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Toward the Development of an Intervention Model for Learning Disabled Adolescents: The University of Kansas Institute

Jean B. Schumaker, Donald D. Deshler, Gordon R. Alley,
Michael M. Warner, *University of Kansas*

At the Kansas institute, research was concentrated on the problems of LD adolescents. Epidemiological studies revealed the unique characteristics of LD in students of high school age. A curriculum comprised of strategy training, social skills, modified materials and instructional procedures was developed. Instructional, motivational, and evaluation components of the curriculum were described.

The major mission of the University of Kansas Institute for Research in Learning Disabilities (KU-IRLD) has been the development of a validated intervention model that is sufficiently powerful to affect the performance of learning disabled (LD) adolescents in school settings. Because of the limited amount of empirical information available on the characteristics and problems of older LD individuals, the KU-IRLD devoted the initial years of its work to the establishment of a comprehensive epidemiological data base. The data collected during our epidemiological research came from a variety of sources (parents, teachers, administrators, the LD youths themselves), tapped a broad array of variables (academic, social, medical, environmental), and used several data instruments (formal psychometric tests,

a circular recall task, interviews, surveys). The goal of the epidemiological research was to describe both the attributes of the LD learner and the setting or conditions under which learning and failure occur for this learner. The epidemiological research strategy proved invaluable in assisting us to form a clearer profile of the LD adolescent and the settings and conditions that may precipitate his or her failure. More importantly, this data base has allowed us to base our intervention decisions on an empirical foundation. The purpose of this article is to summarize the intervention studies we have conducted in an attempt to design and validate an intervention model for LD adolescents. This article is divided into four sections, each representing a major component of the intervention model that has evolved during the last three years. The major components discussed are the curriculum, the instructional methodology, the motivation system, and the evaluation system.

Before considering these intervention components, however, we must review, in summary fashion, the key epidemiological findings that have influenced our intervention research.

Grounding Interventions In Epidemiological Data

Our epidemiological research and its subsequent cross-validation was conducted in three large school districts in eastern Kansas. Each district represented a different socioeconomic status (one was predominantly upper middle class, one was predominantly middle class, and the final district was predominantly lower middle class). To conduct our epidemiological study on LD adolescents, we compared them to low-achieving (LA) students. The LD students ($n = 318$) included in our study were formally classified as LD by a team of school psychologists and teachers of LD students from outside the districts. Students were included in the LA group ($n = 327$) if they met the following criteria: received one or more Fs in core school subjects, achieved at or below the thirty-third percentile on a standardized achievement test, and had no history of previous special education services. A contrast group of normally achieving students ($n = 275$) came from the high school marching band in a fourth school district.

Our epidemiological findings are reported in several sources (KUIRD Research Reports Nos. 12-20; Warner, Schumaker, Alley, & Deshler, 1980; Deshler, Warner, Schumaker, & Alley, in press; Deshler, Schumaker, Alley, Warner, & Clark, 1982). The statements

below present those findings that relate most directly to our intervention efforts:

Academic and cognitive factors are the most powerful in differentiating LD from LA adolescents. When the performances of LD and LA adolescents were compared on social, medical, environmental, and cognitive-academic factors, it was only the latter that differentiated the two populations. Results indicated that once the LD and LA groups were equated statistically for achievement and ability, virtually none of the other variables served to differentiate the two groups reliably. Further analysis of the academic achievement deficits of LD adolescents indicated that they are the lowest of the low achievers, typically scoring below the tenth percentile on achievement in reading, written language, and mathematics. In addition, it should be stressed that the majority of LD adolescents exhibited low performance in *all* achievement areas, suggesting that these adolescents' disabilities are very general rather than specific.

LD adolescents reach a plateau of basic skills during the secondary grades. Our data suggest that during adolescence there is very little growth in basic skills. This is somewhat surprising in light of the major role played by basic skill remediation in most elementary and secondary LD programs (Deshler, Lowrey, & Alley, 1979). A plateau in reading, written language, and mathematics was observed by the time students reached the tenth grade. In reading and written language, LD students' average achievement in seventh grade is at the high third-grade level and plateaus at the fifth-grade level in the senior high grades. In mathematics, average achievement in the seventh grade is fifth-grade level and plateaus at the sixth-grade level in the senior high grades.

LD adolescents demonstrate deficiencies in study skills and strategies. In a study of school-classified LD students, secondary LD teachers reported that more than 85% of their LD adolescents have difficulties in such areas as test-taking skills and study skills (Alley, Deshler, & Warner, 1979). Similarly, Carlson and Alléy (1981) found that LD high school students performed significantly worse than a group of successful students on notetaking, listening comprehension, monitoring writing errors, test taking, and scanning. Schumaker, Sheldon-Wildgen and Sherman (1980) observed LD and non-LD junior high students in their regular classrooms and found that LD students listened less attentively to teacher statements and used a study strategy

called "alternate reading and writing" less often than the non-LD students.

Many LD adolescents exhibit immature executive functioning. Executive functioning (the ability to create and apply a strategy to a novel problem) was found to be a deficit in over half of the LD adolescents. The executive functioning of LD students was tapped through the use of a circular recall task originally designed by Butterfield and Belmont (1977). Results showed that normally achieving students were superior to both LD and LA groups both in accuracy and executive functioning.

Many LD adolescents demonstrate social skill deficiencies. Several of our studies have indicated that social skill deficits cannot be classified as a characteristic solely associated with learning disabilities; low achieving adolescents often demonstrate comparable deficiencies. Nevertheless, the social deficits of some LD adolescents are clearly evident and appear to have an effect on their lives. Schumaker, Hazel, Sherman, & Sheldon (1982) found the social skills of LD adolescents to be significantly worse than the social skills of non-LD students on seven of eight skills judged to be necessary and important for successful adjustment (accepting negative feedback, conversing, giving negative and positive feedback, negotiating, social problem-solving, and resisting peer pressure).

