

Understanding Vygotsky for the Classroom: Is It Too Late?

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Published online: 15 October 2011
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Abstract Determining the capability of Vygotsky's cultural–historical theory to fulfill key functions of educational theory (such as revealing the complexity of apparently simple events) has been hindered primarily by the following factors: (a) inaccurate information about a minor discussion, the zone of proximal development (ZPD), attracted attention early on and became identified as a major aspect of his theory; (b) the unavailability of accurate translations of his complete theory for several years; and (c) the lack of key information in popular discussions of Vygotsky's work on scientific (subject matter) concepts, a major factor in cognitive development. This article first describes the original misconception of the ZPD, current extrapolations, and discrepancies between Vygotsky's thinking and those views of the ZPD. Then the pivotal role of subject matter concepts in cognitive development, their relationship to logical thinking, and levels of thinking (pseudoconcepts, preconcepts, true conceptual thinking) are discussed. Implications for education include (a) rethinking classroom practices (accurately assessing the ZPD, collaborative learning in the classroom), (b) providing a sound rationale for reducing the proliferation of content requirements, and (c) refuting the practice of introducing abstract ideas and complex intellectual capabilities in the early grades. Issues in constructing curricula according to Vygotsky's perspective are also discussed.

Keywords Vygotsky's theory · Subject matter concepts · Cognitive development · Zone of proximal development

Among the general functions of both theories of learning and theories of cognitive development are that they provide an organizing framework for specific items of

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information, reorganize prior experience, and reveal the complexity of apparently simple events (Suppes 1974).¹ However, accurately assessing the potential of a new theory to fulfill these functions is in serious jeopardy when only fragments of a few concepts attract attention and the limited information becomes popular. Researchers and practitioners begin to make inferences and extrapolations from the limited information, but such views cannot reflect the theorist's orienting framework. The connections between ideas, "the holistic structure (Gestalt) of a scientist's thinking necessary to understand the meanings of the elements" is missing (Valsiner 1988, p. 152). In such situations, the actual tenets of the theory do not emerge to fulfill the functions identified by Suppes.

Nevertheless, if the misconceptions lead to developments that capture the imagination, spur research, and influence educational practice, is this not a positive outcome? The problem is that, in lieu of discussions and applications of key principles, the rich understandings provided by the theory do not receive a hearing in the forum of professional ideas.

A more serious outcome is that ultimately, the theory itself is often discredited when the popular view is found wanting.² This problem has not yet occurred with Vygotsky's theoretical system. However, his theory is the most recent perspective to be discussed largely in terms of popular misconceptions. Moreover, the issue of inaccurate information about his thinking is more than academic. Vygotsky, who described adolescence as an essential period in the development of thinking, warned that the adolescent's thinking does not develop "all the potentials inherent in it" when the environment "fails to create appropriate tasks, advance new demands, or stimulate the intellect through new goals" (Vygotsky 1931/1994a, p. 214). His concern resonates across the years to the twenty-first century as cultures and societies face new challenges that require the best of human potential.

At least four factors have complicated the task of understanding Vygotsky's thinking. First is the less-than-accurate portrayal of Vygotsky's ideas in the 1978 publication *Mind in Society*. In the late 1970s, the name Vygotsky had begun to capture attention in the USA as an alternative to perceived weaknesses of Jean Piaget's concepts (e.g., the limiting aspects of structure; Glick 1997, p. ix).³ *Mind in Society* fueled the growing interest (Gillen 2000; van der Veer and Valsiner 1994), even though the editors of the monograph stated they had taken "significant liberties" with Vygotsky's essays (Cole *et al.* 1978, p. x).⁴ Glick (1997) noted that the monograph was not quite "the unearthed Vygotsky that the name Vygotsky on the title page would indicate" (p. xiii). Nevertheless, "the Vygotsky of *Mind in Society* took off, spawning many publications" (p. vii).

¹ Other functions of theory are serving as a framework for conducting research and serving as working models of complex events until other theories are developed (Suppes 1974). The basic components of theories that fulfill these functions are (a) basic assumptions about the nature of the events to be addressed (learning, cognitive development), (b) precise definitions of terms in the theory, and (c) a set of propositions or hypotheses that are testable.

² An example is Piaget's theory. Piagetian scholars (Bickhard 1997; Chapman 1988; Lorenço and Machado 1996) stated that interpretations of some of Piaget's concepts were so distorted that he was criticized for positions he had never taken.

³ The issues were not Piagetian theory as Piaget intended it, but the ways in which the English-speaking psychological establishment had consumed it (Glick 1997, p. ix).

⁴ The editors stated they had omitted material that they judged to be redundant and added other material (Cole *et al.* 1978). Furthermore, a comparison of "Tool and Symbol in Child Development" which is addressed in the early chapters of the monograph indicates that the editors invented new subheadings for the text.

One problem in the monograph is the inaccurate conception of aspects of the zone of proximal development (ZPD). For example, Glick (1997) noted that the rendition of the ZPD in *Thought and Language* (1962) that [accurately] emphasized its role in developmental assessment⁵ was lacking in *Mind and Society* (p. x) (also, *Mind in Society* had elevated the ZPD from a subtopic to a major topic with its own heading; pp. x–xi). However, the description in *Mind and Society* gained widespread acceptance and became identified as a major component of Vygotsky's cognitive development theory (not known then is that, in the six volumes of Vygotsky's collected works, fewer than 15 pages discuss the ZPD). Educational psychology texts, discussions in professional journals, and recommendations for classroom practice expanded on the initial inaccurate information and lent credence to the earlier description.⁶ One purpose of this paper is to describe the inaccuracies, discuss Vygotsky's statements that do not concur with ideas in that material (e.g., peer collaboration in the classroom, nature of the tasks in the ZPD), and suggest ways to move on beyond the inaccurate information.

