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Tribute to Madeline Hunter

Ang Wai Hoong

Aha! The moment of revelation: that was what I experienced when I heard Madeline Hunter on tape lying in bed with influenza. I was so inspired that I immediately applied to attend her course at University of California, Los Angeles (UCLA).

She described how principles of learning could be applied in a practical and systematic manner. Experienced teachers when asked to advise novice teachers often say "observe and do what I do". They lack the vocabulary to pass on their experiences. Madeline established the vocabulary which teachers can now use to discuss their teaching. Her depth of knowledge in educational psychology was phenomenal. She translated theories into classroom practice which we could apply from kindergarten to graduate school. Madeline was often criticised that her work was not based on research. Dr Karen Spencer, an admirer of Madeline Hunter came to Singapore in 1994 to conduct workshops for ASCD. She informed me that as a doctorate assignment, she established the references for Madeline Hunter's work. Madeline was more interested in helping teachers to apply the psychological theories rather than spend time on academic ramifications.

I still remembered how emotional I was to be scripted by the Madeline Hunter at the lesson I gave at UCLA. My naturally loud voice became a whisper. Her feedback was "You see how the students had to keep so quiet in order to catch what you said. It is a technique that can be employed occasionally."

This incident showed how she dignified mistakes. She truly had the learner's welfare at heart. I can recall these simplified steps she recommended that can be used to dignify a learner's mistake in the classroom:

1. provide the correct question to the wrong answer;
2. a clue for the appropriate answer to the original question;
3. get the pupil to provide the answer to the original question again;
4. reinforce the right answer.

When pupils are put down for giving wrong answers, they often dare not attempt to answer questions again. When this happens repeatedly, they may become disinterested in learning altogether. A learner must have a good self-concept in order to learn. To preserve a learner's self-concept, one must give the learner "a sense of self-worth and a feeling of competence". Teaching is to enhance life.

Her application of the "Reinforcement Theory" was easy to understand (see figure). Madeline would have reminded us that the diagram merely shows propositional knowledge which serves as a foundation for making teaching decisions. We would attain procedural knowledge when we actually practise it. Finally, we achieve conditional knowledge when we understand when to use it.

I was so inspired that when I return to Singapore, I designed a two-lesson programme to teach primary two pupils to use the dictionary. I taught these lessons in several primary schools. Subsequently, I also shared my knowledge with my colleagues and especially with principals and teachers

teaching the Extended Course. I did what Madeline Hunter wanted her students to do.

She modelled what she taught. All trainee teachers need to learn Bloom's Taxonomy. Madeline's presentation of it was so much easier to understand. She called it "Madeline on Bloom". She was truly a great teacher.

How nice it would be if principals and teachers in Singapore have a chance to learn directly from Madeline Hunter. I could not find any sponsorship to bring her to Singapore, so I initiated the formation of the Association of Supervision and Curriculum Development (Singapore) with the main objective of bringing inspiring educationists from abroad for the benefit of all those in the world of teaching and learning.

Madeline Hunter visited Singapore in 1992 to conduct a seminar for about 1000 ASCD members. She was enthusiastically received. I am glad to have achieved my objective. Yes, Madeline Hunter had demonstrated that teaching is a science. We now know many of the cause-and-effect relationships in teaching and learning. As a result, we can use these relationships "to promote pupils learning in the same way the doctors use their medical knowledge to promote health. Of course, whenever humans are involved, we are dealing with probability, not certainty. When a doctor prescribes, it is to increase the probability of the patient's recovery, not to guarantee it. In the same way, when certain teaching decisions and actions are taken, we can only increase the probability of pupils' learning". While teaching is a science, how well we teach is an art.

We salute you Madeline Hunter.

Editor's Note: Madeline Hunter died Jan 27, 1994 at age 78.

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MADELINE HUNTER's REINFORCEMENT THEORY

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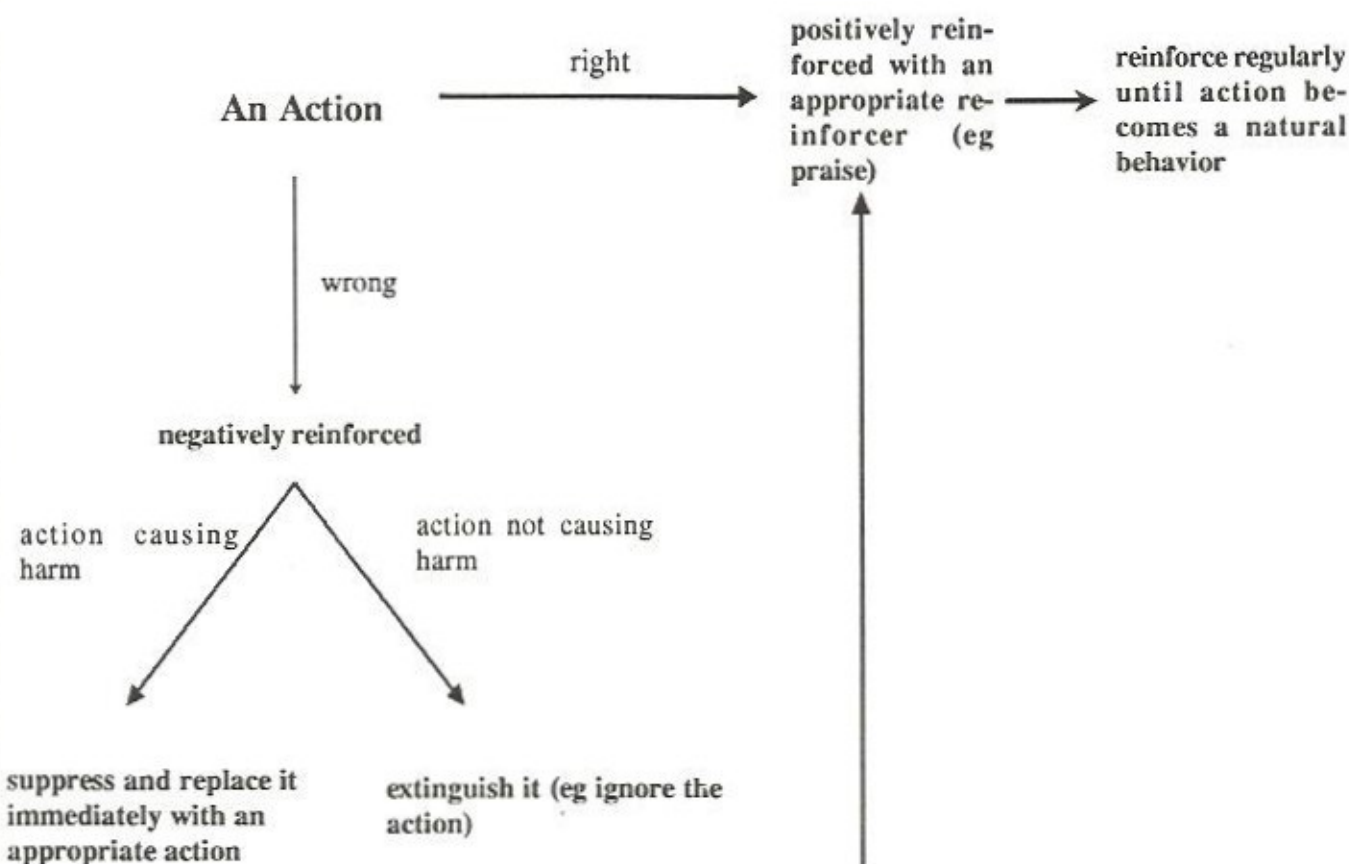
Preventing Early School Failure: What Works?

From early childhood interventions to nongraded primary programs and one-to-one tutoring, research clearly shows that we know how to provide students the skills and knowledge they need to succeed.

Robert E Slavin, Nancy L Karweit and Barbara A Wasik

Once upon a time, a town was having a serious health problem. Approximately 30 percent of its children were coming down with typhoid and other diseases because of contaminated drinking water. The town council allocated millions to medical care for the victims, yet some of them died or were permanently disabled. One day, an engineer proposed to the town council that they install a water treatment plant, which would prevent virtually all cases of the disease. "Ridiculous!" fumed the mayor. "We can't afford it!"

The engineer pointed out that they were already paying millions for treatment of a preventable disease.

"But if we bought a water treatment plant," the mayor responded, "how could we afford to treat the children who already have the disease?"

"Besides," added a councilman, "most of our children don't get the disease. The money we spend now is targeted to exactly the children who need it!" After a brief debate, the town council rejected the engineer's suggestion.

The town council's decision in this parable is, of course, a foolish one. From a purely economic point of view, the costs of providing medical services to large numbers of children over a long time were greater than the cost of the water treatment plant. More important,

children were being permanently damaged by a preventable disease.

In education, we have policies that are all too much like those of the foolish town council. A substantial number of children fail to learn to read adequately in the early grades. Many are retained, assigned to special education, or maintained for many years in remedial programs. The financial costs of providing long-term remedial services after a student has already failed are staggering, but even more tragic are the consequences for individual children who fail so early.

Despite some improvements and a growing acceptance of the idea that prevention and early intervention are preferable to remediation,

programs (and funding) for at-risk students overwhelmingly emphasize remediation. The unspoken assumption behind such policies is that substantial numbers of students - due to low IQs, impoverished family backgrounds, or other factors - are unlikely to be able to keep up with their classmates and will therefore need long-term support services to keep them from falling further behind.

If early school failure, were, in fact, unavoidable, we might have a rationale for continuing with the policies we have now. But a growing body of evidence refutes the proposition that school failure is inevitable for any but the most retarded children. Further, the programs and practices that, either alone or in combination, have the strongest evidence of effectiveness for preventing school failure for virtually all students are currently available and replicable. None of them is exotic or radical.

In the following pages, we summarize the conclusions of our major, federally funded review (Slavin et. al, in press) on the effects of programs intended to prevent early school failure. Our review focused on a variety of indicators of success and failure. Most early intervention programs involving students from birth to age 4 have used IQ, language proficiency, and other measures that predict school success and their outcomes. We reported these outcomes, but placed greater emphasis on measures of actual school success or failure: reading performance, retention, and placement in special education. Whenever possible, we emphasized long-term effects of early interventions.

We reviewed several types of early schooling programs. One important common feature of these programs is that they are expensive, and most are of similar orders of magnitude of cost. For example, reducing class size by half (from 30 to 15, for instance) involves hiring an additional certified teacher for each class. Yet this same teacher could teach a preschool class, could be added to the kindergarten staff to enable a school to have full-day kindergarten, or could tutor about 15 low-achieving 1st graders 20 minutes per day. Retention or provision of extra-year programs for kindergartners or 1st graders adds about $4,000, or one year's per-pupil cost per child. The costs of *Writing to Read* and other integrated computer-assisted-instruction programs require at least one additional aide per school plus initial and continuing costs roughly comparable to the cost of additional certified teachers. The popularity of all these programs indicates that we are willing to spend money to prevent early school failure, but which investments pay off?

The Reading Link

The consequences of failing to learn to read in the early grades are severe. Longitudinal studies find that disadvantaged 3rd graders who have failed one or more grades are reading below grade level are extremely unlikely to complete high school (Lloyd 1978, Kelly et al 1964). Remedial programs such as Chapter 1 have few if any effects on students above the 3rd grade level (see Kennedy et al 1986). Many children are referred to special education programs largely on the basis of reading failure, and then remain in special education for many years, often for their entire school careers.

Almost all children, regardless of social class or other factors, enter 1st grade full of enthusiasm, motivation, and self-confidence, fully expecting to succeed in school. By the end of 1st grade, many of these students have already discovered that their initial high expectations are not coming true, and they have begun to see school as punishing and demeaning. Trying to remediate reading failure later on is very difficult because students who have failed are likely to be unmotivated, with poor self-concepts as learners. They are anxious about reading, and they hate it. Reform is needed at all levels of education, but no goal of reform is as important as seeing that all children start off their school careers with success, confidence, and a firm foundation in reading.

Success in the early grades does not guarantee success throughout the school years and beyond, but failure in the early grades does virtually guarantee failure in later schooling. If there is a chance to prevent the negative spiral that begins with early reading failure from the start, then it seems necessary to do so. Even very expensive early interventions can be justified on cost-effectiveness grounds alone if they reduce the need for later and continuing remedial and special education services, retentions, and other costs (Barnett and Escobar 1987). While the cost-effectiveness estimates associated with the Perry Preschool Model (Berrueta-Clement et al 1984) have been criticized as unrealistic by many researchers (see Holden 1990), they have contributed to a widespread acceptance of the idea that early intervention, even if expensive, ultimately pays back its costs. Given, then, that there is growing agreement on the proposition that investments in early intervention are worthwhile, we must turn again to the question of which forms of early intervention are likely to have the greatest impact.

> **The key issue for at-risk students is not *whether* additional costs will be necessary, but *when* they should be provided.**

Birth to Age 3 Interventions

Both child-centered and family-centered interventions with at-risk children can make a substantial and, in many cases, lasting difference in their IQ scores (Wasik and Karweit, in press). In child-based interventions, infants and toddlers are placed in stimulating, developmentally appropriate settings for some portion of the day. Family-centered interventions provide parents with training and materials to help them stimulate their children's cognitive development, to help them with discipline and health problems, and to help them with their own vocational and home management skills.

The IQ effects of the birth-to-3 programs were mostly seen immediately after the interventions were implemented, but longer-lasting effects were found in a few cases. The extremely intensive Milwaukee Project (Garber 1988) found the largest long-lasting effects. It provided 35 hours per week of infant stimulation, including one-on-one interaction with trained caregivers followed by high-quality preschool. Parent training and vocational skills training were also included. At age 10, the children (of mildly retarded mothers) had IQs like those of low-risk children, and their IQs were substantially high than those of a randomly selected control group of at-risk children. As the children reached 4th grade, they were reading a half year ahead of the control group, and special education referrals were also reduced.

A study of the Gordon Parent Education Program (Jester and Guinagh 1983), which provided impoverished parents with intensive training in child stimulation, found that at age 10, children who had been in the program at least two years still had higher IQs than did a randomly selected control group. Also, they had fewer than half as many special education placements (23 percent vs. 53 percent).

The Carolina Abecedarian Project provided at-risk children with intensive infant stimulation and preschool programs seven hours a day for at least five years, along with services to families. A longitudinal study (Ramey and Campbell 1984) found that K-2 children in the program had higher IQs and fewer retentions than similar control students.

The studies of birth-to-3 interventions demonstrate that IQ is not a fixed attribute. It can be modified by changing a child's environment at home and/or in special center-based programs. Birth-to-3 interventions can also influence special education referrals and retention. It apparently takes intensive intervention over a period of several years to produce *lasting* effects on measures of cognitive functioning, but even the least intensive models, which often produced strong immediate effects, may be valuable starting points for an integrated combination of age-appropriate preventative approaches over the child's early years.

Impact of Preschool

When compared to similar children who do not attend preschool, those who did attend have been found to have higher IQ and language proficiency scores immediately following the pre-school experience, although follow-up assessments typically find that these gains do not last beyond the early elementary years at most (see Karweit, in press a; McKey et al 1985). In addition, little evidence indicates that preschool experience has any effect on elementary reading performance.

Several studies do show that the most important lasting benefits of preschool are on other outcomes such as retention and placement in special education. Preschool has also been found to have a very long-term impact on dropouts, delinquency, and other behaviors (Berrueta-Clement et al 1984). It may be that the effects of preschool on outcomes for teenagers are due to the shorter-term effects on retention and special education placements in the elementary grade. Retention and special education placement in elementary school have been found to be strongly related to dropping out of high school (Lloyd 1978).

Clearly, attendance at a high-quality preschool program has

long-term benefits for children, but it is equally clear that preschool experience is not enough to prevent early school failure, particularly because we find little evidence to support preschool effects on student reading performance. Preschool experiences for 4-year-olds should be part of a comprehensive approach to prevention and early intervention but a one-year program, whatever its quality, cannot be expected to solve all the problems of at-risk children.

The Kindergarten Question

Since the great majority of children now attend kindergarten or other structured programs for 5-year-olds, the main questions about kindergarten in recent years have focused on full-day vs. half-day programs and on effects of particular instructional models. Research comparing full- and half-day programs generally finds positive effects of full-day programs on end-of-year measures of reading readiness, language, and other objectives. However, the few studies that have examined maintenance of full-day kindergarten effects have failed to find evidence of maintenance even at the end of 1st grade (see Karweit, in press b).

Several specific kindergarten models were found to be effective on end-of-kindergarten assessments. Among these were Alphaphonics, Early Prevention of School Failure, and TALK. These are all structured, sequenced approaches to building pre-reading and language skills, which are thought to be important predictors of success in 1st grade. However, only Alphaphonics presented evidence of long-term effects on student reading performance (Karweit, in press b). IBM's Writing to Read computer program has had small positive effects on end-of-year kin-

dergarten measures, but longitudinal studies have failed to show any carryover to 1st or 2nd grade reading (Freyd and Lytle 1990, Slavin 1991).

Retention, Developmental Kindergarten, and Transitional 1st Grade

Many schools attempt in one form or another to identify young children who are at risk for school failure and give them an additional year before 2nd grade to catch up with grade-level expectations. Students who perform poorly in kin-

> By every standard of evidence, logic, and compassion, dollars used preventatively make more sense than the same dollars used remedially.

dergarten or 1st grade may simply be retained and recycled through the same grade. Alternatively, students who appear to be developmentally immature may be assigned to a two-year "developmental kindergarten" or "junior kindergarten" sequence before entering 1st grade. Many schools have a "transitional 1st grade" or "pre-1st" program to provide a year between kindergarten and 1st grade for children who appear to be at risk.

Interpreting studies of retention and early extra-year programs is difficult. Among other problems, it is unclear what the appropriate comparison group should be. Should a student who attended 1st grade twice be compared to 2nd graders (his or her original classmates) or 1st graders (his or her new classmates)?

Studies comparing students who experienced an extra year of school before 2nd grade have generally found that these students appear to gain on achievement tests in comparison to their same-grade classmates but not in comparison to their agemates. Further, any positive effects of extra-year programs seen in the year following the retention or program participation consistently wash out in later years (Karweit and Wasik, in press; Shepard and Smith 1989). Clearly, the experience of spending another year in school before 2nd grade has no long-term benefits. In contrast, studies of students who have been retained before 3rd grade find that controlling for their achievement, such students are far more likely than similar nonretained students to drop out of school (Lloyd 1978).

Class Size and Instructional Aides

A popular policy in recent years has been to markedly reduce class size in the early elementary grades.

Because it is so politically popular and straightforward (albeit expensive) to implement, class size reduction should in a sense be the standard against which all similarly expensive innovation be judged.

