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ABSTRACT

Methods and procedures were developed for monitoring and evaluating classrooms on critical dimensions derived from process-product research. The evaluation process for each of these student behaviors, related to improving academic achievement, is described. The dimensions include student engaged time, which is a product of allocated time and engagement rate; content coverage, including prior learning and instructional overlap; and success rate, including such aspects of student academic success as success on daily work and success on topic tests. Procedures for evaluating the effectiveness of improvement strategies over time are described. A variables management strategy called the instructional improvement cycle was adopted to assist teachers and administrators in making decisions. This strategy assumes that student achievement is more likely to increase if classrooms are at appropriate levels on student engaged time, content coverage, and success rate. The necessity for formal data collection in monitoring critical student behaviors and in meeting requirements of accountability and effective performance is discussed. (DWH)

MONITORING AND EVALUATING THE CRITICAL DIMENSIONS OF EFFECTIVE CLASSROOMS

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MONITORING AND EVALUATING THE CRITICAL DIMENSIONS OF EFFECTIVE CLASSROOMS

Recent research has provided evidence that certain classroom conditions and processes are strongly linked to student achievement gains, especially in the elementary grades. However, in order to make use of this research, practitioners must know what aspects of the classroom are of particular importance, how to monitor and improve those aspects, and whether the selected improvement strategies are having an effect on classroom learning.

Research for Better Schools (RBS) has developed an instructional improvement approach addressing these issues. RBS has previously reported on the selection of three critical student behaviors which teachers and administrators can monitor throughout the school year and a variables management strategy by which educators can address these variables (Helms, 1980). RBS has also previously reported on instruments and procedures which can be used in the monitoring process (Huitt, Caldwell, Traver, & Graeber, 1981; Segars, Caldwell, Graeber, & Huitt, 1981), and strategies selected from research which can be used to improve the three critical student behaviors (Caldwell, Huitt, & French, 1981; Caldwell, Traver, Segars, French, & Huitt, 1981). The purpose of this paper is to report on the development of methods and procedures that can be used to evaluate the effects of selected improvement strategies.

The next section provides an overview of the variables management strategy called the instructional improvement cycle. The following three sections describe the evaluation process for each of the three student

behaviors or variables identified by RBS as being especially important: student engaged time, content coverage, and success. The final section of the paper summarizes RBS's experiences in facilitating use of these methods and procedures.

Variables Management Strategy

In order to facilitate teachers' and administrators' utilization of research for making decisions pertinent to improving classroom instruction, RBS has adopted a simple variables management strategy that can be used in making classroom modifications based on the needs of individual classroom situations. This strategy, which RBS has labeled a "four-phase instructional improvement cycle" (Figure 1), calls for collection of classroom data, comparison of classroom data with a data base that relates classroom conditions/processes to students' achievement, making decisions about what and how to modify instruction, and implementation of planned modifications. Since the improvement cycle is iterative, subsequent collections of classroom data permit practitioners to evaluate the effectiveness of their classroom modifications. On the basis of such evaluation, they are in a position to decide the continuation, revision, or discontinuation of such modifications.

Figure 1 about here

There are three separate monitoring/evaluation questions which arise in the use of improvement cycle. First, upon initial use of the cycle,

there is the question of current status of an individual student behavior in a particular classroom at a specific moment in time. Second, if a decision is made to modify classroom practice and an improvement strategy is implemented, then the subsequent use of the cycle raises an additional question as to the effectiveness of that particular strategy at a specific point in time. However, there is a third question of interest: What are the cumulative effects of using the improvement cycle over the school year? While the data collected during a single observation may provide an accurate picture of the classroom at that point in time, numerous studies (e.g., Medley & Mitzel, 1963; Rowley, 1978) have shown that single estimates do not provide valid and reliable information about the entire school year. Valid and reliable information is needed in order to evaluate the cumulative effects of using the improvement cycle. There are two aspects of these effects to be considered: (1) the impact of the implemented strategies on the student behavior and (2) the relationship of the student behavior to achievement as predicted from the research findings. The remainder of this paper will focus on instruments and procedures which address this third question.

Student Engaged Time

Student engaged time refers to the number of minutes that students are actively working on academic content such as reading/language arts or mathematics. This variable is the product of two other time variables: allocated time, the amount of time provided by the teacher for instruction, and engagement rate, the percentage of time students are actually working on academic tasks. For example, if students are actually working

on academic tasks 50 percent of the time during a 60-minute period, then the student engaged time is 30 minutes.

