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An Ecobehavioral Interaction Analysis of Instruction Within Special Education

Charles R. Greenwood and Judith J. Carta

A fundamental principle in special education is that the performance outcomes of instruction must be assessed in order to evaluate the success of educational programs. But little general agreement exists on exactly how this assessment should be conducted (e.g., Deno, 1985). We have identified three general approaches to the assessment of instruction and instructional outcomes: (a) the deficit approach, (b) the environmental-adequacy approach, and (c) the environment-behavior interaction approach (Greenwood, Schulte, Kohler, Dinwiddie, & Carta, 1986).

The deficit approach is based upon the premise that the student is deficient in terms of organismic, cognitive, or behavioral variables, or any combination thereof. Assessment and treatment based upon this approach focus on identifying the deficit areas and providing the necessary instruction or prosthetic intervention to ameliorate them. This approach has given rise to the many categories of handicaps and disabilities in the field of special education and the wealth of intervention and instructional methods focusing on these particular problems.

The environmental-adequacy approach is based upon the assumption that the environment in which the student is operating lacks the features necessary to support the student's performance (e.g., Bijou, 1981; Engelmann, Granzin, & Severson, 1979). Assessment and treatment based upon this approach are directed at identifying ineffective aspects of the home, school, and community environments and correcting them. This approach has given us the various service delivery settings (e.g., residential, resource room, mainstream) and special education professionals (e.g., resource room teachers, itinerant teachers) trained to provide specific educational services (e.g., Peterson, Zabel, Smith, & White, 1983). This approach has also heavily influenced our initiatives for least restrictive placements, optimal classroom and school physical structures, and the removal of barriers.

Dr. Greenwood is Research Director, Juniper Gardens Children's Project; Associate Scientist, Bureau of Child Research; and Associate Professor, Department of Special Education, and Human Development and Family Life, University of Kansas. Dr. Carta is a Project Director with the Juniper Gardens Children's Project and Research Associate, Bureau of Child Research, University of Kansas.

A third, and rapidly growing, approach is that of ecobehavioral interaction (e.g., Greenwood, Dinwiddie, et al., 1984; Rogers-Warren, 1984). This approach rests on the premise that students' interactions with environmental (or ecological) factors either optimize or limit their performance. The assumption is that assessment focusing exclusively on student performance or on the instructional program is inadequate and seldom leads to optimal learning outcomes.

The ecobehavioral approach is a recent development within the field of applied behavior analysis. It combines ecological psychologists' concerns with "broader" aspects of the environment (e.g., Barker, 1968) with strategies for observational assessment and the designs of applied behavior analysis (Baer, Wolf, & Risley, 1968). As Bijou and Baer (1978) noted:

> The interaction between the child and the environment is continuous, reciprocal, and interdependent. We cannot analyze a child without reference to an environment, nor is it possible to analyze an environment without reference to a child. The two form an inseparable unit consisting of an interrelated set of variables, or an interactional field. (p.29)

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The ecobehavioral approach is an attempt to operationalize this interactional field. It requires that student performance be observed and assessed concurrently with specific instructional variables within the classroom environment. For example, in an ecobehavioral approach to assessment, student performance would be measured in relationship to teacher behavior.

This approach to assessment rejects the notion that instruction should be uniform for all students. What goes on in one special classroom and what one student receives may not be identical in terms of goals, objectives, and curriculum to what is received by a student in the same class, the one next door, in the next building, or in the next state. Students' academic gains within a classroom setting depend heavily on the nature of instruction during individual lessons and what students do during these lessons. Student performance therefore must be evaluated in terms of the multitude of factors that define instruction and how those factors change from moment to moment and day to day.

> The ecobehavioral approach to program evaluation "is a means of assessing program variables through systematic observation and measuring the moment-to-moment effects of an array of variables upon student behavior. The temporal interactions between immediate program variables as ecological factors and student behaviors are the units of analysis for predicting or otherwise investigating program outcomes (e.g. developmental gain or long-term achievement)" (Carta & Greenwood, 1985, p. 92).

Using the ecobehavioral approach to assessment, student behaviors during a lesson, for example, will be evaluated in relationship to the actual activities and materials presented, size and location of the instructional group, and the teacher behavior that accompanies them. As a result, student behaviors can be quantified within very specific contexts of instruction. One can examine the extent to which instruction actually occurs, how it changes over time, and the extent to which the observed student response is congruent with the goals of instruction (Greenwood et al., 1981; Ysseldyke & Algozzine, 1982).

Ultimately, the ecobehavioral approach to assessment can provide teachers with information about their classrooms and their teaching that can be most helpful in arranging more effective instruction. It can provide answers to the following questions:

- What are the best ways to arrange the classroom environment (e.g., use of activities, materials, instructional

groups) to optimize particular forms of performance?
- How can modifications in instructional practices influence student behavior?
- What are the promoters of these behaviors?

WHY ASSESS ECOLOGICAL VARIABLES?

The ecology of a special education environment is composed of both physical and social structures. These include the physical arrangements of classrooms, homes, and community and related service settings. It is widely recognized that physical structures mediate the performance of persons within them. Similarly, social structures—the interactions with caregivers, teachers, and peers—provide the contexts for behavior in ways that either facilitate or hinder performance. Ecological factors define the "standing patterns of behavior" that can operate. Without information concerning the physical and social structure of environments, an analysis of student performance cannot be completed.

WHY ASSESS STUDENT BEHAVIOR VARIABLES?

Students' behavior within special education has been a traditional measure of the effects of special education. Research has demonstrated clearly that specific student behaviors, such as attention to task and task orientation (defined as looking, writing, and speaking during instruction) are correlates of academic achievement (e.g., Rosenshine & Stevens, 1986). Recent research has refined these findings and determined that student achievement is highly related to the actual time spent in behaviors relative to specific instructional topics. Obviously, what students do during lessons has a profound effect on learning outcomes regardless of how they are measured (e.g., as curriculum-based measures, criterion-referenced measures, or standardized achievement measures).

