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AUTHOR Wang, Margaret C.
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ABSTRACT

Information should be gathered on specific features of school learning environments that are effective in maximizing all students' chances for schooling success, particularly the chances of success for special students who require greater-than-usual educational support. Research and educational practice support the contention that information on learning environments or conditions can enhance innovative program development, school implementation, and strategic planning. Research on the learning environment has studied productivity factors involving the interaction between students, instruction, and environment and the characteristics of instruction which are adaptive to student differences. In addition, it is important to gather information on learning processes as outcomes of effective schooling. Schools need to be more effective in creating environments that foster basic skills development as well as preparing every individual to make the educational, occupational, and professional choices that each person deserves. The National Center for Education Statistics data base could include these indicators of learning outcomes: students' use of resources, study strategies, use of specific lesson materials, learning behaviors, motivation, and self-concept. (GDC)

Toward Achieving Educational Excellence for All Students

Margaret C. Wang

Learning Research and Development Center
University of Pittsburgh

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Working to provide school learning environments that lead to educational success for all students has been a staple of reform efforts throughout the history of public education in the United States. In recent years, this goal has been conjoined with that of improving schools' capabilities to effectively serve increasingly diverse student populations, particularly students from economically, culturally, and language disadvantaged backgrounds and other academically-at-risk students. Public, judicial, and legislative movements calling attention to both equal access and equal chances to achieve schooling success have been a key factor in the intersecting of these two goals. The enactment of the Education for All Handicapped Children Act of 1975 (PL 94-142) is a prime example of such efforts.

Significant progress has been made, especially during the past decade, in providing equal access to free and appropriate schooling for all students. Now that virtually all school-aged children and young adults attend school (Plisko, 1984), ensuring equal opportunities for schooling success through quality education has become a national priority (e.g., National Coalition of Advocates for Students, 1985; National Commission on Excellence in Education, 1983; Twentieth Century Fund, 1933; U. S. House of Representatives, 1983). The current push for educational excellence recognizes that the critical goal of merging human resources and talents with technological and economic growth cannot be achieved without a concerted effort to curtail the rising number of students with poor prognoses for academic success while also increasing educational efficacy and productivity for all students.

Thus, a number of convergent realities challenge us to bring about improved education for <u>all</u> students. These include public sentiment, legislative and regulatory developments, the need to invest in human capital, technological innovations, and demographic changes. Greater-than-usual educational support is likely to be required for accommodating the expanding literacy requirements that accompany rapid technological growth in our advancing society as well as the anticipated continuing trend of increasing proportions of the school-aged population from culturally, economically, and language disadvantaged backgrounds. In responding to this challenge, school improvement efforts can draw from parallel developments in research on learning and effective schooling, advances in educational technology, and the development and implementation of innovative programs.

In this context, this paper has two main purposes. The first is to discuss the implications of findings from the past decade of educational reform aimed at improving the quality of schooling -- particularly for special needs students. (Special needs students are defined here as students who are academically-at-risk and/or who receive

special education or compensatory education services such as Chapter I, bilingual education, or migrant education.) The second purpose of the paper is to identify information needs and formulate recommendations to the National Center for Education Statistics (NCES) regarding specific ways of broadening the current data base to enhance its relevance for description, analysis, and improvement of the conditions and quality of schooling for all students.

RECENT DEVELOPMENTS AND CURRENT SCHOOL IMPROVEMENT EFFORTS

The State of Practice

In response to the call for both equal access to schooling and educational success, the past 20 years have witnessed a proliferation of legislation and federally-supported "special" or "compensatory" remedial education programs. Actual steps to improve the educational attainment of special needs students generally have focused on creating separate programs that have been implemented, for the most part, in settings segregated from regular education students and classes. The growth of this segregated approach was especially rapid in the 1970's when, for example, students with learning problems (e.g., low achievement, disciplinary problems) were treated as "special" and relegated to separate programs implemented primarily by specialists. This approach, albeit well-intentioned, neglected to recognize the larger problem -- that regular school environments had failed to accommodate the educational needs of a large number of students. On the one hand, it can be argued that special programs are positive steps reflecting a commitment to provide effective instruction for all children. However, the "set-aside" strategy on which the programs are based is driven by the fallacy that poor school adjustment and performance are attributable solely to characteristics of the child rather than to the quality of the school learning environment.

The problems faced by schools in their efforts to adequately provide for special needs students are derived from a variety of sources. These range from changes in national educational priorities to the increased focus on procedural rather than programmatic issues. Included among the specific road blocks to equal access and educational excellence for special needs students are the redeployment of critical resources (human and fiscal) from the provision of education to the administration of an inordinate number of separately funded and delivered programs; the proliferation of classifications for students with special learning needs, combined with the growing use of noninstruction-related criteria to label and classify greater and greater numbers of students in mildly handicapped categories such as learning disabled (LD); a downshift in public and financial support for school programs in both regular and special education; inadequate personnel preparation programs for instructional staff -- including regular and special educators -- who are expected to develop and implement effective instruction for students in the many special and compensatory education categories; and an overall lack of coordination between educational experiences in special and regular education settings.

Observations in a variety of school settings have suggested that reliance upon separate school improvement programs often leads to piecemeal remediation in segregated environments. While "pull-out" programs may be helpful for certain students (e.g., severely disabled students), such programs are more likely to have negative results, including discontinuities and interruption in the instructional-learning process for teachers and students, loss of control by school district leadership over specialized programs, and the fostering of narrow categorical attitudes and instructional programming (cf. Heller, Holtzman, & Messick, 1982; Reynolds & Wang, 1983). As further evidence of the inadequacy and arbitrariness of the segregated approach to providing instruction for special needs students, enrollments in the least well-defined categories such as LD are climbing beyond the tolerance of budget makers; the courts are taking away many of the "special" classification procedures (as in Larry P. v. Riles, 1972); scientists tell us that most of the diagnoses performed in special education essentially are unrelated to treatments (Reschly, in press; Ysseldyke, Algozzine, & Epps, 1983); and the monitoring of compliance with special education legal requirements tends to be more procedural than substantive. In recent years, the problems associated with the many separate programs have resulted in the emergence of new approaches to more effectively meeting the diverse needs of most, if not all, students in regular school environments.

The Setting for Change

Finding feasible and effective ways to restructure special and compensatory education programs and delivery systems clearly is a pressing current need. It is important to keep in mind, however, that this restructuring process must take place in the context of the entire educational enterprise. Special and compensatory education programs often are expected to accomplish what otherwise would be left undone, or done poorly, by regular education. If headway is to be made in the effective academic and social integration of special needs students in regular classes, regular education staff and specialized professional personnel at the federal, state, and local levels must work together to negotiate the removal of many of the present barriers. We need to achieve a healthy balance between the current preoccupation with classification of students for educational placement, efforts to identify specific instructional needs, and the implementation and refinement of available instructional solutions.

Advances in Research and Innovative Program Development

The history of educational reform generally has been characterized by patterns of parallel developments in psychological theory of learning, technical advances in instructional practices, and socioeconomic and political mandates of the time. Likewise, the beginning phase of the current new wave of developments is marked by significant progress in research on learning and effective teaching, an intense motivation to improve schools' capabilities for effectively responding to student diversity, innovative program development and the implementation of school improvement efforts, and the sociopolitical mandate to maximize the chances of schooling success for all students.

