Teacher facility in and use of the multiple symbol systems relevant to a particular subject matter, at a particular time, in a particular place, and with a particular student population may be the essential feature of adaptive teaching, Mr. Snow suggests.

AS TEACHERS we strive to promote educational progress equally and fairly for all of our students. We devise courses and lesson plans to reach instructional goals for the class as a whole, and we carry these plans forward as best we can each day with evenhanded classroom management.

Sometimes these goals mean that we have to find a style of presentation or a form of participation that fits the particular character of a given class and differs from what we have done in previous years. Often they also mean recognizing student differences within the class group, looking for individual strengths to capitalize on and weaknesses to remove or avoid. We develop alternatives- different approaches to a topic or activity, different organizations of content, different explanations, different representations and examples--and we provide a variety of media and materials from which students can choose, in the hope of connecting with each student's learning strengths and interests. Sometimes we divide students into groups, varying instruction or activities to fit different kinds of student needs. Sometimes we work one-on-one with particular students on particular problems. And we always try to respect and respond to individuality -- each student is in various ways and degrees unique.

However we choose to face it, the problem of individual differences among students is ever present and often overwhelming. Students differ from one another in dozens of important ways that reflect cultural as well as individual characteristics. Minute by minute and month by month, we must decide when and how to adapt to the characteristics of particular students, when and how not to do so, and which student characteristics to attend to in either
case. In all our teaching, we seek to balance the need to help all students reach the common goals of instruction with the need to help individual students reach individual goals. In other words, we hope to minimize some aspects of student differences while maximizing others. When done well, it is an awesome balancing act.

The what/when/how question of adapting to student learning differences has motivated philosophical pronouncements for many centuries and empirical research by educators and social scientists for most of this past one. Critics scoff at our inability to give simple deterministic answers. But we know that answers depend on the local conditions and contexts of teachers and learners and are in any event probabilistic. We have come to respect these complex, conditional answers because each new decade of experience and research has increased our appreciation for the complex, conditional nature of the question.

In the 1920s and the 1930s, it was thought sufficient to adapt instruction only to the levels of general intelligence of students and to do so in a fixed and standard way across the curriculum. In the years around World War II, it was recognized that mental abilities were multiple and that different school subjects required different mixes. Through the 1960s and 1970s, it became clear that different patterns of personal strengths within an individual course called for different instructional methods and media. And this realization brought in the role of various symbol systems in different media as they related to student differences. In addition, personalities as well as abilities had to be taken into account somehow. It was also recognized that teachers too display characteristic personal profiles that can lead to matches and mismatches in the teaching/learning process.

Furthermore, work in the 1980s and 1990s has produced a fuller appreciation that this adaptive teaching/learning process seeks a match with student learning profiles not only to reach specific achievement goals but also to strengthen, expand, and prepare the learners themselves for future learning. In other words, education at its best is now seen as an "aptitude development program"--a program that promotes the development of learning abilities and effective personal styles that are propaedeutic -- that is, that are needed as preparation for future learning in school and throughout life. An important part of this development involves adapting and expanding the symbol systems used in teaching and learning to convey essential meanings.

**Examples of Adaptive Teaching**

Some simple examples will serve to ground the idea of adapting teaching to student
characteristics in relation to symbol systems. I need not discuss the definition and delineation of symbol systems themselves here, since my colleagues have done that well elsewhere. In my examples, I use just the most obvious cases of symbol systems, such as language, mathematics, and visual/pictorial representation. Even in these cases, however, there are different subsystems or mixtures with subtle, yet important differences. There are different languages, different genres or styles within a language, and differences between spoken and written language. There are also different kinds of mathematics, and these may contrast or mix numerical, abstract symbolic, and pictorial systems. Indeed, the contrast between verbal or numerical systems and visual/pictorial systems is important across subject matters. Moreover, only rarely does instruction in any domain rely purely on one symbol system alone, a point I revisit later.

A bilingual reading program. A first example concerns a reading program in which Hispanic American children were having trouble making progress in English reading comprehension. The program required that the children be kept at a beginning reading level until they were proficient in oral English. However, when it was realized that the children could read as well as speak fluently in Spanish, the program was changed to allow them to discuss in Spanish what they read in English. They then quickly advanced to grade level in English reading and even began using some English in discussion as well.