Secondary school settings place complex demands on LD adolescents. As students progress from elementary to junior and senior high school, the demands for successful performance increase. The complexity of the setting demands contribute as much to the LD adolescents' failure as his or her learning deficits. Moran (1980) in an observational study of secondary content classes, found heavy listening and writing demands on adolescents. Specifically, she found teachers to rely heavily on the lecture method to communicate with students. Lectures were typified by few advanced organizers, rapid speech, and few checks for students' understanding. Schumaker, Sheldon-Wildgen, and Sherman (1980) found the largest proportion of student time in junior high classes was spent doing independent work requiring reading and writing skills. In a study designed to determine the expectations of secondary content teachers, Knowlton and Schlick (in prep.) found that teachers hold expectations of students in four areas: skills to cope with subject matter, general study skills, independent work habits, and communication skills. Finally, Link (1980) asked secondary content teachers to report the major reasons

they felt LD adolescents had difficulty coping with curriculum demands. They reported the following areas of difficulty: following oral and written directions, skimming reading selections, locating information in a textbook, recalling information for tests, locating answers to questions, and taking notes from discussions.

An analysis of the epidemiological data presented above strongly suggests that by the time LD adolescents enter the secondary grades, they are severely deficient not only in basic academic skills but also in those skills necessary to enable them to cope with the broad array of demands encountered in secondary settings. Furthermore, while the social skills of LD adolescents are comparable to those of their low-achieving peers, they are significantly different from their normally achieving counterparts, a situation necessitating serious intervention considerations. The need to design interventions sufficiently powerful to overcome these existing skill deficits as well as to increase the students' ability to cope with the complex setting demands is apparent.

Thus, during the second year of our institute, we turned our attention to the design of an intervention model consistent with the major findings of our epidemiological work. Given the broad range of academic deficits demonstrated by the LD adolescents that result in their inability to cope with secondary school curriculum demands, the KU-IRLD adopted a learning strategies approach as the core component of the intervention model. This approach is designed to teach students how to learn rather than to teach students specific content. Learning strategies, as initially defined by Alley and Deshler (1979), are "techniques, principles, or rules that will facilitate the acquisition, manipulation, integration, storage, and retrieval of information across situations and settings." For example, under a learning strategies approach, the instructional goal is to teach students techniques for organizing material that has to be memorized for history tests, rather than teaching them actual history content. Thus, while learning to use organizational strategies to improve comprehension and retention of history concepts, students also learn a skill that will theoretically facilitate acquisition of information in other subject areas. An ultimate goal of learning strategies instruction is to enable LD individuals successfully to analyze and solve novel problems that they encounter in both academic and nonacademic environments. The overall intent of learning strategies instruction, therefore, is to teach students skills that will allow them not only to meet immediate requirements successfully but also to generalize these skills to other situations over time.

To test the efficacy of the learning strategies approach, our insti-

tute designed a set of learning strategy packets that were matched to the major curriculum demands of the secondary school. These were validated and refined for individual students (Deshler, Schumaker, Alley, Warner, & Clark, 1982) and then implemented in a high school resource room program to determine the overall effect on the academic performance of LD adolescents. Each strategy was taught to students according to a specific set of acquisition procedures designed by Deshler, Alley, Warner, and Schumaker (1981). Detailed information on the specific learning strategy packets and the acquisition steps is provided below in the sections entitled "Learning Strategies Curriculum" and "Acquisition Steps."

While initial results of student progress showed gains in student performance in the resource room setting, they did not show generalized gains under other conditions. Thus, subsequent months of our intervention research efforts saw the addition of other components to the overall intervention model. The specific components added to the existing components of the learning strategies curriculum and the acquisition steps were the following: a social skills curriculum component, an instruction and material modification component, a generalization and maintenance component, a cooperative planning component, a motivation or goal-setting component and an evaluation component. As each component was added to the intervention model, it was designed to address the unique instructional needs of LD adolescents and the unique demands of the secondary setting. While many questions remain to be answered about our existing intervention model for LD adolescents in secondary schools, our findings clearly underscore the fact that the performance of LD adolescents in secondary schools can be favorably affected. The complex nature of the population and the secondary school, however, still require the additional refinement of even our most powerful intervention components to determine the subpopulations and conditions most appropriate for specific procedures. The following sections of this article will summarize key findings from our institute's intervention research.

Curriculum Components

Learning Strategies Curriculum

The Learning Strategies Curriculum includes a number of packages, each of which consists of instructional procedures and materials

for the training of a learning strategy or a group of related substrategies. The strategies are currently organized into two strands that correspond to the demands of the secondary setting: strategies for gaining information from written (e.g., textbooks and novels) and oral materials (e.g., lectures and films) and strategies for expressing information in permanent products (e.g., reports, themes, tests, and assignments).

In the strand for gaining information from written and oral materials are eight strategies. The Word Identification Strategy is aimed at the quick decoding of multisyllabled words. Three other strategies are aimed at increasing the student's comprehension of reading passages. The Visual Imagery Strategy is used while reading in order to form a mental picture of the events being described in the passage. The Self-Questioning Strategy is also to be used while reading to form questions about information that has not been divulged by the author and to find the answers to those questions later in the passage. The Paraphrasing Strategy is used to paraphrase the main idea and important details of each paragraph after it is read. A fifth strategy, Interpreting Visual Aides, is to be used by the reader to gain information from pictures, diagrams, charts, tables, and maps. All of these strategies are prerequisite to Multipass, a strategy for attacking textbook chapters, using three passes over the chapter to survey it, obtain key information from it, and study the key information. Most recently, the S.O.S. strategy was developed as an alternative version of the Multipass strategy for students whose reading ability levels are more than four years below their grade levels. This strategy includes the same three passes over the textbook chapter as specified for Multipass, while simultaneously using a visually marked version and an audiotaped version of the chapter. (See the section on "Instruction and Materials Modification" for a description of these materials.) The final strategy in this strand was developed in response to the heavy use of the lecture format in secondary classrooms. The Listening-Notetaking Strategy allows the student to identify organizational cues, to note key words, and to organize the key words in outline form.