A number of alternative interventions have been developed and tested for

integrating special needs students in regular classes. Recent research literature as well as the reports of several prominent groups (e.g., Cantalician Foundation, 1983; Heller et al., 1982; Mayor's Commission on Special Education, 1985) point to the potential of these interventions. Some of the specific recommendations that have emanated from recent reports are the full academic and social integration of special needs students (handicapped students and other children at the margin) in regular classes and schools; the provision of appropriate educational experiences based on learning needs rather than on rigid classifications, labels, and placements; and the restructuring of regular education to more effectively accommodate all individual students, regular and special needs students alike. Researchers, policymakers, and practitioners all have become lobbyists for the delivery of compensatory and special education services in regular classes; in doing so, they have espoused the educational vision of ensuring quality schooling services for the increasingly diverse student populations our nation's schools are challenged to serve (Heller et al., 1982; National Coalition of Advocates for Students, 1985; U.S. House of Representatives, 1983).

Implementation and Fiscal Barriers

In spite of recent research findings and experience with innovative program development and implementation that point to the feasibility and efficacy of integrating special needs students in regular classes, special education programs and a wide variety of compensatory education programs continue to operate as separate systems (often more accurately characterized as "nonsystems"). In many cases, overlapping separate services are provided for the same students. Implementation of an integrated approach to improving educational conditions in this area will require fundamental programmatic, organizational, and funding policy reforms. A first step in this direction would be the establishment of an open, experimental period, during which regular, special, and compensatory education could be combined to encourage innovative development aimed at providing improved and integrated educational services along a full continuum -- including supplementary aids and pre-referral services in regular classes. In local schools, leadership should be encouraged for experimentation and for evaluating the effectiveness of a variety of educational approaches in solving the widespread persistent problem of how to achieve more productive learning for all students. Attention must be directed to putting into operation the most promising ideas and practices and, at the same time, making the necessary policy changes.

Information Needs

If the implementation of an open system for educational restructuring is to occur with a high level of precision and credibility, efforts during the next decade must include the development of a data base on a variety of alternative programs of educational excellence for all students. This improvement orientation dictates gathering the kinds of information that further understanding and specification of what constitutes effectiveness (indicators of efficacy); the conditions that influence effectiveness (e.g., program features and classroom environments); and the features of cost-effective, alternative programs and practices, particularly programs and practices directed at students with poor prognoses for educational success.

An overriding design concern in the task of gathering information on the conditions and impact of educational programs is the extent to which the resulting data base will be useful to researchers, educators, policymakers, and parents in their choice of avenues for improving schools' capabilities to become increasingly more effective in maximizing the chances of schooling success for all students. In this context, information-gathering agencies like NCES can play a critical leadership role in turning around the current preoccupation with collecting data for trend analysis and forecasting purposes only. The focus more appropriately should be shifted to a data-based approach whereby information is used to guide the formulation of visionary educational improvement goals and agendas for supporting futures research.

A major limitation of the current NCES data base is its lack of utility for meeting the information needs of school improvement efforts. As noted by Ravitch (1983), it is designed almost exclusively to gather data on the socioeconomics, rather than the quality, of education. Like the extant data sets being compiled by other federal, state, and local educational agencies, the NCES data base can be characterized as predominantly "status" in nature. It consists mainly of information such as enrollment trends, cost per pupil, student achievement as measured by standardized tests, and teacher-student ratios and other status information derived primarily from easily accessible quantifiable data. Status-oriented information is admittedly useful for conducting trend analysis aimed at describing the nation's educational enterprise from the socioeconomic and/or political perspectives. However, these data provide little information for informed decision making on the quality of education -- that is, the crucial conditions and instructional practices for creating school learning environments that facilitate educational effectiveness.

RECOMMENDATIONS FOR BROADENING THE NCES DATA BASE

The discussion in this section centers on three topics. They are (a) the rationale and research bases for broadening the NCES data base to include information on program features, implementation conditions, and a wide array of program efficacy indicators; (b) the specific types of data that should be included; and (c) the implications for using the NCES data base to formulate, monitor, and evaluate school improvement efforts.

Rationale and Research Bases

In making recommendations to NCES, two major areas of concern are addressed. The first is the need for information on the learning environment (where, how, and the conditions under which instruction and learning take place). The second area of concern is the need for information on a variety of outcomes of effective schooling, particularly what students learn beyond the basic skills as measured by achievement tests (e.g., the quality of students' functioning in and outside of the school learning environment, students' ability to learn on their own and from others, students' perceptions of self-competence). The rationale and research bases for addressing these concerns are discussed below.

Features and the Efficacy of School Learning Environments

The design and implementation of school learning environments that enable each student to achieve desired educational outcomes are at the core of effective schooling. The basic premise here is that, insofar as learning is a function of a student's response to the school learning environment, instruction is the intentional manipulation of the learning environment to facilitate appropriate student responses. A major complicating factor in this purposeful design and use of learning environments is the diverse requirements of individual students for achieving given outcomes. Thus, the task of improving the quality of schooling is twofold. It involves increasing schools' capabilities to effectively accommodate the unique learning needs of individual students, while also providing instructional interventions that enhance each student's ability to respond effectively to schooling and thereby to eventually attain intended outcomes. Accomplishing this dual-natured task is a continuing challenge for educators.

Responses to this challenge have included a variety of research and development efforts with significant implications for the design and implementation of educational practices that enable students, including students with special learning needs, to maximize their chances for learning success. In fact, the development of practicable educational interventions that provide greater-than-usual educational support to accommodate the learning needs of individual students has been the hallmark of effective schooling (cf. Brandt, 1985). Four recently completed research integration studies are discussed below to provide an overview of these developments. All four studies were designed to identify critical features of widely-implemented educational interventions or approaches, as well as investigate the relationship of the program features to a variety of desired student learning processes and outcomes. When considered collectively, findings from the four studies represent a comprehensive analysis of the state of the art and the state of practice in topics related to schooling and student diversity. For the specific purposes of this paper, they serve to illustrate in particular the research base for the kinds of information on the features and efficacy of school learning environments that should be included in the NCES data base.

The first study involved the compilation and summary of findings from over 2,500 studies of educational effects on learning (Walberg, 1984). It was conducted to identify major causal influences on educational productivity. The second and third studies were designed to identify characteristic features of programs that provide for student differences. One of these studies was a quantitative synthesis of studies of features and outcomes of instructional programs aimed at adapting to student differences (Waxman, Wang, Anderson, & Walberg, 1985). The other was a quantitative synthesis that focused on the features and efficacy of mainstreaming, or the integration of handicapped students in regular classes (Wang, Birch, Anderson, & Reynolds, 1985). The final study was a large-scale, classroom observation study of program features, classroom processes and outcomes in exemplary classes of eight instructional models (Wang & Walberg, in press).

Findings from the four studies are summarized under two headings: productivity

factors in learning, and characteristic features of learning environments that provide for individual differences.

