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ABSTRACT

With respect to the high school student, there has been: (1) a decline over the past 10-15 years in high school student averages in aptitude for learning, in achievement from learning, and in motivation for further learning; (2) an increase in the need for remedial mathematics and reading and writing skill courses for college students; and (3) an even more severe need for remedial instruction for the non-college bound high school graduate, particularly in the military. In reviewing studies done on teenage reading and television viewing habits, it becomes obvious that many teenagers today show little purposive striving toward goals of intellectual development, and they invest little mental effort in learning. General observations of schools today indicate that they are profoundly diverse, porous, loosely-coupled systems and that the education system in general is panacea-ridden. These aspects of schools operate to complicate the problem and to thwart attempts at improvement. Recommendations for improvement include: (1) federal and state policies must be framed as adaptive strategies; (2) instructional strategies within a locale must be adaptive; (3) cognitive psychology needs to be researched more thoroughly; (4) cognitive instructional techniques must be taught to teachers; and (5) technology must be used in the classroom. (JM)

Intelligence, Motivation, and Academic Work

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— Discussant remarks prepared for a Symposium on

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These are three fine papers as presented by Walter Doyle, Robert Sternberg, and Deborah Stipek. They deserve to be studied in detail. Given the time limits and being the last discussant, I have chosen not to reiterate the many important points each of the speakers and previous discussants has made but rather to offer some general observations and some specific examples that I think encompass the issues we are all here to confront today. Although my remarks focus primarily on the educational problems of students in the junior and senior high school years in California, they can be interpreted to apply elsewhere and to educational levels before and after those years, to some degree.

Some general observations on students today. First, some general observations that I take as given with respect to the high school student population of today:

1. There have been substantial declines over the past 10 to 15 years in high school student averages in aptitude for learning, in achievement from learning, and in motivation for further learning. The declines have been pronounced on such scholastic aptitude measures as the SAT and ACT, but appear using many other measures as well.

2. Among students going on to college, there has been a substantial increase in the need for remedial mathematics and reading and writing skill courses, i.e., precollege courses offered at the college level. This is so even at colleges and universities that serve the highest ranks of high school graduates.

3. Among students not going on to college, the problem may even be more severe. The military now spends millions of dollars annually educating its new recruits--in effect, developing the basic learning skills that students should have learned in high school. It appears that the military, and industry as well, is forced to teach more and more complicated technology

to less and less complicated human beings. Students who go neither to college or the military or industry show a marked tendency to drop out altogether, physically or psychologically or both.

4. These tendencies appear particularly problematic among teenagers today. But there is evidence that young children are now showing average increases in aptitude and achievement test scores. The causes and interpretations of these various trends, and the predictions to be made from them, are thus debatable.

It is possible that persistent weaknesses reside in the high school system that may be expected to continue affecting each oncoming generation of students adversely. On the other hand, we may be observing a "lost" generation in the age range from 12 to 22 or so that is now passing through the school system, to be followed by a return to normal levels of aptitude, achievement, and motivation, in oncoming generations. A useful discussion of the multiplicity of home, school, and cultural factors that might have contributed to the production of such a generation is available in the Wirtz and Howe (1977) report on the SAT score decline. It is clear from this discussion that the problem is not simply a school problem, though it is certainly an educational problem. Notable among the nonschool factors most relevant to the present generation of teenagers are the post Viet Nam malaise, the break-up of many primary families through divorce, and the rise of the teenage drug culture and the oervasive explosion of nonprint popular media that seems to feed it and to feed off of it. There certainly are also school factors: Textbooks have been significantly downgraded in reading level over the past decade, for example, and there has been a proliferation of watered-down, elective alternatives to basic course sequences. I see these steps as maladaptive adjustments to the characteristics of the teenage culture by the schools.

Some specific examples. Four bits of anecdotal evidence that I have collected recently serve to pinpoint aspects of teenage educational life today as these intersect with the topic of this symposium.

1. Woody Allen tells a joke about a speed reading course in which he was taught how to read straight down the middle of each page without having to bother shifting his eyes left and right. He says he was able to read War and Peace in 20 minutes, concluding: "It's about Russia!"

2. Stephen King leads a growing pack of bestselling novelists these days, turning out paperback horror shows that also appear in movie and comicbook versions. The books play particularly well among teenagers, seemingly because they call on familiar media pop culture and require little mental effort. According to one reviewer, who calls this genre "postliterate prose" (Gray, 1982, P.87) these books show how "... writing can appeal to people who do not ordinarily like to read. King uses language...to remind those present of what they have already seen...., [to produce perceptions that] spare readers the task of puzzling them out. They short-circuit thought, plugging directly into pre-fabricated images."

