

of development interacts with and influences students' ability to comprehend and learn from subject-matter texts.

Perhaps the most widely known theory of conceptual development is that of Piaget (Kuhn, 1979). Educators have relied on Piaget's work for several decades to help themselves understand the intellectual capabilities of children and adolescents. Recently, experimental psychologists also have borrowed from Piaget's theory to explain processes underlying comprehension and memory performance (Brown, 1980). Piaget, however, did not consider instruction and school experiences to be factors that influenced conceptual development in children (Duckworth, 1979). Indeed, a common interpretation of Piaget's theory is that intellectual development results from maturation or biological processes; therefore, children can achieve mature forms of intellectual functioning even if they are not exposed to the types of knowledge and instruction provided by teachers in schools.

The purpose of this paper is to describe briefly an alternative theory of cognitive development. I will focus on the theory formulated by Vygotsky, a Soviet psychologist, because he proposed that instruction in and mastery of subject-matter knowledge are the primary forces underlying cognitive growth (Vygotsky, 1962, 1978, 1979). Since Vygotsky developed his theory nearly fifty years ago, I will begin by discussing why his theory is still relevant to current issues in educational research. I will then summarize his ideas about (1) the origins of higher intellectual operations and (2) the self-regulatory functions of inner-speech. Finally, I will describe global implications Vygotsky derived for educational practice and how these implications apply to comprehension instruction for unsuccessful students.

Vygotsky's Influence on Current Research

Because Vygotsky died in 1934, many readers might assume that his work has no current value. Such an assumption would be incorrect for at least two reasons. First, Vygotsky (1978, 1979) saw social interactions among teachers and students as well as instruction in formal school disciplines as central to children's acquisition of knowledge and self-regulatory skills. A basic premise of his theory is that psychologists will not be able to understand or explain highly developed cognitive skills in adults until they discover how school instruction affects cognitive development in children.

Many comparative psychologists who study cross-cultural differences in memory performance attribute their interest in this area to Vygotsky's hypotheses about the effects of formal school instruction on intellectual development (Cole & Scribner, 1974). Results of these studies raise serious questions about the universality of Piaget's stage model; and, they support Vygotsky's assumption that children's acquisition of conceptual skills varies as a function of the type of education they receive and the level of literacy they achieve (Wagner, 1978; Scribner, 1979).

A second reason Vygotsky's work still has current value is related to his research on the self-regulatory functions of inner-speech. The basic conclusion Vygotsky (1962) derived from his research is that without instruction in subject-matter areas, students cannot develop insights about how their own minds work and, therefore, do not develop the ability to use language (inner-speech) to guide, monitor, and control their own learning. Although American psychologists have not directly addressed the issue of inner-speech as it relates to learning in content area disciplines, the theoretical functions of inner-speech described by Vygotsky underlie (1) current discussions about the construct of metacognition (Brown, 1978), and (2) current research designed to improve the academic performance of unsuccessful students by training them to use executive routines or self-interrogatory strategies (Meichenbaum, 1977; Brown, Campione, & Barclay, 1979).

VYGOTSKY'S THEORY OF INTELLECTUAL DEVELOPMENT: THE EFFECTS OF SUBJECT-MATTER INSTRUCTION ON SELF-REGULATED COGNITIVE PROCESSES

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Results of current research suggest that text comprehension depends on students actively using background knowledge and executive routines for regulating their own comprehension and learning performance (Bransford, 1979; Brown, Campione, & Day, 1978). One implication of such findings is that comprehension processes and conceptual development are closely related. While researchers have formulated elaborate theories of how knowledge is represented in memory and subsequently used to process information in texts, much less is known about how students acquire new knowledge structures and strategies for controlling their own learning (Kintsch, 1980). Reading educators and researchers realize that instruction in content areas influence the concepts students acquire and use to study and understand their textbooks. Nevertheless, few researchers have examined specifically (1) how content area instruction affects the knowledge structures and cognitive abilities students develop as they progress through school, or (2) how this type

The Social Origins of Intellectual Development

What distinguishes Vygotsky's theory from the schema theories of Piaget and others is Vygotsky's claim that all higher level cognitive processes arise out of social experience. Each intellectual function a person acquires, like voluntary attention, concept formation, and deliberate memory strategies, must appear two times: first at a social, external level between individuals, and then at a personal, internal level within an individual. Transfer from external (social) to internal (individual) planes results from a prolonged series of events; but once a function is internalized, the structure and organization of one's mind is changed, moving individuals to higher levels of conceptual ability.