Productivity Factors in Learning

Nine interrelated factors have been found to be consistently associated with student learning outcomes (Walberg, 1984). These factors fall into three categories: student characteristics (aptitude); instruction; and environment. The three factors in the student characteristics category are ability or prior achievement, as measured by standardized tests; development, as indexed by chronological age or state of maturation; and motivation or self-concept, as indicated by personality tests or students' willingness to persevere intensively in learning tasks. The instruction category consists of two factors: the amount of time that students are engaged in learning; and the quality of instructional experiences, including psychological and curriculum aspects. The four factors in the environment category are the educational and psychological climates of the home, the classroom social group, the peer group outside of school, and the use of out-of-school time.

Overall, the major causal influences on student learning flow from student characteristics, instruction, and the environment to learning. Furthermore, the three categories of factors also influence each other and, in turn, they influence how much students learn. For example, each of the five factors in the student characteristics and instruction categories appears necessary for learning in schools; without at least a small amount of positive influence of each factor, a student learns little. Large amounts of instruction and high degrees of ability may not count for much if a student is not motivated or if instruction is unsuitable. Thus, findings from Walberg's research synthesis not only provide empirical support for examining the conditions of schooling and their impact from multiple perspectives, but the findings also suggest that such examination requires a host of information on both the quality of schooling and a wide range of outcomes.

Characteristic Features of Learning Environments That Provide for Student Differences

The past decade of instructional experimentation and innovative program development and implementation aimed at improving schools' capabilities to effectively accommodate students with diverse characteristics and learning needs has resulted in a substantial research base. A rather consistent list of salient features of programs aimed at accommodating individual differences can be derived from the extant research base. Findings from two quantitative syntheses of empirical studies reported in the literature during the past decade provide a summary analysis of this research. The first synthesis included 38 empirical studies of adaptive instruction that were published in the period from 1972 through 1982 (Waxman et al., 1985); the data base consisted of a combined sample of approximately 7,200 students. The second synthesis was designed to characterize the program design features and effects of instructional interventions for mainstreaming handicapped students in regular classes (Wang, Birch, Anderson, & Reynolds, 1985). This study was based on statistical data from 29 empirical studies of mainstreaming effects.

A common core of program features is distinguishable across the studies of adaptive instruction reviewed by Waxman et al. (1985). These features include (a) instruction based on the assessed capabilities of each student; (b) materials and procedures that permit each student to make progress in mastering instructional content at a pace suited to his or her abilities and interest; (c) periodic evaluations to inform each student of his or her progress toward skills mastery; (d) students' assumption of responsibility for diagnosing their present needs and abilities, planning individual learning activities, pursuing the planned activities, and evaluating mastery; (e) alternative activities and materials for aiding each student's acquisition of essential academic skills; (f) student choice in selecting educational goals, outcomes, and activities; and (g) students assisting one another in pursuing individual goals and cooperating to achieve group goals. Similar features also were found to be prominent in the data from studies included in the quantitative synthesis of mainstreaming program features and effects (Wang, Birch, Anderson, & Reynolds, 1985). The design features cited most frequently among the mainstreaming programs are continuous assessment, use of alternative routes and a variety of materials, individualized progress plans, student self-management, peer assistance, and instructional teaming.

The features of adaptive instruction found in the two quantitative syntheses of extant empirical studies discussed above also were noted in the results from the observation study of design features, processes, and outcomes of eight widely-used contemporary educational programs (Wang & Walberg, in press). Many of the programs included in the Wang and Walberg study are identified by descriptors such as individualized instruction, mastery learning, and adaptive education, and they incorporate program features such as cooperative learning, differentiated staffing, and computer-assisted management and instruction. A number of the programs are considered to be prototypes, and several have been widely adopted by schools (Jeter, 1980; Rhine, 1981; Talmage, 1975). The eight programs included in the study are the Adaptive Learning Environments Model (Wang, Gennari, & Waxman, 1985); the Bank Street Model (Gilkeson, Smithberg, Bowman, & Rhine, 1981); the Behavior Analysis Model (Ramp & Rhine, 1981); the Direct Instruction Model (Becker, Engelmann, Carnine, & Rhine, 1981); Individually Guided Education (Klausmeier, 1972); the Mastery Learning approach (Bloom, 1968); Team-Assisted Individualization (Slavin, 1983); and the Utah System Approach to Individualized Learning (U-SAIL) (Jeter, 1980). Classrooms that represent exemplary implementations of these programs were identified by the program developers and served as the sample pool for the study.

A major objective of this observation study was to identify (a) the specific features of adaptive instruction that are integrated into working programs with the design objective of making instructional provisions for individual differences, and (b) the kinds of classroom processes and outcomes typically associated with these programs. Data from 65 second-, third-, and fourth-grade classrooms provided information on contextual characteristics of the programs and the implementation sites, critical features of adaptive instruction as they were implemented, and the nature and patterns of classroom processes.

Analysis of the design features of the eight programs was based on two data

sources: program design documents on each program, and data from classroom observations of the sample program classrooms. Results from analysis of the program design documents suggest that, although the eight programs are derived from different theoretical bases and use different instructional strategies, there are striking similiarities in program features across their designs. For example, a diagnostic-prescriptive component is a core feature of all the programs included in the study. Each program emphasizes the importance of prescribing tasks that are appropriate for the learning needs of individual students. Similiarly, each of the programs uses assessment procedures to determine whether students have achieved objectives and are ready to move on, or whether they need further instruction or practice. All the programs stress the need to maintain current and accurate records of each student's placement and progress -- information which also is used in instructional planning.

One of the most salient findings of the analysis of program features is that all of the programs emphasize the importance of incorporating a broad range of demonstrably effective strategies and practices. No one specific set of strategies is claimed by any of the programs to be a panacea for solving all educational problems. The wide variety of strategies and practices adopted by the eight programs for accommodating student differences range from teacher-led, group instruction to student-initiated, individualized activities; from peer tutoring to student-cooperative work; and from the use of contingency contracts to student choice and scheduling of activities. Thus, each of the programs includes in its design a core of instructional practices (not unlike those cited most frequently in the effective-teaching literature) that are implemented in various ways to meet school improvement needs and goals.

Learning Processes as Outcomes of Effective Schooling

Throughout the history of formal education, improving students' ability to function as active learners who assume responsibility for the acquisition of knowledge and skills and are motivated to sustain patterns of self-directed, life-long learning has been prominently and consistently identified as a major objective of schooling. It is generally agreed that a basic goal of education is to enable individual students with diverse learning characteristics and needs to acquire those fundamental skills that facilitate continuing learning as well as positive feelings about, and confidence in, their personal capabilities for achieving schooling success. The crucial task in achieving this educational goal is to find ways of helping schools to become increasingly effective in creating learning environments that not only foster basic skills development but also prepare students to make the educational, occupational, and professional choices that each person deserves the chance to make. Each student should be empowered with the knowledge and skills required to think and to participate in and shape the socioeconomic and political worlds in which he or she lives.

Recent theoretical advances and expanded empirical bases regarding the nature of learning and instruction and the effects of innovative educational programs provide a rich data base for furthering our understanding and characterization of students' knowledge and skills acquisition and their effective functioning in the schooling process. This data base has broadened our conceptualization of the learning process and learner outcomes.