Decades of research on class size have established that small reductions in class size (for example, from 25 to 20) have few if any effects on student achievement. However, research has held out the possibility that larger reductions (for example, from 25 to 15) may have a meaningful impact (see Slavin, in press).

The largest and best-controlled study ever done on this question was a recent statewide evaluation in Tennessee (Word et al 1990). Kindergartners were randomly assigned to classes of 15, 25 with an aide, or 25 with no aide, and they maintained the same configurations through the 3rd grade. This study found moderate effects in favor of the small classes as of the 3rd grade. A year after the study, this difference was still positive but very small (Nye et al 1991). Other statewide studies of class size reduction in the 1st grade in South Carolina (Johnson and Garcia-Quintana 1978) found even smaller effects of substantial reductions in class size.

The Tennessee class size study also evaluated the effects of providing instructional aides to classes of 25 in grades K-3. The effects of the aides were near zero in all years (Folger and Breda 1990). This is consistent with the conclusions of an earlier review by Schuetz (1980). However, there is evidence, cited below, that aides can be effective in providing one-to-one tutoring to at-risk 1st graders. Reducing class size may be part of an overall strategy for getting students off to a good start in school, but it is clearly not an adequate intervention in itself.

Non-graded Primary Programs

The non-graded primary is a form of school organization in which students are flexibly regrouped according to skill levels across grade lines and proceed through a hierarchy of skills at their own pace (Goodlad and Anderson 1963). This was an innovation of the 1950s and '60s that is making a comeback in the 1990s.

Research from the first wave of implementation on nongraded primary schools supports the use of simple forms of this strategy but not complex ones. In simple forms, students are regrouped across grade lines for instruction (especially in reading and mathematics) and are taught in groups. Such programs primarily allow teachers to accommodate individual needs without requiring students to do a great deal of seatwork (as is necessary in traditional reading groups, for example). In contrast, complex forms of the nongraded primary - which make extensive use of individualized instruction, learning stations, and open space - are generally ineffective in increasing student achievement (Gutierrez and Slavin 1992).

One-to-One Tutoring

Of all the strategies reviewed in this article, the most effective by far for preventing early reading failure are approaches incorporating one-to-one tutoring of at-risk 1st graders. Wasik and Slavin (1990) reviewed research on five specific tutoring models. One of these, the model used in Success for All, is discussed below. In addition, Reading Recovery (Pinnell et al 1988) and Prevention of Learning Disabilities (Silver and Hagin 1990) use certified teachers as tutors. The Wallach tutoring program (Wallach and Wallach 1976) and Pro-

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grammed Tutorial Reading (Ellison et al 1968) use paraprofessionals and are correspondingly much more prescribed and scripted.

The immediate reading outcomes for all forms of tutoring are very positive, but the largest and longest-lasting effects have been found for the three programs that use teachers as tutors. Reading Recovery is a highly structured model requiring a year of training and feedback. It emphasizes direct teaching of metacognitive strategies, "learning to read by reading." "teaching of phonics in the context of students' reading, and integration of reading and writing. Two follow-up studies of this program have found that strong positive effects seen at the end of 1st grade are maintained into 2nd and 3rd grade. Effects on reducing retentions were found in 2nd grade in one study, but these effects had

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mostly washed out by 3rd grade.

Prevention of Learning Disabilities focuses on remediating specific perceptual deficits as well as improving reading skill. It usually operates for two school years (whereas Reading Recovery rarely goes beyond 1st grade). Reading effects of this program were substantial in two of three studies at the end of the program and remained very large as of the end of 3rd grade in one follow-up study.

Improving Curriculum and Instruction

One strategy for enhancing early reading performance is, of course, improving curriculum and instruction in the early grades. All of the tutoring programs cited above used a particular curriculum and set of instructional methods, and it is therefore impossible to separate the unique effects of tutoring from those of the materials and procedures used. Further, any comprehensive approach to prevention and early intervention must include an effective approach to curriculum and instruction in beginning reading.

We do not intend in this article to take on the current controversy about appropriate instruction in beginning reading. We generally agree with the conclusions reached by Adams (1990, p. 416) in a comprehensive, federally mandated review on the topic:

> In summary, deep and thorough knowledge of letters, spelling patterns, and words, and of the phonological translations of all three, are of inescapable importance to both skillful reading and its acquisition. By extension, instruction designed to develop children's sensitivity to spellings and their relations to pronunciations should be of paramount importance in the development of reading skills. This is, of course, precisely what is intended of good phonic instruction.

Adam goes on to define "good phonic instruction" as instruction that teaches word attack skills in the context of meaning, not in isolation from real reading.

The practice and theory of beginning reading are changing so rapidly at present that this is a poor time to make recommendations about appropriate practice. At the moment, very little evidence supports any of the new "whole language" approaches in 1st grade beginning reading (see, for example, Stahl and Miller 1989), but such evidence may develop as these programs gain in sophistication and use.

Success for All

Each of the strategies presented above has focused on one slice of the at-risk child's life. While the birth to age 3 and preschool programs have often integrated services to children with services to parents, the programs for older youngsters often focus only on academics and, in most cases, only one aspect of the academic program such as class size, length of day, grouping, or tutoring in reading.

How much could school failure be prevented if at-risk children were provided with a coordinated set of interventions over the years designed to prevent learning problems from developing in the first place and intervening intensively and effectively when they do occur? This is the questions posed in research on Success for All (Madden et al 1991), which is designed to provide children with whatever programs and resources they need to succeed throughout their elementary years.

Success for All emphasizes prevention and early intervention. Prevention includes the provision of high-quality preschool and/or full-day kindergarten programs; research-based curriculum and instructional methods in all grades, preschool to grade 5; reduced class size and nongraded organization in reading; activities to build positive relationships and involvement with parents; and other elements. Early intervention includes one-to-one tutoring in reading from certified teachers for students who are beginning to fall behind in 1st grade and family support programs to solve truancy, behavior problems, emotional difficulties, or health or social service challenges. In essence, Success for All combines the most effective interventions identified in this article and adds to them extensive staff development in cur-

riculum and instruction and a school organizational plan to flexibly use resources to see that students read, stay out of special education, and are promoted each year.

Research on Success for All has found substantial positive effects on the reading performance of all students in grades 1-3, and on reductions in retentions and special education placements (Slavin et al 1992). The lasting effects of Success for All into 3rd grade are the largest of any of the strategies reviewed in this article, but they cannot be interpreted as maintenance assessments, as the program continues through the elementary grades. However, with few exceptions, the program beyond the 1st grade consists of improved curriculum, instruction, and family support services, not continued tutoring.

Consistent Patterns

We see a consistent pattern in most of the programs and practices in our review. Whatever their nature, preventative programs tend to have their greatest impacts on outcomes closely aligned with the intervention and in the years immediately following the intervention period. The long-term research on effects of preschool on dropout and related variables is one exception to this, but on measures of IQ, reading, special education placements, and retention, preschool effects were like those of other time-limited interventions. The positive effects seen on these variables were strongest immediately after the program and then faded over time.

Some might take the observation that effects of early interventions often fade in later years as an indication that early intervention is ultimately futile. Such a conclusion would be too broad. What research on early intervention suggests is

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that there is no magic bullet, no program that, administered for one or two years, will ensure the success of at-risk children throughout their school careers and beyond. However, it is equally clear that children must successfully negotiate key developmental hurdles in their first decade of life, and that *we know how to ensure that virtually all of them do so.*

The first hurdle, for children from birth to age 5, is development of the cognitive, linguistic, social, and psychological bases on which later success depends. Second, by the end of 1st grade, students should be well on the way to reading. Each year afterward, students need to make adequate progress in basic and advanced skills. Their

progress should enable them to avoid any need for remedial or special education and to be promoted each year.

Research on birth-to-3, preschool, and kindergarten programs shows that we know how to ensure that children enter 1st grade with good language skills, cognitive skills, and self-concepts, no matter what their family backgrounds or personal characteristics. Research on tutoring and on instruction, curriculum, and organization of early grades education shows that we know how to ensure that children enter 4th grade reading, regardless of their family backgrounds. We have focused on early interventions, but it is important to note that many programs and practices show strong evidence of effectiveness for at-risk students throughout the grades (see Slavin et al 1989). Rather than expecting short-term interventions to have long-term effects, we need to provide at-risk children with the services they need at a particular age or developmental stage.

Does this mean that we need to provide intensive (and therefore expensive) "preventative" services to at-risk students forever? Perhaps we do need this for a very small portion of students now served in special education. But for the great majority of students, including nearly all of those currently served in compensatory education programs and most of those now called "learning disabled", we believe that *intensive* intervention will only be needed for a brief period, primarily one-to-one tutoring in 1st grade. After these students are well launched in reading, they still need high-quality instruction and other services in the later elementary grades to continue to build on their strong base. Improving instruction is relatively inexpensive.

If a cook puts a high flame under a stew, brings it to boil, and then turns it off, the stew will not cook. If the cook puts a stew on simmer without first bringing it to a boil, the stew will not cook. Only by bringing the stew to a boil and then simmering will the stew cook. By the same token, intensive early intervention for at-risk children with no follow-up in improved instruction is unlikely to produce lasting gains, and mild interventions over extended periods may also fail to bring low achievers into the educational mainstream. Yet intensive early intervention followed by long-

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term (inexpensive) improvements in instruction and other services can produce substantial and lasting gains.

The best evidence for this perspective comes from research on Success for All. This program usually begins with 4-year-olds, giving them high-quality kindergarten experiences. These are enough for most children, but the program provides one-to-one tutoring primarily in 1st grade, for those who have serious reading problems. After that, improvements in curriculum and instruction, plus long-term family support services, are intended to maintain and build on the substantial gains students make in tutoring. The program's findings have shown the effectiveness of this approach; not only do at-risk students perform far better than matched control students at the end of 1st grade, but their advantage continues to grow in 2nd, 3rd, and 4th grades. This is not to say that the particular elements implemented in Success for All are all optimal or essential. Other preschool or kindergarten models, reading models, or tutoring models could be more effective, and outcomes for the most at-risk children could probably be enhanced by intervening before age 4. What is important here is the idea that linking prevention, early intervention, and continuing instructional improvement can prevent school failure for nearly all students.

How Many Students Can Succeed At What Cost

Our research summary shows that virtually every child can succeed in the early grades *in principle*. The number who will succeed *in fact* depends on the resources we are willing to devote to ensuring success for all and to our willingness to reconfigure the re-

sources we already devote to remedial and special education and related services.

We have evidence (particular from the Success for All research) to suggest that we can ensure the school success of the majority of disadvantaged, at-risk students using the local and Chapter 1 funds already allocated to these schools in different ways (primarily to improve curriculum, instruction, and classroom management in the regular classroom). However, to ensure the success of *all* at-risk students takes a greater investment. There is a large category of students who would fail to learn to read without intervention but would succeed with good preschool and kindergarten experiences; improved reading curriculum and instructional and perhaps brief tutoring at a critical juncture, eyeglasses, family support, or other relatively inexpensive assistance. A much smaller group of students might require extended tutoring, more intensive family services, and so on. A still smaller group would need intensive intervention before preschool as well as improved early childhood education, tutoring, and other services to make it in school. One could imagine that any child who is not seriously retarded could succeed in school if he or she had some combination of the intensive birth-to-3 services used in the Milwaukee project; the high-quality preschool programs used in the High/Scope model; the tutoring provided by Reading Recovery or other models; and the improvements in curriculum, instruction, family support, and other services (along with tutoring) provided throughout the elementary grades by Success for All.

The cost of ensuring the success of these extremely at-risk children would, of course, be enor-

mous. Yet a multi-risk child (such as a child from an impoverished and disorganized home with low IQ and poor behavior) will, without effective intervention, cost schools and society an equally enormous amount. Even in the mid-term, excess costs for special or remedial education over the elementary years are themselves staggering. This leaves aside the likely long-term costs of dropping out, delinquency, early pregnancy, and so on (see Barnett and Escobar 1987). The key issue for at-risk students is not *if* additional costs will be necessary, but *when* they should be provided. By every standard of evidence, logic, and compassion, dollars used preventatively make more sense than the same dollars used remedially.

The good news in research on prevention and early intervention is that early school failure is fundamentally preventable. The implications of this should be revolutionary. At the policy level, it means we can choose to eradicate school failure, or we can allow it to continue. What we cannot do is pretend that we do not have a choice.

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Helping Underachievers in Schools

Lily Y.S. Wong, Alan Chen Cheong Leong, Tan Long Ng and Yeo Lay Suat.

While schools continually explore for better ways to educate the young, there is a common "problem" faced by the educators. Children who are capable of learning, children with average and above-average intelligence, children from homes where education is supported and valued are simply not performing to their capabilities.

These children have capabilities obvious practically to everyone: teachers, parents and peers. Yet despite their mental ability, they are not doing well in school, they underachieve and are generally called underachievers. McCall, Evahn and Kratzer (1992) define underachiever as "a child who performs more poorly in school than one would expect on the basis of his or her mental abilities."

Observable characteristics of underachievers

Underachievers can be found in every classroom and at all levels. They can be identified when a discrepancy is noted in their perceived ability and their performance in school. Examples of this discrepancy would be if a child demonstrates good verbal skills when out of class but cannot, or will not, participate during lessons; is able to learn to play games very quickly but does not seem to be able to follow instructions in class.

In the classroom, underachievers would most likely attract the teacher's attention because of their misbehaviour or poor performance. They may be distracting other pupils during lessons, bullying them, doing everything else except following the lesson, and almost always 'forgetting' or 'being unable' to do their homework or bring the necessary books. Those who do their work would likely do it in a careless manner. In some cases, underachievers may even feign ignorance and stupidity so that their teachers would lower their demands and expectations of them.

It may seem that only those who do not perform well or are disruptive in class are underachievers. However, underachievers may be pupils who are well behaved and good in certain subjects but poor in others.

Characteristics which are less apparent to the teachers but are common among underachievers include poor study habits, feelings of helplessness with regard to educational performance, lack of self-confidence and esteem, avoidance of work and manipulative of people around them.

Causes for underachievement

According to Rimm (1986), "There is no genetic theory to explain why many children who have obviously good abilities do not perform well in school. Therefore, in identifying the causes of underachievement we must look toward learned behaviours."

One central problem that Rimm has identified is the fear of failure.

This problem perpetuates as underachievers stay away from areas they cannot win. In so doing, they miss the important skills, and this further assures them of failure. It is simply a vicious circle.

Home Factors. A few of the more common factors in the home which may individually or in connection with others lead to a child's underachievement include:

a. Excessive attention given to the child. The child who is used to having everything done for him and whose every need is provided by his parents soon realises that there is no need for effort on his part to get what he wants.

b. Order of birth and sibling rivalry. It is very common that the youngest child in the family, especially a boy, is given extra attention. That being the case, it is likely that he will face the same situation as the child who is doted on. Comparisons of siblings often have adverse consequences on the child who is less welcome and lead him to give up matching the performance of the higher achieving sibling, resulting sometimes in his underachieving. Parents play a very important role in either fuelling or reducing the rivalry or by their remarks and treatment of their children.

c. Marital problems of parents. The child is often left feeling confused but soon learns to manipulate his parents to get what he wants as they try their best to win him over. A result is that the child does not have to achieve academically to get his way as neither parent is willing to risk alienating the child by reprimanding him. There have also been cases where the child wrongly believed that by underachieving he could get the attention of his parents because his previous achievement in school did not help keep his parents together.

d. Negative example set by parents or persons bringing up the children. Parents who proudly tell their children how poorly they themselves fared in school but made it in life send the message to their children that school work is immaterial to success. Negative attitudes of parents towards certain subjects also surface in the form of pupils underachieving in those subjects because of children's tendency to emulate their parents.

School Factors. The school, like the home, can contribute to a child's underachievement. This usually happens when there is

a. lack of or too much of classroom control by the teacher resulting in pupils having control over the teacher and doing as they please in class or rebelling through non-achievement respectively.

b. too much competition and focus on success resulting in the underachiever giving up to avoid failure.

c. labelling of pupils as poor in work and thus placing a stigma on them, leading to lower expectations by them and their teachers of their work. These pupils find this comfortable as it is easier not to achieve than to achieve.

d. misplacement of attention, that is, children get attention when they do something wrong or when they do not require it, for example, children purposely do not perform well so that teachers will give them more attention.

e. differences between pupil and teacher and parents and teacher. These differences arise when the pupil cannot get along with the

Characteristics which are common among underachievers include poor study habits, feelings of helplessness with regard to educational performance, lack of self-confidence and esteem, avoidance of work and manipulative of people around them.

teacher's way of classroom management, or when parents' expectations are inconsistent with those of the teacher. It may also be due to the pupil being given a lot of say at home but not so in school.

Helping the Underachiever - What Schools Can Do

The problem of underachievement exists in every school and in every classroom in varying degrees. There is therefore a need for a plan of action to help underachievers help themselves. What a school can do is to:

a. create awareness of the problems of underachievers among teachers by organising talks/workshops on the subject. This will help teachers see the needs of underachievers more readily and be more understanding in their management and interaction with their pupils.

b. equip teachers with the necessary skills to help underachievers through in-service courses, workshops and providing teachers with relevant information through books and media.

c. motivate and provide support for teachers. Personal interest of, support from and recognition of the principal and those in authority would motivate teachers to make attempts to help underachievers. Teachers must see the need for and advantages of helping underachievers. They will if the school administration gives additional support and encouragement by:

- facilitating contact between teacher and parent,
- providing facilities for counselling underachievers,
- taking into consideration the workload of teachers who have a large number of underachiev-

ers in the class,

- providing opportunities for teachers to share their problems and successes in the management of underachievers with their colleagues and those in authority, and
- setting up committees of teachers who teach the same level so that they can help one another and share appropriate teaching materials, discuss problems, brainstorm for solutions and give feedback to one another.

d. involve parents in helping their children by making them aware of the causes of underachievement, and ways to eliminate the causes or minimize their effects on the children. To do this there is a need to create an atmosphere of trust and genuine interest and desire to help them help their children. The school must therefore welcome parents to participate in school activities.

e. set clear targets and develop programmes and curriculum to help underachievers catch up with their class in terms of content and competency, taking into account the learning style of the individuals. This should not be interpreted as grouping underachievers in a class and providing them with remedial lessons. This is to avoid labelling the pupils and causing them to have a lowered sense of self-esteem.

f. have a system of identifying, helping and monitoring the progress of underachievers. For example if a teacher suspects that a pupil is underachieving, she then compares her observations with that of other teachers who have or are presently teaching the child. Once a pupil has been identified as an underachiever, hold a dialogue with the parents to find out ways of helping the child. The progress of the child

Pupils who do not seem to care about school and grades can be motivated to learn and to achieve by teachers who understand the underlying causes of their learning problems.

is recorded in pupil profile cards which will be available to the child's subsequent teachers. The system should be professionally sound and one which teachers are comfortable with.

g. make available professional help and advice for teachers when they encounter difficulties.

