. However, he went ahead and matched the cards and appeared to be happy and to be learning.

Variation: Students could write their own word cards for this game. They could copy a list of contractions or compound words and then try to figure out what the matching word would be.

Recognition and Understanding Contractions: Sample Lesson Number 2

Grade Level: 1-6, depending on student's knowledge of contractions

Number of Students: 1-to-1 or small groups

Lesson Length: Approximately 30-35 minutes

Brigance Objective: II A 5

Method: Heuristic with "Make Me Say" Game

See and Adapt: "Recognition and Understanding of Abbreviations: Sample Lesson"

Recognition and Understanding of Common Signs: Sample Lesson

Grade Level: 2-6

Number of Students: 2-4

Lesson Length: Approximately 35 minutes or as little as 15 minutes

Brigance Objective: II A 6

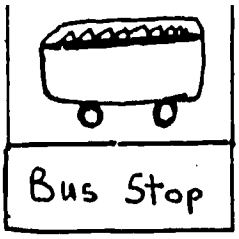
Method: Heuristic, inquiry with "Make Me Say" Game as a variation

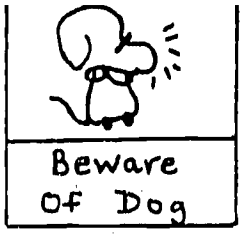
Materials: List of common sign vocabulary on chalk board, paper, or cards. Crayons, paper, scissors, ruler, pencils (colored), tape

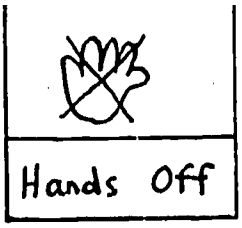
Procedure: The teacher allows about five minutes without teacher interaction for students to become acquainted with some common sign vocabulary written on the chalk board or cards, the "messing around" time. Then the teacher questions students to ascertain whether they can identify the sign words. She asks probing questions about the signs, for example: "What do they mean? Where are they seen? What are they telling us? Tell me more about them. How would you describe them to someone else?"

After the inquiry procedure, the students draw pictures or write statements related to each common sign word. Then the students match the pictures and sign cards. If possible, they might display their art work and sign cards on a bulletin board or table.

Observation: Many students enjoyed this lesson. Copies of some of their pictures are on the following page.







Variation 1: The teacher describes situations which might occur in the students' lives and asks the students to point to the sign that would fit the situation. For example: "You're riding your bike and you come to a busy street corner. Point to the sign that shows me what you'll have to do before you can cross the street." The student should point to the Stop sign. If he does, she says, "That's the Stop sign. You have to stop before you can cross the street." If the student points to a different sign other than the Stop sign, she tells him what that sign means, then repeats her original situation. They continue in this manner until the student points to the Stop sign. (This is a variation of the "Make Me Say" Game).

Variation 2: After the student finishes the earlier lesson or variation, the student tells his own stories about the signs.

Increase of Vocabulary; Classification, Analogies, Antonyms, and Homonyms: Sample Lesson

Grade Level: 2-6

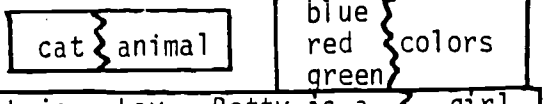
Number of Students: 2-4

Lesson Length: 15-25 minutes

Brigance Objectives: II D 2-5

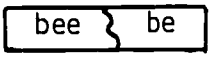
Method: Heuristic, inquiry

Materials: Word cards or brief sentences cut into puzzles, generally of two cards each. Samples for various vocabulary types might be:

for classification 

for analogies 

for antonyms 

for homonyms 

Procedure: Students "mess around" with the scattered puzzle parts for a vocabulary lesson, such as one on antonyms. The students are likely to begin matching the antonyms and their split puzzle parts without teacher intervention. If the students request assistance, the teacher provides it. She encourages the students to match the word card parts, if they do not start by themselves. The "Make Me Say" Game is suitable for assisting students in matching cards. After students have matched the words, they might use them in sentences or create poems, riddles, or rhymes with them.

Observation: Teachers can modify the use of word card puzzles to fit many other language arts and reading objectives. Use of the words in students' own sentences helps make the words meaningful to the students.