There has been a major shift in the kinds of information on student learning that are being gathered by researchers and practitioners. A preoccupation with information on achievement in basic skills acquisition gradually has given way to an emphasis on the different cognitive processes that are used by individual students to mediate the acquisition and retention of knowledge and skills. Instead of characterizing student learning solely by outcome measures, there has come to be increased recognition of the importance of analyzing the processes by which individuals learn as well as the specific ways in which variations in learning performance are related to the adoption of particular learning processes for specific tasks by individual students. More and more, learner differences are characterized in terms of the manner in which information is processed, the mental mechanics and rules that students bring to the instructional environment, the motivation and affective response tendencies involved in the acquisition and retention of knowledge, and the knowledge and competence of individual students (cf. Wang & Lindvall, 1984).

Growing research evidence suggests a wide range of variability in the ways that students acquire, organize, retain, and generate knowledge and skills. As a result, researchers and practitioners are giving increased attention to instruction that is based on the specific learning needs of individual students. These needs are identified through analysis of the processes by which students acquire and retain knowledge and skills. Rather than being viewed as static, such learner characteristics have come to be considered alterable. Concomitantly, learner characteristics are less likely to be identified through traditional tests. Instead, they are identified and described according to the manner in which students process information and the knowledge and competence they possess for specific learning tasks (cf. Glaser & Bond, 1981).

This changing conception of the individual's learning process, combined with recent developments in research on classroom processes, has many implications for the ways in which learning and instruction are examined and described. Of particular interest is the reexamination of students' role in the learning process and the relationship between students' functioning in classroom learning and learner outcomes. In this context, students are conceptualized as active information processors, interpreters, and synthesizers (e.g., Brown, 1978; Doyle, 1979; Segal, Chipman, & Glaser, 1985; Wang & Peverly, in press). Individual learners are expected not only to take greater responsibility for managing, monitoring, and evaluating their learning, but also to be instrumental in adapting the learning environment to their needs and goals (e.g., identifying and obtaining learning resources) and adjusting themselves to the demands of the learning process.

Underlying this view of the active learner role is the assumption that essentially all learning involves both external and internal adaptation. External adaptation occurs in the ideas and content that are to be learned and in the modes and forms in which content is presented to the learner. Internal adaptation takes place in the learner's mind as new content is assimilated and internal mental structures are modified to accommodate the new content. Operationalizing the view that students' ability to make adaptations in their learning process is an individual difference variable with significant relevance for schooling success requires descriptions of greater varieties of

learner competencies.

Three examples of information on learning-as-adaptation are discussed here as illustrations of candidate items for broadening the NCES data base to include indicators of learning outcomes beyond standardized achievement scores.

Use of Resources

In most learning environments, students are encouraged to use a variety of resources (e.g., time, curriculum materials, instructional and management help from teachers and peers) to facilitate completion of their schooling tasks. Even in classrooms where this is not the case, successful learners have been found to seek out and use supplementary resources. For example, in situations where the emphasis is on large-group instruction and where the only form of in-class presentation is the teacher's lecture, successful students make adaptations such as seeking supplementary reading sources, discussing lesson content with fellow students, spending greater-than-usual amounts of time on particular tasks, and arranging for personal conferences with the teacher. One important difference between programs that provide for individual differences and more conventional, group-paced programs is the former's built-in provision for assisting students in making these types of adaptations (e.g., by making alternative materials available, using a variety of instructional-learning procedures, allowing varying amounts of time for individual students to learn and to receive additional information). Descriptions detailing the nature and patterns of students' use of resources to facilitate their learning are likely to provide an important data base for characterizing an aspect of student competence that is integral to effective learning.

Study Strategies and Use of Specific Lesson Materials

Different learners who study the same chapter in a textbook, listen to the same lecture, or have any other common exposure to presentation of a lesson probably use different techniques in adapting lesson materials to their individual methods of learning. One may attempt to outline the chapter while reading it. Another may first scan the chapter and formulate questions that he or she will seek to answer while reading. Still another learner may underline key sentences during the first reading and then reread the underlined sentences in a review of the chapter. Individuals develop such techniques to adapt lesson materials to their learning needs.

Many teachers typically assist students in this type of adaptation by providing instruction on study strategies, but it is likely that most students learn "how to learn" very much on their own. Data on students' use of study strategies or skills, such as various aids to the comprehension of text, specific techniques for facilitating memorization of essential content, effective problem-solving skills, and related procedures, may constitute important information for curriculum developers and teachers. This kind of data base is likely to increase their understanding and their capabilities to help students become increasingly more competent in adapting lesson materials and in making the kinds of internal adaptations that facilitate learning.

Learning Behaviors and Motivation

Much research on adjustments in classroom learning has focused on cognitive process requirements in subject-matter learning. However, the goals of effective schooling obviously include learning in areas other than subject-matter achievement. Findings from research suggest that certain classroom environments may be more or less conducive to the development of schooling outcomes that are equally as valuable as subject-matter learning. These outcomes include positive attitudes toward learning, motivation for life-long learning, independence and self-responsibility, and social and personal skills. Moreover, some student characteristics (e.g., achievement level, affective response tendencies, temperament, perceptions of task/environment demands and affects, self-concept, work habits) are more or less effective than others in response to certain task/environment demands.

A data base on such behavioral patterns would greatly increase teachers' understanding of students' functioning. The individual learner possesses a unique profile of instructionally relevant characteristics which, in their interaction with particular elements in the classroom learning environment, elicit particular learner behaviors that may or may not facilitate certain learning conditions. The roles students are expected to play or, in other words, the adjustments students are required to make in their behavior and their motivation for effective functioning in different classrooms, are likely to vary greatly. Students' functioning in classrooms that are characterized by a preponderance of teacher-directed activities involving students working as a whole class at the same pace is likely to be very different from students' functioning in classroom environments that are characterized by the predominance of flexible instructional-grouping patterns, student responsibility and initiative, the availability of a variety of materials, peer assistance, and adequate time for teachers to respond to students' requests for assistance.

Recommendations of Specific Types of Data

Two lines of specific information are suggested for inclusion in the NCES data base. They are (a) information on the school and classroom learning environments, and (b) information on student outcomes. It is important to note that the recommended foci are meant to broaden the current NCES data base, not to replace it. Status information such as achievement test scores, school demographics, and information on instructional and related service staff is viewed as being important for future planning -- but at a different level. The kinds of data on the learning environment and student outcomes discussed in this paper would constitute additional components of the NCES data base that would address more directly many of the current "quality of education" concerns. These data are summarized in Tables 1 and 2.