The second complication in understanding Vygotsky's thinking is the late appearance of definitive English translations of his work. In the translation of Vygotsky's *Collected Works*, aspects of the zone of proximal development appear in Volumes 1 (published in 1987) and 5 (published in 1998), 9 and 20 years, respectively, after the initial misstatements about the ZPD.^{7,8} Third is Vygotsky's own particular definitions for some terms. Four examples described in this paper are *intellectual imitation*, *subject matter concepts*, *voluntary* (in terms of mental functions), and *logical thinking*.⁹

Finally, Vygotsky's emphasis on the role of scientific (subject matter) concepts in cognitive development is little known. *Mind in Society* included only six paragraphs that mentioned concepts in relation to memory and stated obvious information (such as children's concepts are concrete recollections and the connections in word meaning differ in the child and the adult). Although the monograph editors referred to chapter 6 in *Thought and Language* (1962), they chose not to address essential information about Vygotsky's conception of scientific (subject matter) concepts.¹⁰ However, in Vygotsky's view, subject matter concepts are the epitome of word meaning of which the name [word label] is a sign (Minick 1987; van der Veer and Valsiner 1991). He also described forming scientific (subject matter) concepts as "the key to the whole history of the child's intellectual development" (Vygotsky, 1934/1994a, p. 355). When this process is completed in late

⁵ Vygotsky (1930–1931/1998c) corroborates the *Thought and Language* (1962) view and elaborates his rationale for the diagnostic role of the ZPD.

⁶ Specific texts and articles are not cited here because the inaccurate information is almost universally accepted.

⁷ Some aspects of Vygotsky's theory appeared in English in the 1920s and in a 1939 publication. Also, a translation of *Thinking and Speech* entitled *Thought and language* appeared in 1962. However, these publications did attract the attention of American psychologists.

⁸ Vygotsky's grueling academic schedule in the relatively young USSR included a heavy teaching load, supervising research, working with children with physical and mental disabilities, and translating psychological texts from European languages into Russian (van der Veer and Valsiner 1991). His only time for writing was late at night. Also, his short life did not permit him the time to review his many writings to organize them into a more coherent whole.

⁹ Other terms that he defined uniquely are *cultural development* ("consists of man mastering processes of his own behavior"; Vygotsky 1982–1984/1997b, p. 243) and *cultural age* (mental measurement; Vygotsky 1982–1984/1997i, pp. 231–239).

¹⁰ *Thought and Language* (1962) includes the same two chapters on concept development as the 1987 *Thought and Language* in Vol. 1 of the English translation of Vygotsky's *Collected Works*. They are Chapter 5. An Experimental Study of Concept Formation and Chapter 6. The Development of Scientific [subject-matter] Concepts in Childhood.

adolescence, the individual has mastered “the most advanced form of the sign created by human thinking” (Vygotsky, 1934/1987a, p. 159).¹¹

Vygotsky’s analysis of the role of subject matter concepts in cognitive development speaks directly to the issue of school curricula in developing thinking. A second purpose of this paper, consistent with the general functions of theory identified by Suppes (1974), is to present Vygotsky’s psychological definition of subject matter concepts, describe the relationships he identified between subject matter concepts and the levels of thinking attained by elementary school children and adolescents, and propose a role for his thinking in the review of content standards in the school curriculum.

A Major Misconception: Views of the Zone of Proximal Development

Discussed in this section are the early misconception of the zone of proximal development and subsequent extrapolations.

The early misconception

The 1978 monograph accurately described (a) the two levels of cognitive development—an actual level indicated by independent problem solving [an IQ test, according to Vygotsky (1930–1931/1998e)] and the ZPD which is indicated by assisted problem solving and (b) the hypothetical example of two children with the same mental age (8) whose ZPDs differed.¹² However, a major problem in the text is the statements that (a) the ZPD can be determined by problem solving “in collaboration with more capable peers” (p. 86) and (b) “learning awakens a variety of developmental processes that are able to operate *only* when the child is interacting with people in his environment and *in cooperation with his peers*” (emphasis added, p. 90).^{13,14} These statements are not corroborated in definitive translations or reliable discussions of Vygotsky’s work which do concur about his thinking.¹⁵

¹¹ Four chapters in Vygotsky’s *Collected Works* discuss scientific (subject matter) concepts. Two chapters (Vygotsky 1934/1987a, 1934/1987b) appear in *Thought and Language* which is in Vol. 1 of the *Collected Works* in English. One chapter (Vygotsky 1930–1931/1998b) is in Vol. 5 (and also in *The Vygotsky Reader*) and one (Vygotsky 1934/1994a) is in *The Vygotsky Reader*.

¹² This example also appears in Vygotsky (1934/1987b) and Vygotsky (1930–1931/1998f).

¹³ The editors of *Mind in Society* stated that their chapter 6 entitled Learning and Development is taken from a translation of some of Vygotsky’s ideas in a posthumous (1935) collection of some of his essays. Van der Veer and Valsiner (1991) who completed a 10-year study of Vygotsky’s published and unpublished writings identified six essays in the 1935 publication that addressed the ZPD. Cole *et al.* did not identify the essays that they consulted.

¹⁴ *Mind in Society* stated that the research of Dorothea McCarthy, an American, indicated that children from three to five performed some functions (at the developmental level of 5- to 7-year-olds) “under guidance, in groups, and in collaborating with one another but which they have not mastered independently” (p. 87). This version is contradicted in the translation by van der Veer and Valsiner (1991) which stated that “McCarthy had shown that three- to five-year-old children can perform some tasks independently and *other tasks only under the guidance of or in cooperation with an adult*” (emphasis added; Vygotsky 1933c/1935, in van der Veer and Valsiner 1991, p. 338). They noted also that McCarthy’s work indicated that “normal children who experienced adult speech environments produced generally longer speech samples to an (adult) investigator than children who either associated with older children or peers” (p. 318).

¹⁵ Definitive English translations of Vygotsky’s writings include his *Collected Works* and the selections in *The Vygotsky Reader*. Reliable discussions of his work are authored by (a) Vygotsky’s two principal collaborators, A. N. Leont’ev and A. R. Luria (1968), and (b) the 10-year detailed study of more than 250 of Vygotsky’s published and unpublished papers by R. van der Veer and J. Valsiner (1991).