Helping Underachievers - What Teachers Can Do

If teachers are expected to help underachievers, then the school has first to create a supportive environment. The underachiever's class teacher is the best person to help him. However, any programme to help underachievers must involve parents as much as it involves the teacher. Teachers should be encouraged to follow some guidelines in helping underachievers such as:

a. identify underachievers. Teachers should look at each of their pupils as individuals and try to understand them by finding out more about them and by being in contact with their parents.

b. be good role models.

c. counsel underachievers to help them see themselves and what they are capable of. Through counselling the teachers can also try to

  - reduce the fears of underachievers of failure and help them cope with competition,
  - explain the inconsistencies observed about the adults around, and
  - reduce the anxiety of underachievers and help them set realistic goals for themselves and realistic expectations of those around.

d. meet with parents of underachievers to explain the needs of their child, help them find out the cause of underachievement and

seek their help in reinforcing desired behaviours of underachievers.

e. set appropriate tasks for underachievers so that they can experience success in school and improve their self concept.

f. help underachievers organise themselves and know the limits within which their behaviour is acceptable.

g. give meaningful tasks which underachievers can pride themselves for doing well in.

h. avoid criticising underachievers in front of the class or labelling them as underachievers.

i. find out the learning style that is most effective for them.

j. develop themselves so that they are equipped with the necessary skills and knowledge to help their underachieving pupils.

Conclusion

Teachers can definitely help underachievers. They will be able to do this better if they learn to identify the causes of underachievement. They can accomplish even more if they work together with other teachers. Teachers may not be able to change every error they uncover, but even small improvements will be gratifying. A sense of achievement for underachievers in the classroom will build their self-confidence. Pupils who do not seem to care about school and grades can be motivated to learn and to achieve by teachers who understand the underlying causes of their learning problems. Pupils can master the necessary skills and can be freed to experience the joy of self-motivated learning and accomplishment.

There is no wonder cure to eradicate underachievement from the school environment. Teachers should take time to understand their underachievers and perhaps, apply

the Rimm's Laws of Achievement when dealing individually with underachievers. Such an attempt will make an impact on the performance of underachievers. Symptoms of underachievement will most likely decrease and achievement motivation will improve for the learners under their care.

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Concept Mapping: A Study Tool for Underachievers

Claudia S. Sullivan

Concept mapping is a strategy that organizes information so that it becomes meaningful to the learner and makes it easier to remember. It is based on schema theory (Rumelhart, 1985) which suggests that learning involves making connections between prior knowledge and what is to be learned. Successful learners make these connections by organizing "what they know in terms of fundamental principles, concepts, and patterns that are both meaningful and accessible" (Jones & Idol, 1990, 519). Instead of simply rereading the information many times the learner actively processes it.

Why is concept mapping important for underachievers?

A list of seven strategies which could help students process new information was suggested in Weinstein et al (1990). All of these strategies promote in-depth information processing and are useful study tools for independent learning. However, primary and second-

ary school teachers who have underachievers in their classrooms find it especially difficult to motivate these students to invest the time and effort required to use these strategies.

The solution could be to concentrate on the one strategy from the list that represents information in a way that is least like its original text form. This strategy, called "transforming information into another form" (Weinstein, et al, 1990, 5), capitalizes on the human ability to use visual patterns for learning and it involves visual representations of text such as charts, graphs, or concept maps. Charts and graphs are more suitable for technical information such as that found in science texts while concept maps can represent both technical and non-technical text in either expository or narrative forms.

An important advantage of concept mapping is that it can be taught to younger children, perhaps preventing the beginning of an under-achievement-failure-underachievement cycle. Research in Hawaii showed that 24 11-year-olds with

> **Learning involves making connections between prior knowledge and what is to be learned.**

a wide range of reading comprehension and general achievement scores were able to learn to construct concept maps (Sullivan, 1993). Of particular interest to teachers of underachievers is the finding that after 4 months of concept mapping instruction in social studies the positive attitudes towards social studies that were recorded in the students' learning logs increased from 38% to 77%. One of the initially less motivated students concluded, "I am feeling very happy about concept mapping because I am learning a lot and it is easier to do instead of reading the story over and over" (108).

The benefits of concept mapping from primary to secondary grades have been researched in the United States (Novak, Gowin, & Johansen, 1983; Stice & Alvarez, 1987; Sullivan, 1993). In Singapore the benefits for secondary science students have recently been investigated (Chang, 1992). All of the results support the inclusion of concept mapping instruction in the curriculum.

What does a concept map look like?

The model of concept mapping advocated by Novak and Gowin (1984) has certain characteristics that differentiate it from the more familiar semantic webbing model used to teach vocabulary (Heimlich & Pittelman, 1986). The main topic appears prominently at the top or in the centre of a hierarchy of nodes which represent subordinate ideas and specific details (see Figure 1). The nodes are connected by lines that are labeled to represent the relationships between the ideas and details.

How is a concept map constructed?

The construction of a concept map involves selecting the main topic and the subordinate ideas from the text. Next, the subordinate ideas are grouped into catego-

> Effective learning strategy instruction requires direct teaching of the strategy as well as information about when, how, and why the strategy can be useful.
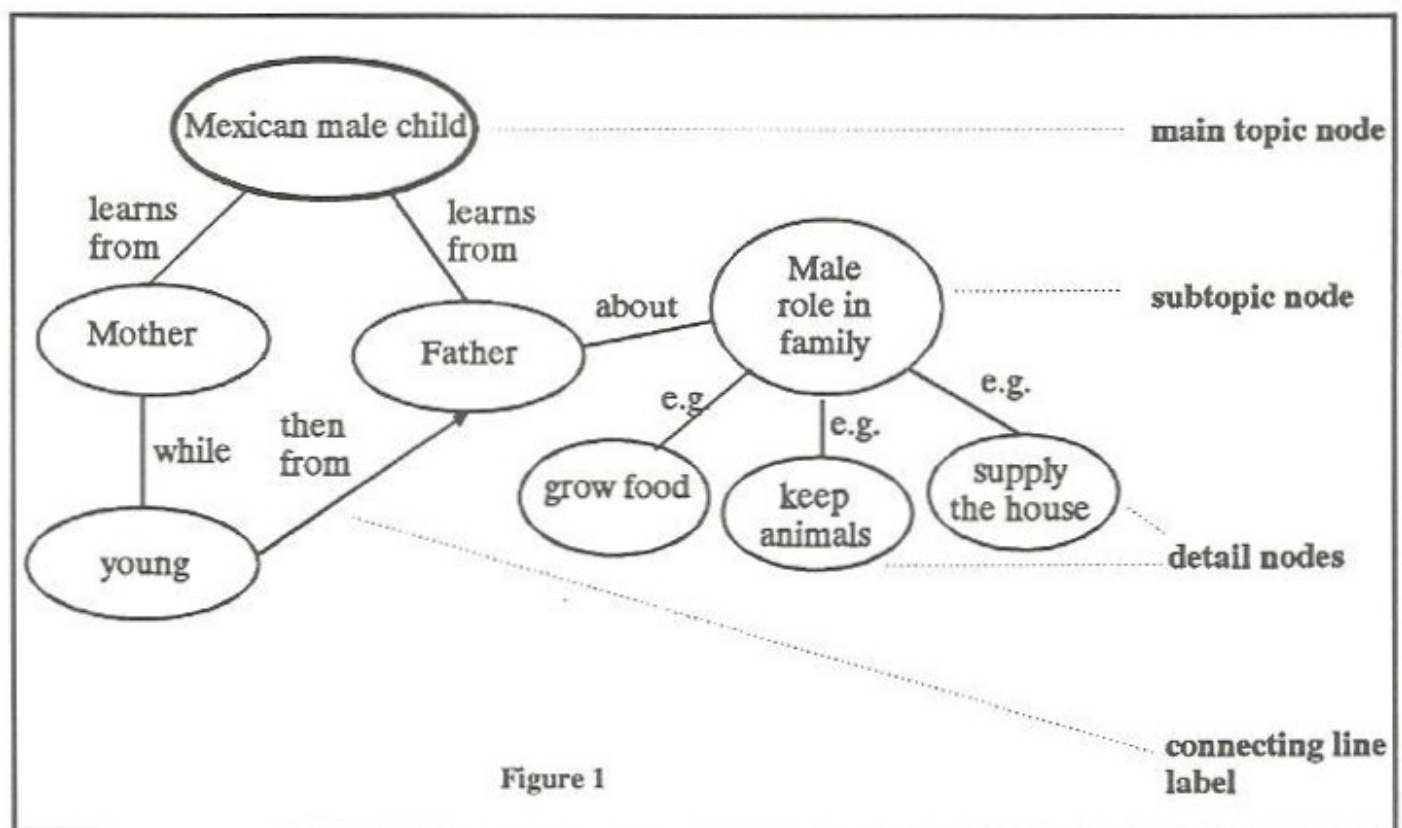

Figure 1

ries and reworded concisely, omitting all unnecessary words. Finally, connecting lines are labeled to represent relationships between and among the nodes. All of these processes are similar to those used in summarizing (Brown & Day, 1983), a skill that is difficult to master but is required of most secondary and tertiary students. Summarizing is also one of the useful study tools described by Weinstein et al (1990). However, the conciseness of a summary lacks details and its prose form closely resembles that of the text underachievers may find difficult. Concept maps provide the details needed for study in a format that is easier to remember.

What are the implications for teachers?

Effective learning strategy instruction requires direct teaching of the strategy as well as information about when, how, and why the strategy can be useful (Brown, Bransford, Ferrara, & Campione, 1983). To do this teachers must themselves be able to construct concept maps as well as appreciate the benefits.

If concept mapping is to be taught in schools it must first be taught to preservice and inservice teachers. These teachers can develop their mapping skills as they plan a particular lesson, organize units of work, or process text for their own personal use. Once they are comfortable with mapping they must convince their school administrators that a commitment of curriculum time is necessary for instruction - time which could be found in social studies classes. Once students know how to map they can be encouraged to transfer the skill to other subjects.

A strategy based on sound learning theory that can be taught

to students with a variety of abilities and can motivate underachievers seems worthy of whatever investment is required. Concept mapping fits this description.

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Piloting Pacesetter: Helping At-Risk Students Meet High Standards

The San Diego City Schools, in partnership with the College Board, are piloting a program that seeks to prepare *all* students for the educational demands beyond high school.

Thomas W Payzant and Dennie Palmer Wolf

Martin is 14. He reads on a 4th grade level. His writing is simple - not because he doesn't have complex thoughts - but because he often struggles to find the English word he wants, and 40 minutes simply isn't enough time to think, draft, and revise. He wants to graduate from high school and enter a demanding job-training program at a local light and power company. As his father points out, "It's the difference between $6 and $20 an hour all the rest of your life."

But the entry test is no joke. To pass, you need the modeling skills to notice patterns and predict possible difficulties down the line in the machinery. That entails working with Boyle's and Charles' laws and algebraic equations, and diagnosing sources of possible error. And it doesn't end there. The company is looking for employees who are able to interview suppliers and examine product information and forms written in Spanish, Japanese or German.

Access to High Outcomes

Gone are the days when graduation was a matter of going to school just enough to earn your Carnegie credits, or when any high school diploma could act as a passport. Public high schools, like those in San Diego, have as their major imperative helping *all* students prepare for postsecondary education - in colleges, in public service, or on the job, where the ticket is high-level competence, not attendance. The challenge is daunting. San Diego is an urban district of 125,000 students with diverse racial, ethnic, linguistic, and socioeconomic backgrounds. Sixty different first languages are spoken: 30 percent of the students are Hispanic, 19 percent are Asian (with large Indo-Chinese and Filipino groups), 16 percent are African American, 34 percent while, and 1 percent "other".

In this context, we have had to rethink traditional approaches to equity. We can no longer be content solely with the simple arithmetic of inputs - racially mixed schools, racially diverse teachers, classes of equal size, and bilingual opportunities for learning. We now face the challenge of providing eq-

uity of *outcomes*. This is a tall order in American public schools, where there is a long-held belief that ability is distributed in a normal curve pattern and, consequently, tracking is not only convenient, but appropriate. To uproot such deep beliefs demands a program of serious and sustained change in attitudes, daily practices, curriculum, and assessment.

In San Diego, we began five years ago by instituting a common core curriculum. Today, to be graduated from high school, a student must take four years of English, three years of math, two of science, three of social studies, and must meet a fine arts requirement. At the same time, we eliminated lower-level elective courses in English, math, and science. In mathematics, we established a pre-algebra/algebra sequence for all students, dropping all general consumer, and business math courses.

As promising as these innovations are, by itself, this educational architecture won't promise Martin the life he and his family hope for. As a district, we have to guarantee more than coursework. We have to ensure that Martin encounters mathematics that is more than blind calculation and formula juggling. However, no urban district of our size and diversity has the dollars to guarantee these outcomes single-handedly. To provide excellence for *all* demands partnerships. We have to build on the standards the National Council of Teachers of Mathematics has developed, and we have to join hands with the social and natural sciences, as well as technology, to figure out the "big ideas" we ought to be concentrating on. But most critically, partners can help us think about the minute-by-minute invention of actual courses that can *enable* Martin - not merely remediate him.

A Push-Pull Strategy

If you say "College Board", most people think of an elite gatekeeping organization that decides who should go where with how much scholarship money. Not so. For the last decade, the College Board has been an active, vocal participant in school reform. Ten years ago, the board published *Academic Preparation for College* to inform students, teachers, and families about the necessary pathways to post-secondary education. In the ensuing years, the Educational EQuality Project (E for equality, Q for quality) developed workshops and publications to get the word out that more students deserved to attend, and could flourish in college. In a second decade, the College Board has launched even bolder steps that add up to what has been called a "push-pull" strategy for major school reform. For example, the board, working with major educational foundations and a national consortium of researchers and teachers, has developed EQUITY 2000 - a demanding program of pre-algebra, algebra, and geometry designed to ensure that minority students thrive in vigorous high school mathematics programs.

If EQUITY 2000 accounts for the "push" of this strategy, then the College Board's Pacesetter initiative accounts for the "pull". Through this program, the College Board is devoting major resources to determine how to make the high-standards curriculum, strong teaching, and performance assessment, long associated with its Advanced Placement Program, a part of every high school student's experience.

In San Diego, we have long used the AP Program as an equity tool. Unlike gifted and talented programs, these courses do not require

cutoff scores or special certification; any willing student can enroll, and any teacher can take up the challenge of teaching a rigorous and inventive course. Characteristically, such courses focus on ideas and concepts and on helping students display their understanding in performance assessments (for example, applying physics principles to a novel situation and predicting possible outcomes). AP teachers often form professional groups, exchanging syllabi and teaching strategies and acting as readers when the open-ended portions of exams are graded. Not surprisingly, we have found these courses work towards equity, not elitism. They turn out to be laboratories for thinking through how excellent work might be demanded of a full range of our students.

Consequently, when the College Board proposed Pacesetter, we were more than interested. The project called for developing yearlong courses and associated assessments, along with detailed plans for teacher training, in mathematics, English, world history, science, and foreign language. Some courses would be keystones designed to integrate and deepen what students had learned throughout high school. For instance, in 12th grade science, students might conduct projects about complex issues that involved the merging of concepts and problems from earth science, biology, chemistry, and physics (for example, situations in which the chemical composition and the direction of flow affect how toxic waste takes its toll on the plant and animal life in a particular ecological niche). In 12th grade English, students might draw on their reading and insights from American, British, and world literature to trace the evolution of literature written in English from its origins to the

present.

Other cornerstone courses, such as those in intermediate Spanish and world history, would suggest the kinds of knowledge and skills students should have midway through their high school careers. These worthwhile outcomes that addressed the chronic problem of differential access to knowledge would be worked on with national committees of skilled teachers, researchers, and members of national curriculum organizations. At the same time, as part of Pacesetter, we would be linked to six quite diverse pilot sites: Broward County, Florida; Prince George's County, Maryland; Battle Creek, Michigan; Charlotte-Mecklenburg, North Carolina; Irving, Texas; and Rutland, Vermont.

From Declaration to Realization

San Diego already has a history of innovation and a wealth of partners. Why take more?

We are in the midst of a vigorous national effort to set standards. We have national educational goals for the year 2000. The National Council of Teachers of Mathematics has published widely regarded content standards. Social studies, foreign language, arts, and language arts teachers are headed in the same direction. Clearly, there is no shortage of statements about what we *ought* to do. What we lack is a clear, concrete vision of *how* to reach those goals. The issue for us as an urban district is not more declaration; it is realization.

Pacesetter is centrally about realization. At this moment, national committees of classroom teachers are designing specific course frameworks. English teachers are hotly debating how to give students entry to the major "cultural conversations" of our evolving culture. They are deliberating how to pro-

vide a background knowledge of writers like Shakespeare, without ignoring the fact that contemporary performances of *Othello* - set in Haiti or Los Angeles - could give new meaning to the play. Mathematicians are struggling to design a course that can offer pre-calculus students what they need and teach other students how to be critical consumers and become skillful at quantitative reasoning. World history teachers are grappling with how to use the concepts of climate, migration, and technology to make the study of history increasingly more global.

Each Pacesetter course will include:

1. an outline of subject content and anticipated learning outcomes developed by leading teachers and specialists from professional subject-matter associations and universities (for example, in the case of mathematics, the National Council of Teachers of Mathematics and the Mathematics Association of America);

2. teacher-training and support activities keyed to the content outline for each course, including in-school assessment techniques, summer institutes, workshops, and publications illustrating successful approaches to teaching diverse students;

3. classroom assessments that help teachers monitor and shape instruction while providing ongoing feedback to students;

4. end-of-course assessments (such as projects or portfolios);

5. a valid system for scoring end-of-course assessments on a state, regional, or local level.

But realization - even at this early stage - has to get beyond lists of ingredients to new visions of learning, collaboration with teachers, and assessment.

Learning Outcomes for Students

Although the dust has hardly settled on the outcomes for Pacesetter English 12, early collaborations between the College Board and the National Council of English are sketching a lively picture of what's to come. Students will read both classic and modern works in order to understand how we have framed and currently think about major human issues. Lit-

Public high schools, like those in San Diego, have as their major imperative helping *all* students prepare for postsecondary education - in colleges, in public service, or on the job, where the ticket is high-level competence, not attendance.

eracy, in this context, becomes not just the ability to decode and record, but to interpret and create a wide range of cultural texts - speeches, performances, written literature, documents, and even films.

