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ABSTRACT

This review critiques the use of Lev Vygotsky's concept of the zone of proximal development (ZPD) in quantitative research that focuses on the role communication plays in learning. A study that makes claims in terms of the ZPD should include a pretest, a problem-solving activity, and a posttest. Without these minimal elements, researchers are not working specifically with the ZPD. This review explores research on the ZPD and evaluates how closely each study approximates the necessary elements. It was found that only 3 of the 15 studies analyzed include all of the elements necessary to make claims in relation to the ZPD. This review does not aim to nullify some studies and applaud others; rather, it aims to highlight work that uses the ZPD as a means of interpreting experimental results. What some researchers do not realize is that Vygotsky had some very specific guidelines in mind when he introduced the idea of ZPD. Contains 24 references. (Author/TB)

The use of Vygotsky's theory of the zone of proximal development in quantitative research: A critical review

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Abstract

This review critiques the use of Vygotsky's concept of the zone of proximal development in quantitative research that focuses on the role communication plays in learning. A study that makes claims in terms of the ZPD should include a pre-test, a problem-solving activity, and a posttest. Without these minimal elements, researchers are not working specifically with the ZPD. This review explores research on the ZPD and evaluates how closely each study approximates the necessry elements. It was found that only three of the 15 studies analyzed include all of the elements necessary to make claims in relation to the ZPD.

Introduction

Vygotsky's ideas have been of interest to American researchers since the posthumous publication of his book, *Thought and Language*, in 1962, and the past few years have seen intensified interest in his work among developmental psychologists in particular (Henderson, 1986, p. 406). This heightened interest in the Soviet educational psychologist and his theoretical work has had a significant impact on research focusing on the intersection between communicative interaction and learning conducted in the United States and abroad.

One of Vygotsky's most widely embraced concepts is the "zone of proximal development". In fact, the zone of proximal development (or ZPD) seems to crop up in many types of research studies. Vygotsky's ZPD is, indeed, a revolutionary theory of learning and has far-reaching implications for the instructional communication and educational fields. It is fortunate that Vygotsky's work was published posthumously and his writing has had such an extensive effect. It is unfortunate, however, that his name has become a name to "drop", and as a result, well-intentioned, but incorrect use of the theoretical framework of the ZPD to analyze experimental data has taken place. As Griffin & Cole (1984) point out:

> "Translation from one conceptual system to another is always a risky business. When the translation crosses cultural boundaries, the risks are even greater (p. 45)."

The risk incurred in haphazardly inserting Vygotsky's ZPD into research on communication and learning, is ending up with

misinterpreted results. There is much that can and should be done to explore the ZPD and its implications, but using the term as a unit of analysis without remaining true to Vygotsky's intentions does more harm than good. What were Vygotsky's intentions when he coined the term "zone of proximal development"? In his seminal work, *Mind and Society*, Vygotsky introduces the zone of proximal development as he reports:

> "When it was first shown that the capability of children with equal levels of mental development to learn under a teacher's guidance varied to a high degree, it became apparent that those children were not mentally the same age and that the subsequent course of their learning would obviously be different. This difference between twelve and eight, or between nine and eight, is what we call *the zone of proximal development. It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers* (Vygotsky, 1978, p. 86)."

Vygotsky addresses the role that communication and imitation play in developmental learning. Imitation and learning are not purely mechanical processes, because it has been shown that a person can only imitate that which is within her developmental level (Vygotsky, p. 88). He further explains:

> "Children can imitate a variety of actions that go well beyond the limits of their own capabilities. Using imitation, children are capable of doing much more in collective activity or under the guidance of adults (p. 88)."

In practice, an expert, usually an adult, guides the behaviors of the child novice in a joint activity, directing decisions concerning the tasks that the child performs (Ratner, 1991, p. 1). This direction comes predominantly in the form of communicative interaction between the two. As time goes on, the decision making

involved in the task comes to be shared between the expert and the child. If the guidance is effective, the child should eventually be able to regulate his or her own activity in the task (Ratner, p. 1-2).