Table 1 is a sample list of educational goals and corresponding expected student outcomes that are included in the recommended information foci -- the classroom learning environment and a broad array of expected outcomes. Based on analysis of the research bases on schooling requirements and the outcomes of effective schooling that are discussed in this paper and elsewhere (cf. Good, 1985; National School Public Relations Association, 1981; Wang & Walberg, 1985; Wittrock, in press), four major

Table 1

Educational Goals and Examples of Expected Student Outcomes of Effective Schooling

Educational Goals	Examples of Expected Student Outcomes
Mastery of subject-matter content	• Mastery of the curriculum content and skills necessary for effective functioning and further learning (e.g., the conventional basic-skills subjects such as reading, math, social studies, and science; as well as learning skills such as reasoning, remembering, comprehension, problem solving, oral communication, and writing)
Acquisition of a variety of learning skills	• Ability to study and learn independently • Ability to plan and monitor one's own learning activities • Ability to obtain needed assistance from others and provide assistance to others in learning situations
Development of positive attitudes toward learning	• Enjoyment in taking part in learning activities • Viewing the receiving of help from peers and the assisting of others in their learning as positive learning experiences that are integral to the classroom learning process • Special interest in certain learning areas • Motivation to continue learning and to persist in overcoming learning difficulties
Development of positive self-perceptions	• Confidence in one's ability as a learner • Confidence in oneself as a contributing member of the school/community • Confidence in one's ability to take self-responsibility for learning and behavior • Perceptions of internal locus of control

Table 2

Examples of Features of Effective Classroom Learning Environments and Expected Student Outcomes

Features of Classroom Learning Environments	Examples of Expected Student Outcomes					
	Mastery of content and skills for effective functioning	Mastery of content and skills for further learning	Ability to study and learn independently	Ability to plan and monitor learning activities	Ability to obtain assistance from others	Enjoyment in taking part in learning activities
Instructional content that is:						
• essential to further learning	X	X				
• useful for effective functioning in school and in society at large	X	X				
• clearly specified	X	X	X	X		
• organized to facilitate learning	X	X	X			
Assessment and diagnosis that:						
• provide appropriate placement in the curricula		X	X			
• provide regular assessment of progress and feedback		X	X	X		
Learning experiences in which:						
• ample time and instructional support are provided for each student to acquire essential content	X	X				X
• disruptiveness is minimized	X	X				X
• students use effective learning strategies/study skills	X	X	X		X	
• each student is expected to and actually experiences success in achieving mastery of curriculum content, and accomplishments are reinforced	X					X
• alternative instructional strategies, student assignments, and activities are used	X		X	X		X
Management of instruction that:						
• permits each student to master many lessons through independant study			X			
• permits each student to plan his or her own learning activities			X	X		
• provides for students' self-monitoring of their progress with most lessons				X		
• permits students to play a part in selecting some learning goals and activities			X	X		X
Collaboration among students that:						
• enables students to obtain necessary help from peers	X	X		X	X	
• encourages students to provide help	X	X			X	X
• provides for collaboration in group activities	X	X	X	X	X	X

Table 2 (cont.)

Examples of Features of Effective Classroom Learning Environments and Expected Student Outcomes

Features of Classroom Learning Environments	Examples of Expected Student Outcomes						
	Viewing help-giving and help-receiving as positive experiences	Special interest in certain learning areas	Motivation for continuing learning	Confidence in one's ability as a learner	Confidence in oneself as a contributing member of the school/community	Confidence in one's ability to take self-responsibility for learning and behavior	Perceptions of internal locus of control
Instructional content that is:							
• essential to further learning		X					
• useful for effective functioning in school and in society at large		X	X				
• clearly specified				X		X	
• organized to facilitate learning				X		X	
Assessment and diagnosis that:							
• provide appropriate placement in the curricula			X	X			
• provide regular assessment of progress and feedback			X	X			
Learning experiences in which:							
• ample time and instructional support are provided for each student to acquire essential content		X	X	X		X	X
• disruptiveness is minimized			X				
• students use effective learning strategies/study skills			X	X		X	
• each student is expected to and actually experiences success in achieving mastery of curriculum content, and accomplishments are reinforced			X	X	X	X	
• alternative instructional strategies, student assignments, and activities are used		X	X	X			
Management of instruction that:							
• permits each student to master many lessons through independent study			X	X		X	X
• permits each student to plan his or her own learning activities			X	X		X	X
• provides for students' self-monitoring of their progress with most lessons		X	X	X		X	X
• permits students to play a part in selecting some learning goals and activities		X	X	X		X	X
Collaboration among students that:							
• enables students to obtain necessary help from peers	X			X		X	X
• encourages students to provide help	X	X			X		X
• provides for collaboration in group activities	X	X		X	X	X	X

educational goals of effective schooling have been delineated. As shown in Table 1, these goals are (a) mastery of subject-matter content, (b) acquisition of a variety of learning skills, (c) development of positive attitudes toward learning, and (d) development of positive self-perceptions.

Table 2 provides a summary list of program features that are suggested in the literature to be facilitative in fostering the variety of expected student outcomes of effective schooling. Referring to the table, for example, the feature "assessment and diagnosis that provide appropriate placement in the curricula" is associated with at least four expected student outcomes -- mastery of content and skills for further learning, ability to study and learn independently, motivation for continuing learning, and confidence in one's ability as a learner.

Implications for Use of the NCES Data Base in School Improvement

As previously mentioned, the recommendation to broaden the NCES data base to include information on conditions of learning (the context of ongoing innovative school improvement efforts) as well as student outcomes data beyond standardized achievement test scores is derived from an "improvement" orientation rather than a "forecasting" orientation. The latter orientation is predominant in the design of most large-scale data bases, including those developed and maintained by NCES. The underlying assumption of this paper is that trend projections are simply extensions of the past. By contrast, the proposed improvement orientation recognizes and anticipates future changes; it integrates forecasting with strategic planning. In this context, effective data bases are those that provide the foundation for developing alternative futures scenarios and for making informed choices that strategically "create" futures.

Selected findings from the previously-cited observation study of eight contemporary educational programs (Wang & Walberg, in press) are discussed here to illustrate the potential use of data on the quality of education (e.g., data on program features and classroom processes) for planning and informed decision making. The results from two types of analyses are discussed as examples of potential data utilization -- findings from a series of analyses that focused on delineating differences among the eight programs, and findings from a series of analyses of relational patterns between features and classroom processes.

Differences Among Programs

Findings based on the classroom observation data suggest some significant differences among the eight programs. For example, the Bank Street Model classes were observed to have the highest number of indicators of personal interactions with teachers. Programs with classrooms that were observed to have the highest numbers of indicators in other areas included, Mastery Learning -- teachers' use of explaining and demonstrating/modeling; the Adaptive Learning Environments Model -- students working on independent tasks in group settings, use of exploratory learning materials, one-to-one tutoring, and teachers encouraging student self-responsibility; the Behavior Analysis Model -- responding, praising behavior, and cueing or prompting; Team-

Assisted Individualization -- constructive student interactions, students working alone on independent tasks, students assisting in classroom management, and student assessment of task difficulty; and the Direct Instruction Model -- small-group instruction, reading, and communicating criteria.

With respect to classroom processes among the eight programs, the Adaptive Learning Environments Model and Team-Assisted Individualization were observed to be most prominent and distinctive. Classes using these two programs had the most indicators of adaptive instruction. The Adaptive Learning Environments Model classes were observed to feature constructive student interactions, encouragement of self-management, student choice, exploration, and the teacher acting as manager and consultant rather than as disciplinarian or lecturer for the whole class or small groups. In the Team-Assisted Individualization classes, students were observed to work individually on written assignments and tests and quizzes; the teacher's role was to diagnose and assist.