IV. WORD ANALYSIS

Recognition of Initial Consonant Sounds: Sample Lesson Number 1

Grade Level: 1-3

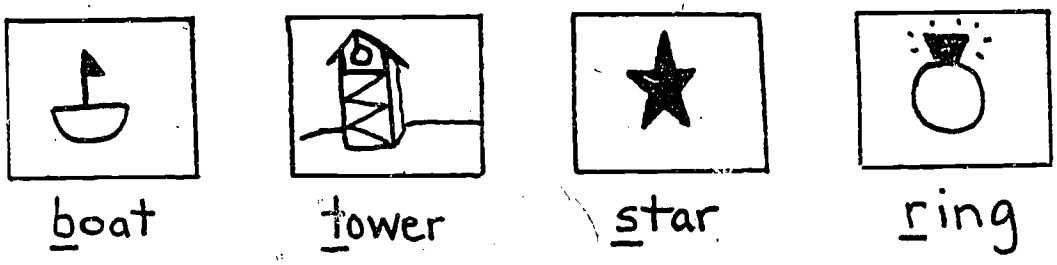
Number of Students: 1 or small groups of 2-4

Lesson Length: Approximately 25 minutes

Brigance Objective: II C 2

Method: Heuristic, with "Make Me Say" Game

Materials: Picture cards representing different initial consonant sounds. For example,



Procedure: The teacher gives the cards to the student and lets him "mess around" with them for a short time. The student may start naming the pictures. If so, the teacher simply repeats the names he says. Then she spreads the cards out and asks the student to make her say the _____ sound by handing her the picture that begins with that sound. She says the picture and repeats the initial sound of the word. At this time she can also ask the student to make her say the corresponding letter's sound by handing her another picture that begins with that letter. The teacher says the name of the picture and emphasizes the beginning sound and says, "You made me say the sound of _____" (the letter she requested).

Observation: This method is fun for many students. The picture cards can be used for spelling lessons. Matching word cards can be made for the pictures so that students can see what the word looks like.

Recognition of Initial Consonant Sounds: Sample Lesson Number 2

Grade Level: 1-3

Number of Students: 1 or small groups of 2-4

Lesson Length: 20-30 minutes

Brigance Objective: II C 3

Method: Heuristic with "Make Me Say" Game

Materials: Consonant letter cards

Procedure: The teacher gives the student the cards and lets him "mess around" with them for a short while. Then she spreads the cards on the table and asks the student to make her say the ____ sound by handing her the card with the letter that makes the sound. For whatever letter the student hands her, she says the sound. If it is the one she asked for, she says the sound and then says, "You made me say the ____ sound," and then asks for a new sound. If the student hands her a different letter from the one asked for, she says the one he hands her and then repeats her first request. She continues in the same [illegible] until the student successfully recognizes all of the letters and their sounds.

Observation: Students often enjoy this method and profit from it. For variety, the "Make Me Say" Game can be reversed.

Comprehension of Concept of Rhyming Words and Substitution of Initial Consonants: Sample Lesson Number 1

Grade Level: 1-3

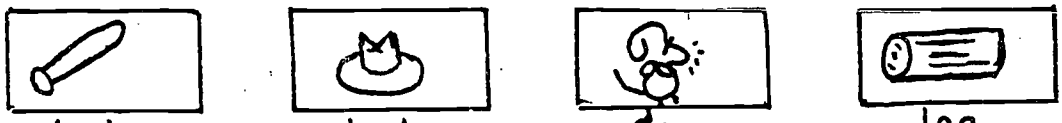
Number of Students: 1 or small groups of 2-4

Lesson Length: Approximately 25-35 minutes

Brigance Objective: II C 4

Method: Heuristic, inquiry

Materials: Picture cards for rhyming words, flannel board, newsprint, and felt pen.



Procedure: The teacher gives the student picture cards and lets him "mess around" with them on the flannel board. Then she takes all the pictures off the board and puts them on the table. Next, she asks the student to put a picture on the flannel board that rhymes with _____. She writes her word on paper, and after she says the student's picture word, she writes it on the paper next to her word, if it rhymes. If the picture word he chose does not rhyme with her word, she simply says the picture word and repeats her original word. She continues in this same manner for 5-10 words, always writing down the two rhyming words. When she has a sufficient number of words, she asks the student to look at the rhyming words and tell her why they rhyme. She might write a list of words that do not rhyme next to the rhyming words so the student has something to compare. The teacher writes down all of the student's reasons for rhyming. When the student has finished, the teacher reviews his reasons and sees if they work with each pair of rhyming words in the list.