At the outset of the course, students might introduce themselves, then play back what they have said about themselves and their lives - analyzing how words, images, and performances create specific impressions. Turning from their own oral expression, students will read short works from literature written in English, examining similar issues of self-presentation and representation through language. Moving on to larger works, students might read and watch productions of *The Tempest*, thinking about how self, familiar, and other (Prospero, Miranda, Ariel, and Caliban) are created through their own speech and what others say of them. Working in independent reading groups, students will investigate this legacy by looking at works as diverse as *Othello* or Toni Morrison's *Beloved*. Throughout the course, students will explore focal works that have shaped the way English speakers make sense of the world. British works as diverse as *The Tempest* and *Heart of Darkness*. American works that could range from early settlers' journals to *The Adventure of Huckleberry Finn* - as well as African, Carribean, and Indian literature. Throughout, students will take on the active roles of authors and critics, in addition to the familiar role of reader.

New Opportunities for Teachers

The 12th grade mathematics course focuses on what happens when we confront complex quantitative data sets with the need to understand patterns, continue research, or reach conclusions. In this setting, teachers' roles shift dramatically. They become researchers constructing rich "case studies" in which linear, exponential, and logarithmic functions can be applied to problems in fields like industrial design, economics, and demographics. For example, one member of the mathematics committee has proposed that students use mathematics to model the impact of major historical events. For instance, one problem might be "How different would contemporary Europe be if the Black Death had not occurred?"

Teachers are also designers, as they try these novel, more demanding approaches with students and assess how the materials work with a full range of students. What, for instance, does it take to get a student with a shaky mathematics background to apply reasoning capacities and questioning abilities he or she may have developed elsewhere?

Already by the summer of 1993, mathematics teachers from all seven sites will address the question of teachers' learning. Joining with teachers from the College Board's EQUITY 2000 project, they will examine what teachers need to know in order to become strong coaches and diagnosticians for students working in challenging mathematical environments. Subsequently, participants will assume the dual roles of instructor and critic, as they field-test a proposed sequence of applications that call for simple linear through complex logarithmic functions.

What is emerging from these efforts? A radically different view of professional development - no shrink-wrapped, teacher-proof materials to be swallowed whole the night before. If teachers are to become inventive users of the course frameworks and skilled assessors

Project Pacesetter called for developing yearlong courses and associated assessments, along with detailed plans for teacher training, in mathematics, English, world history, science, and foreign language.

of student work, they must be actively involved in all stages of implementation.

New Questions About Assessment

Two conflicting purposes often criss-cross assessment programs: the *responsibility* to use any assessment to respond to student work and encourage growth and the *demand* that assessment provide reliable, quantifiable information about student learning. As a nation, we have a long history of downplaying the first and highlighting the second. So consuming has our demand been for accountability data that we have often allowed rote and short-answer testing formats to obscure

Two conflicting purposes often criss-cross assessment programs: the *responsibility* to use any assessment to respond to student work and encourage growth and the *demand* that assessment provide reliable, quantifiable information about student learning.

the potential richness of assessment. But if students like Martin are to realize their dreams, we need a more complex view of student assessment.

Pacesetter will allow urban districts like San Diego to take part in a broader national discussion about combining these two aspects of assessment. While we clearly want to value authentic work and acknowledge student growth, as a school district, we also have serious obligations to conduct student and program assessment responsibly. As we move toward more open-ended and authentic forms of assessment, no one should be allowed

to fall through the cracks.

Moreover, as our approaches to assessment move in this direction, serious questions arise about equity and costs. Fortunately, Pacesetter allows our teachers to work with an extensive team of researchers and assessment experts from Educational Testing Service. They are proposing new ways of combining our need to assess students' knowledge with our interest in recording their progress toward valued outcomes.

Unanswered Questions

Many questions about Pacesetter are still unanswered. Present the program to teachers and administrators, and many hands fly up. People want to know:

1. When fewer than half of our students sign up for fourth year math or science, how can we get *all* students to a level where they can take Pacesetter courses in 10th or 12th grades?
2. Particularly in hard financial times, how will we give teachers the time they need to teach and sustain the extra demands of Pacesetter courses.
3. How can we use Pacesetter courses - which are still taught within traditional subject-matter boundaries - to move toward a more integrated high school experience?
4. Pacesetter courses are supposed to be designed for all students. How will we include students with weak academic histories, special education needs, or languages other than English in such demanding courses?
5. The College Board produces other forms of student testing, such as SATs and the Achievement Tests. How will Pacesetter's more open-ended approach to student assessment

affect these other tests?

There are no simple answers. Pacesetter is a "work in progress", just as the College Board is involved in rethinking its mission as a major educational institution. At the turn of the century, it was a tremendous move toward equity to insist that all students be eligible for college on the basis of a common exam. No longer could your last name, and your father's occupation and education, be the gatekeepers to education after high school. A hundred years later, we have learned that equity demands additional tools. We cannot claim to have "done our job" when we have not offered instructional and assessment opportunities that prepare students for college or the world of work. In that light, we are going to have to reinvent our means. Pacesetter provides one laboratory in which to do so.

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How a Staff Development Plan Can Rescue At-Risk Students

An on-site inservice program that trains teachers how to intervene early in the school year helps prevent many students from "falling through the cracks."

Daniel L Duke

W hat does staff development mean to you?.

"Four days a year." The teacher's response to my question gave me pause. Could it be that inservice for teachers was not always well received? Apparently.

Lessons such as this became commonplace during my year as acting director of staff development for my local school district. Taking advantage of a unique exchange program between the University of Virginia's Curry School of Education and Albemarle County Schools, I agreed to assist the district on a half-time basis when its director of staff development took a new job in late August 1990. As someone who had studied and

taught about staff development, I harbored a variety of ideas and beliefs and felt I could make a contribution.

My year "in the field", however, wound up profoundly changing my views of staff development. It also led to the development of Student-Based Staff Development (SBSD), a model for assisting teachers to perform their instructional roles more effectively.

The Context for a New Approach

Albemarle County Public Schools was far from a troubled school district desperately seeking new ideas, as it already possessed a more sophisticated staff development system than most districts its

size. Despite the district's advantages, those engaged in Albemarle's staff development program had reason to be concerned. While some efforts - particularly those dealing with reading interventions and computers - had yielded documentable evidence of student gains, the impact on students of many other activities remained unclear.

This uncertainty became a liability when, in the fall of 1990, the recession struck Virginia. An unprecedented state deficit coupled with local taxpayers' anxiety sent school officials scurrying for line items in the budget to pare. Unable to muster hard data to support many staff development initiatives, district personnel looked on helplessly as the allocation was decimated.

Opportunity Amidst Retrenchment

Those of us responsible for teacher growth realized that any attempt to recoup monies for staff development would need to be justified in terms of impacts on students. I was charged with assessing staff development needs and proposing a delivery system for which the district might be held accountable.

One of the most frequent concerns of teachers and administrators involved instruction for at-risk students in regular classroom settings. I reasoned that if staff development could equip regular classroom teachers to deal effectively with at-risk students, additional support might be forthcoming.

The first step was to adopt a simple straightforward definition of "at risk": any student with a grade D or F (or its equivalent) at the end of the first grading period (in October) was considered to be "at risk" of failure for the year. Low grades were known to be highly correlated with poor attendance, behavior problems, and dropping out of school. Basing "at-riskness" on grades also implied a clear measure of accountability. Any staff development that could help teachers work with failing students so that they earned passing grades by June would be regarded as effective.[1]

The next step was to determine how to equip regular classroom teachers with strategies that could lead to higher grades. Learning disabilities teachers, Chapter 1 teachers, and other specialists had no lack of intervention strategies, so that was not the problem. As I visited schools and sat in on case conferences to discuss at-risk students, I began to realize that the real problems had to do with organizational factors, interpersonal relations, and attitudes that denied the value of instructional adjustments.

"I have it my best shot." Some teachers who referred students to case conferences were unprepared to entertain additional suggestions. The act of referral for these teachers signaled that they had exhausted either their repertoire of interventions or their willingness to work out the problems of the student in question.[2] While others in attendance at the conference (fellow teachers, specialists, administrators) might believe the meeting's purpose was to brainstorm ideas that could be useful to referring teachers, the latter regarded the meetings as an occasion to consider alternatives to classroom interventions.

"Who couldn't be successful with a handful of students?" A second problem involved relations between regular and special education teachers. Instead of seeing special education teachers as a treasure trove of tips and insights concerning at-risk students, many regular education teachers saw only low teacher-student ratios, reduced academic expectations, and an abundance of resources. Administrators who tried to promote greater integration of regular and special education services frequently encountered considerable resistance from regular classroom teachers.

"Where's the follow-through?" A third problem concerned school organization and leadership. For case conferences to work, teachers indicated that administrators needed to take an active interest in the process - attending meetings, assigning responsibilities, monitoring progress, and scheduling follow-up sessions to assess progress and adjust interventions. Often, however, the first meeting to discuss at-risk student was also the last.

"Training is important, but when?" Many teachers acknowledged that they might benefit from activities that focused on ways to assist at-risk students in regular classroom settings and improve the effectiveness of case conferences. Their major frustration centered on the timing of staff development. Although the district provided a number of days during the school year for staff development, many of them were scheduled during school hours. Unhappy about missing school, teachers wondered why greater use could not be made of the summer. The summer that I became acting director, Albemarle, in fact, had experimented with linking thinking skills training to summer school and found the marriage to be a good one.

How to Help the Neediest Students

Reflecting on my observations, I believed that the school system was most likely to secure financial support for staff development when it could demonstrate direct benefits for the neediest students. The time had come to stop pretending that staff development could effectively address a variety of different needs in the same year. Regular classroom teachers and administrators needed to focus on learning how to help students who were experiencing difficulties.

Winning acceptance for such staff development would require accommodating teachers' concerns about the scheduling of inservice activities, ensuring administrative support and follow-through, fostering norms of collegiality and commitment to at-risk students, and demonstrating that instructional interventions could be effective. Our goals were to:

- *Increase the willingness and*

capability of classroom teachers to address the instructional needs of individual at-risk students. By experiencing success with one student - rather than being expected to simultaneously address the needs of all at-risk students - teachers might gain the confidence needed to work with others.

- *Utilize the expertise available within the school district and community.* Many teachers and administrators had attended workshops and inservice courses to acquire special instructional and related skills, but they rarely were asked to share this knowledge with their colleagues. In fact, no inventory of trained personnel existed, nor had efforts been made to list resource people in the community.

- *Reduce the numbers of students who (1) are placed in pullout programs, (2) receive low grades, and (3) drop out of school.* We assumed that most teachers were motivated to "make a difference" in the lives of students. The bottom line, this set of goals would require that SBSD be evaluated in terms of its direct impact on students.

To achieve these goals, SBSD focuses on early identification of students experiencing academic problems and speedy delivery of customized training *within individual classrooms.* All staff development is directed at helping participating teachers raise the grades of specific students. After collaborative assessment of strategies that have already been tried and generation of additional interventions, an Instructional Assistance Plan (IAP) is developed. Less formed or complicated than an Individual Education Plan, the IAP is a guide

for in-class staff development and follow-up. Figure 1 illustrates the SBSD process.

Many aspects of SBSD represent the conventional wisdom about how best to work with teachers. Not only is the focus of staff development on assisting students, but also teachers collaborate to assess their needs and to share intervention strategies. Other elements of SBSD are relatively new and entail a restructuring of staff development. That teacher training is triggered by student performance during the first grading period is unique. Also somewhat novel is the delivery of inservice training in the classroom of the student experiencing difficulty. Such a system eliminates the disruptive impact of off-campus staff development. Linking training needs to IAPs constitutes an additional departure from standard practice.

How the Model Works

To get an idea of how the model works, imagine that it is late October and the first six weeks' grading period has just ended. The principal, a counselor, and a representative group of regular and special education teachers meet to review printouts of students' grades. They compile a list of students who are failing or performing unsatisfactorily and who are judged to need changes in instruction. They then assign these students to case review teams consisting of teachers, administrators, specialists, and a staff development resource person. Teams meet on a conference day to review previous efforts at intervention and to brain-storm additional ideas. The teams then write an IAP for each student.

Next, the teams determine whether those expected to implement the plan, particularly the referring teacher, desire staff devel-

opment to implement it. In cases where inservice assistance is requested, the staff development resource person on the team creates a customized inservice program. Inservice typically brings resource people from the school district and cooperating community agencies into the classroom to provide on-site training. In some cases, teachers may be released for a day or two to observe other teachers using promising instructional interventions.

For every IAP, a team member is designated to monitor progress. Unsuccessful plans are modified quickly so that at-risk students are given as great a change to succeed as possible. Revised plans may necessitate additional staff development.

There is nothing unique about expecting school personnel to confer about how to help struggling students. What's been missing is a direct link between the development of assistance plans for individual students and staff development.[3] SBSD provides this link in a relatively cost-efficient manner by utilizing local experts and delivering training in the classroom. Released time for teacher trainers and per diem payments for other local resource people are the primary costs.

During my year as acting director of staff development, my colleagues and I undertook limited tests of SBSD in several schools.[4] Specifically, we refined the team meeting process, provided awareness workshops for cadres from schools in one of Albemarle's feeder patterns, developed IAPs for several dozen students, and delivered training in behavioral, motivational, reading, and learning disabilities intervention. Roughly half of the students for whom IAPs were developed experienced improve-

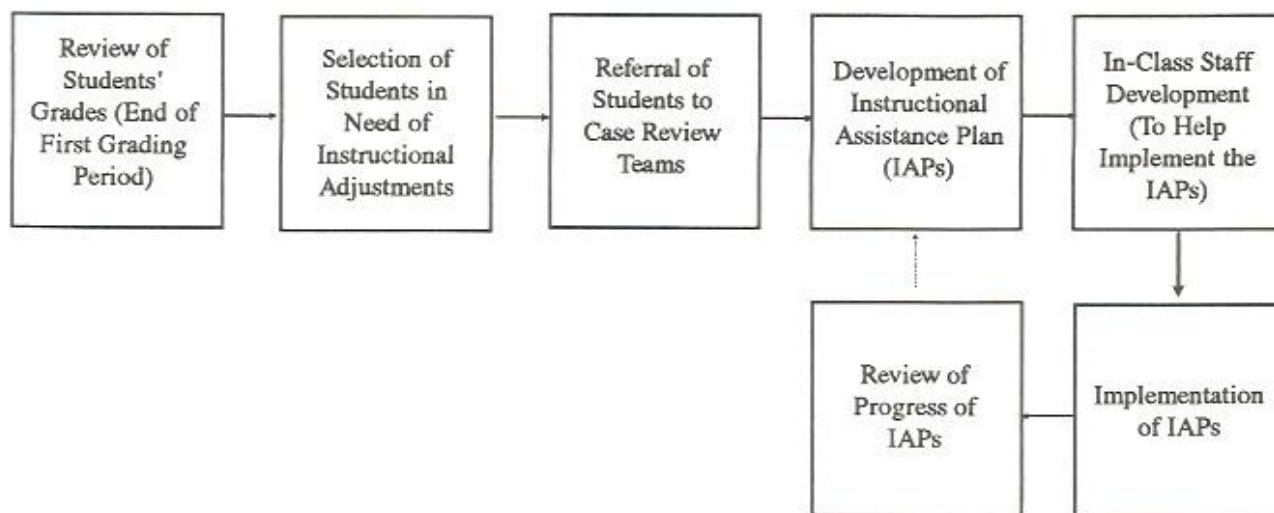## Process Model of Student-Based Staff Development

| Review of Students' Grades (End of First Grading Period) | → | Selection of Students in Need of Instructional Adjustments | → | Referral of Students to Case Review Teams | → | Development of Instructional Assistance Plan (IAPs) | → | In-Class Staff Development (To Help Implement the IAPs) |

| Review of Progress of IAPs | Implementation of IAPs |

Figure 1

ment. Most of those who did not eventually qualified for special education services.

Ingredients for Success

To increase the likelihood that SBSD will succeed, several supporting activities may be useful.

First, districts should compile a directory of local expertise. Besides listing the special skills and knowledge of district personnel, the directory might include similar information about resource people in the community. With such a directory, staff development specialists can match a teacher's need with a local expert. Only in cases where expertise is unavailable locally would districts make an effort to contact resource people elsewhere.

Cadre training is the second necessary element. The objective is to provide three individuals from each school in the district with systematic training in instructional interventions and related strategies pertinent to the needs of at-risk students. These individuals need not

be masters of particular interventions, but they should be competent to make recommendations during case review conferences.

After visiting Pittsburgh (at our assistant superintendent's behest), I became convinced that the best time for cadre training was summer school. Pittsburgh Public Schools makes extensive use of local summer schools for staff development. Teachers and administrators there appreciate the opportunity for sustained training in a school setting that does not take place during the regular school year.

After a series of brainstorming sessions with Albemarle teachers and administrators, a summer school prototype emerged. The summer school would be offered at no cost to students who were experiencing academic difficulties. Teachers trained in various interventions - for example, Reading Recovery. cooperative learning, learning disabilities strategies, HOTS - would be hired to teach

summer school classes to help students prepare for the next grade level. These teachers also train and supervise three to five cadre members from different schools. The presence of cadre members in the class ensures that each at-risk student receives individual attention.

Classes meet in the morning. After lunch, students either go home or attend a recreational program coordinated by the Parks and Recreation Department. Cadre members meet with their supervising teacher to debrief one another after the morning's experiences, receive training, and plan for the following day. Over the course of several summers, cadre members acquire a broad repertoire of interventions, equipping them to provide suggestions during team meetings. They also learn how to conduct productive team meetings and how to develop and assess IAPs.

Albemarle tried a modified version of this summer school with encouraging results, but full implementation is contingent on the

district's ability to secure state, federal, or foundation funds or to restore loss staff development funds to the budget.

Staff Development that Delivers

SBSD promises to enhance teacher efficacy by providing regular classroom teachers with a variety of interventions to assist at-risk students. It also helps create a school culture in which teachers and administrators openly discuss instructional issues. It is vital that teachers do not give up on struggling students when conventional practices fail. Often more can be learned from understanding why instruction is not working with certain students than by listening to the "success stories" of outsiders.

SBSD represents a restructuring of staff development. Rather than traditional "large-batch" inservice, the model calls for on-site training to assist individual students. This focus provides a clear basis for assessing the effectiveness of staff development, which typically has been missing. With a system like SBSD in place, those in charge of staff development can approach the school board with exact figures about:

1. the number of students receiving low grades at the end of the first grading period;
2. the number of these students' teachers who received customized training;
3. the cost of the training (calculated mostly in terms of released time for district employees and per diem payments for other local resource people);
4. the number of target students whose grades and performance improved during the year.

It would be difficult for a school board to cut funds for staff development when presented with a list of actual students who benefited as a result of teacher training.