Rogoff, Mosier, Mistry, & Goncu (1989) contrast Vygotsky's ZPD with other theories of development. Most developmental theories focus on the individual and the social or the cultural context as separate entities, adding or multiplying one or the other (p. 211). Vygotsky's sociohistorical approach is distinct because it assumes that individual development cannot be fully understood unless the communicative elements of the social context are taken into account:

> "Vygotsky stressed that cognitive development involves children internalizing skilled approaches from their participation in joint problem solving with more skilled partners, who bring the intellectual tools of society within the reach of children in the 'zone of proximal development' (p. 211)."

According to Rogoff, et al., when many researchers examine the zone of proximal development as interaction between children and their social partners, the analysis is incomplete (p. 211). These researchers fail to consider the societal basis of the problem solving task.

Wertsch (1984) has warned against incorrect use of the ZPD construct. Failure to fully understand this construct raises the risk that it will be used loosely and indiscriminately, thereby becoming so amorphous that it loses all explanatory power (p. 7). Wertsch explains that researchers often believe change in the zone

of proximal development is a steady accretion of knowledge about a task. This assumption is more than often incorrect, because:

> "...it is essential to understand that major portions of this change occur through a shift in one's basic understanding of what the objects and events in a setting are (p. 11)."

In other words, developmental change in the ZPD is not always a gradual maturation of intellect -- it can often occur through a dramatic shift in understanding of the task.

Cazden (1980) also points out that there is a distinct difference between the potential zone of development and the proximal zone of development. Every child has potential to do something at some future time. But proximal refers to what the child can do now with assistance and should be able to do soon on his/her own. Instruction in this zone leads development by aiming at the "ripening" function; by being just a little ahead, not out of sight (p. 198).

Objectives

The purpose of this review is to critique the use of the concept of the ZPD in current quantitative research that focuses on the role communication plays in learning. This review is limited to quantitative work which has appeared in scholarly publications. The predominant focus is on American journals, since it is the importation of Vygotsky's ZPD into U.S. research that appears to be most problematic. The following review is not meta-analytical. It seems futile to analyze results if those results were achieved through misguided testing procedures. This review, instead, looks at the conceptual foundation that researchers lay when they develop

a quantitative study that proposes to use the ZPD as an experimental construct.

As researchers continue to jump on the "Vygotsky bandwagon", it becomes imperative to sort through the theoretical frameworks they adopt and see how closely they approximate Vygotsky's intentions. In order to critique the use of the ZPD in quantitative research it would be helpful to outline what elements an experimental study should contain to achieve results that can be meaningfully interpreted in terms of the ZPD.

A study that purports to look at learning as a communicative process, in the manner of Vygotsky's ZPD, should contain the following minimal elements to be meaningful -- for the data to be interpretable in terms of the ZPD:

1. Participants in the study should be given a pretest to determine their existing capabilities prior to working with an adult or older child. Ideally, the pretest should mirror the problem-solving activity students will work on later with the adult or older peer so that a baseline developmental level on the task can be recorded.

2. When the children and adults (or older peers) work together on the experimental activity, there should be a clear goal to the activity. The partners should be trying to solve a problem together and not interacting for merely social purposes. There should be a definite direction outlined for the activity portion of the study. A record should be made of achievement gains at the end of the task.

3. A posttest should be administered to students alone following the activity portion. This part of the experiment is necessary to evaluate the child's new level of achievement on the problem at hand in comparison to the baseline level. Ideally, the posttest should focus on the same type of problem the partners or groups tried to solve earlier.

Any study that claims to utilize the ZPD in its analysis and does not minimally adhere to the above elements, may be reporting

meaningless results. For example, how can gains through the ZPD be measured if both pretests and posttests are not used in combination? Also, how can we expect to see a change in a child's maturity level on a task if the problem-solving portion of the experiment is loose and open-ended? If the adult is not aware that he/she should be modeling cognitive processes through communication with the child, how can we be sure that the child and adult are working on the task in a goal-oriented way?

What this review proposes to do is to look at existing quantitative research on the ZPD and to evaluate how closely each study approximates the three major elements mentioned above. The review will categorize these studies by the elements they do or do not include. It is hoped that through this process of critique, it becomes more apparent that there is a gap between researchers that are legitimately using the ZPD according to its intended purpose, and those researchers who are merely using the ZPD in their work because ZPD has gained considerable attention as a "catchword" in education-oriented research.