Observation: By this method students often derive for themselves the concept of rhyming.

Variation: Instead of picture cards, this variation uses initial consonant cards and word ending cards, such as

and , for a variety of rhyming words. The teacher lets the student play with the letter and word ending cards for a short while. Then she puts a word on the board (for example b at) and asks the student to make her say a word that rhymes with that word by putting a new consonant on the flannel board. Whatever consonant the student puts up, she says the new rhyming word, whether it be a nonsense word or a real word. They continue in the same manner with the rest of the word endings.

Comprehension of Concept of Rhyming Words and Substitution of Initial Consonants: Sample Lesson Number 2

Grade Level: 2-6

Number of Students: 1-4

Lesson Length: 15-25 minutes

Rigance Objective: II C 4

Method: Heuristic, inquiry

Materials: Rhyming word card pairs cut into puzzles of two word cards each. Examples below:

Procedure: The teacher presents the numerous scattered puzzle parts to the students and they "mess around" with the pieces. Frequently students will automatically read the words and match the rhyming words along with the split puzzle parts without teacher intervention. Students often interact with each other; the teacher provides assistance if the children request it. If students do not by themselves start to match the word card parts, the teacher suggests they do so. She might use the "Make Me Say" Game for the matching. After the students have matched the rhyming word card pairs, they often suggest (if they do not, the teacher may suggest) that they use the words in written or oral sentences, or create poems, riddles, or rhymes with the words.

Observations: Many students have fun with this lesson and learn much with it. Using the words in their own sentences helps make the words meaningful to the students. This lesson's use of word card pairs as puzzles can be modified to fit numerous other language arts and reading objectives.

Short or Long Vowel Sounds: Sample Lesson Number 1

Grade Level: 1-3

Number of Students: 1 or small groups of 2-4

Lesson Length: Approximately 30-40 minutes

Brigance Objective: II C 7-8

Method: Heuristic with "Make Me Say" Game

Materials: For short vowel sounds: Word cards with consonant-vowel-consonant (c-v-c) written on them. Word cards with nonsense c-v-c words on them. Newsprint sheet to write student's responses on.

Procedure: For short vowel sounds: The teacher spreads out the c-v-c word cards in front of the student and tells him that all of these words have short vowel sounds in them. Next she asks the student to tell her why these words have short vowel sounds. She writes all of the student's responses on the newsprint. When the student has finished with his reasons for the short vowel sounds, the teacher reviews the reasons with the student. Then they play the "Make Me Say" Game. To do this, the teacher asks the student to make her say a certain short vowel sound by handing her a word that has that sound in it. No matter what word the student hands her, she says the word. If it is a word containing the short vowel sound she asked for, she says "You made me say _____." If it is not a word with the vowel sound she asked for, she simply repeats her request and follows the same procedure as above. When the student has had sufficient practice with these words, they use the nonsense words and do the same thing.

Observation: This lesson can enliven the learning of vowel sounds.

Variation: The above lesson can be adapted for long vowel sounds.

Short or Long Vowel Sounds: Sample Lesson Number 2

Grade Level: 1-2

Number of Students: 1-4

Lesson Length: Approximately 30 minutes

Brigance Objectives: II C 7-8

Method: Heuristic

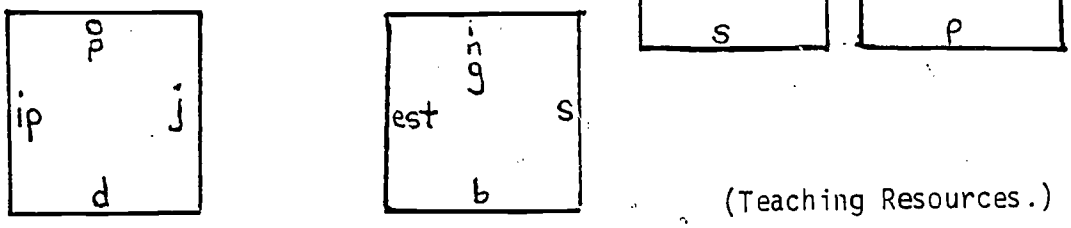
Materials: Four Square cards (M.R. Langtry. Hingham, Mass.: Teaching Resources, 1981.)