3. A recent study of television viewing habits among public school students, conducted by the California State Department of Education, showed that higher amounts of television viewing were associated with lower school achievement, but also that higher achievers tended to watch shows such as MASH and the Evening News while lower achievers tended to watch shows such as the Dukes of Hazzard. The newspapers reported this as if the television viewing differences caused the achievement differences when, actually, the relationship is probably reciprocal: MASH requires and produces more active investment of mental effort than does the Dukes of Hazzard;

in turn, those students less able or willing to invest mental effort will choose the Dukes of Hazzard over the more complex MASH. Similar choices probably occur in school courses. Students know, for example, that the older the textbook the harder the course; they will choose the level of mental effort that suits them, and for many this seems to be the easier level.

4. My son, age 17, who has received credits toward basic English requirements in high school for both speed reading and film study courses, also reads King and sees lots of movies and television, particularly horror shows, but also both MASH and the Dukes of Hazzard. He drove me to the airport for the trip to this meeting, and asked about the meeting's purpose. This prompted a 20-minute exchange--a very long discussion to have with a teenager these days. In it I asked why so many kids turn off and drop out of education today. He said: "They think it doesn't matter--nothing is happening in class--it's boring--they have better things to do. And they'll rebel against being told what to do. They don't want adults to play 'parent' or 'teacher' or 'counselor'--they want them just to be 'friends'."

To paraphrase and connect these observations and anecdotes, many teenagers today show little purposive striving toward goals of intellectual development and they invest little mental effort in learning. The emphasis in the teen pop culture is not on gaining a deep or lasting comprehension of any particular domain of interest but rather on a speedy, snappy, superficial run across vaguely related "happenings"--sort of like a Cheech and Chong movie. One should be able to tune in or out or switch among ideas, fads, and even school courses, as easily as one can switch radio or television channels. Thus, many teenagers will read if the imagery is fast and familiar enough.

But reading what an adult thinks one should read is a turn-off, and is probably too abstract anyway. Even in a pop horror story, pages will be skipped the instant they drag. Many teenagers can stay tuned in to games and puzzles, too, if there is enough action. But they cannot sustain the exercise of adaptive, flexible, executive-level intelligence in response to educational problems and puzzles; these are boring. It seems that "boring" and "hard" have come to have the same definition. Many teenagers can also work, as in the fast-food services. But school is not work; it's just a dull place to be, where nothing is "happening." Most distressingly, many teenagers do not seem to reflect on all this. They show what a colleague of mine once called "secondary ignorance," i.e., they don't yet know what they don't know, or what they are and are not yet good at.

All three of the symposium papers touch these themes in one way or another. All agree that learning is a function of the amount of active mental effort invested in the exercise of intelligence to accomplish cognitive work. Such cognitive accomplishments require intrinsically motivated cognitive reorganizations born of deep and sustained cognitive processing and also of continuing metacognitive surveillance of such processing. Many teenagers seem either uninclined to engage these mental functions or incapable of so doing. They will not accept adult advice about this. And the teen pop culture seems to promote the further development of this pervasive inaptitude for learning. Such students have no role in learning. Thus, the problem.

Some general observations on schools today. As we look toward recommendations for improvements in this state of affairs, however, it is important also to keep in mind some general facts about schools today.

1. Schools are profoundly diverse. U.S. public schools today face a degree of human diversity, i.e., of individual differences among students, that is greater by far than at any time in the history of the world. This diversity taxes conventional school and classroom practices severely and makes simple blanket solutions to educational problems impossible automatically.

2. Schools are also porous. Students walk on and off most campuses at will, between as well as before and after classes--incidentally, so do the dope-pushers. The registered student population also shifts monthly, even weekly in some places. Family, peer, and societal problems are brought into schools easily, and school problems easily carry over to outside lives. Students also switch courses (and even schools) easily and without much guidance, especially now that substantial budget cuts have all but eliminated counselling services. There is no one to tell students that film study and speedy reading, for example, may count for high school English credit but they do not count in many universities, and they do not build the learning abilities needed there. The diversity and porousness adds quite a measure of chaos to the school environment; more is "happening" in the halls and around the grounds than in the classrooms.