Spanish-speaking ability was the initial student aptitude here, and it was capitalized on by shifting the language of discussion temporarily until the full learner profile of reading and speaking abilities in both languages could be developed for use in later learning. Of course, this adaptation requires that teachers also be proficient in reading and speaking both languages. One can imagine dividing a class into several different language subgroups for this purpose if teacher aides with the necessary language proficiencies were available.

A culturally compatible reading program. A second example comes from the replacement of the structured coding emphasis of conventional reading instruction, which seems to be ineffective for many native Hawaiian children, with the talk/story format, familiar in Hawaiian culture. Here a cultural compatibility between home and school is sought as a means of capitalizing on a strength the children bring with them so as to develop another strength they will need in later schooling.

A similar example is the adoption of classroom discourse and participation styles that are more compatible with the cultures of Native American children than the conventional teacher-centered recitation style. Native American children often require holistic, visualized
story forms rather than the linear, analytic, verbal form of many teacher presentations. A shift to visualized story form capitalizes on a cultural strength of the home, just as in the Hawaiian talk/story example. In each of these cases, an adaptation of the symbol system was made to fit the aptitudes of a particular group of students. Of course, different adaptations are needed for different cultural groups if they do not share the same student strengths.[4]

More general cases. Unlike these relatively homogeneous situations, most classroom groups are heterogeneous with respect to relevant aptitudes. But the same principle of finding and capitalizing on individual student strengths to circumvent or remove impediments can still be applied to find useful teaching adaptations. And, as in the cases above, many of these adaptations involve a change in symbol systems, directly or indirectly.

An example from my own teaching capitalizes on the fact that some mathematical concepts and procedures can be expressed in either algebraic/numerical or geometric/pictorial forms and that students often differ strongly in their proficiencies in and preferences for each form. But the mathematical understandings that my students need can be reached initially by either route. So a computer program was developed to provide both algebraic and geometric representations as alternative, self-contained pathways to the math concepts to be learned. As a homework assignment, students could log on and choose either route, based on their sense of their own aptitudes. Once they had mastered the concepts using their strong or preferred route, they could return if they wished to follow their weaker or less preferred route.

This adaptation worked well. But it was merely a two-hour, out-of-class assignment, not a unit- or course-length, in-class requirement. And it allowed students choice rather than assessing their strengths and weaknesses independently. Choice of materials or projects has often been used in class and out as a form of adaptation. It assumes that the appropriate alternative choices are provided and that students already know what is best for them. But some, perhaps many, do not.

A final example of the use of contrasting symbol systems that is both unit-length and required in class, rather than chosen by students to be done outside of class, comes from work with a high school unit on economics. The principles of supply and demand can be represented verbally or graphically. They can also be taught either in a bare-bones presentation with little elaboration or with substantial verbal or graphical elaboration and examples. It turns out that teaching a two-week unit in these different ways can have quite
different effects on students with different patterns of general, verbal, visual/figural, and specific graphic abilities. What is best for particular students depends on their aptitude profile and its match with the symbol system emphasized in instruction, but it also depends on the difficulty of the instructional task and the ways in which learning is assessed. These effects, and other research on these contrasts, show the more complicated questions that those who attempt adaptive teaching must face. In particular, teaching that seeks to adapt symbol systems to student aptitudes must simultaneously take into account the complexity or difficulty of the instructional learning tasks and situations. I will return to these complications later.

**Current Reconceptions of Aptitude** Much recent work, including my own and that of several of my colleague contributors to this special section, has sought to reconceptualize the most important student differences—both cultural and individual—using terms such as attunements, dispositions, intelligences, orientations, predilections, proclivities, strategies, and styles of learning, thinking, self-regulation, and the like. Our aim has been to reach a deeper understanding of the teaching/learning match and of individual student development. I still prefer for such constructions the old-fashioned term aptitude (and aptitude complex) because it is the most general term; it includes all of the above concepts and more. I also have reasons for rejecting the other terms, but there is not space for those arguments here.

We need not quibble over terminology anyway. For me the concept of aptitude by any other name would smell as sweet—and be as useful. However, my theory of aptitude also carries a proviso that student aptitude differences always be considered a function of the interaction between persons and situations, not of persons or situations considered separately. I believe that this must be a central focus regardless of terminology, and I think it is at least implicit in most of my colleagues' views as well, though again there is no space to pursue that possibility. Let me instead review some critical details of my aptitude theory that relate most directly to a consideration of symbol systems in teaching.