Procedure: The teacher separates the cards (one stack of short vowels, one of long vowels). The procedure is the same whether using the long or the short vowel cards. The teacher then gives the student a stack of cards and encourages him to play around with them and see what he can do with them. The student soon realizes that he can make words with the cards, both real and nonsense words. After this investigation period, the teacher asks the student to make her say the "ă" sound by making a word (real or nonsense), from the squares. No matter what word the student makes, the teacher says that word. If it contains the "ă" sound, she says, "You made me say the 'ă' sound." If the word does not contain the "ă" sound, after saying the word, the teacher repeats her request, "Can you make me say the 'ă' sound?" She continues this until she feels the

Procedure (Cont'd): student can sufficiently identify those sounds.

Observation: Students enjoy the cards and the many different ways they can be put together to make words.

Variation 1: The teacher asks a student to make her say the "ĭ" sound in four different words. The student then "builds" words by connecting the different cards. Sample cards in this set are illustrated below:



(Teaching Resources.)

Variation 2: The roles can be switched: the student gives the sound and the teacher makes the words for the student to say.

V. READING: ORAL AND COMPREHENSION

Oral Reading: Sample Lesson

Grade Level: 1-6

Number of Students: 1 or small group

Lesson Length: About 20 minutes

Brigance Objective: II B 1

Method: Heuristic

Materials: Basal text or other reading matter

Procedure: The teacher provides the student, whenever possible, with a choice of passages to read. The teacher and student have a brief discussion about the passage chosen to be read: what they anticipate the story to tell and a quick study of new words in the story. Before the student reads aloud, the teacher explains to the student that she will say or help him with any word he points to or needs help with. Then the student begins to read aloud. The teacher is silent, unless the student requests or needs assistance. If the student reads a word incorrectly but does not alter the meaning of the story by his word, the teacher does not interrupt but merely notes the actual word in the story and the student's word on cards. At the end of the lesson, she shows the word cards to the student, and the teacher and student study the words heuristically. (The word recognition section of this manual provides examples of methods for that study).

Observation: During the project, oral reading was frequently combined with reading comprehension. Teachers may obtain further ideas by reading that section of this manual.

Reading Comprehension: Sample Lesson Number 1

Grade Level: 2-6

Number of Students: 2-4

Lesson Length: Approximately 30 minutes

Brigance Objective: II B 2

Method: Heuristic, inquiry

Materials: Abstract of story, basal text or other reading matter, sentence strips, marking pens, and paper

Procedure: Before class the teacher prepares a brief written abstract of the story to be read. The abstract is prepared with the following items in mind:

1. Hand print or type abstract in readable form for students. Use ditto, blackboard, large cards, and cartoons.
2. Abstract is to include an inquiry setting, leaving out the ending or result. After reading abstract, students are to predict results with minimal information.
3. Abstract is intended to motivate students to read the complete story in their text and find out the result.

At the beginning of the class the teacher presents the abstract to the students. They read it and discuss their predictions of the story's outcome. The teacher, or a student, writes down those predictions. Briefly, the students and teacher study, heuristically, vocabulary words to be introduced in the story. (See word recognition section of this manual for methods). Then the students read the complete story silently and discuss the story, comparing what actually happened with their predictions.

Observation: This method challenged students.

Variation: At the end of the lesson students might draw pictures of the story or an aspect of it. The group might draw a series of pictures to display the story on a bulletin board.

Reading Comprehension: Sample Lesson Number 2

Grade Level: 5-6, also appropriate for other levels

Number of Students: 2 or small group

Lesson Length: About 30 minutes

Brigance Objective: II B 2

Method: Heuristic, inquiry

Materials: William Liddle, Reading for Concepts, Book D, "Animals mean wealth" p.30. Second Edition. (New York:Webster Division, McGraw-Hill Book Company, © 1977).

Procedure: The teacher presents the story to the students and gives them an inference question to think about and write a brief answer to: "What else might the Navahos do when the government asks them to make their herds smaller?" Students read silently, think, and write. Then students discuss their answers to the inference question and discuss the story and its meaning. During the lesson, the students and teacher work on new vocabulary in the story, for example: wealth, communities, roots, business, herd.