As a further example of how results from analyses of the patterns of similarities and differences in program features can be used to analyze the quality of the learning environment under each program, the observation data are summarized in Figures 1-A through 1-D. For illustrative purposes, the eight programs are referred to by letters in the figures. Figure 1-A shows, for example, that Program A was tightly clustered around the mean T-score of 50 and appeared to be the most typical or representative of the eight programs; that is, it was neither positively nor negatively distinct from the other programs. Program B, although slightly above the mean in other respects, was notable for scores below the mean on the variables, learning centers and materials in order. Program C was sharply above the mean in all five physical design features. Programs D, E, and G were clustered close to the mean in most respects. Program F had notably high scores on all features except classroom arrangement, on which it was two standard deviations below the mean. Program I was fairly low in all physical design features.

Relational Patterns

The results from a series of canonical correlation analyses of the data on program features and classroom processes suggest that when controlling for socioeconomic status, program features were closely associated with classroom processes, and both sets of variables predicted students' perceptions of classroom climate. Program features alone were found to predict students' perceptions of self-responsibility; classroom processes alone were found to predict students' adjusted achievement outcomes. Furthermore, results from the canonical correlations specifically linked program features and classroom processes. Eleven program features -- student choice, task flexibility, teacher monitoring, peer tutoring, students seeking adult help, record keeping, classroom arrangement, task directions, learning centers, variety of materials, and clear labeling -- were associated with classroom processes such as student use of exploratory materials, student work in parallel groups, teachers interacting with students on personal matters, student self-management, and student participation in presentations. It is noteworthy that the same 11 program features were found to be associated negatively with classroom processes such as students working in group-interactive settings, whole-class