In its original, broad definition aptitude means aptness, inclination, tendency, propensity, predisposition, fitness, or suitability for performance in some situation, usually involving formal or informal learning. Its meaning is akin to the concepts of susceptibility (to treatment or to persuasion) and proneness (as in accident proneness). This definition admits motivational, volitional, affective, social, and psychomotor, as well as cognitive, characteristics of learners as part of the concept of aptitude (although I deal only with the cognitive here). It also carries the strong implication of readiness for some particular learning situation and mutual person/situation compatibility in this condition.[5] The notion of cultural
compatibility of the first examples of teaching adaptation above fits this view of aptitude nicely.

This concept of aptitude came to us over the centuries from Latin by way of French, but it can also be found in German and even in early English. Unfortunately, by the late 18th century, aptitude had become strongly associated with intelligence in English; thus in British and American psychology it came to be restricted to meaning either "general intelligence as fitness for any situation" or "special narrow talents for particular occupational pursuits." The breadth, the mutuality, and the situational specificity of the concept had somehow been lost. This is an odd historical twist because in earlier English usage, aptitude clearly carried the implication of person/situation and even person/person compatibility: perhaps the best example is John Milton's phrase "that sociable and helpful aptitude between man and woman." [6] At that time even intelligence, defined as quality of understanding and quickness of mental apprehension, also implied mutual conveyance, communication, or intercourse between mind and thing, mind and knowledge, or mind and mind. I urge that we go back to these old meanings because they provide a new way to think about teacher/learner/symbol-system interactions.

But the central point here is that aptitudes by whatever name should be defined primarily as characteristics of the person/situation interaction, not as characteristics of the person alone. Aptitudes do not simply reside inside students' heads as a list of independent, fixed entities or functions that are always in force. Certainly their constituents are carried by the mental system in some neural form from past situations into the present instructional situation. However, they are then constructed for and come into play in relation to the particulars of the new situation; they are exhibited, usually in consort (i.e., in aptitude complexes), as resultant strengths, weaknesses, or preferences relative to present and similar past conditions. In other words, the differences in student aptitudes that we observe as teachers should be interpreted as reflecting the compatibility of the present person/situation union. And the character of that interaction reflects in part the compatibility or suitability, or the matches and mismatches, of person/situation interactions experienced by the student in the past.

When student aptitudes are well matched or well tuned to the present instructional situation, learning progresses smoothly, and we do not really notice the aptitudes independently. When student and instructional situation are not well matched, learning is difficult or fails altogether, and the aptitude mismatches stand out. But in each case the source of match or mismatch is in the aptitude/situation interface. This view of individual differences in learning from instruction is often called "aptitude-treatment interaction" theory, or ATI for short.
Teachers who take this ATI view look for the sources of success or failure in the student/situation interaction rather than attributing either success or failure to the student alone. These teachers try to choose, adapt, and evaluate instructional conditions accordingly.

What features of instructional treatment situations become part of this mutuality -- this matching or tuning process between student and treatment-- as it occurs in classrooms? In ATI theory, the key situational features are described as "affordances," a concept adapted from the perception theory of James Gibson.[7] Affordances are what the situation offers, provides, furnishes, or demands of the person. They are arrangements of treatment conditions that provide the student with opportunities to use personal strengths to advance learning, to avoid or circumvent weaknesses or impediments, and at times to use strengths to remove weaknesses or impediments directly. They are also arrangements that require particular strengths on the part of the student. Particular persons are tuned or prepared to perceive particular affordances that invite particular actions of which they are capable. In turn, particular situations can be tuned or designed to provide the affordances that fit the actions of which particular persons are capable.

Thus the concept of affordances implies a complementarity of person and situation (and, for Gibson, of animal and local environment, as in an ecological niche). This usage is at many points close to the old meaning of aptitude and to John Milton's usage noted above. Milton's "helpful aptitude between man and woman" becomes Gibson's "what the male affords the female is reciprocal to what the female affords the male."

This construction leads us to look for the demands and opportunities afforded by particular kinds of classroom teaching as these either match or fail to match the aptitudes brought by particular students. It especially directs our attention to the affordances provided by different symbol systems in interaction with different student aptitudes.