For example, children were seen to acquire symbolic processes like spoken and written language by interacting with their parents, teachers, and other adults. Such interactions allow children to identify and abstract effective means for speaking, remembering, and problem-solving. Internalization occurs only after children have first used cognitive operations in situations where adults or experts verbally mediate and regulate their performance. Gradually children transform or reconstruct these external operations and the means for regulating the operations so that they occur internally. Some operations may always remain external; but if an operation is internalized, the structure of the child's mind is reorganized, creating new abilities in the child which would not have existed otherwise (Levina, 1979).

Thus, Vygotsky proposes that cognitive development results from learning experiences in which children are taught to use various intellectual or cognitive skills through social interactions with others. A basic implication of his theory is that the structure and quality of the intellectual abilities children develop reflect the structure and quality of the social interactions children have had with their parents and other adults. Vygotsky's emphasis on the social origins of development makes his theory of cognitive development distinct from the theories of most Western psychologists (Wertsch, 1979a).

The Development of Self-Regulatory Speech Functions

While Vygotsky saw all higher mental functions arising out of social interactions, he was basically interested in the regulatory or executive functions of inner-speech (Wertsch, 1979b). Vygotsky's description of innerspeech functions mirrors the American construct of metacognition (Brown, 1978; Flavell, 1979). In both constructs, inner-speech and metacognition, self-regulatory skills are defined as routines people use to plan, monitor, and direct their own cognitive behavior based on insights they have about how their own minds work. For each cognitive function people acquire, like text comprehension, self-regulation appears only after the function has been used and practiced unconsciously for long periods of time. Vygotsky's construct of inner-speech differs from the American construct of metacognition in that Vygotsky (1) emphasized self-regulation as a language function children acquire through social interactions with their parents, teachers, and peers; and (2) attributed the development of this function specifically to students having to learn abstract concepts such as those taught in the academic courses of most schools.

Vygotsky (1962, 1979) defines inner-speech as language used to mediate thinking. The roots of this language function lie in children's acquisition of oral speech, or the ability to respond to and communicate with other people. Inner-speech, however, only develops as students learn ideas that reflect culturally shared and accumulated knowledge. Since schools are established to transmit this type of knowledge, Vygotsky proposed that school instruction induces two interrelated types of cognitive function concept formation and self-regulation.

Concept Formation

Vygotsky (1962, 1979) argues that by learning concepts in school students acquire a type of knowledge that is fundamentally different from concepts they acquire through everyday experience. For example, children can acquire and understand a concept like "brother" based on their everyday activities; but they cannot acquire and understand concepts like "manifest destiny" or "exploitation," unless someone teaches them history or other school concepts which make these theoretical ideas meaningful. School concepts are abstract, divorced from concrete experience, and have to be learned as systems of ideas that are organized in superordinate, coordinate, and subordinate relations. Learning such systems creates hierarchial knowledge structures in students which enable them to classify and-generalize ideas and to think in relational terms. Students must practice these thinking skills or operations unconsciously under adult guidance before they can subject the operations to deliberate direction and control. But once students grasp the significance of the structure of relations between ideas in one content area, they can transfer and use this type of knowledge to learn more complex concepts in that area as well as concepts in other domains of school instruction.

Self-Regulation

According to Vygotsky (1979), as students acquire new knowledge, they also acquire routines for regulating and controlling their use of that knowledge. Self-regulation occurs only after students perceive the significance of structural relations among concepts and only after teachers have verbally mediated and guided students' use of the concepts for extended periods of time. From these mediated learning experiences, students eventually acquire language for regulating their own learning, and they do so by reconstructing in their own minds the speech or language forms teachers use to teach them (Wertsch, 1979a, Vygotsky, 1979). Through instruction, students learn what it means when a teacher asks them to remember, interpret, classify, compare, or judge ideas. Understanding these terms and the cognitive operations they label gives students insights about the functions of their own minds. These insights are what enable students to use language consciously to mediate and regulate their own thinking and study behavior.