ECOBEHAVIORAL FINDINGS FROM RESEARCH ON TEACHING

In our work we have developed several ecobehavioral observation systems including the Code for Instructional Structure (CISSAR) (Stanley & Greenwood, 1981; Greenwood & Delquadri, in press), the CISSAR-Special Education version (Rotholz, Whorton, McGrale, Norris, & Greenwood, 1985), the CISSAR-Mainstream version (Carta et al., 1987), and the Ecobehavioral System for Complex Assessment of Preschool Environments (ESCAPE) (Carta, Greenwood, & Atwater, 1985; Carta, Greenwood, & Robinson, in press). These systems have been used in both descriptive and experimental studies of instruction.

We have reported that specific academic responses (i.e., reading aloud, talk academic, writing) were better correlates of achievement than passive attention defined as "looking at the teacher" (e.g., Greenwood et al., 1981; Stanley & Greenwood, 1983). Specific ecological arrangements were associated with low levels of academic responding. We defined these arrangements, which included relatively frequent use of audiovisual media and teacher-student discussion, as "decelerator variables" (Greenwood et al., 1985). Arrangements that increased academic responding, called "accelerator arrangements," included the frequent use of readers and paper-and-pencil tasks. Interestingly, we found that teachers in the suburbs more frequently incorporated accelerator variables and that inner-city teachers more frequently used decelerator arrangements of variables.

Finally, we have conducted a number of experimental studies that have determined that classroom interventions affect changes both in ecological arrangements and in student behaviors (Greenwood, Delquadri, & Hall, 1984; Greenwood, Dinwiddie, et al., 1984). For example, the use of Classwide Peer Tutoring (Delquadri, Greenwood, Whorton, Carta, & Hall, 1986) brought increases in the use of accelerator variables, decreases in the use of decelerator variables, and associated increases in academic responses such as writing and academic talk. When these ecobehavioral changes occurred in classrooms, students in these classes demonstrated gains in curriculum-based measures (weekly spelling, math, and vocabulary test scores, and correct oral reading rate checks).

Collectively, these descriptive, correlational, and experimental studies have demonstrated the importance of examining ecobehavioral interactions within special education programs. The information obtained can lead to modifications in instructional procedures that quickly enhance student academic responding during daily lessons. In contrast, assessment based on the former approaches does not reveal either the efforts to teach (deficit approach) or the immediate effects on student behavior (environmental adequacy approach) and therefore are less useful to the teacher and program designer. The benefit of the ecobehavioral interaction approach is the advantage gained by information on the *interaction* of events rather than single events.

A PRACTICAL ECOBEHAVIORAL OBSERVATIONAL MEASURE

An observation system for use by special education personnel employing two categories of ecology (activities and

tasks/materials) and one category of student behavior (student academic responding) is presented here. This system is a down-sized version of the CISSAR system previously discussed. It contains a few of the most important categories and codes to make it both functional and easy to implement by the teacher or a support staff member.

Purpose

The purpose of this system is to provide a means of examining the percentage of time in which a student uses various tasks and materials during a specific instructional activity (e.g., reading) and to determine how the student responded in relationship to each particular task. Data from this system can be used to assess, plan, and monitor the effects of changes in the use of instructional materials and related teaching procedures.

Ecological Variables (Activities, Tasks/Materials)

Two categories of ecological variables are included: Activities and Tasks/Materials. Activities are defined as the subject or content of instruction. In this system we have included: daily living skills (Dl), handwriting (H), language (L), mathematics (M), motor skills (Ms), prevocational and vocational skills (Pv), reading (R), spelling (S), self-care (Sf), science (Sc), and social studies (Ss). These basic skills activities are defined in the Appendix. Only codes for basic skills activities are provided. Thus, we have excluded codes for arts/crafts, music, and free time.

Tasks/Materials are defined as the stimuli or setting events currently available to guide students' responding. In some cases these stimuli are materials (e.g., readers or worksheets). At other times they emanate from teachers (e.g., lecture, student-teacher discussion, or instructions to clean up and end the session). The eight tasks included in the system are: fetch/put away (Fp), lecture (Ll), other media (Om), paper/pencil (Pp), readers (Rr), teacher-student discussion (Tsd), workbook (Wb), and worksheet (Ws). The definitions for these variables are included in the Appendix.

Student Academic Responding

Seven academic responses are included in this system: answer question (ANQ), ask question (ASK), task participation (TP), read aloud (RA), read silent (RS), talk academic (TA), and write (W). Two additional codes are included: attention (AT) and other behavior (OB). Attention is considered a passive response and is recorded only when the prior seven academic responses are not observed. Other behavior refers to task management behaviors such as raising hand, moving to academic stations, looking for materials, and the like, and also includes inappropriate behaviors such as inappropriate locale and inappropriate play. The definitions for all of these behaviors are provided in the Appendix.

Method of Recording

Observations focus on an individual student. *The student is the unit of ecobehavioral study*. Thus, a sufficient amount of observation sampling of the activities and tasks of one student and his or her behavior is necessary. This means at least 15 minutes of continuous data for one student. As a result, the system is data-intensive for the individual student. We do not recommend sampling many students for shorter periods of time (5 or 10 minutes) with this system.

Students to be observed should be selected as either (a) representative of students in the class generally (i.e., at random or as average achieving), or (b) of special interest because of behavior problems or low academic achievement. In some cases teachers may wish to conduct observations of a high, average, and low achieving student to estimate the ecobehavioral effects for students of differing skill levels.