Subsequent extrapolations

Publications subsequent to *Mind in Society* (a) quoted the phrase that the ZPD can be determined through problem solving “in collaboration with more capable peers” (p. 86)¹⁶ and (b) elaborated on that phrase. Early examples added that the ZPD (a) is “*the structure of joint activity in any context where there are participants who exercise differential responsibility by virtue of differential expertise*” (emphasis added; Cole 1985, p. 155) and (b) consists of collaborative contexts “where neither partner can be seen as objectively ‘more capable,’ but where the partners may assume separate but complementary social roles” (Foreman and Cazden 1985, p. 155). A later text added that the ZPD is the region in which *the transfer of ability from collaboration with adults or more competent peers to internalization of the new capacities occurs* (emphasis added, Berk and Winsler 1995, p. 24). Also, “Vygotsky’s ZPD specifies that collaborative activity on yet-to-be-mastered tasks is central to effective instruction” (emphasis added, p. 136).

Others (in a 1984 text) discussed learning in the ZPD in adult–child dyads with tasks such as assisting young children with simple jigsaw puzzles. The editors depicted the ZPD as addressing a task the child had partially mastered (Rogoff and Wertsch 1984, p. v).¹⁷ A more recent situation (mother–child dyads planning shopping for items in a grocery store) was described as “entirely consistent with the 1978 notion of the zone of proximal development” (Gauvain 2001, p. 183) because (a) the task involved experienced partners (mothers) and less experienced partners (the children) (b) in a task that was challenging for the children. Gauvain (2001) also referred to the ZPD as addressing microgenetic change only—change that is “defined in relation to a particular task, problem, or activity” (p. 37), but not ontogenetic or developmental change!

A different rendition focused on “performance capacity.” Teaching refers to offering assistance “at points in the ZPD at which performance requires assistance” (Gallimore and Tharp 1990, pp. 183–184). Also added were four stages presumed to define the ZPD for a variety of tasks and skills, from completing a puzzle to reading.

Currently, Wikipedia quotes the 1978 description and states that the ZPD is “the difference between what a learner can do without help and what he or she can do with help” (retrieved from http://en.wikipedia.org/wiki/Zone_of_proximal_development). In addition, education is described as providing children with experiences that are in their ZPD.

In summary, a questionable description of the ZPD attained widespread circulation. The concept was then further elaborated in any of several ways (e.g., the structure of joint activity, the transfer of ability, performance capacity, and microgenetic change). As discussed in the following section, both the early 1978 description and current views lack key information about the ZPD and related concepts.

Discrepancies Between Vygotsky’s Thinking and Current ZPD Descriptions

The inaccurate information in *Mind in Society* and subsequent elaborations reflect four problems in terms of Vygotsky’s thinking. They are (a) a lack of information about the

¹⁶ For example, the quotation from *Mind in Society* appears on pages 11, 24, 155, 273, and 341 in *Culture, Communication, and Cognition*.

¹⁷ The emphasis on tasks and assisted performance in instruction doubtless contributed to Wertsch (1984) stating the need for the term *intersubjectivity*. The term refers to establishing a shared task definition between adult and child which may require the adult to communicate in somewhat simple terms (p. 12).

teacher's role in determining the child's ZPD, (b) the belief that cooperation or collaboration among students is appropriate for addressing students' ZPDs, (c) the focus on activities that do not address cognitive development as Vygotsky conceptualized it, and (d) the belief that the ZPD applies to young children as well as older children and adolescents.

Determining the ZPD¹⁸

Vygotsky (1930–1931/1998c) identified two types of assessments he viewed as essential for understanding the child's level of development. One is the actual level of development which is the “first and basic task of the diagnostics of development . . .” (p. 200). This assessment determines the child's mental age (an IQ test, p. 201). The assumption is that only solving the problems independently can indicate the individual's level of thinking (p. 201). Vygotsky did not accept that assumption, maintaining that

ascertaining the processes that have not matured at the time, but are in the period of maturation is the second task of the diagnostics of development. This task is accomplished by finding the *zones of proximal development* (emphasis in the original, p. 201).

Vygotsky (1930–1931/1998e, p. 204) chose non-independent problem solving as the method for identifying maturing higher cognitive functions (processes) which constitute the ZPD at a particular point in time. The four ways that the teacher can determine these emerging functions are to (a) demonstrate the solution to see if the child can imitate the steps, (b) begin to solve the problem to see if the child can finish it, (c) have the child “cooperate with another, more fully developed child” (a child who has a higher IQ), or (d) explain the principles of solving the problem, ask leading questions, analyze the problem for the child, and so on (p. 202) (as indicated above, the option of interacting with a child who has a higher IQ as a method of assessing a child's ZPD is different from the erroneous view that Vygotsky advocated peer collaboration in completing classroom tasks).

Vygotsky's rationale for these assessment methods is that (a) the social environment is the source of the human characteristics acquired by the child and (b) the situation essential for their development is the “interaction of the ‘ideal’ [the behavior of the adult] and present form” [the thinking of the child] (p. 203). Therefore, an adult engaging the child in problems that are just above his or her independent problem solving indicates the child's intellectual functions that are maturing, but not yet matured.

The process executed by the child in the ZPD is that of *intellectual imitation*; the child understands enough to be able to participate in carrying out the intellectual operation (Vygotsky 1930–1931/1998e, p. 202; 1960/1997k, p. 95). Included are activities the child “can do with direction or cooperation or with the help of leading questions” (Vygotsky, 1930–1931/1998e, p. 202). Given this definition, the “capability for intellectual imitation is not limitless” (p. 201); a specific zone of intellectual imitation

¹⁸ Vygotsky introduced the zone of proximal development in relation to intelligence testing and gradually broadened it later to address the relationship of education and cognitive development (van der Veer and Valsiner 1991, p. 329). Vygotsky (1930–1931/1998f) discussed the assessment role in identifying a child or adolescent's ZPD. Vygotsky (1934/1987) compares instruction in the ZPD to three theories of the relationship between instruction and development.

is connected to each actual level of development (the intellectual capabilities the child can execute independently; p. 202).