Symbol Systems and Student Aptitudes

Among the aptitude constructs developed by research in differential psychology over the past century, some of the most important are closely associated with symbol systems. That is, particular symbol systems seem to make possible the use of particular human abilities and vice versa. The result is a mutuality or transaction between ability and symbol system over the course of individual development. Presumably over the course of evolution, human beings developed the symbol systems that both reflect their abilities and allow them to be
implemented, and these systems in turn shaped the profile of ability development in succeeding generations. That there are substantial individual differences among human beings in these ability profiles shows that not everybody develops proficiency in all symbol systems, presumably for some mixture of biological and environmental reasons. Of course, although educational institutions typically provide access to most of the important symbol systems, education has never adopted the development of student proficiency in all such systems as a common goal.

Verbal/linguistic and visual/pictorial systems. Two of the most prominent symbol systems, especially with respect to adapting instruction to student differences, are those involved in the contrast between verbal/linguistic processes and visual/pictorial processes. Consider the verbal side first. Conventional classroom teaching can often be characterized as relatively verbal, abstract, conceptual, logical, and heavily auditory. Learners who cannot comprehend or keep pace with the verbal conceptual stream will fall behind. Similarly, students who cannot produce meaningful verbal conceptual streams will have difficulties. The relations between these particular student aptitudes and particular symbol systems seem obvious because they are describable in common terms. If instruction relies heavily on reading printed pages, then the ability to read and comprehend is essential to learning. If instruction is conveyed largely through teacher and student talk, as in lecturing, recitation, or group discussion, then auding ability -- that is, auditory speech discrimination and comprehension - -is also required. Similarly, speaking and writing abilities play significant roles in much of today's instructional interaction.

Reading, writing, auding, and speaking abilities are organized collections of skills developed in and for particular verbal contexts and media of communication that use particular combinations of verbal and para verbal symbol systems. All of them are also both aptitudes for learning in education and aptitudes to be developed from learning in education. The symbol systems and the skills involved with each overlap substantially and yet can differ in subtle and sometimes important ways. The collection of abilities we refer to as "verbal-crystallized intelligence" or just "verbal ability" for short, is made up of the overlap between writing, reading, auding, and speaking. (Other aspects of verbal ability, such as spelling, word knowledge, or foreign language acquisition, could be added, of course.)

Next consider that each of these abilities can be broken down into components designed to deal with particular aspects of each symbol system. Some of these are common to several or all of the abilities in the cluster, and some are unique to particular abilities. For example, reading includes a number of constituent skills, such as constructing text models,
constructing situation models, constructing propositions, encoding phrasal units, retrieving word meanings, and encoding graphemes.[8] Some of these components may be involved in specific learning disabilities, so research has sought to assess these specifics and to invent training that promotes their development.[9]

Classroom teachers obviously cannot be sensitive and adaptive to all these components. But it is important for teachers to recognize that reading ability is not one "thing." For simplicity in communication, we often refer to "it" as a whole, but reading is an organized assembly of components. In turn, verbal ability includes reading ability along with the other abilities. There is a coordinated hierarchical assembly embedded within the deceptively simple term "verbal ability," and this assembly is adapted or tuned to the affordances of the verbal/linguistic symbol systems. The organization and tuning of this aptitude/affordance system through the learning and development of the individual bring about "verbal ability.[10]

The major aptitude construct that is usually contrasted with verbal ability is labeled with some combination of the terms visual, figural, spatial, mechanical, and perceptual.[11] Here I refer to it simply as "spatial ability." This construct also consists of multiple abilities that overlap but also exhibit various unique features. Examples of constituent spatial abilities include spatial orientation, spatial relations speed, visualization, and closure speed. As with verbal ability, other constituents of spatial ability -- such as flexibility of closure, perceptual speed, and visual memory -- could be added. Also in parallel with verbal ability, a number of component skills are involved in each of the separate spatial abilities. For example, visualization includes a number of component skills: synthesizing images, transforming images, rotating images, comparing images, constructing images, and encoding figures.

Again, the point is that cognitive aptitudes such as spatial ability are organized assemblies of skills developed to fit the affordances of particular kinds of learning and performance situations. In this case, the assembly we call spatial ability is designed to fit the demands and opportunities of learning situations that involve visual/spatial/figural/pictorial scenes and representations of scenes. When confronted by such situations, learners attempt to construct their meaning and their performance in them by marshaling the needed component skills. For example, instructional presentations may use the visual/pictorial symbol system in ways that demand visualization. Perhaps instruction requires that students comprehend which complex three-dimensional objects are pictured in two-dimensional blueprints or that they draw pictures to distinguish lunar and solar eclipses, or that they imagine the shape of the horizon in different directions given a contour map.
Thus the verbal/linguistic and visual/pictorial symbol systems can be used in instruction in ways that demand the use of high-level verbal or spatial ability. However, there are also instructional situations that merely invite the use of these abilities as aids to learning. Reading tasks in which it is helpful though not essential to envision the situation being described from two vantage points might be one example. Drawing a picture of the conditions described in arithmetic word problems might be another.