Before conducting observations three requirements must be satisfied. First, the observer must be familiar and practiced with the data recording sheet. Second, the observer must know the procedure necessary for cuing 10-second time intervals. Third, the observer must be trained in the ecobehavioral definitions and be reliable in identifying these events in the classroom.

An illustration of the data recording sheet is provided in Figure 1 (pp. 6-7). The first line provides for recording the student's and the teacher's names, followed in line two with identification of the *activity* of instruction; the activity code is check-marked or circled. If the activity changes during the observation, a new sheet is initiated and a new activity marked. The third line is used to record the total observation time, which is the ending time (ET) minus the start time (ST) or [(ET - ST) = total time observed].

Events are recorded in the Activity/Task/Behavior Matrix, which is defined by eight task codes listed down the left side of the matrix and nine student behaviors listed across the top of the matrix. At both the right side and at the bottom of the matrix, space is provided for summing the total numbers of events recorded.

Observations are made every 10 seconds using momentary time sampling. Observations can be paced using the second sweep hand of a watch, a digital stopwatch, or a Walkman-type tape player with an audiocassette on which 10-second observe prompts have been recorded.

At the onset of the interval (e.g., when the sweep hand crosses a 10-second point), the observer looks at the target student and notes both the task and the student's behavior. This momentary observation is completed in approximately the first 3 to 4 seconds of the interval. The observer then looks at the recording sheet, locates the correct task and behavior cell, and marks a tally in the cell. Thus, if the student were observed using a paper/pencil task and concurrently engaged in writing behavior, a tally would be made in the cell defined by Pp and W. If the student were receiving a lecture (Ll) and looking at the teacher (AT), a tally would be marked in the cell defined by Ll and AT.

Using this system, the observer records ecobehavioral events, those tasks and student behaviors occurring simultaneously. When the tally is marked, that observation sample is completed. The observer then should look away from the student, resting until onset of the next 10-second interval. At the onset of the next interval, the observe-tally-rest cycle is repeated.

When the student is not engaged in an academic response or an attention response, the Other behavior code is tallied. Only the specific student behaviors defined in the Appendix as academic responses or attention are tallied in this system. All other responses are recorded as Other behavior. This enables the recording of just those events and behaviors we wish to promote.

Learning to Use the System

Certainly there is a price to be paid to obtain the information available in this system. That price is memorizing the 15 task/behavior definitions, becoming fluent with the Activity/Task/Behavior Matrix, and the actual time required for data collection. Before learning the system, a partner is needed both for collecting the data and supporting your efforts. A partner can be a fellow teacher, an aide, or any other professional (e.g., school psychologist, resource teacher) who is interested in the system. To memorize the definitions, a set of flash cards should be prepared with the code (e.g., Rs or RS) on one side and the code name (e.g., Readers or Read Silent) and the definition (from Appendix) on the other side. The names and definitions will have to be mastered before trying to use the Matrix. We recommend studying them individually and testing them with a partner.

The second step involves practice observations using the Matrix and the timing device selected. We recommend the tape player option because it leaves the observer free to look at only the student or the tally sheet. It provides an auditory prompt to observe every 10 seconds. We suggest that a person who is learning the system should conduct at least five practice observations with the partner, noting any problems, either with definitions or perhaps missing the pace (failing to complete a tally before onset of the next interval). An agreement check, comparing the consistency with which the partners apply the task and behavior definitions, also is recommended.

To complete an agreement check the timing devices must be synchronized. The procedure to do this depends on the type of device being used. If using a tape player, for example, a dual jack should be obtained so that both headphones are powered by a single player. Also, partners should make certain that they both begin and stop the observations at the same time.

Agreement is analyzed by comparing the tallies made by each observer in each task/behavior cell in the matrix. If the accounts agree exactly or disagree by no more than ± 2 tallies, agreement is scored for this cell. If the counts in a cell disagree by more than 2 tallies, a minus is scored for the cell. After checking the 72 cells (8 tasks x 9 behaviors = 72 cells), divide the total number of agreements by 72 and multiply by 100. This figure is the percentage of agreement for the observation. If it is 85% or higher, adequate use of definitions has been demonstrated. If below this level, the definitions in the Appendix should be reviewed.

Method of Analysis

A completed observation is presented in the upper panel of the Matrix in Figure 2. In this observation the student, Chris L., in Ms. Davis' class, was observed during reading (R). The observation lasted from 9:00 to 9:20 (20 minutes). A number of task/student behavior events have been recorded. For example, four intervals were tallied as Wb (workbook) and W (writing behavior). Three intervals were tallied as Wb (workbook) and RA (reading aloud), and three intervals were tallied as Wb (workbook) and Other behavior. Of the 10 student behaviors concurrently observed with Wb (workbook), 7 were academic responses (writing and reading aloud), and 3 were other behaviors.

In contrast, 26 behavior tallies were made in association with Rr (readers). Six were RA (read aloud), 10 were RS (read silent), 2 were ANQ (answer question), 3 were AT (attention), and 5 were Other behaviors. In this case, 18 (6 RA + 10 RS + 2 ANQ) of the tallies were academic responses.

The combined set of tallies for behaviors over the entire observation displays the baseline levels of student behavior across all task situations. These ranged from 0 (TP—task participation) to 22 (W—writing) across the academic responses. AT—attention received 24, Other received 37, and the academic response composite was 51. The total number of intervals recorded was 112.