Collaboration and the ZPD

A second problem is the accepted link between cooperation or collaboration among students and the ZPD. *Mind in Society* stated that “learning awakens a variety of internal developmental processes that are *able to operate only when the child is interacting with people in the environment and in cooperation with his peers*” (emphasis added, p. 90). In contrast, Vygotsky (1934/1994c) stated that groups of children are not capable of facilitating their own cognitive development (p. 350). Their conversations “cannot serve as a source of any significant development for them” (p. 350). If, for example, children develop their understanding of numbers without adults, even the development of the most gifted child “will remain extremely limited and narrow in scope” (p. 351).

Teacher–student collaboration Two points are important in understanding the role of the teacher (and other adults) in cognitive development. First, the process of teaching is “always in the form of the child’s cooperation with adults” (Vygotsky 1930–1931/1998e, p. 204). For example, “the development of the scientific [subject-matter] social science concept, a phenomenon that occurs as part of the educational process, constitutes a unique form of the systematic cooperation between the teacher and child” (Vygotsky 1934/1987b, pp. 168–169).

Second, this interaction between the adult (the “ideal” form of behavior) and the child (present form) is essential for mental development. A child learns to master his or her behavior “from the example of how an adult masters it” (Vygotsky 1982–1984/1997b, p. 248). “If the child did not see how others manage memory [for example], he would not be able to master this process” (Vygotsky 1930–1931/1998e, p. 182). The “maturation of the child’s higher mental functions occurs in this cooperative process . . . through the adult’s assistance and participation” (Vygotsky 1934/1987b, pp. 168–169). This interaction between the ideal and the present form is one of the general laws of the development of the child (Vygotsky 1930–1931/1998e, p. 204).

Non-classroom examples of the ZPD Vygotsky (1934/1987b) also identified situations in which the child can function in his or her ZPD without overt assistance. The school child who solves problems “on the basis of a model he [or she] has been shown in class” (p. 216) is an example. The “help” from the teacher is “invisibly present” (p. 216). Another situation is the child in a home with many books, magazines, and newspapers, where the parents read extensively. The child may learn to read without direct instruction by observing others using these materials (Vygotsky 1956, p. 437, cited in Valsiner 1988, p. 148).

Task focus

A third problem, the task focus in instruction in the ZPD, includes the various views discussed earlier. One is that any task will do, as long as it is a challenge for the child. Others are that the ZPD is “performance capacity” or the structure of joint activity. These views focus on external characteristics of some instructional situation, not internal mental functions as Vygotsky defined them. They do not address the cognitive transformations essential for mastery of the higher mental functions. The issue of the transformations essential for cognitive development is discussed in the section entitled “*Levels of thinking.*”

Mental functions prior to school age

A fourth problem is the belief that the ZPD is relevant for young children in adult–child dyads. However, Vygotsky never discussed mother–child dyads or joint problem solving that emphasized the “steering role of the more experienced other in an intimate setting” (van der Veer and Valsiner 1994, p. 6). More important, intellectual imitation, the cognitive process that reveals the mental functions in the ZPD, is inconsistent with the level of mental activity in early childhood (1 to 3 years) and the preschool years. First, perception is the dominant process in the young child (Vygotsky 1934/1987b, p. 189). Because perception dominates memory, the child recognizes only concrete situations, and thinking is limited to re-establishing a connection in a visual situation (Vygotsky 1930–1931/1998d, p. 264). Second, when speech develops, words are primarily connected to concrete objects (Vygotsky 1930–1931/1998d, p. 279); verbal perception has simply replaced nonverbal perception (p. 280). Also, although speech does provide “active direction and spontaneous arousal to action of perception” (e.g., “I see,” “I’ll have a look,” p. 280), *this is the only self-directed form of the child’s internal activity* (emphasis added, p. 280).

The development of egocentric speech from about age three to school age means that *the child can solve a practical task with the help of not only eyes and hands, but also speech* (emphasis in the original; Vygotsky and Luria 1994, p. 109). An example is getting a piece of candy from the top of a cupboard (Levina 1981). However, there is a less than complete point-to-point correspondence of speech and action; they are objectively connected, but not consciously and purposefully connected to each other (Vygotsky 1982–1984/1998a, p. 118). In other words, the preschool age “is characterized by a syncretic combination of speech and practical action” (Vygotsky 1982–1984/1998a, p. 118).

Equally important in terms of intellectual development is that preschool children are in the *naively psychological* stage of thinking. They are not able to use cultural symbols (signs) to manage their memory and attention in tasks that could not be completed successfully through natural memory¹⁹ or involuntary attention (see Leont’ev 1959; Vygotsky and Luria 1994). Particularly important is that the preschool child has not developed the two “foundational” psychological functions essential for the development of higher mental functions—conscious awareness of and mastery of his or her memory and attention through symbols (Vygotsky 1934/1987b, p. 187).²⁰ Thus, the ZPD, which consists of emerging higher mental functions, is not an aspect of the child’s cognitive development until the school-age years (7 to 12).

Summary

Reviewing Vygotsky’s words indicates the following: (a) assisted problem solving under adult direction is important for determining a child’s ZPD because the child acquires human

¹⁹ The task in the memory experiments was to choose pictures to serve as recall cues for each of 15 words from a set of 30 pictures. However, the pictures were unrelated to the words; successful use as a recall cue required constructing a verbal structure that linked picture and word. Preschool children, although they attempted the task either (a) chose a picture but later recalled a different word or (b) searched for symbol that had a ready-made connection to the word to be remembered (Vygotsky and Luria 1994, p. 139). One preschooler chose notebooks for the word *study* but later recalled only the phrase “one goes to school” (Leont’ev 1959). Another chose a picture of a hatchet for the word *sun* because the picture contained a small red circle (Vygotsky and Luria 1994).