In the strand for expressing information in permanent products are an additional eight strategies that can be divided into two groups. The first group was developed in response to the heavy emphasis in secondary schools on expressing information in writing. This group includes the Sentence Writing Strategy through which a student learns to apply several formulas for writing four basic types of sentences. The Paragraph Writing Strategy is aimed at the organization and writing of a cohesive and flowing paragraph. Similarly, the Theme

Writing Strategy is aimed at the organization and writing of an integrated five-paragraph theme. The Error Monitoring Strategy can be used to detect and correct errors of capitalization, punctuation, spelling, and overall appearance in written work.

The second group of four strategies within the expressing information strand has been developed to aid students in coping with the completion of the tests and assignments on which their grades are most often based. The Test Preparation Strategy enables students to organize the key information needed for a test. The Memorization Strategies provide students with several options for memorizing that key information. The Test-Taking Strategy gives the student several behaviors to use while actually taking a test. Finally, the Assignment Completion Strategy is to be used to record assignments, collect needed materials, schedule time for working on assignments, complete the assignments, and hand the assignments in to a teacher on time.

Each of the strategies described above has undergone or is currently undergoing a series of development and research activities focused on the strategy's validation as a "true" learning strategy (as the definition cited above specifies). The sequence of development and research activities follows. First, each strategy was behaviorally specified. This specification process involved the listing of the steps a student must follow in using the strategy. In many cases, an acronym has been developed to aid the student in remembering the steps. Next, the strategy was pilot tested with one or two students to determine whether all the steps were useful, necessary, and ordered correctly. Extensive revisions in the strategy usually resulted after pilot testing. Next, the strategy was taught to six or more students individually. Multiple baseline designs were employed to show how students responded to the strategy instruction. The results of these studies (e.g., Clark, Warner, Alley, Deshler, Schumaker, Vetter, & Nolan, 1981; Moran, Schumaker, & Vetter, 1981; Schumaker, Deshler, Alley, Warner, Clark, & Nolan, 1982) show similar results. Before training, the LD students demonstrate very little evidence of using strategies. Their reading comprehension is low (usually answering fewer than 50% of the comprehension questions correctly), their writing skills are very poor (papers include many errors, poor syntax, and poor organization), and their lecture notes are sparse and incomprehensible. They achieve very low grades on tests (usually failing or barely passing grades) and they hand in few assignments. In all of the studies to date, once training in a strategy has been implemented, the students show marked gains. In over 80 instances of these carefully controlled

studies, only a few students have been unsuccessful in learning the strategies. Only one student has been unable to learn any strategy. Another student reached mastery on two reading strategies in reading level materials but was unable to do so in grade level materials. Two other students made marked gains in notetaking but did not reach criterion within the time allowed during a summer school session. All remaining students have learned a strategy or several strategies to criterion. As a result of many replications of these phenomena, we have concluded that LD adolescents can learn to use a variety of learning strategies. They can use the reading strategies to improve comprehension of, and acquire information from, materials written at their reading ability levels and at their current grade levels. For example, the use of the Multipass Strategy enables students to improve their test scores on chapter material from failing to average or above-average scores (Schumaker, Deshler, Denton, Alley, Clark, & Warner, 1982). They can use the writing strategies to organize and write themes at a level accepted by a high school minimal competency board (Schmidt, Deshler, Schumaker, & Alley, in preparation). They can use the listening and notetaking strategy in such a way that their test scores over the material covered in the lectures improve (Deshler, Schumaker, Denton, & Alley, 1982).

Once the controlled research study has been completed on a strategy and the results have been analyzed, the next step in the development process has been a further revision and refinement of the strategy. In some cases, this has meant total modification of a strategy that has resulted in a return to the pilot research again. In most cases, only minor refinements have been required.

After refinements have been made, the next step has been the introduction of the strategy materials within a resource room program. Instruction on the strategies in these programs has yielded positive results that are comparable to the findings that were achieved under more laboratory-like conditions. LD teachers who have used the strategy packets in their resource rooms report that the packets are easy to work into their programs and easy to implement. They are very pleased with the results of the strategy training, as well. Learning strategy materials are currently being used in ten school districts ranging from a New York City school district to rural Kansas school districts. All are reporting positive results.

Current research is focusing on the final refinement of the strategies described above and on the development of procedures for training LD adolescents to design and apply their own strategies. The latter

research is based on the notion that it is not feasible to teach LD individuals every strategy that they will need for the rest of their lives. Nevertheless, it may be possible to teach them that strategies are a class of cognitive behaviors and that once they understand the common features of the class they can design new strategies to solve whatever problems they face.

The implication of this line of research, given the successful development of a number of strategies and procedures for teaching new strategy development, is that methods and materials will be available for effectively teaching learning strategies to LD adolescents. Students will be able to use the strategies to cope with the typical demands of secondary school. When faced with an atypical demand in or outside of school, the students ideally will be able to adapt an old strategy or develop a totally new strategy to meet that demand. The ultimate result of learning-strategy training will be LD adolescents who are active in their approach to solving problems.

Social Skills Curriculum

The Social Skills Curriculum is the result of several research projects aimed at the development of materials and procedures that can be effectively used to teach learning disabled and other mildly handicapped students generalizable social skills. Underlying these projects and the resulting curriculum is the notion that social competence is a composite of skills. That is, an individual who is socially competent can perceive situations where social skills can be used, discriminate which social skill is appropriate for a given situation, and perform the appropriate skill. The individual is also motivated to perform the skill. The actual performance of a skill has been viewed as a composite of subskills: the ability to name the verbal and nonverbal steps of a social skill, the ability to translate skill steps into specific behaviors that apply to a particular situation, the ability to respond to the other person's feedback, and the ability to organize the components into a flowing interaction. Thus, KU-IRLD research has focused on the development of materials and methods to teach these skills.