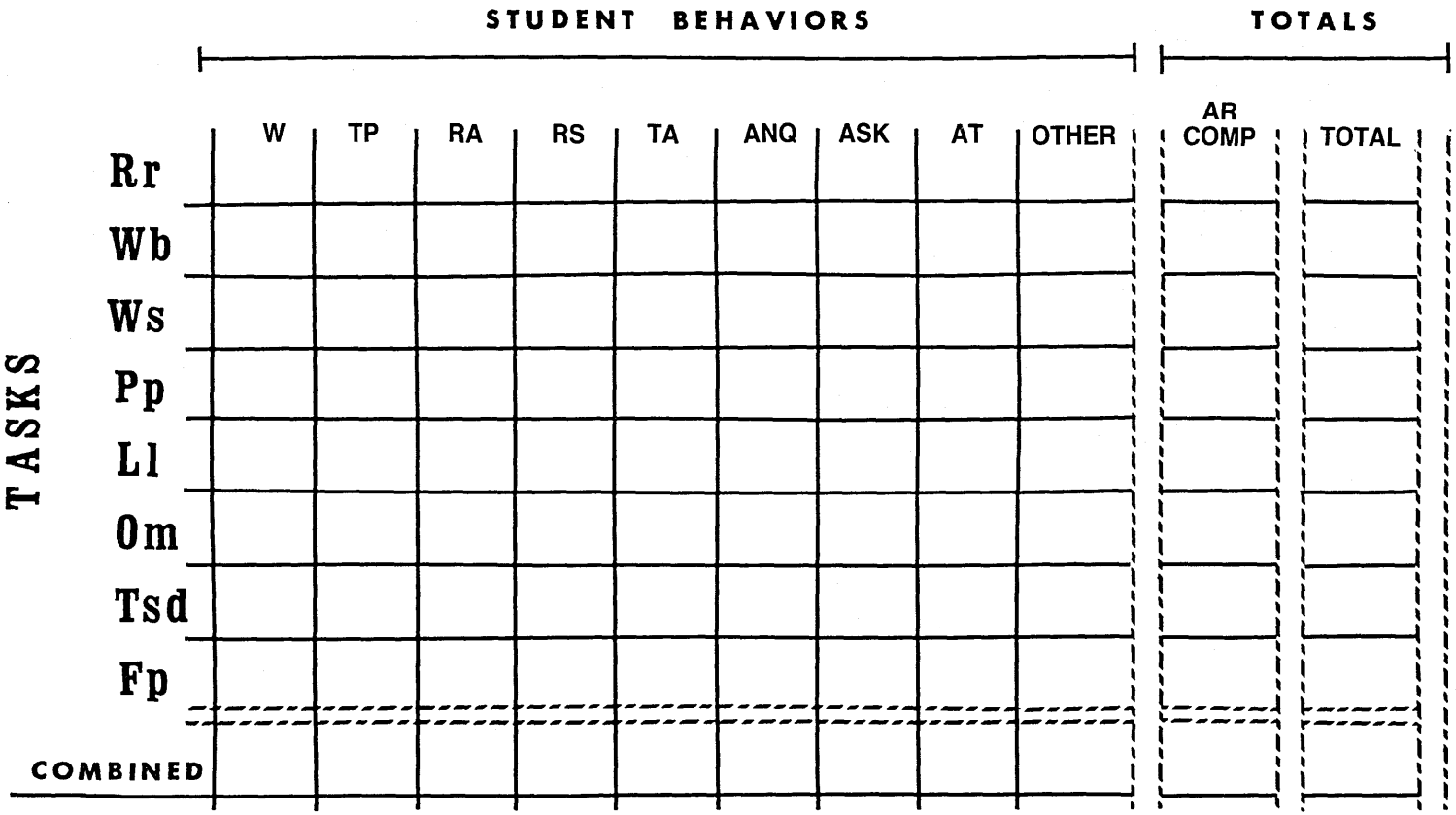
FIGURE 1
Activity/Task/Behavior Matrix

Student Name: _____ Teacher Name _____

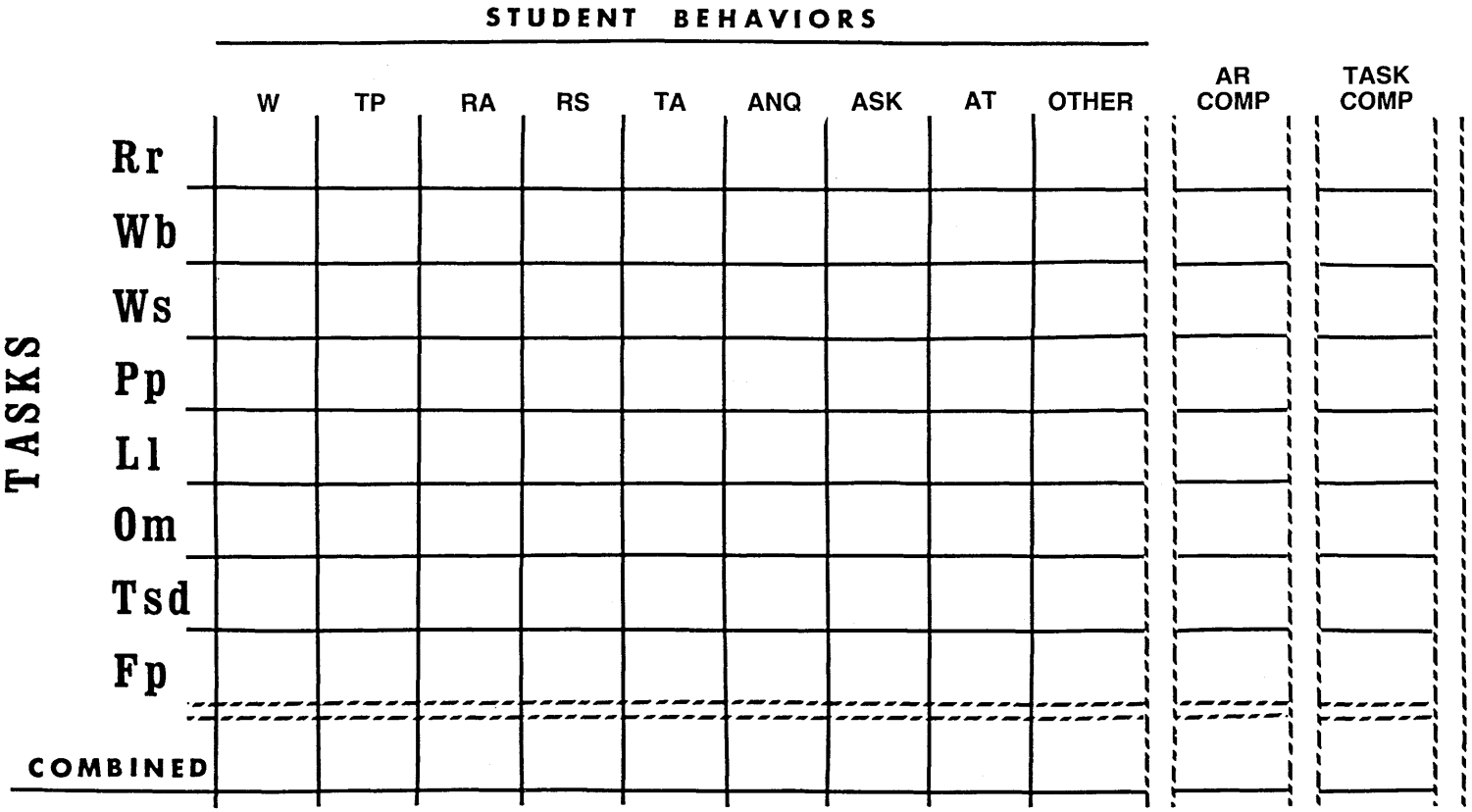
Activity: D1 H L M Ms Pv R Sc Ss Sf S (CHECK ONE)