Student engaged time has been shown to be significantly related to student achievement in numerous studies. RBS has reanalyzed the data from two of those studies (Stallings & Kaskowitz, 1974; Fisher, Marliave, Cahen, Dishaw, Moore, & Berliner, 1978) so that it can be used to help teachers and administrators identify opportunities for improvement in their classrooms. Huitt and Rim (1980) provide a complete discussion of the reanalysis procedure.

The results of the reanalysis (Table 1) indicate whether given levels of student engaged time were associated with achievement below, at, or above the expected level (i.e., residual gains that were negative, zero, or positive). Specific procedures for generating these zones are described in Huitt and Rim (1980). In general, the data indicate that more student engaged time is better with the exception of third grade reading/language arts and first grade mathematics. In these cases, the relationship between engaged time and achievement was curvilinear. That is, as engaged time increased, achievement increased only up to a point and then began to decrease.

Table 1 about here

Teachers and administrators have used the data collection instruments described in Huitt et al. (1981) and the information described in Table 1 to make decisions about whether changes in the use of classroom time are needed. If an opportunity to improve exists, strategies designed to

impact student engaged time can then be selected and implemented. The effectiveness of these strategies can then be evaluated by collecting a second round of data and comparing it to the original level of student engaged time.

However, procedures for evaluating the status of student engaged time across the year are still an issue. RBS has developed observation records (Figure 1) which educators can use to record the time data collected over the school year. The vertical axis represents student engaged time in minutes per day and the horizontal axis represents the months of the school year. The vertical axis is marked into three zones: the better than expected level of achievement zone is white, the at expected level of achievement zone is shaded, and the below expected level of achievement zone is slashed. In this example, a third grade mathematics classroom has been observed once a month over the course of the school year. Student engaged times for the first three observations were in the "below" zone, and the remainder were in the "at" zone. If the goal were to move into the "at" zone, then it would probably be reasonable to conclude that the use of the improvement cycle was successful. However, it is also necessary to consider seasonal patterns in student engaged time throughout the year. For example, Evertson and Veldman (1981) have shown that engaged time is generally higher in the middle of the year than at the beginning or end. Therefore, it is probably necessary to monitor the situation closely next year to determine whether the higher student engaged time is simply an indicator of the time of the year.

Figure 2 about here

Content Coverage

Content coverage refers to the concepts and skills that the student actually covers during the course of instruction. There are two important aspects of this variable: the student covers content that 1) is necessary for new learning (prior learning) and 2) is relevant to the content tested (instructional overlap).

Research suggests that both aspects of content coverage are significantly related to achievement. With respect to prior learning, Bloom (1976) estimates that 60 to 80 percent of the difference in student achievement test scores is due to differences in student's past learning. With respect to instructional overlap, RBS has reanalyzed data from the Instructional Dimensions Study (Cooley & Leinhardt, 1980) in the same way as previously described for student engaged time. Again, in general, more is better though that is not always so (Table 2).

Table 2 about here

In order to monitor content coverage, it is first necessary to plan instruction for the year by examining prior learning and instructional overlap. Prior learning is analyzed both in terms of the students' entering level of achievement and in terms of their specific strengths and weaknesses. Instructional plans are established in such a way as to

address these prior learning concerns and, at the same time, to obtain a desired instructional overlap. If these plans are recorded on a school year planning guide such as is shown in Figure 3, then monitoring content coverage is simply a matter of recording the date each topic is completed and comparing the number of days spent on that topic to the number of days planned. If students spent more time than was planned on a topic, the teacher may implement strategies to increase the pace of instruction on the next unit. The success of the implemented strategies is then evaluated by again comparing the number of days used to the number of days planned. Evaluating the status of coverage over time is accomplished by comparing the total number of days used thus far in the school year to the total number of days planned for covering those topics.

Figure 3 about here

The school year planning guide facilitates the making of short-term unit or topic plans. These are different from the usual weekly lesson plans in that planning is done in terms of units or topics rather than days or weeks. In addition, the objectives and skills covered in these units are in turn tied to the curriculum, topics on the test, and prior learning strengths and weaknesses through the school year planning guide. By making these kinds of plans, teachers are able to determine quite early whether students are actually covering content as planned. They can thus make adjustments throughout the school year rather than waiting until just before the test or the end of the year.

Success

Success refers to students' performance on academic work. There are two important aspects of student success that should be monitored: success on daily work, including both new and review content and success on unit or topic tests.