²⁰ Also of interest in that, in discussing various cognitive functions (processes), Vygotsky discussed practical intellect and the higher mental functions in separate sections with separate headings (Vygotsky 1987/1999; Vygotsky and Luria 1994).

characteristics by interacting with the ideal form of behavior, (b) addressing maturing functions is not restricted to the classroom but can occur whenever the learner stretches his or her thinking to apply higher cognitive functions, (c) simply engaging the child in a challenging task is insufficient for mental development, and (d) the intellectual imitation that occurs in the ZPD is not a capability of early childhood or the preschool child.

Education and Cognitive Development

Vygotsky (1930/1997g) defined education as “the artificial mastery of natural processes of development” that *restructures all the child’s mental functions* (emphasis added, p. 88) and is essential to the development of thinking. Therefore, he studied the child as a schoolboy (sic), in part because the child in the highest grade differs from the child in the lowest grade “*in the degree of mastery of his own behavior*” (emphasis added, p. 88). Vygotsky (1934/1987b) also agreed with Koffka that some instruction provides only a narrow skill, such as learning to type, whereas instruction that includes a new method of thinking contributes to changes in the general structure of consciousness (p. 188).²¹ Discussed in this section are the nature of cognitive development, the role of subject matter concepts, and levels of thinking.

The nature of cognitive development

Theories of cognitive development differ from theories of learning that primarily address the acquisition of particular skills or information. Cognitive development theories describe (a) outcomes that are advanced forms of thinking, (b) the internal transformations of intellectual processes that build toward advanced thinking, and (c) the conditions essential for the transformations (Gredler 2009). For example, Vygotsky (1966, 1977, 1960/1997a, 1960/1997d, 1930–1931/1998b) identified (a) the higher mental functions of voluntary attention, categorical perception, conceptual thinking, and logical memory as the outcomes of cognitive development and (b) the child’s interactions with adults (the “ideal” forms of behavior) as essential in that development (Vygotsky 1934/1994c, 1930–1931/1998e, 1982–1984/1997b, p. 248). Moreover, the adjectives *voluntary* and *logical* may be transposed, as in *logical attention* and *voluntary memory* (Vygotsky 1982–1984/1998a, p. 121) because the basis of both is the same—the formation of concepts which restructures thinking. Therefore, to say that attention becomes voluntary means that “it is organized and directed primarily by thought” (Vygotsky 1930–1931/1998a, p. 99; see also Vygotsky and Luria 1994).

Particularly important is that the internal transformations that build toward advanced thinking are dialectical, not incremental change. “Every subsequent stage in the development of behavior, on the one hand, negates the preceding stage, negates it in the sense that properties present in the first stage of behavior are removed, eliminated, and sometimes converted into an opposite higher stage” (Vygotsky 1960/1997e, p. 111). The outcomes of cognitive development “are not simply a continuation of elementary functions and are not their mechanical combination, but a qualitatively new mental formation” (Vygotsky 1998b, p. 35). For example, “ordered and comprehended perception, connected with thinking in words, is the complex product of a new synthesis in which visual

²¹ Leont’ev and Luria (1968) noted that “The nature and internal structure of man’s consciousness as the product of a social history became the basis for all of Vygotskii’s creative work” (p. 341; see also Vygotsky 1925/1997c).

impressions and processes of thinking are merged in a single alloy” (Vygotsky 1930–1931/1998a, p. 88). Vygotsky referred to this development as visual thinking in which word meaning that involves the perception of an object includes abstract thinking (this development differs qualitatively from the visual thinking of the child in which word meaning is simply a group of “concrete objects connected by a factual tie”; p. 89).

The role of subject matter concepts

The outcomes of cognitive development are the higher mental functions which represent the highest level of the mastery of one’s thinking. The basis for developing this capability is the mastery of subject matter concepts which requires thinking at the level of “true” or complete concepts (Vygotsky 1930–1931/1998b, 1934/1987b, 1931/1994b). Discussed in this section are Vygotsky’s psychological definition of concepts, relationship to cognitive development, and concept mastery and logical thinking.

A psychological definition Other theorists have treated a concept in terms of its external, easily observable characteristics—as a category for objects and events with a set of defining attributes. In contrast, Vygotsky defined the term psychologically by identifying the internal cognitive processes reflected in one’s thinking at the level of concepts. He noted that

a real concept is an image of an objective thing in all its complexity. Only when we recognize the thing in all its connections and relations [with other concepts], only when this diversity is synthesized in a word, in an integral image through a multitude of determinations do we develop a concept (Vygotsky, 1930–1931/1998b, p. 53).

In other words, “the logical concept, that is, the simultaneous sum total of traits . . . is a fiction” (p. 55). Instead, the concept is a process—“an aggregate of acts of judgment, apperception, interpretation, and recognition” (p. 55) united in a particular psychological structure (p. 56). Therefore, we must seek the concept in the “system of judgments in which the concept is disclosed” (p. 55). This system of judgments includes hierarchical relationships between subject matter concepts²² (Vygotsky 1930–1931/1998b, 1934/1987b, 1935/1994a), and forming true concepts (Vygotsky 1934/1987b, p. 229) involves the totality of the relations of the concept to others in the system (Vygotsky 1982–1984/1997f, p. 100). An example is *bacteria*—one-celled *microorganisms* (superordinate concept) in one of three shapes (*cocci*, *bacilli*, *spirilla* [subconcepts]). Those that are *pathogens* (related concept) are less than 1%, causing *diseases* such as *streptococcus*, *staphylococcus*, *tuberculosis*, and others (subconcepts), and they differ from *viruses* (parallel concept).

Relationship to cognitive development Consistent with the above description, Vygotsky (1935/1994a) rejected the idea that the child simply acquires subject matter concepts in finished form, directly adopted from the adult realm of thinking (pp. 355–356). “The concept does not emerge in the child’s mind like a pea in a sack” (Vygotsky 1934/1987b, p. 224). The mental processes involved in developing complete concepts (i.e., conceptual thinking) are abstracting, synthesizing, comparing, and differentiating, and they are the very

²² The psychological nature of academic concepts differs from the everyday or spontaneous concepts the child learns through his or her daily experience, e.g., table, flower, dog. These spontaneous or everyday concepts do not form a system; they have only empirical connections to the objects they represent (Vygotsky 1934/1987b).

processes essential to the development of the other higher mental functions of voluntary attention, categorical perception, and logical memory. Specifically, memory, perception, and attention are (a) “an internally connected system” (Vygotsky 1930–1931/1998a, p. 121) and (b) evolution of the system is “derived from the central leading function, the function of forming concepts” (p. 121).