START TIME: _____ END TIME: _____ TIME OBSERVED: _____ (ET - ST)

EVENT TALLY



PERCENT SCORES SUMMARY



Note: AR COMP = Academic Response Composite Score. It is the sum of tallies for the behaviors W through ASK.

The combined tallies for tasks over the entire observation are displayed down the far right in the Total column. These ranged from 7 for Tsd (teacher-student discussion) to 26 total tallies for Rr.

These raw data from the observation are analyzed by converting them to percentages. Completed percentages are shown in the lower panel of Figure 2—the Percent Scores Summary. To convert the *behavior tallies* to percent requires that each cell count be divided by the total count for each task row (see the upper panel for these values). For example, 6 Rr/RA events divided by 26 total Rr events times 100 produces 23%. The percentages are computed from the tallies and recorded in the correct cell in the Percent Scores Summary.

To convert the *task tallies* to percentages requires that the task totals be divided by the grand total, or 112. Thus, the percentage for Rr is computed by dividing 26 by 112 x 100 = 23%. The most efficient method of converting tallies to frequencies is to use a microcomputer. A program can be created for this purpose using a spread sheet program such as SuperCalc III or Lotus 1-2-3.

FIGURE 2
Completed Activity/Task/Behavior Matrix

Student Name: CHRIS L. Teacher Name MS. DAVIS

Activity: DI H L M Ms Pv R Sc Ss Sf S (check one)

START TIME: 9:00 END TIME: 9:30 TIME OBSERVED: 30 (ET-ST)

EVENT TALLY

TASKS	W	TP	RA	RS	TA	ANQ	ASK	AT	OTHER	AR COMP	TOTAL
Rr			6	20		2		3	5	69	26
Wb	4		3						3	70	10
Ws	5			5					5	75	20
Pp	8								2	80	10
Ll					1		1	5	5	15	13
Om							1	6	5	6	16
Tsd								5	2	0	7
Fp									10	0	10
COMBINED	22	0	9	15	1	2	2	24	37	51	112

PERCENT SCORES SUMMARY

TASKS	W	TP	RA	RS	TA	ANQ	ASK	AT	OTHER	AR COMP	TASK COMP
Rr			23	38		8		12	19	69	23
Wb	40			30				0	30	70	9
Ws	50			25				0	25	75	18
Pp	80							0	20	80	9
Ll					8		8	46	38	15	12
Om							6	63	31	6	14
Tsd								71	29		6
Fp									100		9
COMBINED	20	0	8	13	1	2	2	21	33	46	100

Interpretation

With all the percent scores computed, several interesting comparisons can be made. *First*, the relative use of tasks during the observation period is evident in the far right column marked TASK COMP (task composite) score. In rank order, the use of tasks was 23% Rr (readers), 18% Ws (worksheets), 14% Om (electronic media), 12% Ll (lecture), 9% Wb (workbook), 9% Pp (paper/pencil), 9% Fp (fetch/put away), and 6% Tsd (teacher-student discussion).

Second, the baseline percentage of student behaviors over the entire observation (see the Combined row at the bottom) can be seen. The academic responses from highest to lowest were 20% W (write), 13% RS (read silent), 8% RA (read aloud), 2% each for ANQ (answer question) and ASK (ask question), 1% for TA (talk academic), and 0% for TP (task participation). The academic response composite was 46%. Passive attention (AT) was 21%. Other behavior accounted for 33%.

Third, the effects of tasks on behaviors can be seen by comparing the profiles of student behaviors (the rows). For example, the first four tasks (rows)—Rr (readers), Wb (workbook), Ws (worksheet), and Pp (paper/pencil)—produced academic response composite scores (AR COMP) ranging from 69% in Rr to 80% in Pp. The last four rows—Ll (lecture), Om (media), Tsd (teacher-student discussion), and Fp (fetch/put away)—were associated with academic response levels ranging from 0% to 15%.