SBSD also ensures a measure of accountability for parents of at-risk students. While school officials may not be able to guarantee that *all* students will succeed as a result of SBSD, they can guarantee that students experiencing academic difficulties will be identified early in the school year and provided an assistance plan that typically calls for in-class instructional adjustments, rather than referral or reassignment. In most districts, only handicapped students currently are assured such attention.

SBSD serves the needs of at-risk students who may not be eligible for special education - the students often described as "falling through the cracks". At a time when tight money threatens staff development budgets, school districts must be able to demonstrate that inservice dollars directly benefit students most in need of assistance.

Notes

[1]Purists complain that a more "objective" measure than teacher-based grades should be used. I believe such criticism assumes that most teachers are unable to make professional judgments about student performance. I reject such an assumption. Besides, students and parents are well aware of the importance of grades in determining school progress.

[2]In a large-scale study of instructional interventions, my colleagues and I found that the likelihood that a teacher would try various interventions was greatest prior to the end of the first grading period. Interventions after students were given a low grade actually decreased in number! See D.L. Duke and B. Gansneder, (1991) "The Identification of Effective Interventions for At-Risk Students." (Paper presented at the annual meeting of the American Educational Research Association).

[3]"Consulting teachers" are being used as trainers with increasing frequency to assist regular education teachers with mainstreamed handicapped students, but similar provisions for nonhandicapped students are relatively rare.

[4]The following people played valuable roles in pilot-testing SBSD: Barry Chlebnikow, John English, Sylvia Dorsey-Robinson, Pat Lloyd, Pam Moran, Andy Overstreet, John Lloyd, Bill Banks, Beth Rogers, Diane Tallerico, Carolyn Paige, and Jan Searle.

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What Helps Students Learn?

An analysis of 50 years of research reveals that direct influences like classroom management affect student learning more than indirect influences such as policies.

Margaret C Wang, Geneva D Haertel and Herbert J Walberg

Changes in education should be grounded in a knowledge base derived from research, and such a base is now beginning to take shape. By analyzing the content of 179 handbook chapters and reviews, compiling 91 research syntheses, and surveying 61 educational researchers, we created a knowledge base comprising 11,000 statistical findings that shows reasonable consensus on the most significant influences on learning (Wang, 1990, Reynolds et al. 1992)[1].

In general, we found that direct influences have a greater impact on learning than indirect influences. Direct influences include the amount of time a teacher spends on a topic and the quality of the social interactions teachers have with their students. Indirect influences, include policies adopted by a school, district or state, and organizational features such as site-based management.

Accumulating the Data

We summarized the results of our analysis, using a 28-category conceptual framework based on models of schooling that posited influences on learning[2]. The earlier models included variables such as student ability, motivation, prior knowledge, and background. Classroom instructional variables such as enthusiasm, clarity, feedback, and correctives were also key elements. Increasingly, models of schooling have been extended to include out-of-school variables, social-psychological influences, instructional delivery systems, program design, and implementation. Figure 1 lists the 28 categories of the conceptual framework we employed and a representative variable for each category[3].

By combining the results from the content analysis, the research synthesis, and the survey of experts, we obtained an average score for each of the 28 categories[4]. Figure 2 presents the 28 categories of influence from most to least influential. Classroom management processes, metacognitive processes, cognitive process, home environment/parent support, and student and teacher social interactions had the greatest influence on school learning. Program demographics,

school demographics, state-level policies, school policies and organization, and district demographics had the least influence on learning.

This method of statistically aggregating the findings of many studies varying in sample size, rigor, and characteristics is called *meta-analysis*. Meta-analysis yields estimates of the effect of all studies that can be found for a given method or condition. Thus, the estimates we obtained represent an average or mean effect.

It should be noted that many of the meta-analyses were based only on standardized tests, essay examinations, and other traditional measures of learning outcomes. Few studies employed portfolio ratings, exhibitions, laboratory exercises, and other newly recommended measures, largely because little research has been done on such measures. Nevertheless, the many scholars who participated in our survey showed a high level of consistency in weighing the possible effects of some of the methods and conditions on the new outcome measures. The collective judgment of these experts then served as one of the indexes of the effectiveness of each method.

To better understand which influences were most important, we grouped the 28 categories into six broad types of influences: student aptitude, classroom instruction and climate, context, program design, school organization, and state and district characteristics (see fig. 1). Figure 3 lists the six broad categories and their average rating of influence. These averages again confirmed the significant effect of direct influences.

Student Aptitude

Our research indicated that student aptitude was the most influ-

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Figure 1

Twenty-Eight Categories of Influence on School Learning

<u>Categories</u>	<u>Examples of One Variable in Category</u>

Student Aptitude includes gender, academic history, and a variety of social, behavioral, motivational, cognitive, and affective characteristics.

1. Metacognitive Processes	*Comprehension monitoring (planning; monitoring effectiveness of attempted actions and outcomes of actions; testing, revising, and evaluating learning strategies)*
2. Cognitive Processes	*Level of specific academic knowledge in subject area*
3. Social and Behavioral Attributes	*Positive, nondisruptive behavior*
4. Motivational and Affective Attributes	*Attitude toward subject matter instructed*
5. Psychomotor Skills	*Psychomotor skills specific to area instructed*
6. Student Demographics	*Gender and socioeconomic status*

Classroom Instruction and Climate includes classroom routines and practices, characteristics of instruction as delivered, classroom management, monitoring of student progress, quality and quantity of instruction provided, student-teacher interactions, and classroom atmosphere.

7. Classroom Management	*Group alerting (teacher uses questioning/ recitation strategies that maintain active participation by all students)*
8. Student and Teacher Social Interaction	*Positive student response to questions from teacher and other students*
9. Quantity of Instruction	*Active engagement in learning*
10. Classroom Climate	*Cohesiveness (class members share common interests and values and emphasize cooperative goals)*
11. Classroom Instruction	*Clear and organized direct instruction*
12. Academic Interactions	*Frequent calls for substantive oral and written response*
13. Classroom Assessment	*Assessment used as a frequent, integral component of instruction*
14. Classroom Implementation and Support	*Establishing efficient classroom routines and communicating rules and procedures*

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ential of the six broad types of influences. Among the categories of student aptitude, a student's *metacognitive processes* - that is, a student's capacity to plan, monitor, and, if necessary, re-plan learning strategies - had the most powerful effect on his or her learning. Research on metacognitive processes has generated new curriculums and new instructional techniques such as reciprocal teaching and cognitive skills instruction.

Cognitive processes were also identified as highly influential. Cognitive processes include not only variable such as general intelligence, but also prior knowledge, competency in reading and mathematics, and verbal knowledge.

Given the social nature of schooling, *social and behavioral*

Context includes community demographics, peer culture, parental support and involvement and amount of time students spend out of class on such activities as television viewing, leisure reading, and homework.

15. Home Environment/Parental Support	*Parental involvement in ensuring completion of homework.*
16. Peer group	*Level of peers' academic aspirations*
17. Community Influences	*Socioeconomic level of community*
18. Out-of-Class Time	*Student participation in clubs and extra-curricular school activities*

Program Design refers to the physical and organizational arrangements for instructional delivery and includes strategies specified by the curriculum and characteristics of instructional materials.

19. Curriculum Design	*Instructional materials employ advance organizers*
20. Curriculum and Instruction	*Alignment among goals, content, instructions, student assignments, and evaluation*
21. Program Demographics	*Size of instructional group (whole class, small group, one-to-one instruction)*

School Organization refers to culture, climate, policies and practices, includes demographics of the student body, whether the school is public or private, funding for categorical programs, school-level decision variables, and school-level policies and practices.

22. School Culture	*Schoolwide emphasis on and recognition of academic achievement*
23. Teacher/Administrator Decision Making	*Principal actively concerned with instructional program*
24. Parents Involvement Policy	*Parental involvement in improvement and operation of instructional program*
25. School Demographics	*Size of school*
26. School Policies	*Explicit schoolwide discipline policy*

State and District Characteristics refer to governance and administration, state curriculum and textbook policies, testing and graduation requirements, teacher licensure, provisions in teacher contracts, and district-level administrative and fiscal variables.

27. State Level Policies	*Teacher licensure requirements*
28. District Demographics	*School district size*

chomotor skills and *student demographics* (for example, gender and socioeconomic status) were minimally influential.

Classroom Instruction and Climate

When averaged together, the different kinds of classroom instruction and climate had nearly as much impact on learning as the student aptitude categories. The most influential category, *classroom management*, includes group alerting, learner accountability, smooth transitions, and teacher "with-it-ness". Effective classroom management increases student engagement, decreases disruptive behaviors, and makes good use of instructional time.

Constructive *student and teacher social interactions* also have a documented effect on school learning. The frequency and quality of these interactions contribute to students' sense of self-esteem and foster a sense of membership in the class and school.

The extensive research on *quality of instruction* indicates that students need to be fully engaged in their academic pursuits and teachers need to make wise use of instructional time. Other things being equal, the more time spent in instruction, the better (within limits, of course).

Classroom climate refers to the socio-psychological dimensions of classroom life, including cooperation among teachers and students, common interests and values, the pursuit of common goals, a clear academic focus, well-organized and well-planned lessons, explicit learning objectives, an appropriate level of task difficulty for students, and an appropriate instructional pace (Haertel et al. 1981).

Classroom instruction includes the techniques for ensuring that stu-

attributes constitute an important category. Children who frequently engage in disruptive behaviors, such as talking out of turn or hitting other children, often perform poorly in school, while children who engage in constructive behaviors are more likely to perform well.

The category *motivational and affective attributes* has received increased attention in the past decade. Student motivation determines effort and perseverance. Long acknowledged as significant by classroom teachers, effort and perseverance are now regraded by educational researchers as key attributes necessary for developing self-controlled, self-regulated learners.

Two remaining influences, *psy-*

The different kinds of classroom instruction and climate had nearly as much impact on learning as the

dents understand both the goals of instruction and the content being presented. One example of these techniques is direct instruction, which emphasizes systematic sequencing of lessons, including the use of review, the presentation of new content and skills, guided student practice, the use of feedback and correctives, and independent student practice.

Both *academic interactions* and *classroom assessment* were moderately influential. Academic interactions include teachers' styles for questions, praise, reinforcement, and use of correctives. Classroom assessment, perhaps more than other methods, depends heavily on the nature and implementation of the assessment for its effectiveness. Many studies indicated that frequent assessment and feedback effectively promoted learning. Some researchers, however, were concerned about national and state assessments and outcome-based education driving educational reform. The mixture of these good results and grave concerns probably accounted for the moderate rating for assessment.

Classroom implementation and support deals with the delivery of instructional services, and staff development and the adequate training of teachers. This category was the least influential of the classroom instruction and climate categories. As with other categories that have been perceived by educators as important but which showed a weak influence on student learning, this category's weak showing may reflect the lack of implementation of its variables more than its relative influence. Although teachers may receive training on how to implement a particular practice or innovation, they may not be successful at putting these practices into action. This can be due to lack of

resources, such as time or materials, or a lack of fit between existing classroom and school routines, instructional goals, and the new innovation.

Even though classroom implementation and support variables did not appear to be strong determinants of student performance in the present knowledge base analysis, they can have large effects if they are well implemented and well aligned with school and district goals. However, implementation not geared toward the targeted student outcomes may do little to enhance student learning.

Context

The four out-of-school contexts influenced school learning to nearly the same degree as student aptitude and classroom instruction and climate. The category *home environment/parental support* was among the most influential of the 28 categories. The benefits of family involvement in improving students' academic performance have been well documented, as have its effect on improving school attendance and on reducing delinquency, pregnancies, and dropping out (Epstein 1984, Moles 1982, Peterson 1989, Walberg 1984). According to the data reported in the current research, the *peer group* category also had a strong influence on school learning.

The *community influences* category had less effect on school learning than either the home environment/parental support or the peer group categories. Only recently has the influence of the community on school learning been examined through empirical studies, and the evidence is not yet sufficient to suggest strong effects.

Out-of-class time includes student extracurricular activities and social clubs. These activities had

Relative Influences on Learning

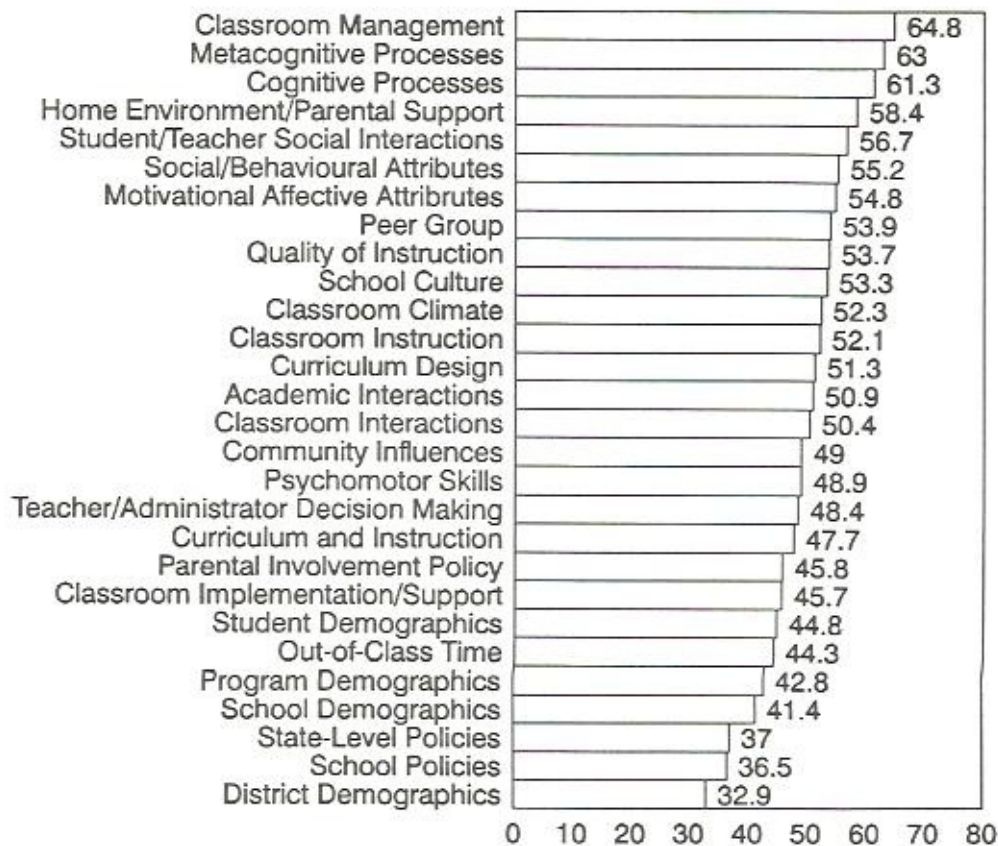| Influence	Value
Classroom Management	64.8
Metacognitive Processes	63
Cognitive Processes	61.3
Home Environment/Parental Support	58.4
Student/Teacher Social Interactions	56.7
Social/Behavioural Attributes	55.2
Motivational Affective Attribrutes	54.8
Peer Group	53.9
Quality of Instruction	53.7
School Culture	53.3
Classroom Climate	52.3
Classroom Instruction	52.1
Curriculum Design	51.3
Academic Interactions	50.9
Classroom Interactions	50.4
Community Influences	49
Psychomotor Skills	48.9
Teacher/Administrator Decision Making	48.4
Curriculum and Instruction	47.7
Parental Involvement Policy	45.8
Classroom Implementation/Support	45.7
Student Demographics	44.8
Out-of-Class Time	44.3
Program Demographics	42.8
School Demographics	41.4
State-Level Policies	37
School Policies	36.5
District Demographics	32.9

0 10 20 30 40 50 60 70 80

Figure 2

considerably less influence on school learning than the other contextual influences. The lack of measurement of the degree or validity of implementation limits research on student activities. Nevertheless, if well designed and well executed, such activities can contribute much to academic accomplishments. Out-of-class time spent on nonconstructive or nontargeted educationally related activities would not likely yield the expected student outcomes.

Program Design

As a set, the three program design categories had a moderate influence on learning. Well-designed textbooks, appropriate organization of instructional groups, and effective alignment of goals and classroom activities yielded moderate benefits. The degree of program implementation is one likely determinant of the impact of program design variables on student learning.

School Organization

On average, school organization yielded moderate influence. Of its five categories, *school culture* was the most influential. School culture is an ethos conducive to teaching and learning. For example, a school might convey its academic atmosphere through participation in intramural academic competitions or through the use of incentives to reward student scholarship.

The category *teacher/administrator decision making* focuses on the role of the principal as an instructional leader. Although much attention has been paid to the importance of the principal's role, the research showed no strong link between principal leadership and student performance. The influence of an outstanding principal may be mitigated by many factors such as a higher teacher turnover rate, an inexperienced team of teachers, or a high concentration of students in at-risk circumstances.

Parental involvement policy refers to parent involvement in the improvement and operation of the instructional program. A school may adopt a parental involvement

Figure 3

Types of Influence	Average Influence
Student Aptitude	54.7
Classroom Instruction and Climate	53.3
Context	51.4
Program Design	47.3
School Organization	45.1
State and District Characteristics	35.0

policy, but successful implementation of a policy closely related to student development has a greater impact on student learning.

The last two categories, *school demographics* and *school policies,* had little influence compared to the other 28 categories. School demographics include the size of the school, the number of classrooms, and the number of teachers and aides. Examples of school-level policies include assertive discipline and telephoning the home when a child is tardy or absent.

State and District Characteristics

Of the 28 categories we examined, *state-level policies* and *district demographics* were among the least influential in improving student learning. Most of the variables included in these two categories are associated with school governance and administration. Examples of state-level policies include requirements for teacher licensure and evaluation and guidelines for the development and selection of curriculums and textbooks. Examples of district demographics include per pupil expenditure, contractual limits on class size, and the degree of school district bureaucracy. Given that state and district influences are many steps removed from day-to-day classroom life, their

impact on student learning is understandably limited.

Building on the Base

Although our three independent sources of evidence generally agreed on the impact of the 28 categories on school learning, discrepancies existed, indicating areas for additional research. Hopefully, future studies and syntheses will yield consistency, but obtaining precise results has limitations. Due to varying circumstances and implementation, educators should not expect results identical to what others have attained. Practices that work well in some settings and with some students may not work well in others (although evidence for such exceptionality is easier to hypothesize than to show consistently).

The estimates obtained on the effectiveness of various educational strategies for improving student learning provide a set of considerations for formulating educational policies and practices as well as a way of identifying school improvement priorities. Overall, our findings support renewed emphasis on psychological, instructional, and contextual influences.

Paradoxically, the state, district, and school policies that have received the most recent attention to appear to have the least influence on learning. Fifty years of research

contradict educators' current reliance on school restructuring and organizational variables as key components of school reform. Because indirect influences may only affect direct influences, they appear to be weaker and less consistent in their results. For example, implementing a districtwide policy for teacher evaluation does not guarantee that students in any given classroom will have a competent teacher.