In all of the projects in this line of research, a general skills training approach has been used. That is, learning disabled students have been taught general social skills that can be used to respond to classes of social situations. For example, the skill of giving constructive criticism is a general skill that can be applied across a variety of situations within the class of situations where the individual is upset about

something another person has said or done. Thus, the individual who has integrated the general skill of giving constructive criticism into his or her repertoire can give criticism to a peer who has not paid back a loan, to a parent who has broken a promise, or to a child who has just hit another child to get attention.

Three studies sponsored by the KU-IRLD have focused on the training of general social skills in LD adolescents. A study by Whang, Fawcett, and Mathews (1981) demonstrated that two high school LD students could quickly learn job-related social skills, such as accepting a compliment, providing a compliment, accepting an instruction, explaining a problem, accepting criticism, and providing constructive criticism. In a similar study, Gorney-Krupsaw, Atwater, Powell, and Morris (1981) trained three school-related social skills in six junior high LD students. The three skills trained were initiating positive interactions, responding to requests, and recruiting attention for individual help. In both studies, the students were successful in applying the skills to a variety of novel role-playing situations, but they did not use, or were inconsistent in using, the skills at work and at school. These results indicated that LD individuals may exhibit difficulties in generalizing learned social skills to the natural environment.

In a third study, Hazel, Schumaker, Sherman, and Sheldon (1982) trained six general social skills to three groups of youths: LD students; non-LD students in an alternative high school; and juvenile delinquents. They found the LD students learned the social skills as quickly as the non-LD students with regard to applying the new skills to novel role-playing situations, but the LD students did not learn the social problem-solving skill to the same level as the non-LD students. These results may indicate that even though LD individuals have social skills in their repertoires, they have difficulty making use of those skills in solving social problems.

In a more recent study, Schumaker and Ellis (1982) used contrived situations within the natural environment of the resource room to test three LD high school students' generalization of newly learned social skills. They found that all three students showed improved performances in the natural setting after training on some skills but not after training on other skills. In most cases, the gains they did show were not great and barely approximated what can be considered an adequate level of performance. These researchers concluded that a high level of performance in role-playing situations does not necessarily indicate that a student will use the skill to that level in the natural environment.

In all four of these studies, the social skills were trained using one-to-one verbal instruction. In the most recent study sponsored by the KU-IRLD (Hazel, Schumaker, Meyen, & Smalter, in preparation), written instruction in the form of comic books and workbooks has been used to approximate more closely instruction that is practical in today's schools. The written instruction provided the student with the necessary knowledge of skill definitions, reasons for using a skill, the class of situations where the skill is useful, and skill steps. Then the student role played with peers to practice the skill. Although all the students met a criterion of 100% correct in role-playing situations, the students did not use the skills in such naturally occurring situations as thanking individuals for a ride home, greeting someone at the door, and talking to someone on the phone.

The Social Skills Curriculum currently being field tested by the KU-IRLD is the combined result of these five studies. It comprises materials for the training of thirty general social skills. There are three sets of activities a student must complete for each skill: Awareness activities, Practice activities, and Application activities. The Awareness activities include the workbooks used in the Hazel et al. (in prep.) study. The Practice activities involve role-playing activities as were conducted in all of the above-described studies. The Application activities have been designed to permeate the learning environment with an atmosphere of social skill use. Games have been developed that require students to demonstrate social skills in contrived, but natural, situations. Feedback about performances in these situations will be presented individually by the teacher. In addition, materials have been designed for students to use in setting goals about social skill usage in other environments besides the resource room. Self-recording of progress and reports to the teacher will be used.

These application activities and the whole Social Skills Curriculum are being field tested during the 1982-1983 school year. The result of this programmatic research should be materials and procedures that can effectively be employed to teach adolescents to use social skills in their schools, their homes, their communities, and on their jobs.

Instruction and materials modification

The main emphasis of our intervention model has been to teach specific learning strategies to LD adolescents so that they can use these skills to function more independently in academic settings. In short, our ultimate goal has been to design our interventions so that most

responsibility for learning is placed on the students. Given the large volume and complex array of curriculum requirements LD adolescents are expected to meet, it has been necessary to design procedures that modify the way in which classroom content is delivered to the LD student. Instructional procedures and materials have been modified with the goal of altering not the content but rather the format and mode of presentation of the content. Two procedures have been developed. First, techniques for transferring textbook chapters onto audiotapes and teaching LD students a comprehension and organizational strategy for learning the taped information have been developed (Schumaker, Deshler, & Denton, 1982). Second, an advance organizer technique that can be used by content teachers before presenting classroom lectures has been designed (Lenz, 1982). These procedures have been found to be helpful in freeing the resource room teacher from the responsibility to tutor LD students to meet the content requirements in regular classrooms.

The audiotaping procedure consists of two parts: preparing the modified materials and teaching the LD student a strategy (S.O.S.) for successfully learning from the modified materials. Paraprofessionals are employed to prepare the modified materials. Using a study guide, chapter test, or teacher objectives for a textbook chapter (e.g., from the student's history class), the paraprofessional makes markings next to important parts of each section in a chapter. The marking system consists of designations for such things as important facts, main ideas, and so forth. After the entire chapter has been marked, it is read onto a cassette tape. It is not read verbatim, but rather according to the markings. Thus, the paraprofessional stresses important information, omits other information altogether, and "paradenses" information that can effectively be reduced and presented in a few sentences. Each chapter tape is no longer than 1½ hours.

The second part of the procedure involves teaching the student a specific strategy for successfully learning the material from the audiotape and marked text. Students are taught how to survey, obtain detailed information, and test themselves. During the application of the S.O.S. strategy, the student completes an organizer outline. This strategy is designed to make the student active in the learning process and is markedly different than the traditional approach used when students listen to verbatim tapes of reading materials.