Figure 1–A: PROGRAM FEATURE PROFILES:
Physical Design of the Classroom

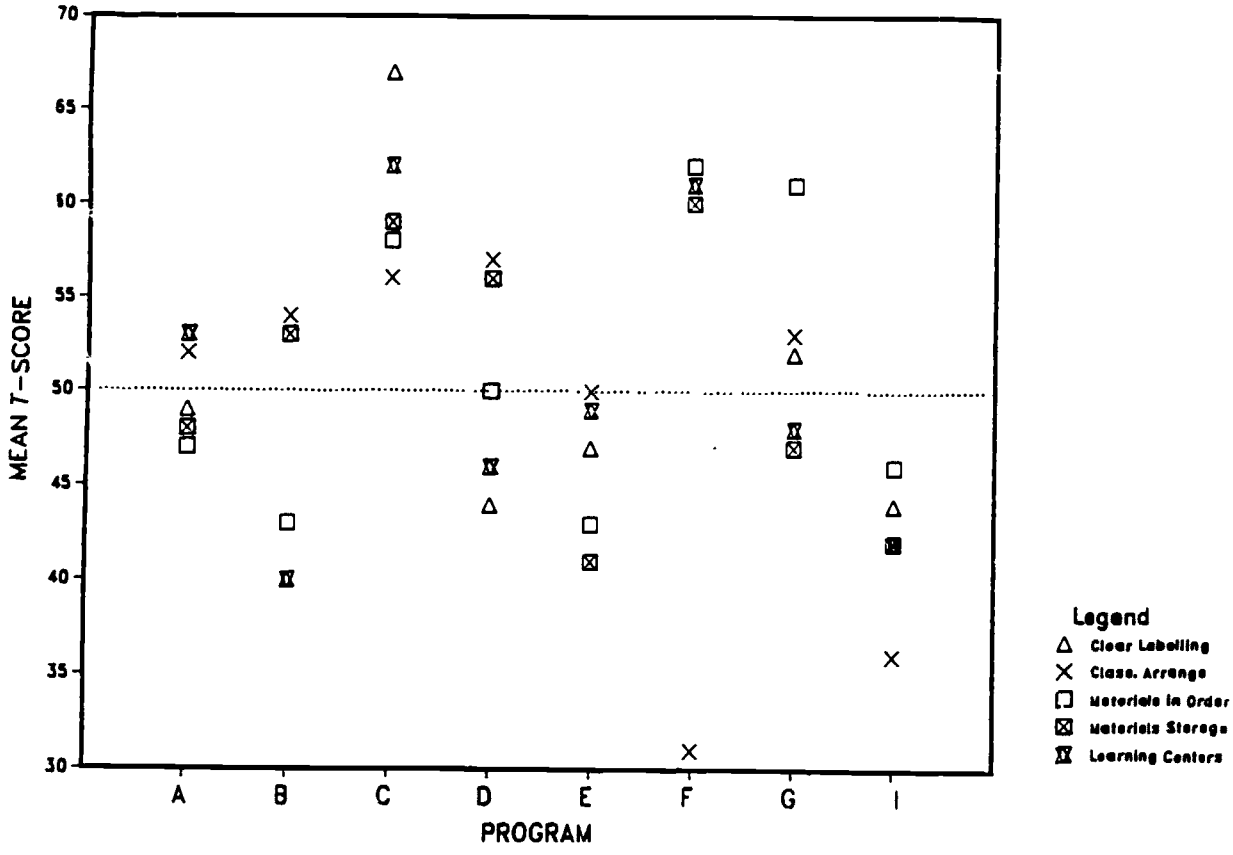


Figure 1–B: PROGRAM FEATURE PROFILES:
Curriculum Materials

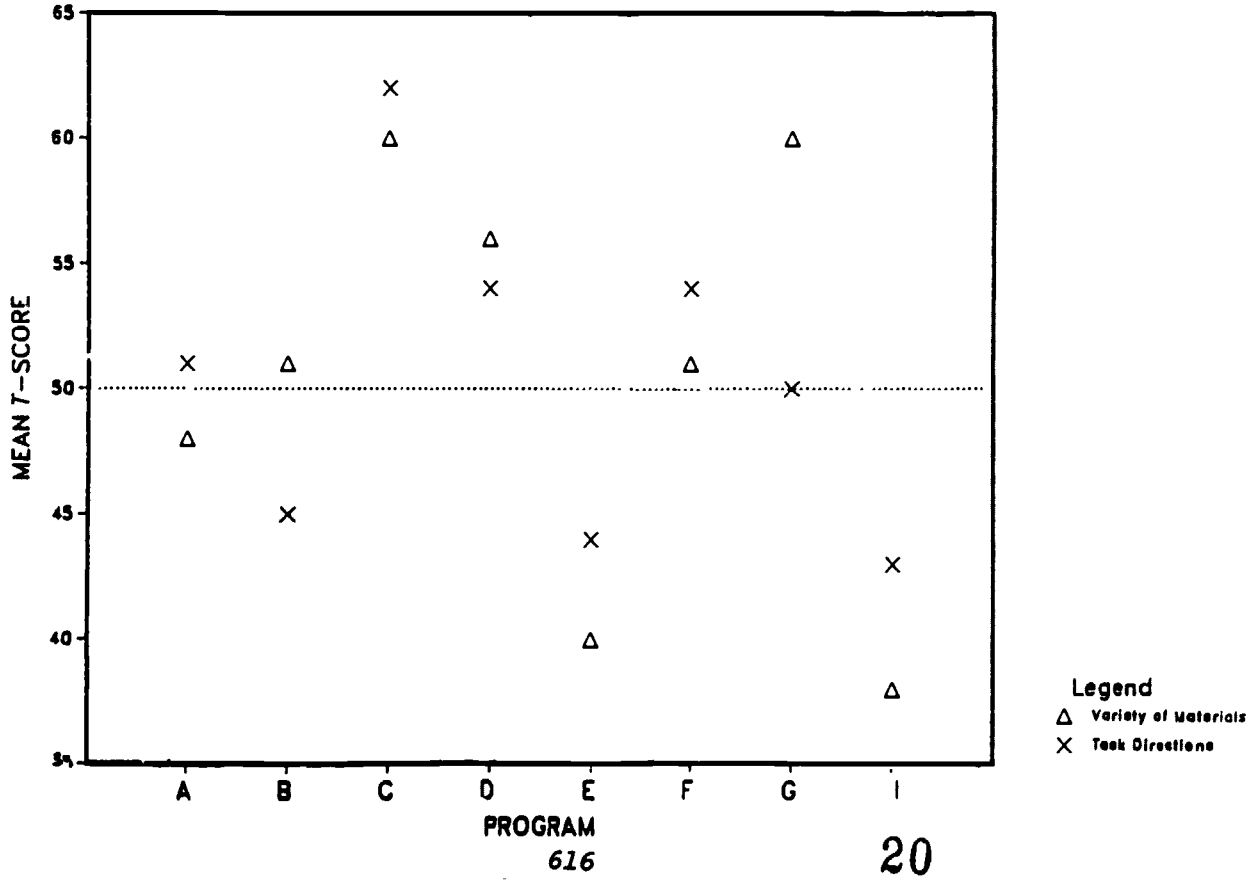


Figure 1–C: PROGRAM FEATURE PROFILES:
Provision of Adaptive Instruction (a)

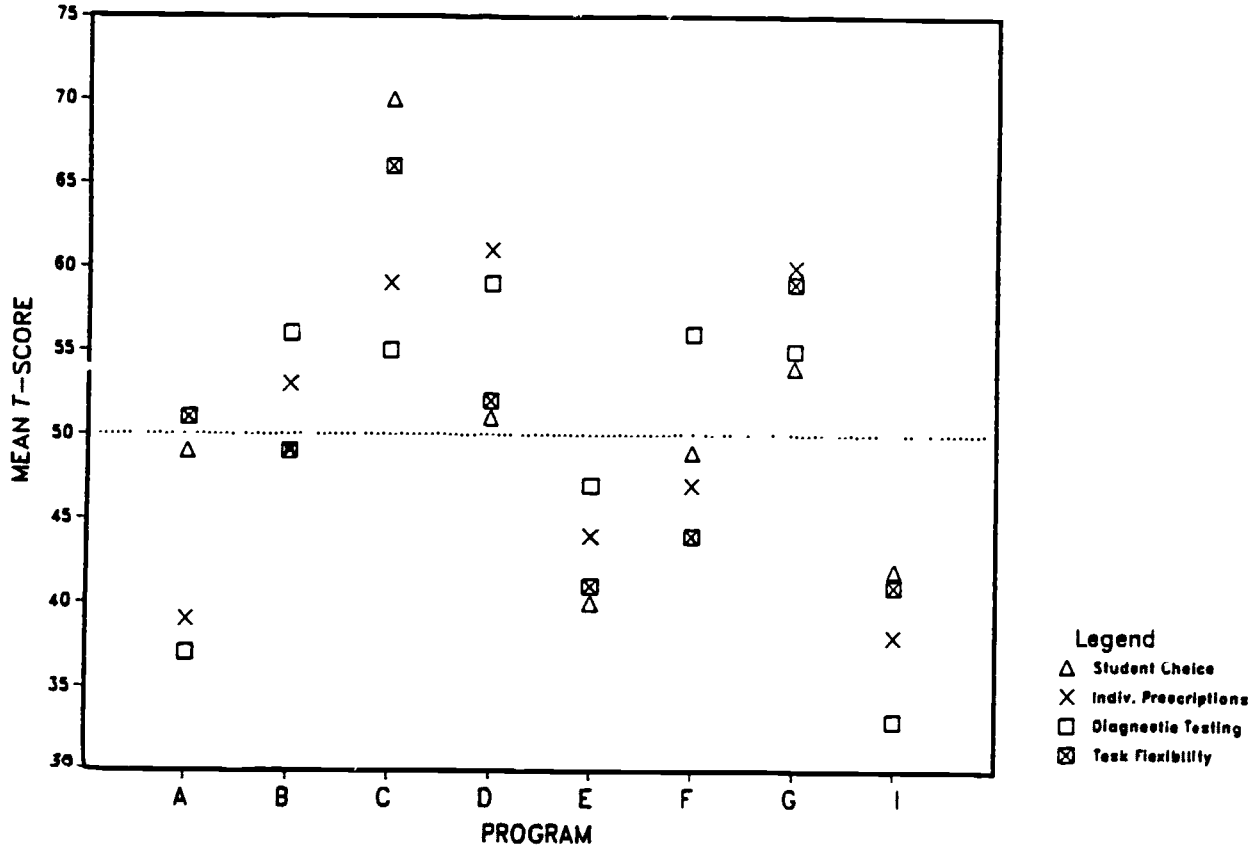
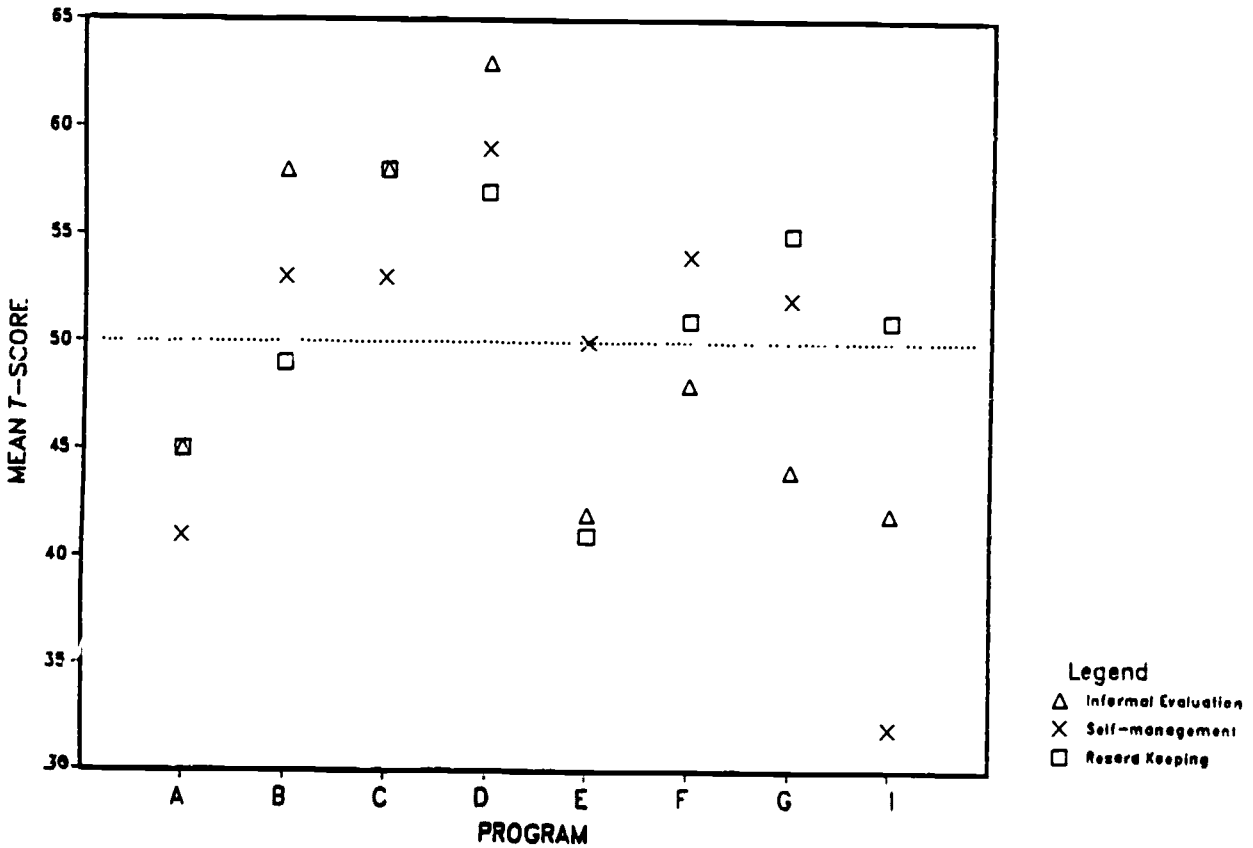