Observations: This method provides students with the opportunity to think for themselves. Although this lesson is structured around a specific reading passage, it could be adapted for other passages.

VI. LANGUAGE ARTS

Grammar Mechanics, Capitalization: Sample Lesson

Grade Level: 5-6, with modification appropriate for other levels

Number of Students: 1-4, also appropriate for larger groups

Lesson Length: 20-30 minutes

Brigance Objective: III B 1

Method: Heuristic, inquiry

Materials: Prepared set of sentences which need capitalization, paper, and pencils

Procedure: Before class, the teacher prepares a set of sentences in which the necessary capitalization is omitted. A sample list is attached. Students, individually or as a group, fill in capitalization and derive rules as to why they capitalize as they do. After the students fill in capitalization and state rules, the teacher presents the students with a sheet which has all the capitalization properly marked. Students then figure out rules for the capitalization they originally omitted.

Observations: Students filled in some capitalization, although they overlooked some places where it was necessary. They stated the rules for the capitalization they used and they reasoned clearly. As in the lesson on punctuation, they were fairly able to figure out the reasons for the capitalization which they had omitted, but which was later pointed out to them as necessary.

Capitalization

1. thanksgiving comes on november 25 this year.
2. halloween comes on sunday, october 31.
3. tom lives at 1340 apple street.
4. anita lives in el paso, texas.
5. christmas will be on a saturday this december.
6. mike goes to conlee school.

Grammar Mechanics, Punctuation: Sample Lesson

Grade Level: 5-6, with modification appropriate for other levels

Number of Students: 1-4, also appropriate for larger groups

Lesson Length: 20-30 minutes

Brigance Objective: III B 2

Method: Heuristic, inquiry

Materials: Prepared set of sentences which need punctuation, paper, and pencils

Procedure: Before class, the teacher prepares a set of sentences in which the necessary punctuation is omitted. A sample list is attached. Students, individually or as a group, fill in punctuation and derive rules as to why they punctuate as they do. After the students fill in punctuation and state rules, the teacher presents the students with a sheet which has all the punctuation properly marked. Students then figure out rules for the punctuation they originally omitted.

Observations: Students filled in some punctuation, although they tended to overlook some places where it was necessary. They reasoned clearly and stated the rules for the punctuation they did use. Also, they were fairly able to figure out the reasons for the punctuation marks which they had omitted, but which had been pointed out to them later as necessary marks.

Punctuation Worksheet

1. Where is Las Cruces New Mexico
2. Mr Smith will take the students on a field trip on November 10
3. Wow Mike said to the teacher who said School is out
4. Will you go to school on October 16 1982
5. Mrs Elsie C Cow sells Bordens milk
6. Lets take a walk on November 6
7. The person to see is Dr T C Swift

Arrangement of Words in Alphabetical Order: Sample Lesson

Grade Level: 2-6

Number of Students: 1, could be adapted for small gro

Lesson Length: 15-30 minutes

Brigance Objective: III D 1

Method: Heuristic

Materials: Word cards

Procedure: Before class the teacher selects word cards so that the student can practice improving his alphabetizing skills. When the student comes to class, he is given a set of cards: cat dog box paper artist and zoo, for example. The student and teacher discuss alphabetizing words and its purpose and use in the world. The teacher might show an index, dictionary, and telephone book. The student then "messes around" with the cards and possibly also a ready-made alphabetical list, such as a dictionary. The student generally arranges the cards in alphabetical order automatically. Or he asks the teacher if he should and then proceeds to arrange them alphabetically, after the teacher indicates it would be a useful thing to try. After the student understands alphabetizing by the first consecutive letter, the teacher can present word cards for the students to use in more complicated arrangements. Such words might be: start see sea stop salt state stopped star and stair.

Observations: Generally, students figure out for themselves most of the rules for alphabetizing, including how to alphabetize second and later letters. They will state those rules in their own words, when asked. Sometimes they forget to notice all the necessary letters and put stop before start because, as one child said, "p comes before r". A few questions from the teacher usually lead students to a realization of proper alphabetizing procedures.