To test the effectiveness of this audiotape procedure, six LD high school students were taught the S.O.S. strategy and then were told

to use the strategy along with the prepared audiotape and marked text rather than to read the chapter in the normal fashion. Chapter test scores were collected under three experimental conditions: after students read the chapter normally, after students listened to verbatim tapes of the chapter, and after students used the S.O.S. strategy, audiotapes, and marked text. All students used their assigned 10th grade history text and took the test that was published with the textbook under normal classroom conditions. The average exam scores in the three conditions were 52% after normal reading, 38% after listening to verbatim tapes, and 91% after using S.O.S.

The advance organizer procedure (Lenz, 1982) involved a brief training procedure in which content teachers were taught the purpose of, the rationale behind, and how to use advance organizers in their classes. Ten components revealed by the literature to be important parts of an advance organizer were taught to each teacher. These components are (a) informing the students about the advance organizer, (b) identifying topics or tasks, (c) providing an organizational framework for the class period, (d) clarifying action to be taken, (e) providing background information, (f) stating the concepts to be learned, (g) clarifying the concepts to be learned, (h) motivating students to learn, (i) introducing vocabulary, and (j) stating the general outcome desired. Teachers were instructed to use these procedures in introducing a lecture. The results of these procedures were very favorable in enhancing the comprehension of content information by LD adolescents. They did not, however, have much effect on the performance of normal achieving students. Specifically, on a 30-item comprehension test, Lenz (1982) found the retention by NLD students of important information to increase only slightly from an average of 20.8 items correct (before advance organizer use) to 22.1 items correct (after advance organizers were used). On the other hand, the performance of the LD students improved significantly from an average 12.7 items correct (before advance organizers) to 18.9 items correct (after the use of advance organizers).

Our research on instruction and material modification suggests that these procedures are important and effective components in our intervention model. Given the high expectations placed on LD students to master large amounts of content materials, these modification efforts represent viable procedures that will not only enhance the possibility of meaningful mainstream placements but will also allow resource teachers to use their very limited time with LD students in the areas of skill and strategy acquisition.

Instructional Methodology Components

Acquisition steps

The teaching methodology used with LD individuals is crucial to the success of instruction in any skill or class of skills. For that reason, the KU-IRLD staff has worked hard to develop a teaching methodology that is based on sound learning principles. The purpose of the acquisition steps of the teaching methodology is to give the students the knowledge, motivation, and practice needed to apply a skill or strategy successfully to materials and situations of a difficulty comparable to what they might encounter in a regular secondary classroom. To this end, the acquisition methodology has evolved to include the following steps.

First, the student is tested to determine his or her current learning habits with regard to a particular task. The student is informed of his or her strengths and weaknesses and commits himself or herself to learning a new skill to remedy the weaknesses. In the second step, the new skill is described to the student. The skill is broken down into its component parts or steps, the reasons for learning the skill are explained, and the situations in which the skill will be useful are delineated. In the third step, the new skill is modelled for the student from start to finish with all cognitive processes specified aloud. In the fourth step, the student learns to instruct himself or herself in the sequence of steps of the skill. Verbal rehearsal of the steps continues until the student can name all the steps in order. In the fifth step, students practice the new skill to criterion in controlled materials. For reading, the controlled materials are at the student's ability level. For listening, the controlled materials are a 3-minute tape of a lecture given very slowly. Reinforcement and corrective feedback are provided in the sixth step, after each practice trial. In the seventh step, the student practices the skill to criterion in materials and situations that closely approximate tasks encountered in regular classes. For example, the student may practice applying a reading strategy to materials written at his or her grade level or might listen to a 30-minute tape of a classroom lecture. In step eight, reinforcement and corrective feedback are given after each practice trial. For step nine, a posttest is given to show the student how much he or she has progressed from the initial test.

These nine steps comprise the acquisition portion of the teaching methodology, which has undergone extensive experimental analysis

in a series of research studies. In each of the studies, the acquisition steps have been used to teach a new skill to LD adolescents. In all of the studies, the teaching methodology has been found to be highly effective. For example, the methodology is effective in producing an increase of 50 or more percentage points in the number of key words a student notes (Deshler, Schumaker, Denton, & Alley, 1982) and an increase as large as 60 percentage points in test scores over materials written at the student's grade level (e.g., Alley, Denton, Warner, Deshler, & Schumaker, in preparation). The effectiveness of the acquisition steps has been replicated numerous times with a variety of LD students, with a variety of learning strategies and social skills, and in a variety of service delivery settings. Both students and teachers have rated all the acquisition steps as necessary and helpful to them in learning and teaching the skills. Students highlight the modelling step as especially important to understanding the process of performing a skill.

After the first year of research on the acquisition steps (which were initially specified for teaching skills to individual students), teachers indicated a desire for a teaching methodology that could be applied to small groups of four to six students. As a result of this request, the acquisition steps have been modified for application to small groups. For each acquisition step, specific procedures have been outlined to ensure that all members of the group do pay attention, do participate, and do learn the skill to criterion. In addition, teacher behaviors have been specified for use across all of the steps (Schumaker & Clark, 1982). These small group procedures have been applied within several resource room programs over the last two school years. In addition, with some procedural modifications, one teacher has taught one of the strategies to a class of 17 students. In all cases, the teachers have expressed satisfaction with the procedures, and the students have learned the skills to the same level of proficiency as students who were taught on an individual basis.

The implication of this line of research is that a set of instructional procedures is now validated as being effective in teaching LD adolescents a wide variety of skills under a variety of instructional conditions.

Generalization and maintenance steps

The most critical test of any academic intervention procedure is the degree to which the skills taught under controlled conditions (e.g., in the resource room) are generalized across settings and maintained

over time. Thus, a major goal in the development of our intervention model was to design procedures sufficiently powerful to allow LD adolescents to transfer skills learned in the resource room to a broad array of academic and nonacademic contexts over time.