Unless reorganization and restructuring strongly affect the direct determinants of learning, they offer little hope of substantial improvement. Changing policies is unlikely to change practices in classrooms and homes, where learning actually takes place. Better alignment of remote policies and direct practices and more direct intervention in the psychological determinants of learning promise the most effective avenues of reform.

Notes:

[2]Models reviewed included those by S.N. Bennett, B.S. Bloom, J.S. Bruner, J.B. Carroll, R. Glaser, and

A. Harnischfeger and D.E. Wiley. See G.D. Haertel, H.J. Walberg, and T. Weinstein, (1983), "Psychological Models of Educational Performance: A Theoretical Synthesis of Constructs" *Review of Educational Research* 53: 75-91; M.C. Wang and C.M. Lindvall, (1984), "Individual Differences and School Learning Environments," in *Review of Research in Education,* Vol 11, edited by E.W. Gordon (Washington, D.C.: American Educational Research Association), pp. 161-225; and M.C. Wang and H.J. Walberg, (1985), "Classroom Climate as Mediator of Educational Inputs and Outputs," in *The Study of Learning Environments 1985,* edited by B.J. Fraser (Salem, Ore: Assessment Research), pp. 47-58.
[3]The variables listed as part of the conceptual framework were transformed into a 228-item rating form and used to code results from the narrative reviews and research syntheses. Based on the proportions of the confirmatory studies reported, the size of the correlations, or qualitative indicators, we rated the data culled from the narrative reviews and the research syntheses on a three-point scale. A "1" indicated a weak relationship between a given strategy and student learning while a "3" indicated a strong relationship.

[4]To make the results comparable, the data from the three sources were transformed into T scores, standard scores with a mean of 50 and a standard deviation of 10. The relative influences on the variables were calculated by weighing composites of effect sizes and ratings obtained from experts and content analyses of authoritative literature.

[5]The relationship between well-managed classrooms and student achievement is documented in J. Brophy and C.M. Evertson (1976) "Learning" in *Teaching: A Developmental Perspective,* (Boston: Allyn & Bacon; and in T. Good, (1979), "Teacher Effectiveness in the Elementary School: What We Know About It Now." *Journal of Teacher Education* 30: 52-64. Some of the earliest and most informative research on classroom management resulted in the new terminology described in J. Kounin, (1970), *Discipline and Group Management in Classrooms,* (New York: Holt, Rinehart & Winston).

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Hard Work and High Expectations: Motivating Students to Learn

U.S. Department of Education
Office of Educational Research and Improvement

Even if we raise standards and succeed at restructuring our schools and improving the quality of our teachers, the result may be little or no improvement unless our children also increase the level of their effort.

Popular opinion has it that students' academic success depends on the quality of their teachers and textbooks. Ask the students themselves, however, and you get a different view. Here is how they account for their academic achievement:

- Most students believe their ability and effort are the main reasons for school achievement. By the same token, if asked whether they would prefer to be called smart or hard-working, they will choose smart almost every time. Why? Because they believe that hard-working students risk being considered either excessively ambitious or of limited ability, both of which they would find

embarrassing.

- To avoid unpopular labels, students - especially the brightest - believe they must strike a balance between the extremes of achievement, not too high and not too low. Many students adopt an attitude of indifference to hard work, a stance that implies both confidence in their own ability and a casual regard for academic success.
- At the extreme, many low-achieving students deny the importance of learning and withhold the effort it requires in order to avoid the stigma of having tried and failed.

These beliefs were voiced by educational researchers at a conference on student motivation sponsored by the Office of Educational Research and Improvement (OERI). They are a consequence of long-standing as well as more recent conditions of school life that limit student effort and academic

achievement. Among these conditions, the following four emerged in the course of the conference discussions:

1. Students have few incentives to study.

Most educators believe that, as an ideal, all students should learn as much as their ability and effort will permit. Yet, most schools reward high achievement alone, apparently assuming that the lure of high grades and test scores will inspire effort in all. Because high ability students usually capture the best grades and test scores, the labor of less-talented students is seldom acknowledged and the grades they receive for it do not inspire effort. Hence, low-ability students and those who are disadvantaged - students who must work hardest - have the least incentive to do so. They find this relationship between high effort and low grades unacceptable, something to be evaded if possible. Some of them express

their displeasure by simple indifference, others by disruption and deception.

2. Many school policies discourage student effort.

Many well-intended education policies and practices have unwittingly worked against the goal of higher achievement. For example, to increase graduation rates, some schools have allowed students to design their own courses of study, offered credit for less-rigorous alternatives to core subjects, and awarded diplomas to students who merely stayed the course and accumulated credits. While such steps may have been taken to ease the task of learning and boost the educational progress of the nation's neediest students, they have also allowed students to evade difficult academic tasks, undercut the need to make the effort, and substituted the appearance of educational attainment for its reality.

3. Peer pressure may discourage effort and achievement.

Peer pressure profoundly influences the academic behavior of students. By the time students reach their teens, peer groups may actually define the stance most of them take toward academic achievement and effort. Typically, peer pressure motivates students to stay in school and graduate, but even as they frown on failure, peers also restrain high achievement. Wise educators seek to enlist peer influence in support of higher expectations and the pursuit of excellence. But, some student cultures actively reject academic aspirations. In this case, high grades can be a source of peer ridicule; and when effort is hostage to peer pressure, those high achievers who persist anyway may face strong social sanctions.

4. Good intentions often backfire.

Many teachers are at cross purposes about setting higher expectations for low-achieving students, especially those who are disadvantaged. Simply put, teachers seek to reconcile the added student effort that higher expectations require with their concern that disadvantaged and low-ability children may be excessively burdened. In their attempt to be fair and to protect their pupils' self-esteem, teachers often excuse disadvantaged children from the effort that learning requires. This practice obscures the connection between effort and accomplishment and shields children from the consequences. The practice also sets the stage for later failure.

The conference on Hard Work and High Expectations brought together prominent researchers who addressed the topic of student motivation from different social, cultural, and instructional perspectives. Summaries of the critical elements of their findings and conclusions are incorporated in this booklet; summaries of selected papers are included at the end. The latter are samplings of the thoughtful and insightful probe of student motivation offered by the papers prepared for the conference.

All of the papers will be published in their entirety by the National Society of the Study of Education. OERI wishes to thank all of the authors for their "hard work and high expectations" and thanks NSSE for recognizing the quality of their work.

ABILITY, EFFORT, AND ACADEMIC PERFORMANCE

The traditional mission of American schools was twofold: to offer a basic education to everyone who attends and to identify and encourage promising students. If ability established promise, as many teachers believed, then effort was the key to accomplishment; hard work was expected of all. When students combined inspiration and perspiration, they were usually rewarded with high grades. Nevertheless, even if less-talented children did not get and could not expect good grades, they were not excused from studying. Most teachers thought that literacy was within the grasp of almost everyone, and they expected their students to make the required effort. Then, as now, not every student complied.

As far as researchers can tell, most educators still subscribe to this traditional way of thinking and believe in the value of student effort. Yet, when achievement drops, parents and policymakers seldom blame the study habits of students. Rather, they blame the schools and, in particular, the teachers. Consequently, over the past 25 years, most educational reforms have assumed that achievement would rise if the quality of instruction, teachers, and textbooks were improved.

Left out of this assumption was the relationship that exists between academic achievement and the amount and quality of student effort. Still, the past decade has produced belated and indirect attempts to "force" greater effort by requiring minimum competency, reinstating an academic core, and raising graduation requirements. To date, these efforts have had a modest and mixed effect on achievement: somewhat better test scores in the basics for minority students but chronic stagnation for the rest, especially at the secondary level.

If these attempts at reform have not produced expected test results, neither have they yielded much greater student effort. For example, national assessments in 1979-80

and 1987-88 both found that about two-thirds of high school seniors read for less than 1 hour a day. And, while the percentage of seniors who did not read at all dropped from 44 percent to 34 percent, it remained that one-third of all high school seniors still do not open a book after school.

Moreover, American students consistently score worse and study less than students in other developed countries. Among 14 industrialized nations, for example, U.S. students rank 13th in mathematics scores. It is no coincidence that they also spend 70 percent less time studying than students in four of the five top-ranked countries. Japan, the leader, is at the top of the list on both counts.

American school children are neither stupid nor lazy. The public remains convinced that schooling is the foundation of society. Parents, rich and poor, still place great store in the value of education and want the best for their children. Why, then, are so many students satisfied if they merely pass and graduate?

After 25 years of trying to fix things, it is time to face a few facts of human nature: setting higher standards and expectations is one thing, persuading students to try harder is another. Students who study too little learn too little, and educational reforms that do not change the study habits of students are unlikely to improve achievement.

Some students' favorite explanations may be on target: boring courses and bad teachers can sap the dedication of any student. But complaints of this kind have been leveled at schools and teachers for generations, and true or false, they are seldom accepted by parents or educators as a legitimate reason for not studying. Rather, other features

of school life and society are contributing to the erosion of academic effort, and as we will see, many are the consequences of good intentions gone awry.

COMPETING VALUES

In...the best eastern boarding schools, the life of the mind mattered less than other goals. Many wealthy Americans sent their sons to prep school to form or reinforce personal traits, particularly self-control, sportsmanship, and leadership. [At] Harvard, Yale, or wherever, sports, clubs, parties, and friendships often overshadowed classes. By the early 20th century, the epithet..."greasy grind"...applied to any unusually conscientious college student.

Robert Hampel

At the OERI conference on student motivation, a high school senior from Alexandria, Virginia, described the competition for her time this way:

"I go to school at 7:30. I have cheerleading from the end of school until about 5:30. Then I go to work and don't get home until 9:00. What more do you want?"

Good question. What exactly do we expect of our schoolchildren? At best, the signals we send about the purpose of school are mixed, especially those about the purpose of academic achievement. Compared to other developed societies, achievement in U.S. schools often takes a backseat to the whirl of student social life and the demands of a part-time job (see box: *Effort: The Key to Japan's Academic Success*).

Most parents say they want their children to do well in school and get good grades. They also want their children to have friends and to participate in after-school activities. Teenagers are encouraged not only to learn academics but also to develop a social life, get a job, find romance, and pursue myriad other activities that compete with academics for their time and interest.

Indeed, in its quest for the well-rounded student, American society often steers the attention of students away from academic pursuits. Schools and parents encourage participation in nonacademic enterprises - sports, hobby clubs, politics, pep club, and community service, not to mention after-school jobs. For the college bound, selective colleges give preference to well-rounded applicants with outside interests and accomplishments as well as - and sometimes instead of - high grades and test scores.

And that is where the conflict arises. So long as we are ambivalent about the comparative importance of academic achievement, we shall continue to underwrite academic mediocrity. So long as students can allocate major fractions of their time as they wish, they will likely give their studies less than the share necessary to meet higher academic expectations.

Yet the conflict itself implies the solution: if students have wide discretion in their use of time, then they also have a great deal of time that could be used for learning if they chose. But parents, teachers, and policymakers have to make the first move. They have to send students an unmistakable message that academic achievement is the students' number-one priority, the most important thing in their young lives.

Effort: The Key to Japan's Academic Success

Lois Peak

Japanese and American families share a similar standard of living and economy, and their children share many similarities in style of life. For example, Japanese children listen to the same popular music groups and watch similar television programs. Why, then, do Japanese children perform so much better academically than American children?

Lois Peak says the answer lies in the Japanese view that any child can master the curriculum if he or she tries hard enough. "Effort," writes Peak, "is so consistently portrayed to children as the key to success that ability is rarely mentioned." Slogans urging children to persevere line classroom walls. Public recognition ceremonies reward outstanding effort rather than academic accomplishment. Ability grouping is virtually unheard of.

Japanese schools not only teach the value of effort but teach children to make an effort. Teachers use routine daily drills to instill perseverance, self-discipline, and concentration. In the earliest grades, this habit training emphasizes physical perseverance. Children are encouraged to push themselves beyond what they expect they can do. They eventually come to realize, Peak says, that with disciplined effort, they in fact are capable of doing more than they thought they could.

Perseverance is extended to academic subjects, and daily homework plays an important part in this habit training. Surveys show that even in elementary school, Japanese children typically spend at least twice as much time on homework as U.S. children do. "Homework not only reflects the strength of teachers' belief that extra practice makes a difference and students' willingness to exert extra effort on behalf of their studies," Peak writes, "it also reflects [the Japanese] emphasis on training in good study habits and self-disciplined effort toward a long-term goal."

In contrast to American society, which permits nonacademic activities such as sports, friends, and hobbies to intrude on school work, the Japanese are careful to maintain the school and family as the center of students' lives. Schools discourage the frequenting of shopping malls, coffee shops, and other places where students might congregate. In many communities, parents help by patrolling their neighborhood to keep a watch on their children's behavior.

Children must be 18 years old before they can get a driver's license, and although Japanese laws on child labor are more liberal than those in the United States, student employment is discouraged. Only 21 percent of Japanese high school students report holding a part-time job, compared with 63 percent in the United States. Instead of being viewed as a valuable tool in developing a sense of responsibility (as it is in the United States), part-time work in Japan is seen as a distraction from the primary job of education.

Adolescent experimentation with the pleasures and vices of adult life are discouraged. "It is only after the majority of students have finished their schooling that young people begin to date, drive, hang around in the city, drink, and come home late at night." Peak explains. "Students in high school remain sheltered and protected, and the society conspires to keep their minds focused on study."

There can be little doubt that Japanese cultural values are well suited to encouraging effort and academic achievement. In marked contrast, American culture treats academic learning as merely one of many desirable results of schooling, and studying is an option that students may exercise at their discretion. The question, Peak suggests, is whether "Americans care enough about improving our students' academic effort to campaign long and hard enough to change our cultural priorities. Are we willing to do this at the risk of de-emphasizing some of our other cultural values?"

DISINCENTIVES IN PUBLIC POLICIES

> What was required [to graduate from high school] was taking courses, earning "credits" by passing the course, and piling up the necessary number of credits to graduate. Getting enough credits...required the same stretch of time of all students...12 grades, 12 years...Persistence is the minimum standard.
>
> *Robert Hampel*

As our cultural values allow our children to spread their efforts over a variety of academic and nonacademic activities, so do many of our educational policies reward students who make only minimal effort at learning. Most of these policies are aimed at easing the obstacles to learning and graduation. Their net effect, however, is to lower teacher expectations and reduce student effort.

High school completion rates illustrate the point. Completing high school is a modern necessity, critical for entry into the workplace as well as a measure of our quest for equality. We have not shirked this responsibility. The high school completion rate for 25- to 29-year-olds has leapt from 61 percent in 1960 to 86 percent today. Eighty-two percent of blacks now finish 4 years of high school, compared with 39 percent in 1960. Despite concerns about dropouts and at-risk children, the present rate of high school completion, particularly for minority children, has been hailed as one of the singular educational accomplishments of the past 25 years.

But all is not as it seems; there is a downside to this story. Completion rates measure how many students pass through the system, not how much they learn along the way. In fact, as graduation rates have gone up, achievement scores have gone down, a relationship that casts doubt on the academic integrity of the increase. In fact, some observers believe that increased graduation rates have been achieved only by reducing the standards of competence required of all students.

Similarly, the need to demonstrate academic achievement as a prerequisite for entering college has given way to the belief that any high school student who wants to go to college should not be denied the opportunity. Getting into an academically elite college is still a powerful incentive to study hard for some high school students. But even those who do mediocre or shoddy work can almost always find a college that will accept them, despite their academic deficiencies.

This unwillingness to link educational incentives to achievement contrasts sharply with practices elsewhere in the world. Students in other developed countries know from the outset that their performance in school will affect their future. They know school makes a difference, and they have an early and continuing incentive to study. School also makes a difference in America, of course, a big difference. But we seem to have gone out of our way to reduce its significance in the eyes of our children.

COLLABORATION IN THE SCHOOL YARD

Even schools, themselves, deliver ambivalent messages about the value of serious study and academic achievement. School administrators and teachers contribute, often unwittingly, to the rationalizations students use to justify the limited effort they devote to learning. For

Parents, rich and poor, place great store in the value of education and want the best for their children

Supports and Compensations

John Thomas

Setting higher academic expectations for children to encourage greater effort and more learning has been one of the key strategies of the school reform movement. Too often, however, the purpose has been defeated by instructional compensations, usually well-intentioned, that subvert the higher demands.

For example, higher-order thinking is an earnestly sought intellectual capability. Signs that one possesses this skill include the ability to note relationships among ideas and extend concepts and principles to other contexts. An essay test rather than a test of memory and recall is required to assess the status of this skill. But the kind of integrative learning required to write a good essay is undermined if, on the day before the test, the teacher passes out a review sheet giving students the essay questions and model answers to go with them.

In other words, Thomas explains, when students are asked to do integrative thinking, they are compensated "by being given the answers to integrated questions in advance of the test." As a result, they are challenged to do little more than memorize the handout sheet.

Having examined the link between course demands and student study practices, Thomas finds this kind of compensation to be nearly universal at the high school level. Instead of giving students a list of content areas, an example of a test item, or general advice about how best to study for a test, teachers often provide students with a selection of items to be committed to memory, summaries of the main ideas or, sometimes, the exact questions and answers that will appear on the test. Some teachers also allow students to compensate for poor performance on tests by giving make-up exams, lowering the weight given to test scores in the final grade, or giving tests that are much easier than the course content.

The students themselves aid and abet this process in their own approach to learning. After surveying the evidence on study habits, Thomas concludes that students spend a minimum amount of time studying and doing schoolwork in school settings; their work is shallow, repetitive, and unproductive when they study alone; they show little of the higher-order thinking skills that most educators believe necessary for mature information processing and problem solving; and they appear uninterested in planning and executing self-management activities.

On the other hand, Thomas has found that certain kinds of supports can induce the kinds of study practices that lead to mastery of course content and the kinds of integrative learning and problem-solving skills necessary to succeed in college or the workplace. Setting clear goals and teaching students the techniques of studying are two important supports. Testing students on the material covered by homework and classwork is also important. Rather than supplying review sheets, teachers can test students' understanding of the subject by asking them direct questions or by giving them time to ask questions.

Thomas, like other researchers, finds feedback to be a critical support. The more individual students receive written comments from their teachers, the more inclined they are to develop study aids, such as note-taking, Thomas said. The more thorough the feedback on quizzes and homework, the more likely they are to manage their study time effectively and to take the initiative for their own learning.

Thomas cautions, however, that it will not be easy to rid the nation's classrooms of compensatory practices. "These practices may ensure that students succeed in a course to some degree," he said. "Removing these compensations carries with it a great risk of student failure and, by extension, teacher failure. . . We cannot expect teachers to act in ways that will increase the risk of student failure (increasing homework, raising standards, dropping compensations) unless and until we are able to demonstrate to them that other provisions (feedback, articulated practice material, study-skills training) will offset the risk they anticipate."