There are also examples that go the other way. Geometry problems can often be solved through verbal/logical reasoning without reliance on visualized transformations. Verbal descriptions can sometimes capture fully for learning purposes the key features of graphs or pictures. The important point here is that it is insufficient and often misleading to judge the aptitude requirements of instruction on the basis of surface characteristics. Because an instructional presentation uses a particular symbol system does not mean that it requires the corresponding aptitudes exclusively and no others. Beneath the surface, some instructional situations provide the opportunity to use aptitudes of either or both kinds interchangeably.

But this introduces a further complexity. Much instruction uses multiple symbol systems that require shifts between and cooperation among the different relevant aptitudes. And especially as instruction also becomes more difficult and demanding, there is a need for a kind of aptitude that is in some sense "above" or "beyond" the affordances of particular symbol systems.

The role of general ability. If we take the hierarchical organization of verbal and spatial abilities seriously, it must also be recognized that they themselves correlate within a larger hierarchy. That is, there is a more general correspondence or correlation across all cognitive performances. This is usually interpreted as general mental ability or general intelligence. I label it G here, rather than g, to avoid the implication of a particular theory of intelligence. In the hierarchical taxonomy of human abilities, which is the theoretical model most consistent with the volume of empirical evidence, G is placed at the top to signify that it is involved in all learning and cognitive performance.[12]

There are various arguments about the interpretation of this general mental ability. But whatever else one may say about G, the preponderance of evidence shows it to be significantly related to learning under many conditions of classroom teaching. The correlations are especially strong when learning is difficult because instruction is in some important sense incomplete, unstructured, novel, or complex.

First, since all instruction is incomplete sometimes for some individuals, the role of G in
learning is ubiquitous. This recognition has led some researchers to define G as the ability to learn from incomplete instruction. Teachers, textbooks, videos, group exercises, and computer and laboratory experiments all leave out or gloss over aspects of instruction that some students need in order to learn. Those who can infer the missing concepts, relations; or procedures do so and learn; those who cannot, fail to learn. The need for inferential reasoning in incomplete instruction is an affordance. Able learners have become attuned to this quality of instruction and infer the missing links automatically; they often do reasonably well at this even when instruction is highly unstructured, irregular, disorganized, or purposefully sparse or staged, as in discovery learning. Once again, the staged incompleteness of discovery learning or inductive teaching is an affordance for student reasoning. Under these conditions, less able students may become confused and give up. They may also fail to perceive what affordances for structure there are.

Novelty and complexity also operate in interaction with student G. Both signal the need for increased analysis, decontextualization, selective attention, self-evaluation, reorganization, and connection to past understanding; these are all aspects of G along with inferential reasoning ability. Instruction that introduces a novel symbol system or involves complex mixtures or shifts among such systems may similarly heighten correlation with G because flexible strategy shifting is required. Students may approach instruction with a well-developed strategy for processing information, in printed text for example, but find they need to shift to different strategies for decomposing and comprehending complex equations or diagrams embedded in the text. Thus, just as different symbol systems offer affordances for different processing strategies, multiple and mixed symbol systems offer affordances for strategy shifting.

The research on verbal versus graphic elaboration of supply-and-demand laws in economics, as noted above, demonstrates the role of G in relation to verbal and spatial aptitudes and also to more specific skills in using graphs. It appears that bare-bones minimal instruction with a mixture of basic verbal and figural statements is best for high G students, but only they can manage the incompleteness and the mix. Both verbal and figural elaborations help low G students, and there appears to be some benefit in matching symbol systems and ability profiles, at least for immediate learning.

That is, for immediate results it may be better to give more verbal elaboration to more verbal students and more figural elaboration to more spatial students. But the opposite may be best if longer-term retention is the goal. It is possible that mismatching symbol system and aptitude profile can provide a kind of compensatory elaboration: students stronger in verbal
abilities may need instruction that provides more figural elaboration as a complement, whereas students with stronger spatial or specific graphic abilities may be helped more by instruction that provides verbal elaboration as a complement. This kind of result does seem to fit the rule: capitalize on student strengths to compensate for student weaknesses. Giving verbally facile students figural presentations may prompt them to use their verbal ability in comprehending and building up figural facility and vice versa. It also may be that this kind of mismatching promotes more active mental work by students and thus more consolidation for long-term memory.