Considerable attention has recently been paid to the phenomenon of generalization (Haring, Lovitt, Eaton, & Hansen, 1978; Stokes & Baer, 1977; Turnure, Buium, Thurlow, 1976). A common message of each author is the importance of carefully programming instructional activities to ensure generalization. Our application of the learning strategies instructional model has underscored the importance of this point. Specifically, after LD students have demonstrated mastery of a learning strategy in a resource room program, we have found it necessary to take them through a set of generalization steps designed to broaden their understanding of the strategy and to increase their facility with it in regular classroom assignments. Without these generalization steps in the teaching methodology, little generalization is realized.

The major research project sponsored by the KU-IRLD and designed to develop and test an effective set of generalization procedures was conducted by Schmidt et al. (in preparation). The purpose of this study, which was conducted in a high school setting with 7 LD students, was to determine how much direct instructional intervention was required to insure the generalized use of the four strategies in the written language strand (the Sentence Writing Strategy, Paragraph Writing Strategy, Error Monitoring Strategy, and Theme Writing Strategy) to written assignments in the students' English and social studies classes. Mastery criterion standards were established for each of the four strategies (e.g., the mastery criteria for the Sentence Writing Strategy required 100% of the student's sentences in a paragraph to be complete and 50% of the student's sentences to be complicated). After the students had learned a strategy by progressing through the nine acquisition steps, four generalization conditions were implemented to enable students to reach the mastery criteria in the regular classroom. Each condition was used *only* when regular classroom data indicated that a student was consistently below mastery criteria.

The first generalization condition was a *review* condition. After students had demonstrated mastery of a strategy in the resource room and before their application of the strategy in the regular classroom was measured, they were provided with a review of the strategy's key components. Specifically, the reemphasized steps (from the acquisition

tion steps) were (1) a description of the strategy, (2) a model of the strategy, (3) verbal rehearsal of the strategy, and (4) practice in controlled materials. If the review condition was not sufficiently powerful to cause students to demonstrate mastery in regular class performance, the next generalization condition, *transfer*, was instituted.

The transfer generalization step consisted of two separate procedures: orientation and activation. The purpose of the orientation was to make students aware of the variety of contexts within which the learned strategy could be applied. Thus, the teacher had a discussion with the student about the different classes where the strategy could be applied. In addition, a discussion was held regarding ways in which the strategy could be adapted to meet the unique requirements of given class situations. The orientation phase was also used to analyze specific products produced in the regular classroom to determine the degree to which the targeted strategy was being applied by the student in actual regular class assignments. The teacher and student conducted this analysis together. The purpose of the activation phase was to provide the students with ample opportunities to practice the strategy using materials that were not used during strategy acquisition and to provide them with specific feedback on their regular classroom assignments. The goals of the activation activities were to increase the degree to which the students could automatically apply the strategy to novel tasks and to provide feedback to the students about their actual generalization of the strategy.

If students failed to demonstrate mastery after the implementation of the transfer condition, they were taught *self-control* procedures. The self-control generalization condition used a behavioral contract that included academic goal setting, task analysis and specification of self-contingencies, self-recording procedures, self-evaluation, and self-reinforcement. The resource room teacher had weekly conferences with the LD student to maintain the use of these procedures.

The final generalization condition involved the implementation of a *cooperative planning* procedure between the resource room teacher and the regular class teacher. The objectives of the cooperative planning conference were the following: (1) explain the strategy(ies) taught in the resource room pertinent to the content class, including a rationale for their use; (2) explain the student's present level of performance of the targeted strategy(ies) in the resource room and compare it to performance before strategy training; (3) provide the content teacher with a set of cue cards that students use to aid them in the use of the strategy; (4) discuss situations in the regular classroom when the stu-

dent could use the targeted strategy(ies), and (5) enlist the classroom teacher's cooperation to cue the LD student in the regular classroom as to appropriate times to use the strategy.

Our data indicated that none of the students were able to reach the mastery criteria in the regular classroom after they received instruction in the Sentence Writing Strategy with the acquisition steps. While their performance increased considerably over baseline, it did not reach the mastery level. The review condition produced some mastery performances in four students but their levels of performance were quite erratic. Six of the seven students reached mastery after the *transfer* condition was implemented. Two of the six did not maintain their performance at the mastery level, however. The most powerful component of that condition appeared to be providing students with specific feedback, relative to use of the strategy, on assignments completed in the regular classroom. The two students who did not maintain at mastery levels, plus the seventh student required the implementation of one additional generalization condition (either self-control or cooperative planning) to reach mastery.

After training in the Paragraph Strategy, five of the seven students showed improvement in paragraph organization on their regular classroom assignments after the review condition. The remaining two students met mastery for paragraph organization after the transfer condition was implemented. Of the three students who needed training in the error monitoring strategy, two generalized immediately to regular classroom assignments after the training condition alone. These results suggest that LD students may be able to more readily generalize subsequent skills if generalization is emphasized in previous instruction.

In addition to the criterion measures on the students' performance on classroom assignments, other measures to determine the external or social validity of the learning strategies instructional model were collected. The following factors were analyzed: the students' grades, regular class teachers' satisfaction with student's written work and student performance on school district composition competency evaluations.

Student grades (grade point averages—GPA) in all high school language arts and social studies classes before intervention were compared with their GPA's after training. The average pretraining GPA was 2.0 on a four-point scale with 4.0 being an A. In the last quarter of the school year, during which the study took place, the average GPA was 2.7. To evaluate satisfaction of classroom teachers with the written work of students, they were asked to complete a question-

naire on their satisfaction with the students' sentence structure, the students' paragraph organization, the number of errors in final drafts, and the students' theme organization. On a six-point scale (with 6 indicating complete satisfaction), mean teacher satisfaction before training was 1.5, whereas mean postsatisfaction was 4.5.