Spelling, General: Sample Lesson

Grade Level: 1-6

Number o. Students: 2, could also be adapted for 3-4

Lesson Length: 30-45 minutes

Brigance Objective: III C 1

Method: Heuristic with "Make Me Say" Game as a variation

Materials: Cardboard crossword board or Scrabble board, thin cardboard strips, felt pen, and scissors, list of spelling words, and dictionary. (Scrabble. Bay S. re, N.Y.: Selchow & Righter, 1948.)

Procedure: Before class the teacher prepares some words from students' spelling lesson and prints the words on cardboard strips, saving enough space between letters that cut letter squares will be large enough to hang. When class begins, students take turns choosing a word, cutting and scrambling it (or having the teacher cut and scramble it), and then spelling the word on the board. The teacher encourages students to move around ("mess around") letters to attempt to spell the words. As the game proceeds, old words are removed and their letters placed in a scrambled area. Students then make words from the scrambled area and request the teacher to make added letters, when they are necessary to complete words. Students are encouraged to experiment with several letters for parts of words about which they are uncertain. For example, in the study one student tried vegtuble vegetble vegtubel and vegetubel. On encouragement to try further, he substituted a for the u and put the word together correctly.

Observation: Students did think about how to spell; it often took a long time for such decisions as together ends in er and not re or err. Some students like to scratch (scribble or print) words on scrap paper to see how they appear, before putting the letters on the board. That was some students' chosen method of "messing around." Caution: When the teacher or a student cuts letters apart (instead of using ready-made letters), cut straight lines so line of cut does not give away the order of letters.

Variation 1: The teacher presents words from a spelling list. A Scrabble board is placed between two students, who are sitting side-by-side. Each student has a set of pre-cut letters. When a word, such as"ring," is presented by the teacher, each student works quickly to put the word in cut-out letters on the board. Students who are uncertain of spellings check a dictionary.

Variation 2: Each student has a list of his own spelling words and gives the list to his partner, who then asks him one word at a time. When asked, the student puts the word in cut-out letters on the board. The two students take turns asking words. When questions arise, students check a dictionary.

Variation 3: The student copies the words himself and then cuts them into letters and scrambles the letters. Then he "messes around," playing with the letters, and later re-makes the words and creates additional words with similar combinations. One student added sake and I'll to an earlier list of make tell and will.

Variation 4: The "Make Me Say" Game can be used for spelling lessons, either as the basis of the lesson or at the end for a quick review.

Spelling, Suffixes: Sample Lesson

Grade Level: 4-6

Number of Students: 1, could be adapted for small groups

Lesson Length: About 20 minutes

Brigance Objective: III C 4

Method: Heuristic, inquiry

Materials: Word cards, dictionary, and list of words to have suffixes attached

Procedure: Before class the teacher prepares a set of word cards and a set of suffix cards. For example, a planned lesson on forming the past tense of verbs might have the following verbs:

play | say | stop | has | pay | walk | keep

and cards for the following variations of the past tense suffixes:

ed | ied | d | id | t | double consonant ed

At the beginning of class, the teacher shows the student the cards and briefly says they will work on changing a present tense verb to a past tense one by adding an ending (or suffix) from the set of suffix cards. The student then looks at the cards and moves them around, the "messing around" stage. Often the student will spontaneously begin to match the endings and verbs. If not, the teacher suggests the student do so. Students, generally, match the regular ed ending to verbs such as walk, easily. They often have difficulty with the proper ending for verbs such as play and pay. The teacher can suggest encounters, such as looking at a dictionary; some students decide for themselves to check a dictionary. If a student becomes frustrated, the teacher offers

Procedure (Cont'd): assistance. If the student works independently on this task and appears to be content, the teacher stays in the background.

Observations: Some students learn well from this task and discover several basic rules of spelling and also learn other things, such as how to use a dictionary effectively. However, some students may do all of that and yet be frustrated by the situation of having to discover and determine the answers for themselves. Teachers need to be alert for frustration problems and use their best judgment in solving them.

VII. CHILI GAME

Grade Level: K-6, appropriate for older children also

Number of Students: 2-6, variation presented here for 1 student

Lesson Length: 10-50 minutes, teacher and student discretion preferred

Brigance Objective: This game can be used as a supplement in teaching many of the Brigance objectives. After reading the procedures section, teachers can adapt the game to numerous lessons.