Concept mastery and logical thinking A key aspect of Vygotsky’s dialectical thinking is his conception of the relationship between form and content. Briefly, he viewed them as indivisible; they develop together such that advances in content are also marked by changes in the form of thinking (Vygotsky 1930–1931/1998b). In other words, subject matter concepts (content) and new ways of thinking (form) are a dialectical unity (Vygotsky 1931/1994b, p. 194; 1930–1931/1998b, p. 57). This unity means that any new step forward in developing the content is “inextricably linked” to acquiring new behavioral mechanisms and “raising intellectual operations to a higher stage” (Vygotsky 1931/1994b, p. 193; 1930–1931/1998b, p. 34) (key levels of thinking in relation to concepts are discussed in the following section.)

For Vygotsky, accepting the concept as “a certain system of judgments” means agreeing that “the unified activity in which a concept is disclosed, the unified sphere of the manifestation of the system, is logical thinking” (Vygotsky 1930–1931/1998b, p. 57). Logical thinking “is not added to concepts as something standing above them and developing after them—it is the concepts themselves in their action, in their functioning”; logical thinking can be defined as “a concept in action” (p. 57). In the earlier example, logical thinking includes abstracting and synthesizing the attributes of bacteria, including the shapes, situating the concept in microorganisms, and differentiating it from viruses.

Levels of thinking

Discussed in this section are the thinking of the school-age child and the adolescent in relation to developing concepts.

The thinking of the school-age child By age 6 (school age), the child can accurately select examples of concrete concepts such as *triangle*. This level of thinking, referred to as thinking in *pseudoconcepts* (see Vygotsky 1934/1987a, pp. 142–146) is so named because the child is not yet able to abstract and synthesize the concept attributes. As already stated, the child simply groups concrete objects together on the basis of “a factual tie” (Vygotsky 1930–1931/1998a, p. 89).

During the elementary school years, the qualitative change in the child’s thinking is that, through instruction, he or she can construct *preconcepts*. Briefly, a preconcept is a limited understanding of a true concept or a special case of a true concept (see Vygotsky 1934/1987b, p. 230). For example, in a study by Shif, third graders were asked about the life of landowners under serfdom. They answered that the landowners were rich, had ten-story houses, many rooms, and electricity (p. 218). Their conscious awareness of the material was “qualitatively different than that of adults” (p. 218).

Despite the development of preconcepts, which is an advance beyond pseudoconcepts, the child’s thinking is limited in two ways. One is that children answer questions intended to require thinking by recalling concrete examples or concrete situations (Vygotsky 1930–1931/1998b, p. 93). The school child’s definition of a concept is “to a large degree a product of recollection” (Vygotsky 1930–1931/1998a, p. 95). In Alfred Binet’s experiments, for example, school children responded to the general question “What is a snail?” with

statements such as “It eats lettuce, they crush it so it won’t eat in the garden” (p. 96)— a reflection of experience with the family garden. The child is consciously aware of only a limited meaning of the concept.

The second limitation in thinking is that the child lacks an adequate understanding of his or her thought processes and, therefore, cannot fully master them (Vygotsky 1930–1931/1998b, p. 40). “The child does not take account of them, he does not react to them and often he does not control them. They flow with him just as actions flowed previously, that is, in a purely reactive way” (Vygotsky 1982–1984/1997b, p. 250). This lack of conscious awareness of one’s thinking is critical for cognitive development because “the underdevelopment of logical thinking consists of the child not being conscious of his or her own process of thinking” (Vygotsky 1930–1931/1998b, p. 72), and it persists until about the age of twelve (Vygotsky 1934/1987b, p. 182; 1982–1984/1997b, p. 251; 1930–1931/1998b, pp. 80–81).

The thinking of the adolescent The major shift in intellect that occurs during adolescence is that the mental functions of memory and thinking are inverted. For the school child, thinking means to rely on memory to a significant degree. However, for the adolescent “to remember is to think” (Vygotsky 1982–1984/1997f, pp. 98–99; 1930–1931/1998a, pp. 96, 121). To remember means to search for needed information in a certain logical order (Vygotsky 1982–1984/1997f, p. 99). The adolescent’s recall of particular concepts “directly reflect[s] the individual’s analysis and systematic organization of material” (Vygotsky 1930–1931/1998a, p. 98). Stated another way, if the word represents a family of things for the school-age child, then for the adolescent, the word represents the essence of things. The learner “easily defines the concept, applies it in various logical operations, and identifies its relationships with other concepts” (Vygotsky 1934/1987b, p. 218).²³

This shift in the relationship between memory and thinking depends on the adolescent developing a “higher form of intellectual activity—to thinking in concepts” (Vygotsky 1930–1931/1998b, p. 38). However, this capability is “a young and unstable acquisition of the intellect” and will not become a dominant intellectual function until the very end of adolescence (p. 51).

Forming true concepts in adolescence also “is the principal and central link in all the changes that occur in adolescence” (Vygotsky, 1930–1931/1998b, p. 81). One reason is that “cognition in the true sense of that word, science, art, [and] various spheres of cultural life may be adequately assimilated only in concepts” (Vygotsky 1930–1931/1998b, p. 42). For the first time, the adolescent understands reality, understands others, and understands him or herself (p. 49).

Implications for Educational Practice

The detailed understandings provided by Vygotsky’s theory of cognitive development have implications for educational practice on at least three levels. They are (a) serving as a template for rethinking current classroom practices, (b) providing a supporting rationale for expressed concerns about current curricula, and (c) constructing and reviewing curricula.