A third measure of social validity was the performance of LD students on a school district composition competency examination. A theme written by each student was submitted to the school district language arts committee for evaluation using 11th grade composition evaluation guidelines. The scores of the 7 LD students were compared with the scores of over 900 regular 11th grade students. Evaluations of style (clarity of language, conciseness, creativity, and smoothness) and overall impression of composition were made on a five-point scale with five being the highest score. For the style and overall impression measures, regular (non-LD) students' average scores were 3.1 and 2.5, LD students who mastered three strategies (Sentences, Paragraphs, and Error Monitoring) had average scores of 2.8 and 2.3, and LD students who mastered all four strategies in the written strand (Sentences, Paragraphs, Error Monitoring and Themes) had average scores of 3.5 and 3.5. Thus, the performance of LD students was comparable to or in some instances better than the performance of regular class students.

Our generalization research has led to several conclusions. First, in order to ensure generalized use of strategies in regular class assignments, the instructional process in the resource room must include specific generalization procedures. Second, not all students require extensive cooperative planning between regular and resource room teachers to ensure successful classroom performance. Third, the amount and types of generalization conditions necessary to obtain generalization vary across students.

Motivation Component

The Motivation Component of the Intervention Model is based on the notion that adolescents need to accept responsibility for their education and that they need to learn skills that will enhance their independence. Hence, many aspects of the Intervention Model philosophy and activities are aimed away from fostering the dependence of these students. One goal of the program is to produce independent and active learners. To this end, the research focus of the KU-IRLD in the area of motivation has been on self-control. Several research

projects sponsored by the KU-IRLD have concentrated on the development of methods and materials for training self-control skills in LD adolescents.

The researchers who have conducted these studies on self-control skills have basically defined self-control as a composite of skills: goal setting, self-recording of progress, self-evaluation, and self-reinforcement. Foster, Dennis, and Maxwell (1981) attempted to teach self-control skills to LD adolescents using a written package. Students read the materials, completed exercises, and took tests over the materials. Their results were not encouraging; the students needed more than one pass through the material to learn the information. Even then it was unclear from their study whether the students could use the self-control skills once they met criterion for learning the information.

Seabaugh and Schumaker (1981) and Tollefson, Tracy, and Johnson (1982) have taken a different tack. Both groups of researchers have taught self-control skills through live instruction and actual use of the skills. In a series of weekly teacher-student conferences, Seabaugh and Schumaker have taught students to use the self-control skills while measuring the students' frequency of lesson completion. They found that the number of lessons completed by LD students using the procedures in an alternative high school increased from .5 to 4 lessons a day. The LD students' also showed greater gains in achievement test scores in comparison to a group of LD students who were not taught self-control skills.

In a later study, Seabaugh and Schumaker (in preparation) found that they could reduce the time involved in teacher-student conferences to 5–10 minutes a week while maintaining levels of productivity at levels similar to those produced in the previous study. Additionally, they found that it is possible to fade the conferences to twice monthly, as long as the students set time aside each week to write their own goals. If goals were written for longer than one week at a time, student productivity often fell to zero. Seabaugh and Schumaker caution against using the twice-a-month procedure except in situations in which a student's productivity has become stable at an acceptable level.

In another study, Tollefson, Tracy, and Johnson (1982) taught LD students self-control skills in a resource room in a public school first by using a game format and later by having the students fill out contracts in an individual conference with a research assistant. Following this training, they found that the students' assignment completion in the resource room (which was targeted in the contracts) increased. They also found that the rate of completion of untargeted assignments

in other classrooms increased. Tollefson et al. concluded that the students were generalizing their use of self-control skills across settings.

These studies have led to the development of a self-control motivation system that is currently being tested in resource rooms using the Intervention Model. Within this system, students progress through several stages, gradually earning more and more independence and freedom of choice. At the first level, skills are targeted for the student and daily assignments are made by the teacher. As the students become more and more skilled in using self-control, they can choose strategies and skills they want to learn, set weekly goals for what they want to accomplish, and, in general, become active in making decisions about their educational program. Also as a part of this system, the students learn how to take an active part in their IEP conferences. The implications of this research are that LD students, within this model, are seen as capable of becoming, and are taught to be, responsible individuals who have a right to have decision-making authority in their personal educational programs.

Evaluation Component

One of the goals of the Intervention Model development program sponsored by the KU-IRLD was to produce a model that would be dynamic and responsive to the needs of the consumers of the program. In order to ensure this dynamic function, a feedback loop consisting of a yearly summative evaluation was designed. This evaluation involves the collection of data in three areas: data concerning the actual implementation of the program, data concerning student progress, and data concerning consumer satisfaction. The implementation data are gathered by observing in the resource room program such variables as the instructional procedures being used, the instructional approach being applied, student-teacher interactions, and student time on task. Student progress measures include pretests and posttests at the beginning and end of the school year on standardized achievement tests and on criterion-referenced tests that are related to the learning strategies. Consumer satisfaction measures include responses from administrators, support staff, regular teachers, parents, and students regarding their satisfaction with the goals, procedures, and outcomes of the program.

These measures have been collected during the 1980-1981 and 1981-1982 school years (Schumaker, Deshler, Alley, & Warner, 1983) in a high school resource room program where the Intervention Model is being implemented (Program A). During the first year, only four

strategies of the Learning Strategies Curriculum were being taught. No other components of the model were in effect. During the second year, many of the components described in this article were in effect. In addition, the evaluation measures were collected during the first year in one other resource room program (Program B) and during the second year in two other programs (B and C). The programs were located in a middle class community similar to the community in which the model was being implemented. The teachers had comparable levels of education, as well.