Several theories of instruction feature the importance of student success for achievement (Bloom, 1976; Skinner, 1968). These theories are further supported by research findings indicating that both success on daily work (Fisher, et al., 1978, 1979) and success on unit tests (Bloom, 1976) are significantly related to achievement. With respect to daily success, in Phase III-B of the Beginning Teacher Evaluation Study (1978), Fisher and his colleagues report that students who completed more than half of their academic tasks at a high level of success (i.e., no errors or only careless errors) had higher gains in achievement in reading and mathematics. Marliave and Filby (1980) suggest in addition that monitoring students' success on daily tasks is one way to ascertain whether students have sufficient prior learning for beginning new academic tasks. With respect to success on tests, research on mastery learning indicates that students who are successful (80-85 percent correct) on unit or topic tests score higher on end-of-year achievement tests (Bloom, 1976). Thus, the research indicates that it is important for teachers to monitor success on both daily work and units of instruction.

Most teachers already monitor students' daily work by grading assignments and recording scores in a grade book. However, most students are probably not meeting standards of success suggested by research. Teachers

can analyze the data collected each day on students' success in order to decide whether daily success can be improved. Strategies for improving student success then may be implemented. In evaluating the effects of these strategies, it may be helpful to look at several written assignments (e.g., 20 workbook pages) at a time. For example, the number of students working at a high level of success on at least half of the assignments may be recorded on the school year planning guide (Figure 3) at the time of testing. If the number of students working at a high success level on at least half of the assignments has increased, then the implemented strategies for improving daily success might be considered effective. By keeping this record across the school year, teachers and administrators can assess the status of daily success over time.

Most teachers monitor students' success on units or topics by giving tests periodically. Teachers may collect data on students' success by indicating whether students have mastered each concept or skill tested. If students have not reached a satisfactory level of mastery (usually 80-85 percent), then remediation strategies may be implemented. The success of these strategies may be measured by retesting students who did not reach the mastery criterion previously. In order to evaluate the status of mastery throughout the year, records of student progress over time must be kept (Figure 4). Students' names are written on the side of the chart, and the topics or objectives covered by unit tests are indicated at the top of the chart. The date on which each student demonstrates mastery is recorded for that student in the column for that unit or topic. Using such a chart, it is easy to see exactly which students have mastered which units or topics.

Figure 4 about here

Conclusion

In summary, research has shown that achievement is increased when students have adequate academic preparation for learning new content and are involved with and successful on content that is related to the achievement test. It is our contention that student achievement will be maximized when teachers and principals monitor students' involvement, coverage, and success; develop strategies to improve these behaviors when appropriate; and evaluate the effectiveness of those strategies over time.

Instruments and procedures for monitoring, as well as strategies for improving, these critical student behaviors have been described in previous papers. RBS has adopted a variables management strategy which facilitates teachers' and administrators' in making decisions regarding these variables. This paper, in turn, has described procedures for evaluating the effectiveness of improvement strategies over time. These same procedures can also be used to evaluate the status of the student behaviors during the entire school year.

Our experience with attempting to facilitate monitoring and evaluation of these three critical student behaviors indicates that if a formal process is to be carried out, then those in the highest levels of authority must desire to see the results. In general, it seems that principals and teachers are satisfied with more informal data. Teachers report that after they become aware of the importance of time, content

coverage, and success, they are more likely to start lessons on time, to look around the room to see that everyone is busy, to cover test-related content, and to look for ways for all students to be successful. However, they are often more concerned with immediate activities than with long-term assessment. Principals, in turn, are likely to accept teachers' statements of classroom behavior rather than to monitor that behavior in a systematic way. It seems that formal monitoring becomes commonplace only when the superintendent or other district office supervisor wants to see the data or when the principal uses the data as part of an evaluation system.

In evaluating the cumulative effects of use of the improvement cycle, we are concerned primarily with comparing the status of the critical student behaviors to the research findings, although there is some concern with demonstrating improvement or change where improvement strategies have been implemented. However, the question is often raised: Is formal data collection necessary in order to produce change? Based on anecdotal evidence from principals and teachers, it is likely that awareness and training in formal data collection are enough to stimulate practitioners to informally monitor the critical student behaviors and to select strategies to impact those behaviors as needed. However, documenting whether change has actually taken place (i.e., whether strategies have been effective), as well as documenting the status of critical student behaviors, requires more formal methodology. As requirements of accountability and effective performance become more severe, there may be more necessity for such documentation.

This paper has discussed methods and procedures that can be used by administrators and teachers to monitor and evaluate three critical dimensions of classrooms: student engaged time, content coverage, and student success. Each of these aspects of the classroom is important in relationship to improving achievement. By monitoring these dimensions and implementing strategies to improve them, and evaluating the effectiveness of those strategies over time, administrators and teachers can work together to improve instruction and student achievement.