Figure 1–D: PROGRAM FEATURE PROFILES:
Provision of Adaptive Instruction (b)



and small-group instruction, teacher instruction, teacher questioning, and no use of materials. Also of interest are the results showing that classes which were observed to combine the program features, clear labeling, learning centers, less teacher monitoring, informal evaluation, students seeking adult help, and diagnostic testing, also were observed to be characterized by the classroom processes, constructive student interactions, student participation in presentations, less teacher explaining and cueing or prompting, and interactions with students for instructional purposes. The overall patterns of relationship between program features and classroom processes suggest the contrast between instructional features that are adaptive to student differences (e.g., one-to-one and small-group tutoring) and the traditional instructional practices that have been predominant since the turn of the century (e.g., the recitation method of questioning, teacher instruction in whole-class or small-group instructional settings). In addition, the results show that classrooms featuring the greatest use of individualized prescriptions, task flexibility, students seeking adult help, a variety of materials, and clear delineation of task-specific directions were associated most closely with high levels of student responsibility. These program features also were associated with greater student perceptions of competitiveness and friction, and lesser student perceptions of cohesiveness and satisfaction.

Findings from the analyses also show that, on average, programs with more features of adaptive instruction tend to raise achievement and student self-responsibility to levels as great as, or better than, those found for programs that feature more teacher-directed and group-paced instructional strategies. In addition, several of the programs with the primary goal of providing for student differences produce superior classroom processes that many students, parents, and educators greatly value. These include constructive student interactions, independent work, individual diagnosis and prescription, cooperative learning, student exploration, and teachers interacting with students on personal matters.

Overall, findings such as those discussed above make it possible to delineate relationships between specific program features and classroom processes and student learning outcomes. The results show that, when they are well-implemented, features such as the allocation of available class time for curriculum-related activities, a variety of instructional strategies, a variety of materials and activities, and learning tasks that are appropriate for students' learning needs and achievement levels, can produce superior classroom processes and achievement results that are not unlike those associated with ideal realizations of traditional, teacher-directed and group-paced instruction. Moreover, features such as student choice, which is suggested in the effective-teaching literature to be an ineffective feature of adaptive instruction programs, actually were found to facilitate student learning.

In light of the findings from the observation study discussed above and from the quantitative synthesis of adaptive instruction programs by Waxman et al. (1985) described earlier in this paper, and given the current push for educational excellence and basic skills acquisition, it seems critical to begin accumulating further evidence that verifies, or contrasts with, the predominant literature supporting the efficacy of group-paced, teacher-directed instruction. One of the central arguments of the extant

effective-teaching literature is that programs which make allowances for individual differences, student initiative, and student self-responsibility for learning tend to be ineffective in increasing time-on-task and basic skills acquisition, while also being impractical for widespread implementation in regular classroom settings (e.g., Bennett, 1976; Brophy, 1979; Hedges, Giaconia, & Gage, 1981). Findings from the observation study by Wang and Walberg, as well as those from the Waxman et al. (1985) quantitative synthesis, are a counterpoint to this argument. In particular, the results from the Wang and Walberg study are pertinent for two important reasons. First, they illustrate that high degrees of implementation of adaptive instruction features in regular classrooms can be established and maintained in a variety of school settings. Second, they show that although different instructional approaches were in use, there seemed to be a close resemblance in observed classroom processes between the exemplary classrooms of the programs included in the study and instructionally effective classrooms as portrayed in the effective-teaching research literature. In this context, these studies represent an important step toward accumulating the kind of data base on instructional features that currently is sorely lacking. Information of this sort is critical for making informed choices from among alternative educational models and for strategic planning aimed at creating alternative futures scenarios with the goal of improving current practice.

CONCLUSION

This paper presents a case for gathering information on specific features of school learning environments that are effective in maximizing all students' chances for schooling success, particularly the chances of success for students who require greater-than-usual educational support. Examination of research and practice supports the contention that information on learning environments or conditions, combined with a broadened data base on student outcomes, can greatly enhance innovative program development, school implementation, and strategic planning. Recent studies with implications for increasing the effectiveness of schooling come from virtually all areas of research on human development and learning, as well as from investigations of effective teaching and classroom processes. This research is adding substantially to our understanding of learner competence, of how such competence is acquired, and of some key characteristics of effective schooling.

The important leadership role of NCES is implicit in the recommendations discussed in this paper for building upon the current research base. This role dictates an improvement orientation whereby data on the quality of education are used (a) "to assist educators and educational policy makers by informing their decisions and to assist the general public by describing the 'health' of American education" (U. S. Department of Education, 1985); and (b) to create alternative futures scenarios and conduct related strategic planning. Thus, NCES is called upon to greatly expand its current focus on disseminating information for the purposes of trend analysis and forecasting; it is challenged to accept responsibility for increasing the relevance of its data base to educators and policymakers as well as providing the general public with information that can be used in making informed choices from among different schooling approaches. The ultimate goal is for NCES to make available information that is most timely and relevant to informed decision making by educational planners and informed

choices by the public -- the primary consumers of educational improvement.

This is a special period in American education. The pervasiveness of the sense that we must somehow improve the quality of schooling is reflected in over 30 major national reports and in the creation of over 300 state task forces on the general quality of education (Cross, 1984). Improvement efforts are under way, and many of them have considerable potential. The current wave of educational reform underscores the leadership role of NCES in pooling the resources and capabilities of other federal, state, and local information-gathering agencies. Only in this way can progress be made in systematically building data bases that go beyond the predominant focus on the socioeconomics of education and address issues related to improving the quality of educational practice.

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