Results from the implementation measures during the first year showed that Program A was devoting about 30% of classroom instructional time to learning strategies instruction. (Instructional time was time students were actively engaged in instructional activities. In both Programs A and B instructional time made up 66% of class time). The remaining instructional time was split between tutorial and remedial instruction. A majority of Program B's instructional time (82%) was spent in remedial instruction. There was no strategies instruction in Program B. The student progress measures showed significant gains at the .01 level for Program A students on three measures and for Program B students on five measures. In addition, there were differences found between the programs on six variables when analyses were completed in which pretest scores served as the covariates with corresponding posttest scores serving as the dependent variables. There were no differences found between the groups when students in Program A who had mastered given strategies were compared to all of the students in Program B. Thus, the differences between the two programs in Year 1 could not be attributed to specific strategy instruction. Consumer satisfaction measures showed, in general, that the consumers of Program A were more satisfied than the consumers of Program B; however, both groups of consumers specified areas for change.

The second year's evaluation, when all the components of the Intervention Model were in effect in Program A, yielded more promising results. New Management procedures and policies in Program A resulted in 82% of student and teacher time spent in instructional activities, and 74% of this instructional time was spent on learning strategies (with 17% on tutorial and 8% on remedial activities). In Programs B and C, the large majority of instructional time (83% for B and 88% for C of total student time) was spent on tutorial instruction (65% for both Programs B and C). The rest of the time in Programs B and C was spent on remedial instruction. In Program A,

teachers interacted with students 98% of the time, while in Programs B and C they interacted 56% and 66% of the time, respectively.

With regard to student progress, students in Program A showed more statistically significant gains from pretest to posttest scores than students in the other programs. Students in Program A showed significant gains (at the .01 level) in thirteen areas including reading, math, and writing achievement scores. These results indicate that an emphasis on strategies instruction does not sacrifice achievement gains. Students in Program B showed significant gains on three measures, and students in Program C showed significant gains on seven measures. Furthermore, Program A students' gains were significantly better than the gains made by the students in the other schools as shown in analyses in which I.Q. scores and pretest scores served as covariates with the corresponding posttest scores serving as the dependent variables. When the students in Program A who had mastered a given strategy were compared to students in the other two schools who had not received strategies instruction, significant differences appeared in measures related to the specific strategy mastered. For example, students in Program A who had learned the Listening and Notetaking strategy had significantly more items written in their notes and had discriminated significantly more main ideas than the students in Programs B and C. The notetaking performance of these LD students, when compared to the results of a previous study (Carlson & Alley, 1981), exceeded the performance of normal achievers on four of the five notetaking measures. Students in Program A who had mastered the Sentences Strategy scored significantly higher on the writing subtest of the Woodcock-Johnson Psycho-Educational Battery than the students in Program C. Students in Program A who had mastered the Error Monitoring strategy also scored significantly higher on the Woodcock-Johnson writing subtest and found more errors in a paragraph on a study skills test than students in Program C.

The consumer satisfaction measures again showed differences in favor of Program A for the second year. Administrators, parents, support staff, and regular teachers rated the program at or above the satisfied level (5 on a 7-point scale that ranged from 0 to 6) in all categories except one (each group rated 22 or more categories). This one exception was the administrators' satisfaction with the method of reporting student progress to them. The other two schools had numerous ratings below the satisfied level from their consumers; School B had 41 ratings and School C had 51 ratings below this level. The students in Program A were the least satisfied group of consumers.

They were less than satisfied in all but one rating area (they rated 26 areas). Students in programs B and C indicated satisfaction with 6 and 3 areas; they were less than satisfied in all other areas. The reasons for Program A students' dissatisfaction are unclear, especially since live interviews two weeks before the satisfaction ratings were collected indicated high satisfaction. End of the year testing intervened during those two weeks, and the testing may have affected students' ratings in all three schools. As a result of these data, ways of improving student satisfaction are currently being explored.

The evaluation of the Intervention Model is also currently being continued. Teachers in Programs B and C have been trained to teach learning strategies, and they are implementing the learning strategies curriculum in their schools during the 1982-1983 school year. Results from this year's and next year's evaluations should indicate whether Program A's effectiveness can be replicated in other settings.

Summary

On one hand, we feel that researchers at the KU-IRLD have made substantial progress in addressing the major mission of developing a validated intervention model for LD adolescents. Components have been specified, developed, and validated; instructional staff and most consumers have voiced a high level of satisfaction with the model; and each component has been field tested in actual classroom settings as well as laboratory environments. On the other hand, programs that have multiple components (as our model does) exist as a whole and not as individual elements. As of this time, the majority of our research has been devoted to the study of specific components rather than the model as a whole. Emphasis must shift to a more comprehensive analysis. The entire intervention model must be studied over time in different school settings where it must ultimately survive. Critical questions regarding such things as the sequencing and combination of different model components, the appropriateness of the model for different subgroups of students, and its required modifications to fit unique staff and setting attributes must be addressed. Our goal to design and validate an intervention model for LD adolescents has been an exciting one to pursue, but perhaps it may also have been an overly ambitious one to accomplish in three years (the time we have devoted to intervention research). Gallimore and Thars (1981, in McNett) after designing and validating the Kamehameha Early Education Project (KEEP) to teach poor Hawaiian children to read, reported that they

needed ten years to prove its success. During that period, they experienced many failures and tested numerous hypotheses before positive results were achieved. Because the pressure in the learning disability field for quick solutions is great, we often allow promising educational interventions to die because we are unwilling to pursue persistently solutions to the myriad of instructional problems that appear after the initial research is completed. What is needed is support for a process of continued testing and refinements. It is clear that this challenge lies before us in the years to come if a validated intervention model for LD adolescents is to emerge.

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Finally, it should be noted that this article has provided a review of the major intervention research efforts of the KU-IRLD in in-school services for LD adolescents. Several other lines of research were pursued by investigators that have shed additional light on the problems of older LD individuals. Research reports are available on our studies conducted in such areas as characteristics of LD adults, effects of minimal competency testing on LD populations, and decision models for population identification. Address inquiries to 313 Carruth-O'Leary Hall, University of Kansas, Lawrence, Ks. 66045.

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Correction Notice

Due to a typesetting error, a portion of the material on pages 27 and 28 in EEQ 3:4 was transposed. We regret any inconvenience to our readers.