Method: Game which can be used heuristically

Materials: Chili Game board, markers (beans, buttons, game markers, golf tees), dice, and timer if desired

Procedure: The teacher chooses an objective and lesson appropriate for this game. (Several such lessons are cited in this manual). Students roll the dice to see who has the first turn. The game then proceeds as follows:

> Markers are placed at base of the chili on large black spot. Students can move in either direction. Students may choose the direction or the teacher and students can make game rules. The rules may be modified. Each player takes a turn by rolling the dice. If a student stops on a chili seed (a ⊂⊃ on the board) on his route to the finish line, he must return to the beginning and start over! The first student to go completely around the chili finishes first.

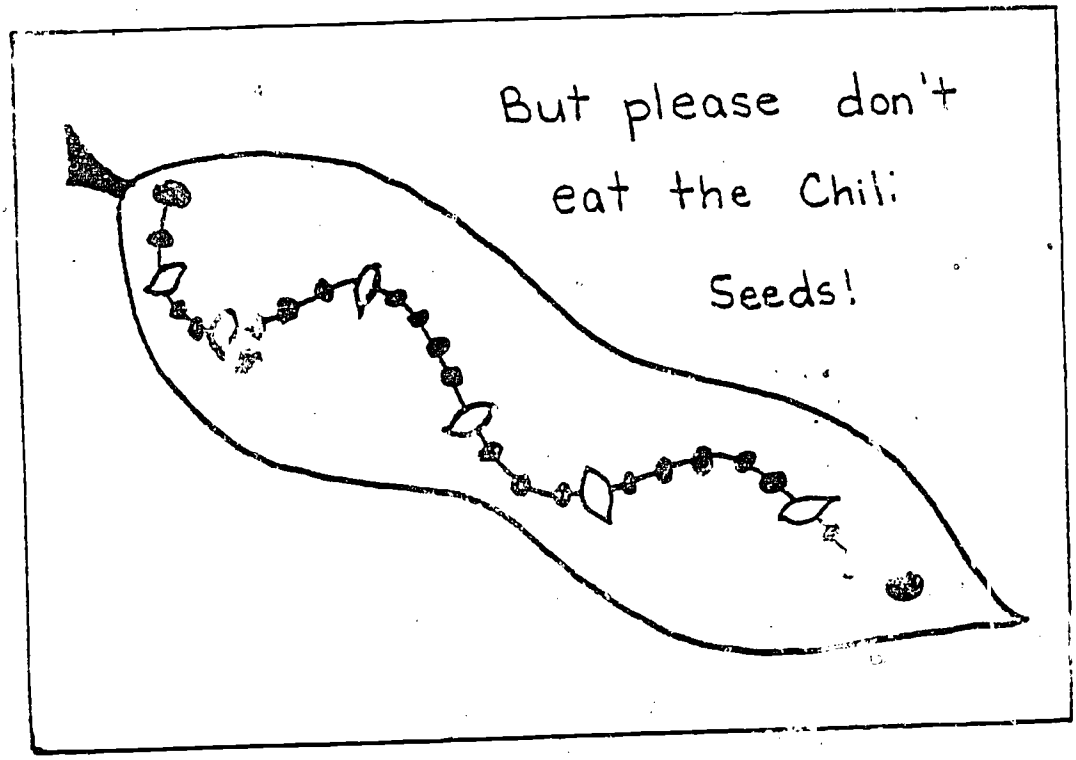
The game board appears on the next page. Chili seeds drawn in a color which is different from the dots will stand out better than in the black-and-white drawing here. The lesson to accompany the game can be in the

form of the "Make Me Say" Game, as described in "Letter Recognition: Sample Lesson Number 1." When the student makes the teacher say the requested word, the student rolls the dice and takes his turn.

Observation: Many students loved this game.

Variation 1: Method of avoiding use of game as a reward: The student may roll the dice and move his marker whether or not he answered correctly the question asked. In that way the game is not used as a reward, but merely as an addition of fun to an activity. If two or more students are playing, they are not competing on an intellectual basis, but merely on the basis of chance.

Variation 2: Game for an individual student: Although the game is probably more fun when played by two or more students, one student can play it and enjoy it. Many individual students enjoy the opportunity to move a marker around the board and see if they can avoid the chili seeds.



Reference

Brigance, A.H. Brigance diagnostic inventory of basic skills. (2nd ed.). North Billerica, Mass.: Curriculum Associates, 1977.