²³ Vygotsky (1930–1931/1998b) chastised those psychologists who described adolescence, for example, as consisting of only the “simple growth of the intellect . . . thinking becomes stronger and firmer” . . . but no new intellectual operation appears (p. 30). Moreover, “their view that only the content of the adolescent’s thinking undergoes major changes is a relationship” that “resemble[s] the relation between a vessel and the liquid that fills it” (p. 33) and leads to much “theoretical blundering” (p. 34).

Rethinking classroom practices

Implementing Vygotsky's principles in rethinking current classroom practices can be useful at a time when international assessments indicate less than stellar performance by US students. Two such practices are assessing students' ZPDs and collaborative learning in the classroom.

Assessing students' ZPDs The purpose of assessing ZPDs, according to Vygotsky (1930–1931/1998e), is to identify maturing intellectual functions (p. 202). The assessment goal is to externalize the learner's internal cognitive processes. In the context of a Vygotskian curriculum, assessments in the ZPD would address the cognitive processes essential in mastering subject matter concepts. They are (a) the student's level of cognitive awareness of his or her own mental processes, (b) the learner's capability in establishing vertical relationships among concepts (levels of generality), (c) the level of the student's concept mastery (e.g., pseudoconcepts or preconcepts), and (d) proficiency in such mental functions as constructing relationships among concepts. Determining whether these capabilities are about to mature is important because both the school-age child and the adolescent perceive a system of connections behind the word, but the actual system of each is very different (Vygotsky 1930–1931/1998a, p. 90).

Vygotsky identified two cognitive processes that are important in any classroom approach intended to developing thinking. They are the extent of the student's (a) conscious awareness of his or her own thinking and (b) understanding of the psychological nature of the task. For example, in the Vygotskian experiments on memory and attention, young children erroneously thought they could rely on their natural (unmediated) capabilities which were insufficient for the task. Preschoolers knew the available aids (pictures and colored cards, respectively) should be used in the task, but they could not make them work (Vygotsky 1981–1984/1997h, p. 183; see Vygotsky and Luria 1994). The children lacked a psychological understanding of the tasks.

Collaborative learning in the classroom At times, collaborative learning among students in the classroom may be important for reasons such as building teamwork. However, facilitating cognitive development requires teacher–student interactions. The focus of these interactions depends on the information generated in assessing the student's ZPD. That is, these interactions may address the student's construction of preconcepts, awareness of his or her cognitive processes, or emerging capability to establish vertical relationships among concepts. Regardless of the focus, the teacher, working with the student, “explains, informs, inquires, corrects, and forces the child to explain” (Vygotsky 1934/1987b, p. 216).

Particularly important is that the teacher should not attempt a direct communication of concepts from his or her head to the head of the student. This practice is “educationally fruitless” (Vygotsky 1935/1994a, p. 356). The result is a “meaningless acquisition of words” and “mere verbalization” that actually hides a vacuum (p. 356).

Providing a supporting rationale for concerns about school curricula

Discussed in this section are the proliferation of content standards and the pressure to teach content at lower grade levels.

Proliferation of content requirements Content standards in different subject areas in K–12 grades are expectations for student achievement that are developed by organizations such as

National Council of Teachers of English as well as by states and school districts. More than a decade ago, Marzano and Kendall (1998) reported that an analysis of 116 documents indicated 200 separate standards that addressed 3,093 particular topics (typically referred to as benchmarks; p. 3) that far exceed the time available for instruction. Moreover, the topics in math and science texts in the USA far outnumber the topics internationally at the grade levels analyzed (Schmidt *et al.* 1996, p. 6).

Gallagher (2010) identified the proliferation of state standards as leading to only shallow thinking because (a) they are assessed on the state tests and (b) teachers know they are judged by student performance. The teachers “sprint and cover” to address at a surface level as much of the content as possible. Examples of two of the standards from a longer list in tenth grade US history are “Relate the moral and ethical principles in ancient Greek and Roman philosophy, in Judaism, and in Christianity to the development of Western political thought” and “Compare and contrast the Glorious Revolution of England, the American Revolution, and the French Revolution and their enduring effects worldwide on the political expectations for self-government and individual liberty” (p. 36). Gallagher (2010) also noted that addressing all the standards for meaningful understanding would require a K–22 educational system rather than K–12, a conclusion reached by Marzano and Kendall some 14 years earlier.

Vygotsky’s perspective clearly supports the inference of shallow thinking in relation to content-loaded curricula. One reason for this problem is the reduced opportunity to develop the higher mental functions. At school age, the child can demonstrate thinking at the level of pseudoconcepts (identifying examples of concrete, observable concepts), but cannot yet abstract and synthesize defining concept attributes. The child is also ready for the first step in developing conceptual thinking—the development of preconcepts because, at school age, he or she has “comparatively mature forms of attention and memory at his [her] disposal” (Vygotsky 1934/1987b, p. 189). However, given the extent of content addressed in subject area standards, the child’s efforts will focus on remembering as much as he or she can. This means that the prerequisites for subsequently developing the inverted relationship between memory and thinking in adolescence (i.e., preconcepts) are not in place and the higher mental functions do not have the opportunity to develop.

Pressure to teach content at lower levels Stipek (2006) expressed concern about the pressures felt by preschools to teach academic skills because of the No Child Left Behind legislation. The pressure is related to the belief of policy makers that an early start on teaching academic skills can help children meet the standards set for elementary school (p. 455). Language arts standards, for example, encompass five areas for all grades, including reading, writing, and written and oral English language conventions. Kindergarten children in one state are expected to meet 35 standards including reading simple one-syllable and high-frequency words and identifying and sorting words in basic categories (e.g., colors, shapes, and foods; California Department of Education, June 2009). Mathematics standards developed by the National Council of Teachers of Mathematics (NCTM) consist of six areas for all grades with a total of 45 content standards in kindergarten through grade 2 in the five areas. Two examples are “represent data using concrete objects, pictures, and graphs” (data analysis and probability) and “understand and represent commonly used fractions such as $1/4$, $1/3$, and $1/2$ ” (National Council of Teachers of Mathematics 2011).