When we compare tasks on the percentages of specific academic responses, we see that Rr (readers) produced both RA (read aloud) and RS (read silent) responses. We also see that Wb (workbook), Ws (worksheet), and Pp (paper/pencil) produced high levels of writing (W) in conjunction with RS — read silent. Pp (paper/pencil) produced the highest levels of writing behavior (W) at 80%.

The highest levels of passive attention were associated with Ll (lecture), Om (media), and Tsd (teacher-student discussion), at 46%, 63%, and 71%, respectively. During Fp (fetch/put away) academic responses and attention were at zero levels as other behaviors accounted for 100% of the tallies.

Fourth, the magnitude of these specific task effects on student behavior can be compared to the combined levels. For example, the baseline level over the entire session for W (write) was 20%, the combined level. Wb, Ws, and Pp, at 40%, 50%, and 80%, were producing these behaviors at 2-4 times greater levels. Similarly, Ll, Om, Tsd, and Fp all produced zero levels of writing behavior and were significantly lower than the 20% base level.

A similar analysis of RS (read silent) indicates that compared to a baseline level of 16%, during Rr (readers) and Wb (workbook) tasks, RS (read silent) occurred at nearly twice this level (37% and 30%). This same comparison to baseline levels demonstrates that the accelerators of passive attention (AT), compared to a base level of 21%, were Ll, Om, and Tsd, at 46%, 63%, and 71%.

These four comparisons—(a) the percentages of tasks used during an observation, (b) the base levels (combined) of student behavior, (c) the specific behavioral profiles produced by different tasks, and (d) the task/behavior levels relative to the base (combined) level—provide an instructive method for evaluating eco-behavioral effects during instruction. This information can be used in several ways to improve instructional methods.

Applications

Tasks that are clear accelerators of active academic responses—those producing more than double the base level—can be identified using this system. Many teachers are unaware that different tasks can have differential effects on student performance. Furthermore, many teachers do not have clear goals regarding the specific types of student behaviors they would like during lessons. As noted earlier, our work has demonstrated that high levels of academic responding are directly related to achievement gains. Based on the data produced by this system, two general approaches to improving instruction are available to teachers:

1. Increase the time devoted to tasks that naturally promote academic responding (accelerators).
2. Modify the student response requirements of decelerator tasks so that they produce more active academic respsonding.

The first strategy—increasing the time spent in accelerator tasks—can be implemented by simply providing more time with particular tasks. This strategy, however, eventually will be limited by aspects of the lesson that require explanation, review, or sustained periods of attention to instructions. These situations, in which students are required to sit and listen, are potential decelerators. For example, audiovisual media as typically used by teachers are not promoters of academic responding, but this is usually because teachers require students only to look at the screen during these lessons.

By using the second strategy and introducing frequent opportunities for student responses during this audiovisual lesson, by requiring students to write each item or to read each item in unison, the number of writing and reading responses can be substantially increased (e.g., Heward, 1978).

Similarly, teacher-student discussion is typically not a promoter of academic responses. Yet, by building in increased response opportunities such as questions, student prompts to respond, and unison responding, the levels of academic talk or asking and answering questions, which typically are less than 1% of a lesson, can be increased to over 10% - 20% of a lesson. Teachers can use the current observation system to monitor the success of these instructional changes.

Additional Applications

The system has several other special education applications. For special education personnel who supervise teacher trainees, the system can be *a basis for objective evaluation and feedback*. Otis-Wilborn (1986) reported the use of the CISSAR system in this capacity. She noted that with feedback based upon observations, trainees were able to modify their instructional procedures to increase levels of active student responding. She also noted that in the absence of an objective system, feedback to trainees was little more than personal advice.

Ecobehavioral approaches also can be used as *an objective means for assessing the match or fit between a student and a potential placement setting*. Hoier, McConnell, and Pallay (1987) used an observation system to select the best match between (a) the patterns of behavior of single-target students, and (b) representative students in several placement settings. Walker and Rankin (1983) provided data on (a) the behaviors of students in relationship to (b) the behavioral expectancies of the teacher in potential placement settings. Although both of these systems provide objective bases for optimizing matches between settings and students, neither has provided information on the subsequent success of these placements. Moreover, these systems have not yet been used to improve placement through systematic monitoring and revision of instructional procedures after placement. The CISSAR observation system could provide this additional information.

Last, this system can serve as *a research tool for personnel interested in evaluating interventions that include specific tasks and their effects on students' academic behavior*. Too often in the past, observational systems have focused on just the inappropriate behaviors of students when in fact the goal of special education is to increase academic performance and appropriate social behavior. Our system provides an efficient, direct measure of the levels of these behaviors.

SUMMARY AND CONCLUSION

The ecobehavioral approach, a recent development within applied behavior analysis, is addressing both ecological and

behavioral concerns. This approach is based on the use of observational methods of assessment and behavioral research design. Results from descriptive and experimental studies of instruction completed at the Juniper Gardens Children's Project, in which ecobehavioral observational assessments have been used, were reported. These results (a) support the importance of assessing specific active academic responses rather than global measures of attention, (b) reveal that certain instructional arrangements are accelerators of academic responding, and (c) indicate that gains in curriculum-based assessments occur when these accelerators are used frequently in classrooms. We have described an ecobehavioral observation system for analyzing activity/task/student behavior interactions appropriate for use by classroom teachers and other special education personnel.

The advantages of an ecobehavioral interaction approach to the assessment of special education, relative to the costs of using these systems, is the leverage they provide in terms of validity, utility, and precision over many other existing methods. As Deno, Mirkin, and Chiang (1982) noted: "To be useful in evaluating the ongoing instructional program, the data produced must be immediately sensitive to the effects of relatively small adjustments made in (a) instructional methods and materials, (b) motivational techniques, and (c) administrative arrangements (e.g., adjustments in groupings, setting for instruction, teacher versus peer tutor, and allocated time)" (p. 37). Clearly, ecobehavioral assessment meets all three of these important criteria.