Avoid practices that undercut student initiative - offers of help where none has been requested, for example, or help that offers a solution rather than a method to figure out the answer

example, when high schools and colleges give athletes a privileged status and exempt them from meeting academic standards, they mock both the need for effort and the integrity of education. They also assure that many athletes will be needlessly unprepared for college.

But the privileged status of athletes is not the only problem. Research tells us that one of the biggest disincentives to academic effort can be school-wide peer pressure. For many children, school's chief virtue is the opportunity it presents to make and be with friends. By the time most children reach adolescence, their need to belong to a crowd with similar interests and values is paramount. Moreover, fear of being cut off from the crowd is a powerful incentive to conform to its views, including those regarding academic achievement.

While teens report general agreement among their peers about the desirability of getting good grades and finishing school, few among them value academic excellence for its own sake. In fact, those who excel may forfeit their claim to popularity. Consequently, students with high academic aptitude may hide their interest and consciously restrain their achievement in order to secure social standing.

Another thing to consider is the phenomenon of peer crowds. Research shows that student crowds may take harsh measures to set limits on academic achievement. For example, when underachievement is the norm, dedicated students may be ridiculed as nerds, brainiacs, and teacher's pets. Academically inclined minority students may be accused of "selling out" and of rejecting their peers if they are hardworking and high-achieving.

In other groups, academics are important but secondary to other

activities and interests. Often, members of these crowds must be careful that academic efforts and accomplishments do not distract from activities that are more central to their status in the crowd. Still other groups - such as "druggies" and "toughs" - may spurn school altogether and illustrate their indifference by refusing to study or attend class.

Any attempt to inspire greater academic effort in students will face and must overcome these powerful barriers. Greater awareness of the dynamics of peer groups can help explain why a student might cringe at a teacher's public praise for a job well done, for example, or why some groups of students might work better together than others. Once understood, however, peer motives and pressure can, in fact, be used to advantage in the planning and design of alternative educational experiences.

CLASSROOM PRACTICES

> What is being suggested here is that motivation not be seen as something existing solely in the student that he or she brings to the classroom and academic tasks; but rather as an outcome of meaningful participation in the classroom and the social practices that accomplish its everyday practical activities.
>
> *Sharon Nelson-Le Gall*

Disincentives to effort and learning are also found within the classroom (see box: Supports and Compensations). Teachers may not insist that students work to their full potential for a variety of reasons, including protecting them from failure. They may offer challenging work but undercut their own expectations by offering students an easy way out. For example,

Attribution Theory: A Key to Understanding

Sandra Graham and Bernard Weiner

Sandra Graham and Bernard Weiner, researchers at the University of California, Los Angeles, are interested in how children account for their achievement in school. They find that most children explain their successes and failures with four possible causes: ability (both aptitude and acquired); effort (how much); difficulty (how hard); and help (or hindrance) from others. Ability and effort are by far the most common causes mentioned by both teachers and children, and both constantly wonder whether failure should be attributed to too little effort or too little ability. Determining the correct cause may decide the child's educational prospects.

Students receive external cues about their own ability, many of them - unknowingly and unintentionally - from teachers.

For example, research has shown that teachers tend to sympathize with students whose failure they attribute to lack of ability, while they get angry with students who fail for lack of effort. Students read the implicit message in these emotional cues the same way: pity is an ascription of low ability, anger one of low effort.

Other common teacher behaviors send similar signals. "A student who receives a lot of praise from [the] teacher for an easy success is perceived as high in effort (and therefore low in ability), when compared to another student who achieves the same outcome and is not praised," Graham and Weiner write. Likewise, students who receive unsolicited help from the teacher are also perceived to be low in ability.

To understand the consequences of these subtle and indirect cues about ability and effort, we must first understand how we tend to think about ability and effort. Most people believe ability to be a personal characteristic that is relatively fixed and beyond the individual's personal control. "This means that failure due to low aptitude is perceived as a characteristic of the failing individual, enduring over time, and beyond one's personal control," the authors say. Effort, on the other hand, is seen as a something that can vary from one situation to the next and that the individual can control.

Various emotions are associated with these perceptions. Children feel pride in themselves if they think the source of their success is a personal attribute such as ability or effort. For example, a pupil who believes he or she has failed because of low ability is likely to feel humiliation and hopelessness, emotions associated with beliefs that personal failures are due to uncontrollable causes. On the other hand, a student who believes he or she has failed because of low effort, may feel guilty about not having tried harder but optimistic about doing better in the future.

How does all this affect student motivation? Graham and Weiner describe how two students who both fail the same math test might respond in very different ways. Jane, who has always done well in the past, attributes her failure to inadequate preparation and feels guilty. The anger and criticism expressed by her teacher and parents reinforce her perception that lack of effort, not inability, was the cause of her failure. Optimistic that she will do better on the next exam if she tries harder, Jane is motivated to find a math tutor and spend more time studying.

Susan, on the other hand, has done poorly on previous math tests and attributes this latest failure to low ability, a perception that is reinforced by the teacher's sympathy and lack of criticism. Believing that she is unable to do anything to improve her performance, Susan decides to drop out of school.

Graham and Weiner believe that this attribution theory is the key to "best understand racially linked deficits" in academic performance. "Far too many black children perform poorly in school not because they lack basic intellectual capacities or specific learning skills, but because they have low expectations, feel helpless, blame others, or give up in the face of failure." They postulate that the history of academic failure among blacks may make them more likely targets of sympathetic feedback from teachers and, thus, the inadvertent recipients of low-ability cues. Furthermore, they observe that teacher behaviors that communicate low ability - such as unsolicited help and excessive praise for easy success - may be subtly incorporated into many instructional programs designed for educating disadvantaged minority children. Such programs entail simple questions, help for students who appear to need it, and little criticism from the teacher.

"We are not so naive as to think that our attributional approach has all (or even most) of the solutions to the motivational problems of African-American children," they conclude. "What it does offer us, however, is a framework to begin to ask some of the right questions."

teachers who provide students with summaries of the main ideas of a course take away the lesson in self-directed study and personal responsibility that comes from puzzling out the ideas for themselves. Giving multiple-choice tests instead of essay questions places a premium on recall and frees students from the need to make connections between principles or to apply them in new situations. Giving students the questions - sometimes even the answers - that will appear on the next test means that they have no excuse for failing the test, but it also means that they have no incentive for mastering the material.

These situations are not rare. Educational researchers note an increase in teacher-student "bargains," those usually tacit but sometimes explicit agreements in which teachers lower their standards in exchange for classroom co-operation. Some teachers engage in these agreements not only to maintain order but also because society holds them responsible for fulfilling its education goals. High graduation rates are seen as an indication of success, and bargains embodying lower standards let teachers and students off the hook without wholly abandoning the appearance of serious work.

Even so, when students do poorly in school, most teachers seek an explanation. Too little ability or too little effort? That is the question teachers customarily ask. How they answer may determine the child's future. Many teachers will excuse low-ability children from trying hard, some because they think it hopeless and some because they think it unfair. Paradoxically, teachers who try to protect less-able children from failure by asking less effort from them may only ensure that the children will not acquire needed academic skills.

In the long run, such tender mercies may actually harm, rather than enhance, self-esteem.

These practices begin early in the child's educational life. At the elementary level, teachers communicate their different expectations for high- and low-achieving children in ways that are sometimes subtle and often contrary to common sense. For example, research has shown that children "read" sympathy offered to them when they fail, praise proffered for very modest accomplishments, and help tendered when it is unsolicited as signs that they lack ability. These and other distinctions are clearly drawn very early in their schooling, and children become sharply aware of cues that identify the ability levels of themselves and their classmates (see box: *Attribution Theory: A Key to Understanding*).

> Far too many black children perform poorly in school not because they lack basic intellectual capacities or specific learning skills, but because they have low expectations, feel helpless, blame others, or give up in the face of failure.
>
> *Sandra Graham*
> *and Bernard Weiner*

A variety of commonplace classroom events can convey information to children about the ability of their classmates. Even in first grade, children believe that teachers are likely to watch low achievers more closely, scolding those they believe could do better. Yet those same teachers are believed to expect less from low achievers, giving them less-challenging assignments and fewer opportunities to lead classroom activities. Children also note that high-achieving students seem to enjoy a better life in the classroom. They get to do

Teachers can assist students with their studying by stressing proficiency in such areas as note-taking, writing summaries, self-testing, creating study plans, and time management

things independently; they work on more difficult and prestigious material; and they get called on more often. From these experiences, children make inferences about their own ability, and those who conclude they are not smart enough to please the teachers or master the material will often cease trying very hard to learn.

That is the crux of failure. The overriding task is to create conditions in which low-ability and low-achieving children do not give up but will keep on trying.

For youngsters who learn slowly and with difficulty, there is a fine line between failure and progress. For example, elementary school children are unsophisticated learners, and the slowest among them have more than their share of trouble developing reliable and effective study habits. Accordingly, they are often subjected to rigidly programmed instructional routines which are designed to avoid the need for self-regulated study. However, because the method may reinforce obedience and dependence rather than self-regulation and autonomy, students may fail to develop their own study capabilities and may become unable to learn effectively when they are on their own.

Not that educators are unaware of the distinction. Teachers have long noted that classrooms filled with children who regulate their own behavior are likely to be more productive than those whose children must be coerced into cooperation. Yet goals such as these have been elusive, especially in schools that serve a disadvantaged clientele and which rely heavily on imposed control to maintain orderly classrooms.

"Preventive classroom management" offers teachers an alternative to traditional - but ever less effective - authority as the principal method to win the attention and cooperation of students. Indeed, modern management strategies are being developed that engage students as a cooperative social group in which they learn to regulate their own behavior without the imposition of external authority. The eventual goal is students who are responsible for much of their own leaning and the selection of many of their academic tasks.

The key to the management strategy, and to a similar parenting strategy, is captured in the phrase "authoritative teaching." In contrast to "authoritarian" methods which are essentially non-negotiable demands for obedience, authoritative teaching (and parenting) offers a plan of continuous negotiation of control and responsibility which is contingent on the demonstrated self-control and adaptive capabilities of the maturing child. When combined with appropriate strategies of parenting, schools can offer students a consistent set of experiences designed to develop internal control and self-regulation.

WHERE DO WE GO FROM HERE?

Plainly, the obstacles to learning far exceed the limits imposed by student ability and background. Understanding the many reasons why students avoid hard work is important, but understanding alone will do little to alter the situation. Other steps must be taken:

- We must make learning the highest priority in our children's lives; they have no future without it.
- We, as a nation, must act to focus the attention of students on the educational substance we agree is critical to the nation's future as well as their own.

- We must define the skills we expect and believe all our children should develop and all our schools must teach.
- We must act on the knowledge that the connection between learning and academic effort is powerful.

The task is daunting, but help is available. At the federal level, world-class standards of academic performance in mathematics and science are being developed in company with skill standards necessary to meet and surpass the workforce requirements of the coming decades. Education researchers across the country are generating new information about why children do not work hard or effectively and what can be done to help. Our teachers are developing classroom strategies that can reinvigorate academic motivation and effort. They and other educators have suggested strategies that can help children make the effort required to learn. Among them:

- Establish a schooling format that offers a better balance between the rewards for effort and for ability. Set goals for each child that can be achieved with high effort, and reward their attainment. Schools can engage children who are less talented and motivated by devising alternate incentives that reward study and personal accomplishment as well as high scores and class standing. Effort and ability are, after all, the child's tools for learning. Both must be encouraged simultaneously.
- Enhance the status of "doing one's best." Rewarding only high academic achievement can turn learning into another competition with rewards available only to a few. Public recogni-

tion of individual excellence, regardless of its rank, is one way to motivate more students, but also perhaps the most overlooked. Schools should look for ways to recognize outstanding performances in areas outside the core curriculum but consistent with goals of schooling.

- Eliminate obstacles to innovative classroom practices, most notably school policies that are inconsistent with self-regulated student behavior. For example, classrooms that emphasize cooperative learning - a routine consistent with pupil self-regulation - employ an instructional strategy that is inconsistent with those that emphasize competitive personal achievement. Avoid practices that undercut student initiative - offers of help where none has been requested, for example, or help that offers a solution rather than a method to figure out the answer. Instigate opportunities for students to seek and provide help to one another in developing an effective exchange of ideas, learning strategies, interests, and goals.

- Send the right signals about the comparative importance of academic and nonacademic achievement. Schools should insist, for example, that athletes meet the same standards as other students. This can help brighten the image of effort-based learning as well as improve the athletes' preparation for college. It can also reduce student cynicism about the integrity of academics and help convince even varsity players that learning is the most important activity they can embrace.

- Adopt incentive systems that encourage students to strive toward a standard of knowledge instead of competing against

each other. Instructional practices that associate success with effort encourage initiative and persistence as well as a growing sense of personal competence.

- Teach children how to learn. There is more to effort than spending time working on a task. The quality of effort is even more important than the quantity. Students seldom learn by themselves how to study effectively, but little classroom time is spent helping them develop that skill. Teachers can assist students with their studying by stressing proficiency in such areas as note-taking, writing summaries, self-testing, creating study plans, and time management.

- Provide supports matched to course demands. The returns to student effort will be increased if teachers do the following simple things:

  - Explain clearly to students what is expected of them, how much work it will require, and how they will be graded.

  - Guide students in how to carry out homework and study for tests.

  - Give extensive practice on instructional objectives.

  - Give extensive feedback on quizzes, homework, and tests.

  - Give significant credit for successfully completing homework.

As with most academic tasks, high-ability students have the edge in picking up these "tools of the trade." But efficient and time-saving methods are especially important for slower learners who are less likely to pick them up from experience and who will not pick them up at all if they abandon learning early on.

Even among students bound for

college, a third or more graduate from high school unprepared to engage in effective academic work. They spend much of their first year in remedial courses and in learning how to study on their own. Some may lack even the most elementary skills. For example, American students are seldom taught to take notes. In contrast, Japanese students are introduced to note-taking in the first grade, and by the fifth or sixth grade, they are keeping notebooks filled with the results of their daily classwork and home studies.

All of this, of course, is easier said than done. Teachers need exposure to good training; they cannot be expected to solve problems of student motivation by themselves. Many of the school and classroom practices and behaviors that undermine academic achievement result from conflicting messages embedded in our cultural values. We must abandon our ambivalence about educational achievement and academic ability. Lowering standards will not solve the problem. To meet higher standards, we must require and reinforce effort that only the students themselves can provide. The best reforms and the best intentions will not carry the day unless they tap the effort as well as the ability of our children.

Helping Your Child Learn Math

Patsy F. Kanter

Most parents will agree that it is a wonderful experience to cuddle up with their child and a good book. Few people will say that about flash cards or pages of math problems. For that reason, we have prepared this booklet to offer some math activities that are meaningful as well as fun. You might want to try doing some of them to help your child explore relationships, solve problems, and see math in a positive light. These activities use materials that are easy to find. They have been planned so you and your child might see that math is not just work we do at school but, rather, a part of life.

It is important for home and school to join hands. By fostering a positive attitude about math at home, we can help our children learn math at school.

It's Everywhere! It's Everywhere!

Math is everywhere and yet, we may not recognize it because it doesn't look like the math we did in school. Math in the world around us sometimes seems invisible. But math is present in our world all the time - in the workplace, in our homes, and in life in general.

You may be asking yourself, "How is math everywhere in my life? I'm not an engineer or an accountant or a computer expert! Math is in your life from the time you wake until the time you go to sleep. You are using math each time you set your alarm, buy groceries, mix a baby's formula, keep score or time at an athletic event, wallpaper a room, decide what type of tennis shoe to buy, or wrap a present. Have you ever asked yourself, "Did I get the correct change?" or "Do I have enough gasoline to drive 20 miles?" or "Do I have enough juice to fill all my children's thermoses for lunch?" or "Do I have enough bread for the week?" Math is all this and much, much more.

How Do You Feel About Math?

How do you feel about math? Your feelings will have an impact on how your children think about math and themselves as mathematicians. Take a few minutes to answer these questions:

- Did you like math in school?
- Do you think anyone can learn math?
- Do you think of math as useful in everyday life?
- Do you believe that most jobs today require math skills?

If you answer "yes" to most of these questions, then you are probably encouraging your child to think mathematically. This book contains some ideas that will help reinforce these positive attitudes about math.

You Can Do It!

If you feel uncomfortable about math, here are some ideas to think about.

Math is a very important skill, one which we will all need for the future in our technological world. It is important for you to encourage your children to think of them-

selves as mathematicians who can reason and solve problems.

Math is a subject for all people. Math is not a subject that men can do better than women. Males and females have equally strong potential in math.

People in the fine arts also need math. They need math not only to survive in the world, but each of their areas of specialty requires an in-depth understanding of some math, from something as obvious as the size of a canvas, to the beats in music, to the number of seats in an audience, to computer-generated artwork.

Calculators and computers require us to be equally strong in math. Their presence does not mean there is less need for know-

> **Because our world is so technologically oriented, employees need to have quick reasoning and problem-solving skills and the capability to solve problems together.**

ing math. Calculators demand that people have strong mental math skills - that they can do math in their heads. A calculator is only as accurate as the person putting in the numbers. It can compute: it cannot think! Therefore, we must be the thinkers. We must know what answers are reasonable and what answers are outrageously large or small.

The workplace is rapidly changing. No longer do people need only the computational skills they once needed in the 1940s. Now workers need to be able to estimate, to communicate mathematically, and to reason within a mathematical context. Because our world is so technologically oriented, employees need to have quick reasoning and problem-solving skills and the capability to solve problems together. The work force will need to be confident in math.

Build Your Self-Confidence!

To be mathematically confident means to realize the importance of mathematics and feel capable of learning to

- Use mathematics with ease;
- Solve problems and work with others to do so;
- Demonstrate strong reasoning ability;
- See more than one way to approach a problem;
- Apply mathematical ideas to other situations; and
- Use technology.

THE BASICS

You may have noticed that we are talking about "mathematics" - the subject that incorporates numbers, shapes, patterns, estimation, and measurement, and the concepts that relate to them. You probably remember studying "arithmetic" -

adding, subtracting, multiplying, and dividing - when you were in elementary school. Now, children are starting right away to learn about the broad ideas associated with math, including problem solving, communicating mathematically, and reasoning.

Kindergartners are building bar graphs of birthday cakes to show which month has the most birthdays for the most children in the class. Second graders are using pizzas to learn fractions, and measurements are being taken using items other than rulers (for example, the illustrator of this book used his thumb to determine how large the pictures of the pizzas should be in proportion to the size of the words on the activities pages).

What Does It Mean To

- Be a Problem Solver
- Communicate Mathematically, and
- Demonstrate Reasoning Ability?