Adaptive Teaching and Symbol Systems

Teachers can use changes in symbol systems to adapt to particular characteristics of learners. This was suggested by the first examples, where language and cultural proficiencies represented both student aptitudes and symbol system treatments. In each case, an existing strength in one symbol system was used as a means to build up strength in another. Adaptive teaching of this kind depends on circumstances of homogeneous language or cultural grouping and on the availability of multilingual and multicultural teachers. The choice offered in the example of algebraic versus geometric representation in mathematics is also an adaptation via symbol systems, though it is only a short-term choice made by each student from alternatives provided by the teacher. Either route would meet the goal; the students need only know —or discover -- which route best fits their strengths. This form of adaptation succeeds if appropriate choices are offered and if students choose well.

But the example of verbal versus figural elaboration in high school economics seems to pose a dilemma. Here is a significant unit of instruction needed as a building block for the rest of the course. Adaptation is an in-class teacher choice in a group that is likely to be heterogeneous, both in G and in verbal and spatial abilities. The long-term goal is really to develop needed ability in both symbol systems and their combined use. And the evidence suggests that what helps students in the short run may not be best in the long run and vice versa. Clearly, research has illuminated the complexity here but provided no prescription. This is probably the example closest to the typical need for adaptive teaching.

What can be done? In my view, teacher sensitivity, adaptability, and fluency in both symbol systems is the key. Just as a teacher with facility in multiple languages or cultures was required in the first examples, so a teacher with facility in both verbal and figural symbol systems is required in the last example. Knowing the local conditions and the students'
performance outside of this particular unit, the teacher can judge relative strengths and weaknesses. The teacher also controls the interaction over time, so the adaptive choice need not be one-shot matching versus mismatching of aptitudes and symbol systems. A teacher who understands both systems and is facile in their use can mix them over time sometimes playing to student strengths, sometimes using strengths to work on weaknesses, and sometimes attacking the weaknesses directly. What mix or sequence will be optimal is at base a professional, on-the-spot judgment.

But the teacher can also be a researcher here. If the day-to-day experience of adaptive teaching in this kind of situation can somehow be recorded, preserved, and studied, it is likely that such practice-based research can go far in explicating the subtleties of aptitude/affordance relations for using symbol systems in instruction. Teacher facility in and use of the multiple symbol systems relevant to a particular subject matter, at a particular time, in a particular place, and with a particular student population may be the essential feature of adaptive teaching.

If the ultimate goal is development in all students of facility in the use of multiple symbol systems, then there is evidence from various sources to indicate that we have not so far succeeded. To cite just one research finding from a recent national survey of high school science achievement, distinctions among quantitative, spatial/mechanical, and basic verbal/conceptual knowledge and reasoning in science showed large individual differences. But there were also substantial gender and ethnic group differences.[15] These three dimensions are basically symbol system distinctions. As in the case of high school economics, however, science students need facility in all three symbol systems and in their combinations; all are aptitudes for further learning in science. But the large gender and ethnic differences favor different groups in verbal facility, in quantitative science, and in spatial/mechanical science. Obviously, we still need to learn a lot about using facility in one symbol system to help build facility in another.


3. See, for example, David R. Olson, ed., Media and Symbols: The Forms of Expression, Communication, and Education: 73rd Yearbook of the National Society for the Study of


8. I use terms such as components and skills here to emphasize a procedural response to situations, but they should be taken to include perceiving situations and knowing or deriving their meaning.


10. Carl Bereiter has used the term "acquired contextual module" to characterize this kind of ability development. Though it is unlikely that abilities are entirely acquired or completely modularized, this term nicely emphasizes the adaptation of abilities to particular contexts or conditions. See Carl Bereiter, "Aspects of an Educational Learning Theory," Review of Educational Research, vol. 60, 1990, pp. 603-24.


14. Some of these results derive from research by Elanna Yalow, Individual Differences in Learning from Verbal and Figural Materials (Stanford, Calif.: School of Education, Stanford University, Aptitude Research Project Technical Report No. 12, 1980). Other evidence is summarized by Cronbach and Snow, op. cit.

15. Laura S. Hamilton et al., "Enhancing the Validity and Usefulness of Large-Scale Educational

ILLUSTRATION

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