Applying Vygotsky’s conceptual framework to curriculum standards generates four major concerns. First, the concepts around which preconcepts and true conceptual thinking

are to develop are not identified. Second, the cognitive processes (mental functions in Vygotsky's terminology) represented by verbs in the standards are not clear (e.g., *identify and produce, recognize and use, create and state* (California Department of Education, June 2009); *recognize and use, understand, describe, work flexibly with, develop fluency with, and model situations* (National Council of Teachers of Mathematics 2011)).

Third, “vertical movement involving . . . relationships of generality between concepts is generally inaccessible to the child” (emphasis in the original, Vygotsky 1934/1987b, pp. 225–226). Yet, the NCTM standards introduce simple fractions in kindergarten which require an understanding of part-whole relationships. Fourth, pre-K–2 standards in mathematics and other subjects, such as “analyze how both repeating and growing patterns are generated,” are questionable because the child (a) is only beginning to develop preconcepts, (b) answers questions intended to require thinking by recalling specific examples or concrete situations, and (c) lacks an understanding of his or her own thought processes. That is, the intellectual process “analyze” is not under the child's self-direction at this age.

Constructing curricula

In a discussion of Vygotsky's view of external and internal regulation, Gredler (2009) suggested three general steps in curriculum design. First is to (a) reduce the number of terms in curriculum materials and textbooks by eliminating those that are not addressed as concepts and (b) place the remaining concepts into a network that reflects their hierarchical and parallel relationships. Second is to identify two general “benchmark goals” at the middle and high school levels. Middle school students should abstract, compare, and differentiate various characteristics of concepts and begin to develop relationships among them. At the high school level, the curriculum focuses on developing the series of judgments that characterize the relationships among concepts. The third step in curriculum design is to use the concept network as a guide to review curriculum materials and make needed adjustments (pp. 14–15).

The above process, while logical, does not take into account the content standards established for different subject areas. Reducing the number of terms in the curriculum must contend with those standards because they represent current priorities for curricula. A related issue is that content is often organized according to an identified logic in the subject area, not from the psychological perspective of learning. An example is *mercantilism*, a term typically introduced in middle school. Historical periods are addressed in chronological sequence; mercantilism is introduced in the period following the decline of feudalism and the emergence of colonialism—a logical placement in terms of a chronological sequence.

In contrast, a Vygotskian approach that can make a stronger case for replacing existing curriculum standards would begin with the identification of key concepts that function as unifying threads in the subject. That is, the concepts can be learned first at the preconcept level and then expanded to the level of complete conceptual thinking. This approach avoids the fragmentation of content in the present curriculum standards. In economic history, for example, such a key concept is *trade*. Consistent with Vygotsky's (1934/1987b, p. 218) view that learning subject matter concepts begins with the verbal definition, the study of trade would likely begin with “the buying and selling of commodities or the bartering of goods” (Webster's New World College Dictionary 1997, p. 1417). From this beginning, trade can be expanded to various forms, including free trade zones. Advantages of this approach to curriculum are (a) a functional understanding of important concepts such as

imports, exports, and tariffs in terms of how their implementation has changed in various forms of trade and (b) the opportunity to learn the varying impact of concepts such as *embargo* and *blockade* in conflicts among nations. In other words, this approach has the potential to develop students' thinking about historical trends as well as economic concepts.

Conclusions

As Valsiner (1988) indicated, the widespread popularity of fragments of an idea often means that the theorist's orienting framework is missing. In Vygotsky's case, this idea was an incomplete view of the ZPD. In implementing the ZPD, psychologists, educators, and others supplemented gaps in the information with their own thinking. To borrow a phrase from Piaget, fragments of an idea were assimilated into existing schemas. As already discussed, the ZPD became known as a collaborative activity between students or with an adult-child dyad on any task that challenged the student(s).

As to the central question, is it too late to understand Vygotsky for the classroom? The answer depends on the particular use to be made of his thinking. In terms of constructing/reviewing curricula, Vygotsky's cognitive development framework is both internally consistent and fulfills the functions of theory identified by Suppes (1974). The framework consists of (a) higher mental functions identified as the outcomes of cognitive development, (b) the role of systems of concepts and the associated levels of thinking in cognitive development, and (c) identification of conceptual thinking (concept mastery) as logical thinking. Vygotsky's perspective also fulfills the function of theory of providing an organizing framework for specific items of information. An example is explaining the school child's limited understanding of abstract concepts. Vygotsky's theory also reveals the complexity of apparently simple events by indicating, for example, the different levels of thinking that stand behind the identification of examples of concrete concepts by children and adults. In addition, his analysis of concept development provides a foundation for curriculum to stimulate the intellect, an essential requirement for addressing cognition in adolescence.

Practically speaking, answering the question of implementing Vygotsky's perspective at the level of curriculum construction is difficult. His perspective requires (a) replacing the tacit assumption about the educational process from a goal of focusing on content to restructuring the learner's mental functions and (b) analyzing concepts in the curriculum in a new way. These requirements suggest that curriculum reconstruction according to Vygotsky's thinking is not feasible at present.

Nevertheless, Vygotsky's thinking can play an important role in (a) further discussions and implementations of the ZPD and (b) analyses of the processes students implement to deal with content-loaded curricula. In the former role, pre-service and in-service education can extend the current view of the ZPD to that of cognitive development and the role of the teacher in that focus. Assessment in the ZPD can then address the student's level of cognitive awareness of his or her mental processes, level of concept mastery, and the mental processes of abstracting, synthesizing, comparing, and differentiating attributes of concepts.

Finally, Vygotsky's levels of thinking and his description of logical thinking can be applied as a template against which students' thinking in relation to curriculum content can be compared. This is a first step in emphasizing higher cognitive functions in the curriculum. Although these steps do not address curriculum construction, they are more realistic in terms of feasibility. As Vygotsky (1960/1997j) himself noted, "It is easier to assimilate a thousand new facts in any field than to assimilate a new point of view of a few already known facts" (p. 1).

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