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Table 1

Relationship of Student Engaged Time in Reading/Language Arts and Mathematics to Student Achievement

Reading/Language Arts	Below	At	Above
Grade 1 †	40-110	110-130	130-210
3 †	45-90	90-115	115-170*
5 Δ	40-80	80-90	90-135
Mathematics			
Grade 1 †	5-35	35-45	45-140*
3 †	10-45	45-60	60-100
5 Δ		Range = 15-45°	

* Student engaged time beyond this point was not positively related to student achievement.

° Not significantly related to student achievement.

† Data Source: Stallings and Kaskowitz, Follow Through Evaluation Study, 1974.

Δ Data Source: Fisher et al., Beginning Teacher Evaluation Study, Phase IIIB, 1978.

Table 2

Relationship of Instructional Overlap in Reading/Language Arts and Mathematics to Student Achievement

	Below	At	Above
Reading/Language Arts			
Grade 1 †	0-55	55-70	70-100
3 †	0-45	45-75	75-100
Mathematics			
Grade 1 †	0-35	35-40	40-90*
3 †	10-50	50-60	60-100

* Instructional overlap beyond this point was not positively related to student achievement.

† Data Source: Cooley and Leinhardt, Instructional Dimensions Study, 1980.

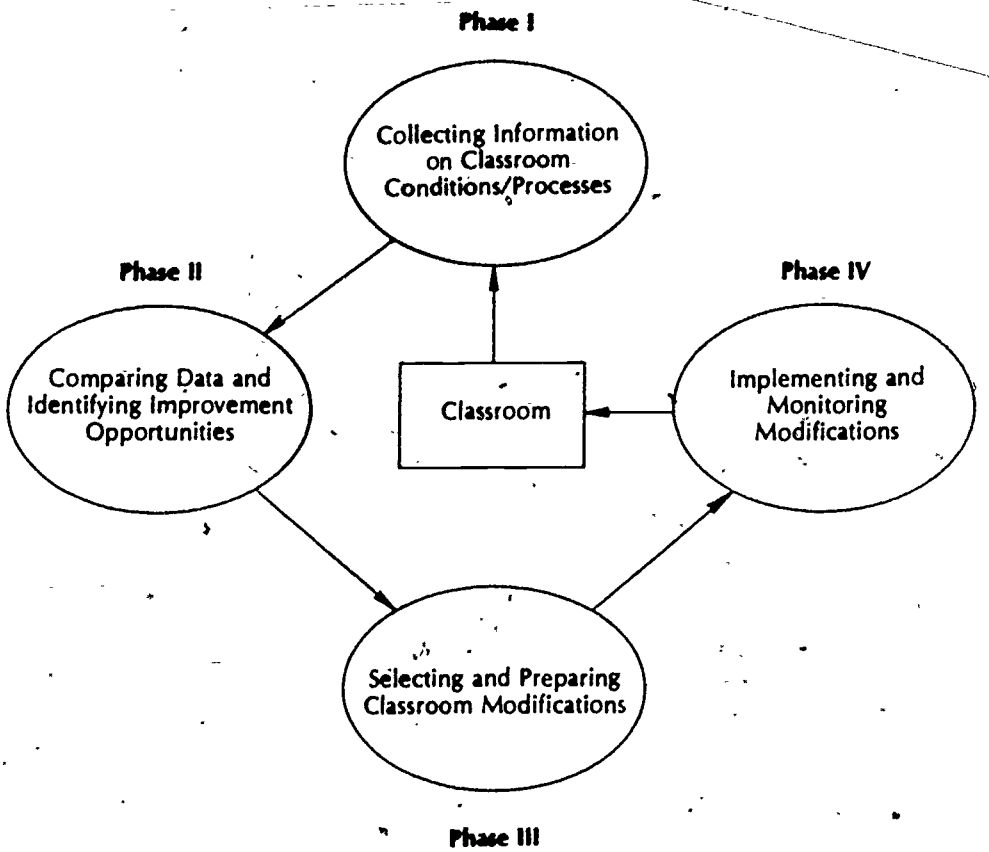

Figure 1. Four-Phase Instructional Improvement Cycle

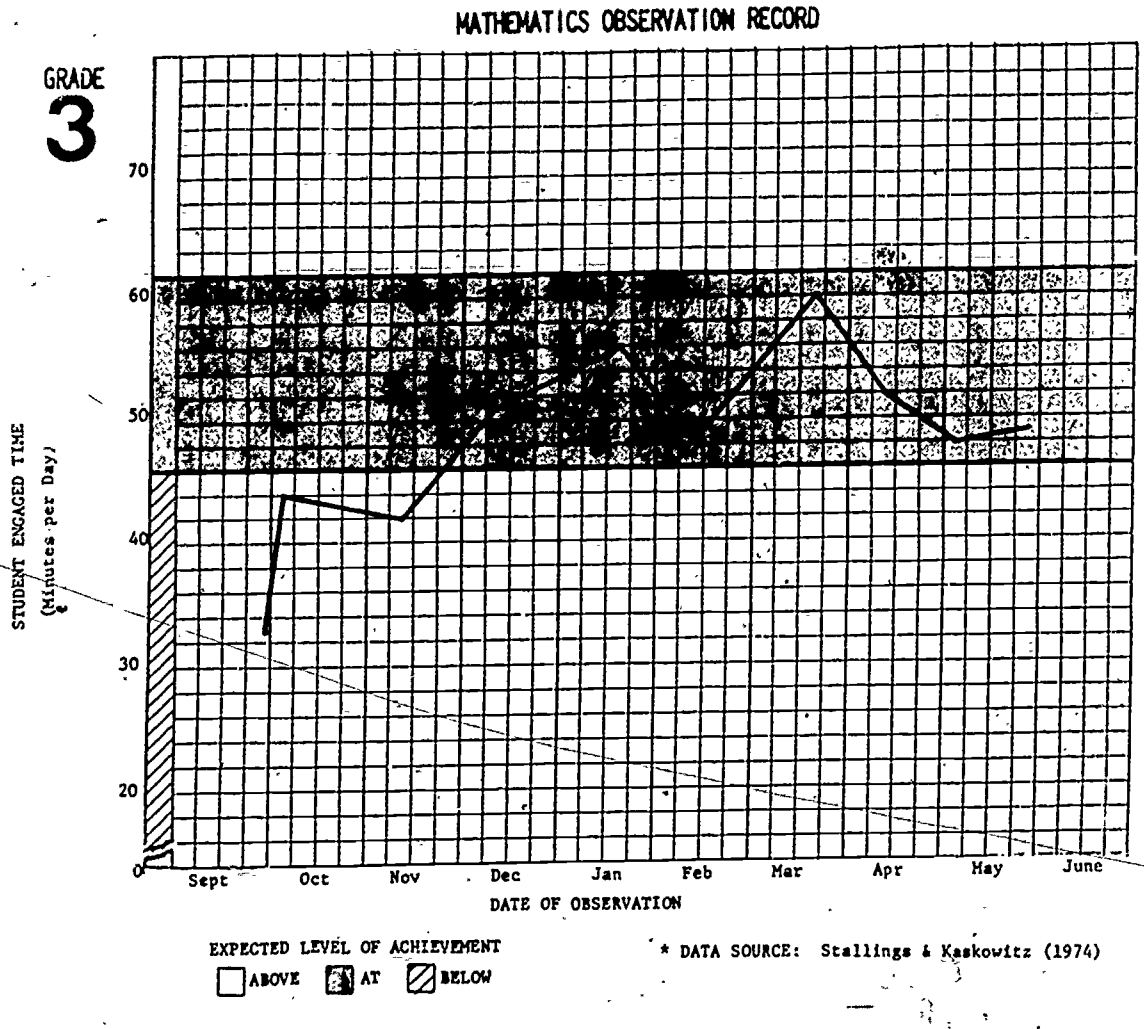

Figure 2. Example of Completed Observation Record

SCHOOL YEAR PLANNING GUIDE

Mathematics - Grade 4

	CURRICULUM	MATERIALS	TOPICS ON CURRENT TEST	PRIOR LEARNING	DAYS NEEDED	DATE / SUCCESS
WHOLE NUMBERS	NUMERATION/ PLACE VALUE Place value to million	Houghton Mifflin pp. 22-29	Place value to ten thousands Renaming numbers		3	9-21 10 of 25
	Roman numerals to 100	Houghton Mifflin p. 44 Supplementary workbook pp. 4-5			2	9-21 12 of 25
	ADDITION & SUBTRACTION Facts	Houghton Mifflin pp. 2-16		Strength-Addition	4	9-21 24 of 25
	Regrouping up to ten thousands place	Houghton Mifflin pp. 47-69 Supplementary workbook pp 15-18	Up to 5 digits, vertical and horizontal formats	Weakness	4	10-9 15 of 25

Total 150 days

Figure 3. Sample School Year Planning Guide