REFERENCES

Baer, D.M., Wolf, M.M., & Risley, T.R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis, 1*, 91-97.

Barker, R.G. (1968). *Ecological psychology*. Stanford, CA: Stanford University Press.

Bijou, S.W. (1981). The prevention of retarded development in disadvantaged children. In M.J. Begab, H.C. Haywood, & H.L. Garber (Eds.), *Psychosocial influences in retarded performance: Issues and theories in development* (Vol. 1)(pp. 29-46). Baltimore: University Park Press.

Bijou, S.W., & Baer, D.M. (1978). *Behavior analysis of child development*. Englewood Cliffs, NJ: Prentice-Hall.

Carta, J.J., & Greenwood, C.R. (1985). Ecobehavioral assessment: A methodology for expanding the evaluation of early intervention programs. *Topics in Early Childhood Special Education, 5*, 88-104.

Carta, J.J., Greenwood, C.R., & Atwater, J. (1985). *Ecobehavioral system for complex assessments of preschool environments (ESCAPE)*. Kansas City, KS: University of Kansas, Bureau of Child Research, Juniper Gardens Children's Project.

Carta, J.J., Greenwood, C.R., Schulte, D., Arreaga-Mayer, C., Hughes, V., & Terry, B. (1987). *Code for instructional structural and student academic response: Mainstream version*. Kansas City, KS: University of Kansas, Bureau of Child Research, Juniper Gardens Children's Project.

Carta, J.J., Greenwood, C.R., & Robinson, S. (in press). Application of an ecobehavioral approach to the evaluation of early intervention programs. In R.J. Prinz (Ed.), *Advances in behavioral assessment of children and families* (Vol. 3). Greenwich, CT: JAI Press.

Delquadri, J., Greenwood, C.R., Whorton, D., Carta, J.J., & Hall, R.V. (1986). Classwide peer tutoring. *Exceptional Children, 52*, 535-542.

Deno, S.L. (1985). Curriculum-based measurement: The emerging alternative. *Exceptional Children, 52*, 219-232.

Deno, S.L., Mirkin, P.K., & Chiang, B. (1982). Identifying valid measures of reading. *Exceptional Children, 49*, 36-45.

Engelmann, S., Granzin, A., & Severson, H. (1979). Diagnosing instruction. *Journal of Special Education, 13*, 355-363.

Greenwood, C.R., & Delquadri, J. (in press). Code for instructional structure and student academic response (CISSAR). In M. Hersen & A.S. Bellack (Eds.), *Dictionary of behavioral assessment*. New York: Pergamon.

Greenwood, C.R., Delquadri, J., & Hall, R.V. (1984). Opportunity to respond and student academic performance. In W.L. Heward, T.E. Heron, J. Trap-Porter, & D.S. Hill (Eds.), *Focus on behavior analysis in education* (pp. 58-88). Columbus, OH: Charles Merrill.

Greenwood, C.R., Delquadri, J., Stanley, S., Sasso, G., Whorton, D., & Schulte, D. (1981, Summer). Allocating opportunity to learn as a basis for academic remediation: A developing model for teaching. *Monograph in Behavioral Disorders*, pp. 22-23.

Greenwood, C.R., Delquadri, J., Stanley, S., Terry, B., & Hall R.V. (1985). Assessment of eco-behavioral interaction in school settings. *Behavioral Assessment, 7*, 331-347.

Greenwood, C.R., Dinwiddie, G., Terry, B., Wade, L., Stanley, S., Thibadeau, S., & Delquadri, J. (1984). Teacher- versus peer-mediated instruction: An ecobehavioral analysis of achievement outcomes. *Journal of Applied Behavior Analysis, 17*, 521-538.

Greenwood, C.R., Schulte, D., Kohler, F., Dinwiddie, G., & Carta, J. (1986). Assessment and analysis of ecobehavioral interaction in school settings. In R.J. Prinz (Ed.), *Advances in behavioral assessment of children and families* (Vol. 2) (pp 69-98). Greenwich, CT: JAI Press.

Heward, W.L. (1978). Visual response system. *Exceptional Children, 44*, 466-468.

Hoier, T.S., McConnell, S., & Pallay, A.G. (1987). Observational assessment for planning and evaluating educational transitions: An initial analysis of template matching. *Behavioral Assessment, 9*, 6-20.

Otis-Wilborn, A. (1986, May). Using eco-behavioral data in training student teachers in instructional management. In C.R. Greenwood (Chair), *Applied uses of eco-behavioral data*. Symposium presented at the 12th Annual Convention of the Association for Behavior Analysis, Milwaukee, WI.

Peterson, R.L., Zabel, R.H., Smith, C.R., & White, M.A. (1983). Cascade of services model and emotionally disabled students. *Exceptional Children, 49*, 404-410.

Rogers-Warren, A.K. (1984). Ecobehavioral analysis. *Education & Treatment of Children, 7*, 283-304.

Rosenshine, B., & Stevens, R. (1986). Teaching functions. In M.C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.)(pp. 376-391). New York: Macmillan.

Rotholz, D., Whorton, D., McGrale, J., Norris, M., & Greenwood, C.R. (1985). *Code for instructional structure and student academic response: Special education version (CISSAR-SPED)*. Kansas City, KS: University of Kansas, Bureau of Child Research, Juniper Gardens Children's Project.

Stanley, S.O., & Greenwood, C.R. (1981). *CISSAR: Code for instructional structure and student academic response: Observer's manual*. Kansas City, KS: University of Kansas, Bureau of Child Research, Juniper Gardens Children's Project.