3. School organizations are loosely-coupled systems, not tight hierarchies. Superintendants do not really control principals, principals do not really control teachers, and teachers really do not control students. Therefore, policies may or may not be implemented as planned and evaluations of their effects are rarely clear. In this unpredictable and uncontrolled environment, students often think the most important thing is which teacher one gets for a given course--and they are probably correct in this view.

4. The educational system in general is panacea-ridden, and has been for many years. Innovative fads come and go. At any given point in time, it will be decided to have direct instruction, or indirect instruction, or self-directed instruction, or other-directed instruction, or fill-in-the-blank instruction. Then, evaluations will show mediocre effects, interest will flag, and the innovation will be dropped in favor of a new innovation, until it is picked up again as a new idea about 20 years later. The new science and math curriculum movement of the early 1960's went this way and now seems about to recur. The same thing will likely happen to the back-to-basics movement. In my view, no matter what policy or practice is adopted, if it is adopted on average, i.e., across the board for all persons, then inevitably it will not work for some significant number of persons and will thus be dropped. The diversity of students and the porous, loosely-coupled character of schools will assure this outcome, and the random walk in the panacea garden will continue.

Some specific examples. There are many examples of how these aspects of schools today operate to complicate the problem and to thwart simple attempts at improvement. Here are a few.

1. The federal government promoted the experimental trial of performance contracting, wherein outside firms were paid on an incentive plan for the reading and mathematics gains they produced. The national evaluation showed no average difference between experimental and control schools, so the program was dropped. But a look at the data (see Ray, 1972) shows tremendous diversity in effects as a function of student pretest score, grade level, and school, and also tremendous diversity across locations in the way the plan was implemented. What is good for Jacksonville is not necessarily good for Anchorage. What is good for Boston is not necessarily good for San Diego. What is good for Johnnie and Jane is not

necessarily good for Mary and Mike. Again, there are no panaceas that apply across schools or across students.

2. There are voluminous data that show the complexity of interactions between student differences and instructional treatment alternatives (see Cronbach & Snow, 1977; Snow, 1977). In one of our studies, for example, (Yalow, 1980) a unit on economics was taught to high school students either in a minimum, bare-bones version that demanded more active mental work or in elaborated versions that reduced the verbal or figural processing burdens on the learner. On immediate achievement tests, the elaborated instruction was best for the less able students while the minimum version was best for more able students. On retention measures, however, both kinds of students profitted from the minimum treatment. Presumably, better retention requires more active mental work during learning, and this may be prompted by the instructional method that is not obviously what is needed by some students in the short run. To predict the outcome for any student, one would have to know the students' entering ability, the instructional treatment given, and whether learning was measured immediately after instruction or with some delay.

3. Another of our studies (Webb, 1977) compared mixed versus homogeneous ability grouping for junior high school mathematics problem-solving. Here, to predict outcome for any student, one would have to know the entering ability of the individual, the mix of abilities in that individual's group, and the role the individual adopted in the group. High ability and low ability students did best in mixed ability groups, especially if the more able students acted as explainers and the less able students asked for explanations. Middle ability students did better in homogeneous ability groups, however. Thus, there are different appropriate roles for different students depending on the group context.

4. All this applies to the evaluation of "direct instruction" a teaching method already mentioned by some other speakers. The evidence I have seen suggests that direct instruction on basic skills may be good for less able learners but it is probably not good for more able learners and, in any event, it must be followed by instruction that promotes complex comprehension. As long ago as the 1940's, Brownell and Moser (1949) showed that rote mechanical drill in arithmetic in the early grades led to inaptitude later when meaningful explanation of mathematical concepts was required. The only generalization about instructional methods that seems supported by all of the above is--no matter how you try to make instruction better for someone, you will make it worse for someone else. This is because students and teachers and schools differ so profoundly from one another, and because the effect of any innovation is dispersed and diverted in different ways in a porous, loosely-coupled system.

Recommendations. There are recommendations that can be derived from the three symposium papers and from the state of affairs in education today as I have described it.

1. If there are no panaceas, we must stop looking for them. No blanket federal or state policies that treat all students or all schools as though they were the same can ever work. Federal and state policies have to be framed as adaptive strategies, geared to promote local developments in different ways in different locales, since what makes for improvement in one locale may not in another. Since local conditions also change over time, such policies and developments must also be made self-monitoring and self-correcting, just as effective individual intelligence is self-monitoring and self-correcting, i.e., adaptive over time.