A problem solver is someone who questions, investigates, and explores solutions to problems; demonstrates the ability to stick with a problem for days if necessary, to find a workable solution; uses different strategies to arrive at an answer; considers many different answers as possibilities; and applies math to everyday situations and uses it successfully.

To communicate mathematically means to use words or mathematical symbols to explain real life; to talk about how you arrived at an answer; to listen to others' ways of thinking and perhaps alter their thinking; to use pictures to explain something; to write about math, not just give an answer.

To demonstrate reasoning ability is to justify and explain one's thinking about math; to think logi-

cally and be able to explain similarities and differences about things and make choices based on those differences; and to think about relationships between things and talk about them.

How Do I Use This Book?

This book is divided into introductory material that explains the basic principles behind the current approach to math, sections on activities you can do with your children, and lists of resources. The activities take place in three locations: the home, the grocery store, and in transit.

The activities are arranged at increasingly harder levels of difficulty. Look for the circles O, squares □, and triangles △ that indicate the level of difficulty. The circle means that a child in kindergarten through 1st grade could probably play the game, the square is for those in grades 2 and 3, and the triangle signals an activity for a child in grades 4 through 8.

The activities you choose and the level of difficulty really depend on your child's ability; if your child seems ready, you might want to go straight to the most difficult ones.

The shaded box on an activity page contains the answer or a simple explanation of the mathematical concept behind the activity so that you can explain when your child asks, "Why are we doing this?"

With these few signs to follow along the way, your math journey begins.

IMPORTANT THINGS TO KNOW

It is highly likely that when you studied math, you were expected to complete lots of problems accurately and quickly. There was only one way to arrive at your answers,

and it was believed that the best way to improve math ability was to do more problems and to do them fast. Today, the focus is less on the quantity of memorized problems, and more on understanding the concepts and applying thinking skills to arrive at an answer.

Wrong Answers Can Help!

While accuracy is always important, a wrong answer may help you and your child discover what your child may not understand. You might find some of these thoughts helpful when thinking about wrong answers.

Above all be patient. All children want to succeed. They don't want red marks or incorrect answers. They want to be proud and to make you and the teacher proud. So, the wrong answer tells you to look further, to ask questions, and to see what the wrong answer is saying about the child's understanding.

Sometimes, the wrong answer to a problem might be because the child thinks the problem is asking another question. For example, when children see the problem $4 + \underline{} = 9$, they often respond with an answer of 13. That is because they think the problem is asking "What is $4 + 9$?", instead of "4 plus what missing amount equals 9?"

Ask your child to explain how the problem was solved. The response might help you discover if your child needs help with the procedures, the number facts, or the concepts involved.

You may have learned something the teacher might find helpful. A short note or call will alert the teacher to possible ways of helping your child.

Help your children be risk takers: help them see the value of examining a wrong answer; assure them that the right answers will

come with proper understanding.

Problems Can Be Solved Different Ways

Through the years, we have learned that while problems in math may have only one solution, there may be many ways to get the right answer. When working on math problems with your child, ask, "Could you tell me how you got that answer?" Your child's way might be different than yours. If the answer is correct and the strategy or way of solving it has worked, it is a great alternative. By encouraging children to talk about what they are thinking, we help them to become stronger mathematicians and independent thinkers.

Doing Math in Your Head is Important

Have you ever noticed that today very few people take their pencil and paper out to solve problems in the grocery, fast food, or department store or in the office? Instead, most people estimate in their heads.

Calculators and computers demand that people put in the correct information and that they know if the answers are reasonable. Usually people look at the answer to determine if it makes sense, applying the math in their heads to the problem. This, then, is the reason why doing math in their heads is so important to our children as they enter the 21st century.

You can help your child become a stronger mathematician by trying some of these ideas to foster mental math skills:

1. Help children do mental math with lots of small numbers in their heads until they develop quick and accurate responses. Questions such as, "If I have 4 cups, and I need 7

How many more do I need?" or "If I need 12 drinks for the class, how many packages of 3 drinks will I need to buy?"

2. Encourage your child to estimate the answer. When estimating, try to use numbers to make it easy to solve problems quickly in your head to determine a reasonable answer. For example, when figuring 18 plus 29, an easy way to get a "close" answer is to think about 20 + 30, or 50.

3. As explained earlier, allow your children to use strategies that make sense to them.

4. Ask often, "Is your answer reasonable?" Is it reasonable that I added 17 and 35 and got 367? Why? Why not?

What Jobs Require Math?

All jobs need math in one way or another. From the simplest thought of how long it will take to get to work to determining how much weight a bridge can hold, all jobs require math.

If you took a survey, you would find that everyone uses math: the school teacher, the fast food worker, the doctor, the gas station attendant, the lawyer, the housewife, the painter.

MATH IN THE HOME

This section provides the opportunity to use games and activities at home to explore math with your child. The activities are intended to be fun and inviting, using household items. Please note that the activities for K - 1st grade are marked with a circle, the activities for grades 2 and 3 with a square, and activities for grades 4 through 8 with a triangle.

Remember,

•   This is an opportunity for you

and your child to "talk math," that is to communicate about math while investigating relationships.

•   If something is too difficult, choose an easier activity or skip it until your child is older.

•   Have fun!

SAMPLE ACTIVITIES

More or Less (O)

Playing Cards is a fun way for children to use numbers.

What you'll need
Coin, 2 decks of cards, Scratch paper to keep score

What to do
1. Flip a coin to tell if the winner of this game will be the person with "more" (a greater value card) or "less" (a smaller value card).
2. Remove all face cards (jacks, queens, and kings) and divide the remaining cards in the stack between the two players.
3. Place the cards face down. Each player turns over one card and compares: Is mine more or less? How many more? How many less?

This game for young children encourages number sense and helps them learn about the relationships of numbers (more or less than) and about adding and subtracting. By counting the shapes on the cards and looking at the printed numbers on the card, they can learn to relate the number of objects to the numeral.

Problem Solvers (□)

These games involve problem solving, computation, understanding number values, and chance.

What you'll need

Deck of cards, Paper, Pencil

What to do
1. Super sums. Each player should write the numbers 1-12 on a piece of paper. The object of the game is to be the first one to cross off all the numbers on this list.

Use only the cards 1-6 in every suit (hearts, clubs, spades, diamonds). Each player picks two cards and adds up the numbers on them. The players can choose to mark off the numbers on the list by using the total value or crossing off two or three numbers that make that value. For example, if the player picks a 5 and a 6, the player can choose to cross out 11, or 5 and 6, or 7 and 4, or 8 and 3 or, 9 and 2, or 10 and 1 or 1,2, and 8.

2. Make 100. Take out all the cards from the deck except ace through 6. Each player draws 8 cards from the deck. Each player decides whether to use a card in the tens place or the ones place so that the numbers total as close to 100 as possible without going over. For example, if a player draws two 1s (aces), a 2, a 5, two 3s a 4, and a 6, he can choose to use the numerals in the following way:

30, 40, 10, 5, 6, 1, 3, 2.

This adds up to 97.

These games help children develop different ways to see and work with numbers by using them in different combinations to achieve a goal.

Card Smarts (Δ)

Have your children sharpen their math skills even more.

What you'll need
Deck of cards, Paper, Pencil

What to do

1. How many numbers can we make? Give each player a piece of paper and a pencil. Using the cards from 1 (ace)- 9, deal 4 cards out with the numbers showing. Using all four cards and a choice of any combination of addition, subtraction, multiplication, and division, have each player see how many different answers a person can get in 5 minutes. Players get one point for each answer. For example, suppose the cards drawn are 4, 8, 9, and 2. What numbers can be made?

$$4+9+8+2=23$$
$$4+9-(8+2)=3$$
$$(8-4)\times(9-2)=28$$
$$(9-8)\times(4-2)=2$$

2. Make the most of it. This game is played with cards from 1 (ace) to 9. Each player alternates drawing one card at a time, trying to create the largest 5 digit number possible. As the cards are drawn, each player puts the cards down in their "place" (ten thousands, thousands, hundreds, tens, ones) with the numbers showing. One round goes until each player has 6 cards. At that point, each player chooses one card to throw out to make the largest 5-digit number possible.

3. Fraction Fun. This game is played with cards 1 (ace) - 10, and 2 players. Each player receives one-half of the cards. Players turn over 2 cards each at the same time. Each player tries to make the largest fraction by putting the 2 cards together. The players compare their fractions to see whose is larger. For example, if you are given a 3 and a 5, the fraction 3/5 would be made; if the other person is given a 2 and an 8, the fraction is 2/8. Which is larger? The larger fraction takes all cards and play continues until one player has all the cards.

> Players can develop strategies for using their cards, and this is where the math skills come in.

Make the most of it!

MATH ON THE GO

In this busy world, we spend a lot of time in transit. These are some projects to try while you are going from place to place.

While you're moving, have your children keep their eyes open for:

- street and building numbers;
- phone numbers on the sides of taxis and trucks;
- dates on buildings and monuments; and
- business names that have numbers in them.

Total It (O □ Δ)

This is a good game for practicing quick mental computation.

What you'll need
License plates

What to do

1. (O) Call out the numbers on the license plate.
2. (□) See who can add the numbers up correctly. What strategies were used? (Were the numbers added by 10's like 2 + 8: were doubles like 6+6 used?)
3. (Δ) Try different problems using the numbers in a license plate.

For example, if you use the plate number 663M218, as "Using the numbers on the plate, can you:

make a 1 using two numbers?
  Yes, 3-2=1
make a 1 using three numbers?
  Yes, 6-(3+2)=1
make 1 using four numbers?

make a 1 using five numbers?
  Yes, 3-[(6+6)-8-2]=1
make a 1 using six numbers?
  Yes, 8x2-(6+6)-3=1
make a 2 using 1 number?
  Yes, the 2.

> The problem solving and computation going on in your child's head is very important. It helps your child be creative with numbers.

PARENTS AND THE SCHOOLS

Here are a few ideas that might help you support a positive math environment in your child's school:

1. Visit the school and see if the children:

- Are actively engaged in math;
- Are talking about mathematics;
- Are working together to solve math problems;
- Have their math work on display;
- Use manipulatives (objects that children can touch and move) in the classroom.

2. Explore the math program with your child's teacher, curriculum coordinator, or principal. Here are some questions you might ask:

- Are there manipulatives in the classroom?
- What can I do to help foster a strong math program where children can explore math concepts before giving the right answer?

3. If you would like to help out, here are some suggestions for parent groups:

- Make games for teachers;

- Help seek out sponsors who believe in a strong math program for the school and who might provide materials and resources;
- Support math classes for families at your school.

4. Keep a positive attitude even if you don't like what you see. Work to improve the math curriculum by doing some of the things mentioned throughout this book.

5. Share this book with your child's teacher.

WHAT SHOULD I EXPECT FROM A MATH PROGRAM?

The National Council of Teachers of Mathematics (NCTM) has recently endorsed standards by which math should be taught in the elementary and middle grade years. The powerful nature of these standards is that they not only have the endorsement of the academic community, but they are also heavily endorsed by corporations. These endorsements, together with the technological advances of our society and the lack of math confidence in our work force, have combined to produce tremendous support for the standards.

These standards make some assumptions about the way math should be taught and what parents might see when visiting the classroom. Here are some examples:

1. Children will be engaged in discovering mathematics, not just doing many problems in a book.

2. Children will have the opportunity to explore, investigate, estimate, question, predict, and test their ideas about math.

3. Children will explore and develop understanding for math concepts using materials they can touch

and feel, either natural or manufactured.

4. The teacher will guide the students' learning, not dictate how it must be done.

5. Children will have many opportunities to look at math in terms of daily life and to see the connections among math topics such as between geometry and numbers.

6. Children will be actively involved in using technology (calculators and computers) to solve math problems.

The complete list of standards is available from NCTM, 1906 Association Drive, Reston, Virginia 22091-1593 (1-800-235-7566).

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Are "Prelim" Examinations Too Easy?

Tan Wee Kiat

Whether we like it or not, examination results tend to be used as yardsticks for measuring academic performance. In the run-up to the national examinations (PSLE, 'O'-levels and 'A'-levels) all schools hold their own "Prelim" (preliminary) examinations. While schools will wish to gear their preliminary examinations to the standard of the national examinations, how can they find out whether this matching was achieved? A simple graphical method for doing this is described here. This graphical method is not at all new but it is worth re-considering whenever a school principal and his teachers want to know whether their preliminary examinations in the various subjects have been overly easy or, as the case may be, overly difficult. Such comparisons may be useful for fine-tuning the level of the next round of the preliminary examinations.

For illustration, let us take a particular national examination such as the Primary School Leaving Examination (PSLE). The possible grades for a single subject range from A* to U, i.e., the grades fall into seven categories as follows:

Grade	Mark Range
A*	91 - 100
A	75 - 90
B	60 - 74
C	50 - 59
D	35 - 49
E	20 - 34
U	below 20.

As there are seven categories draw a seven-by-seven graph (see Graph 1). The bottom row of horizontal squares is numbered from seven to one (from low grades to high grades). The horizontal rows of squares will be used for the preliminary examination grades. In a similar manner, the vertical squares are numbered from seven to one. The vertical squares will be used for the final examination (PSLE) grades.

With this seven-by-seven graph ready, the actual data can then be entered. Since each pupil has a pair of scores (his "Prelim" examination grade and his PSLE examination grade) his position on the graph, as represented by a small line "/ ", is fixed in a particular square. When all the results of a group of pupils are entered into the graph the pattern, known as a scattergram, may look like that in Graph 2. The eight lines in the square (3,4) indicate that there are eight pupils who have that set of scores in the "Prelim" and PSLE examinations (i.e. a Grade 3 for the "Prelim" and a Grade 4 for the PSLE).

An inspection of the general pattern of the scattergram will indicate whether the "Prelim" examination has been too easy or too difficult or whether it closely matches that of the national examination. If there is a close match then the grades obtained by the pupils in both examinations will be mostly the same grade. In this case, most of the lines " / " will fall along the main diagonal (i.e., at a 45-degree angle to the horizontal base) as shown in Graph 3.

If the "Prelim" examination has been easier than the PSLE examination then the PSLE scores will be generally lower than that obtained for the "Prelim" examina-

tions. In this case, most of the lines "/" will be below the main diagonal as shown in the following graph (Graph 4).

On the other hand, if the "Prelim" examination has been more difficult than the PSLE examination then the scores obtained at the national examinations will be generally higher than that obtained in the "Prelim" examination. In this case, most of the lines "/" will be above the main diagonal.

What happens when there is no matching relationship between "Prelim" examination of a school and the PSLE examination? In this case, the small lines will be scattered above and below the main diagonal and the scattergram will not show any clear pattern. Thus, the scattergram shown in Graph 2 indicates that there is no strong relationship between the two examinations for that particular subject.

This simple graphical method can be used whenever there is a need to examine the relationship between two factors (e.g., preliminary examinations and national examinations; English Language and Mother Tongue Language; Mathematics and Science; height and weight, etc.)
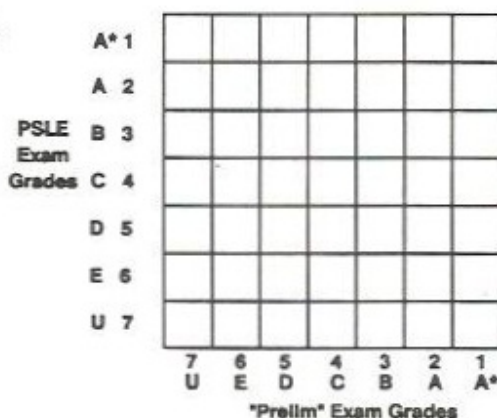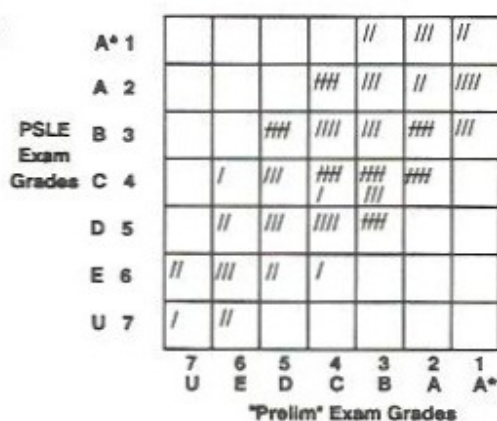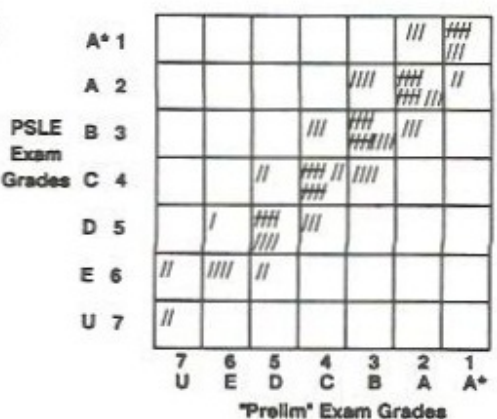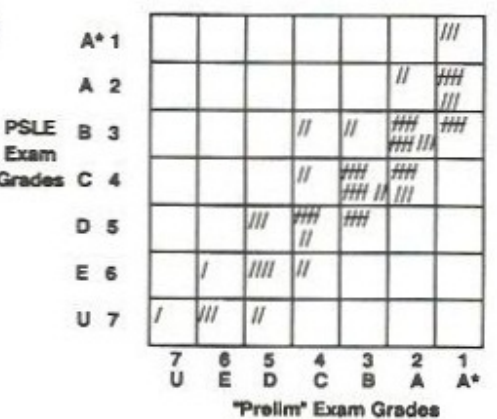
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GRAPH 1

PSLE Exam Grades (vertical axis): A* 1, A 2, B 3, C 4, D 5, E 6, U 7

"Prelim" Exam Grades (horizontal axis): 7 U, 6 E, 5 D, 4 C, 3 B, 2 A, 1 A*

GRAPH 2

PSLE Exam Grades (vertical axis): A* 1, A 2, B 3, C 4, D 5, E 6, U 7

"Prelim" Exam Grades (horizontal axis): 7 U, 6 E, 5 D, 4 C, 3 B, 2 A, 1 A*

GRAPH 3

PSLE Exam Grades (vertical axis): A* 1, A 2, B 3, C 4, D 5, E 6, U 7

"Prelim" Exam Grades (horizontal axis): 7 U, 6 E, 5 D, 4 C, 3 B, 2 A, 1 A*

GRAPH 4

PSLE Exam Grades (vertical axis): A* 1, A 2, B 3, C 4, D 5, E 6, U 7

"Prelim" Exam Grades (horizontal axis): 7 U, 6 E, 5 D, 4 C, 3 B, 2 A, 1 A*