Stanley, S.O., & Greenwood, C.R. (1983). How much "opportunity to respond" does the minority disadvantaged student receive in school? *Exceptional Children, 49*, 370-373.

Walker, H.M., & Rankin, R. (1983). Assessing the behavioral expectations and demands of less restrictive settings. *School Psychology Review, 12*, 274-284.

Ysseldyke, J.E., & Algozzine, B. (1982). Where to begin in diagnosing reading problems. *Topics in Learning & Learning Disabilities, 2*, 60-69.

APPENDIX

CISSAR-Classroom Teacher: Categories, Codes, and Definitions

Ecological Categories

Activity: The activity is the subject area or topic of instruction.

Dl *Daily living and community skills*
Daily living and community activities are those devoted to independent living in the home and community. Examples are budgeting, laundry, cooking, and use of public transportation.

H *Handwriting*
Handwriting is the activity devoted to learning to print or to write in cursive letters.

L *Language*
Language is the activity devoted to either speech or language learning. Language learning can range from the study of word meaning (vocabulary) to English poetry.

M *Mathematics*
Mathematics is the activity devoted to quantitative reasoning, calculation, and computation.

Ms *Motor skills*
Motor skills are activities devoted to developing both fine and gross motor skills. These activities are similar to physical education but with adaptations for certain handicaps. Examples include peg board, stencils, bead stringing (fine motor); scooter boards, balance beams (gross motor).

Pv *Pre-vocational/vocational*
Pre-vocational/vocational activities are those devoted to learning work and job skills.

R *Reading*
Reading is the activity devoted to decoding and comprehending written words.

Sc *Science*
Science is the activity devoted to topics such as insects, health, personal hygiene, weather, biology, and related topics.

Ss *Social Studies*
Social studies is the activity devoted to topics related to mental health, behavior, cultures, ways of life, history, roles, and the like.

Sf *Self-care*
Self-care activities are those devoted to personal hygiene, grooming, and other body care. Examples include dressing, toileting, toothbrushing, and bathing.

S *Spelling*
Spelling is the activity devoted to learning to spell and to write spelling words from memory.

Tasks/Materials

Tasks and materials are the stimuli set by the teacher to occasion students' academic responding. These may be curricula materials or either immediate or standing instructions by the teacher, as defined below:

Fp *Fetch/put away*
Fp is coded when the student is instructed to: (a) change tasks or (b) stop a current task and change to a new one. For example: "All right, students, it is time to clean up for recess" or "Go to reading groups."

Ll *Listen to lecture*
Ll is coded when the task is to listen to the teacher lecture or make a presentation (e.g., a chalkboard lesson or reading a story).

Om *Other media*
Om is coded when the task is based on *electronic* media (e.g., overhead projector, tape recorder, computer, telephone) or other *manipulative* materials (e.g., abacus, counting rods, clocks, word cards).

Pp *Paper/pencil*
Pp is coded when the task consists of paper-and-pencil materials, including pens and other writing instruments. Paper may be lined or unlined.

Rr *Readers*
Rr is coded when the task is based on a reading primer or reading textbook (e.g., a basal reader or library book or other textbook).

Tsd *Teacher-student discussion*
Tsd is coded when task involves listening and talking with the teacher. For example, Ll may change to Tsd when a teacher asks a question and it is answered by the student. Tsd also is coded when the teacher talks with the student individually.

Wb *Workbook*
Wb is coded when the task involves paperbacked, bound materials that require both reading and writing by the student. These may be programmed reading workbooks or exercise books that accompany the main curriculum in reading, math, spelling, or language.

Ws *Worksheet*
Ws is coded when the task is a single printed sheet or a set of printed sheets on which students are expected to read and write responses. These may be from spirit duplicating masters and prepared by the teacher.

Student Behavior Categories

Active academic responses are specific, active responses made in relation to specific academic tasks.

ANQ *Answer question*
ANQ is coded when the student writes, gestures, or orally provides an answer in response to a teacher's, aide's, or peer's academic question. The answer may be correct or incorrect.

ASK *ASK question*
ASK is coded when the student verbally asks the teacher, aide, or peer tutor a question related to the activity or task.

TP *Task participation*
TP is coded when the student is observed to be using an academic game or participating in a social game, either individually or with peers. The response may be verbal, motor, or social. The student may be manipulating flash cards, coloring, using scissors, playing with a toy, spinning a wheel, moving a pawn on a board, etc.

RA *Read aloud*
RA is recorded when the student is looking at printed material and speaking aloud what is written. This may be words or numbers.

RS *Read silent*
RS is recorded when the student is looking directly at printed material and eye movements suggest that student is scanning the material. Materials may be books, flash cards, words on the chalkboard, etc. Students may be reading words or numbers.

TA *Talk academic*
TA is recorded when the student is verbalizing about the activity or task (i.e., the subject matter). Spelling words aloud, presenting words to be spelled by a peer, and correcting a peer are examples.

W *Write*
W is recorded when the student is observed marking tasks with a pencil, pen, crayon, or other writing tool. This involves holding the instrument between the thumb and forefinger and moving it in a manner likely to produce letters, words, or drawings.

FOCUS ON EXCEPTIONAL children

Task Management: Prerequisite or Enabling Response

AT *Attention*
AT is recorded in the absence of above active responses and consists of looking at the teacher, aide, or peer tutor.

Other

OB *Other Behaviors*
Other is recorded in the absence of any of the above behaviors. This may include *task management behaviors* such as moving to a new location in the class, raising one's hand, looking for materials, and appropriate nonacademic play. Other also includes *inappropriate behaviors* such as disruptive, inappropriate talk, self-stimulation, inappropriate play, looking around, self-abuse, and inappropriate locale.

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