2. Similarly, instructional strategies within a locale have to be adaptive. Instruction must be geared to meet students where they are, cognitively and motivationally; it must be adapted to capitalize on students' present strengths and to compensate for present weaknesses, even while attempting to remove those weaknesses for the future. It is possible to train directly the cognitive and metacognitive processing skills involved in intelligent learning and it is possible to prompt intrinsically motivated learning by intelligent arrangement of educational conditions. But intelligence and motivation are themselves idiosyncratically organized, diverse, porous, and loosely-coupled psychological systems; they are not the same "things" for different persons. Thus, direct training or motivational conditions must also be adapted to fit the particular characteristics of each person. And these conditions must also be made adaptive over time. Let us not make the mistake of seeing intelligence training or intrinsic motivation as the new panaceas.

3. Cognitive instructional psychology has been blossoming over the past decade, as all three papers demonstrate, and we now know some important things from such research. But much more theory-oriented, basic and applied research is needed. While this has become a hackneyed phrase, the incredible fact remains that compared to all other organized human endeavors that depend on research and development for their futures, only a pittance of the education budget at federal, state, and local levels goes to support research and development. No corporation that intended to remain in business would divide its resources in such an imbalanced way.

4. The fruits of research in cognitive instructional psychology enrich the conceptions with which teachers work much more than they provide pat procedures for teachers to follow. This must be so if teaching has to be as adaptive as argued above. To enrich educational practice in this

way, however, cognitive instructional psychology must be taught to teachers, and this does not seem to be happening. Recent evidence suggests, furthermore, that the average academic competence of teachers in training is low and that fully qualified teachers in areas such as science and mathematics are increasingly scarce. Again then, more complicated instructional technology must be taught to less complicated human beings. With due respect to the many excellent and dedicated teachers still in the schools, a drastic improvement in the recruitment and training of teachers in this country is needed. Teaching appears to be one of the few vital professions, incidentally, in which there is not an extensive, on site, vestibule or internship training experience, and in which periodic retraining is left to individual whim.

5. Beyond the improvement of teachers and teaching, it is possible to imagine new instructional technologies based on sound cognitive psychological research that would have the required adaptive capabilities. Minicomputers, perhaps attached to videodisc systems, have such capabilities. They can be programmed to provide the kinds of cognitive tasks that promote complex cognitive organizations, as Doyle advocated. These can include direct training in cognitive and metacognitive strategies and skills, as Sternberg advocated. And there is growing evidence that minicomputers are intrinsically interesting in and of themselves, and can be programmed to provide the kinds of intrinsically motivating instruction advocated by Stipek. Most importantly, they can be designed to adapt to student differences, both between-person differences and within-person differences over time. Such adaptive instructional systems may seem fanciful for schools today but they are rapidly becoming commonplace in the military. I find it hard to understand why so much money can be spent on improving education in the military when it is not spent on improving education in education in the

first place. Minicomputer technology is not to be regarded as a new panacea for education, however, as was the slide projector in the 1920's, instructional film in the 1940's, and instructional television in the 1960's. And technology is not itself the answer. People program computers and, so far, the development of computerized instruction has not benefitted much from the new research in cognitive psychology. The adaptability of the computer has been used only to give lots of options for individual learners to choose among. This is hardly the answer when part of the problem is that students don't know how to make intelligent choices. But there are signs of improvement as research continues. Eventually, adaptive computerized instruction can be made to function as a master tutor who knows when to give direct instruction, when to be indirect, when to give options and when not, etc., based on a continuing diagnosis of each learners needs as instruction proceeds. The volume of evidence in hand has long suggested that to reach equality of educational opportunity, instruction has to be adapted to student differences--to give each student his or her best shot at the common goals of education--which means treating different students differently. Somehow, on the face of it, that has always seemed undemocratic, because it implied some sort of grouping. Computer technology now permits true individualization, and the needed adaptations to individual differences become unobtrusive.

The theme of this symposium has been the student's role in learning. In a real sense, I believe that the student role was lost in the formation and domination of teenage culture in the past 10 to 15 years, and in the schools' maladaptive adjustment to this culture. We now need to redefine and recreate the student role in learning. Our nation's young people say they are sick of traditional parents and teachers and just want to be friends. As friends, we need to find the subtler, more unobtrusive, and more adaptive ways to do the parenting and teaching that they think they don't really need.

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