To briefly summarize, Vygotsky describes self-regulation as an inner-speech function. This function emerges after students have had guided instruction and practice in using abstract ideas like those taught in subject-matter disciplines. His basic hypothesis is that the structure of inner-speech forms students use to control their own thinking reflects the structure of the language their teachers used in teaching.

Both the nature (inner-speech) and the origins (content area instruction) of self-regulation that Vygotsky proposed are obscured in most American research on executive functions or metacognitive routines. Instead, American researchers have simply identified and described such things as (1) the age at which students demonstrate different insights about their own cognitive abilities; (2) the difference between good and poor readers use of self-regulatory or executive functions; and (3) the executive strategies adults use to monitor and control their own comprehension and learning (Kreutzer, Leonard, & Flavell, 1975; Brown & Smiley, 1977; Myers & Paris, 1978; Baker, 1979; Owings, Peterson, Bransford, Morris & Stein, 1979).

Neither the content students are expected to learn nor the type of verbal instruction they receive are major variables in American research. Yet, if Vygotsky is correct, American researchers must control for these variables in order to explain (1) how students develop routines for controlling their own learning and (2) why some students learn to monitor and control their own study behaviors better than others.

Educational Implications

Since Vygotsky observed that instruction, or mediated learning, typically preceded the acquisition of cognitive abilities, he concluded that "the only good kind of instruction is that which marches ahead of development and leads it" (Vygotsky, 1962, p. 104). Because of this, Vygotsky criticized psychologists who recommended that teachers match instruction to developmental levels of students as determined by their scores on standardized tests. He felt this was misguided because it focused instruction on abilities students had acquired in the past instead of abilities students could potentially achieve in the future.

As previously noted, Vygotsky claims that both the content students learn and the ways teachers mediate student learning influence the knowledge structures students acquire and their ability to activate, or regulate, their own use of that knowledge. Vygotsky (1978) was especially opposed to education programs designed for unsuccessful students in which instruction was aimed at the students' independent level of performance and based only on concrete experiences and concepts. Instead, he felt teachers and schools should push these students in particular to learn abstract ideas and complex cognitive skills. According to Vygotsky, offering unsuccessful students an academically less rigorous curriculum reinforces their learning handicaps and keeps them from acquiring higher levels of cognitive ability.

In many American schools, unsuccessful students are usually those students who have difficulty learning from subject-matter texts. Because they cannot learn by reading textbooks, they are typically (1) tracked into courses specifically designed for academically less capable students, or (2) sent to some sort of remedial class for reading instruction. In both instances, the intent is to match instruction to levels at which students can succeed and then move them to higher levels of academic performance. Vygotsky's theory can be interpreted to suggest, however, that many of the practices associated with classes designed for unsuccessful students may hinder rather than promote their acquisition of concepts and skills that underlie successful, self-regulated learning.

Instruction in content area courses designed for academically less capable students may perpetuate the learning difficulties these students have. Instruction in these classes often is modified so that students are expected to read less material and learn only concrete ideas or facts. Vygotsky argues, however, that the concepts students acquire in school directly affect the intellectual skills they develop. To Vygotsky, abstract concepts are tools of thought which dramatically alter the nature and structure of people's minds. Students who learn abstract concepts, therefore, develop more powerful thinking skills than students who do not learn abstract concepts. Thus, teaching students only concrete ideas and expecting them to apply the ideas by reading less material may maintain students at lower levels of academic and cognitive achievement. As an alternative, Vygotsky suggests that teachers modify the way they mediate and regulate how less capable students learn instead of simply modifying what they expect these students to learn.

A similar problem may occur in remedial reading classes. Perhaps remedial reading instruction helps students develop decoding skills. As it is usually organized, however, remedial instruction might not help students develop comprehension and learning strategies that can be transferred to subject-matter texts. The motivational, easy, and interesting materials used in most remedial classes can seldom be used to teach students ideas that are abstract, related in complex meaning structures, and divorced from students' personal experience or past learning. Yet, according to Vygotsky, only through mastery of this type of knowledge can transfer occur from one domain of instruction to another. Thus, we may maintain unsuccessful students at low levels of comprehension development by not expecting them to understand, remember, and

apply abstract knowledge that can be transferred and applied to understanding subject-matter texts.

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