Review Search Procedures

To gather data for this critical review, a computer search of relevant abstracting services was conducted to approximate all publicly available research (Cooper, 1982). Because Vygotsky's ideas have infiltrated the areas of communication, education, psychology, and sociology, it was important to search the prominent abstracting services in all of these fields to achieve the best representation of published research utilizing the zone of proximal

development. A computer search was made of ERIC (1966 to September, 1991), PsycLIT (1974 to September, 1991), and sociofile (1974 to August, 1991).

The search was limited to published journal articles that were highlighted through the abstracting services and were either originally written in English or translated into English. Only experimental studies that claimed to be using Vygotsky's concept of the ZPD as a framework for analyzing data were included. Although some studies reviewed did not bring discussion of the ZPD in until later portions of the analysis, claims were made that the results could be interpreted in terms of Vygotsky's ZPD. These claims were significant enough to include those studies in the review as well. Review pieces and qualitative studies were excluded from the search. Fourteen articles that met the above criteria were targeted for analysis. One of the articles discussed results of two distinct portions of one study and, therefore, will be treated as two separate studies. Fifteen studies, in total, were reviewed.

Categorization of Research Reviewed

The fifteen studies highlighted by the computer search were categorized according to the presence or absence of the three essential elements discussed earlier. Studies that included a pretest; a guided, goal-oriented activity session; and a posttest were noted. Also noted were studies missing any combination of one or more of the elements. A total of eight categories were developed: 1) all three elements present in study; 2) pretest missing from study; 3) guided practice session missing; 4) posttest

missing; 5) pretest and guided practice missing; 6) pretest and posttest missing; 7) guided practice and posttest missing; 8) pretest, guided practice, and posttest missing. The following table summarizes the results of the categorization:

Categorization of Articles by Elements Present and Absent

I. All Three Elements Present

Salomon, Globerson & Guterman (1989), "The computer as a zone of proximal development: Internalizing reading-related metacognitions from a reading partner"

Diaz, Neal & Vachio (1991), "Maternal teaching in the zone of proximal development: A comparison of low- and high-risk dyads"

Moore, Mullis & Mullis (1986), "Examining metamemory within the context of parent-child interactions"

II. No Pretest

McNaughton & Leyland (1990), "The shifting focus of maternal tutoring across difficulty levels on a problem-solving task"

III. No Directed Problem-solving Task

(No studies)

IV. No Posttest

Pellegrini, Brody & Sigel (1985), "Parents' teaching strategies with their children: The effects of parental and child status variables"

Braun, Rennie & Gordon (1987), "An examination of contexts for reading assessment"

Moss (1990), "Social interaction and metacognitive development in gifted preschoolers"

Henderson (1984), "Social support and exploration"

V. No Pretest and No Directed Problem-solving Task

(No studies)

VI. No Pretest and No Posttest

Pellegrini, McGillicuddy-DeLisi, Sigel & Brody (1986), "The effect of children's communicative status and task on parents' teaching strategies"

VII. No Directed Problem-solving Task and No Posttest

Pellegrini, Perlmutter, Galda & Brody (1990), "Joint reading between Black Head Start children and their mothers"

Pellegrini, Brody & Sigel (1985), "Parents' book-reading habits with their children"

Henderson (1991), "Describing parent-child interaction during exploration: Situation definitions and negotiations"

Henderson (1984), "Parents and exploration: The effect of context on individual differences in exploratory behavior (Study #1)"

Henderson (1984), "Parents and exploration: The effect of context on individual differences in exploratory behavior (Study #2)"

VIII. No Pretest, No Directed Problem-solving Task, and No Posttest

Vandell & Wilson (1987), "Infants' interactions with mother, sibling, and peer: Contrasts and relations between interaction systems"

Summarization and Critique of Research

All Three Elements Present

Salomon, Globerson, & Guterman (1989), "The computer as a zone of proximal development: Internalizing reading-related metacognitions from a reading partner" This study was designed to test the general hypothesis that intellectual partnership with a reading-related computer tool leads to the internalization of the computer guidance. This guidance, in turn, should facilitate better text comprehension and writing ability (Salomon, Globerson, & Guterman, 1989, p. 625). Seventh-graders were pretested with a test of reading comprehension 2 weeks before the onset of the study. At that time, language and math grades were also obtained from the school records (p. 622). A computerized Reading Partner

presented reading principles and metacognitivelike questions during the subjects' reading of 11 texts over three reading sessions. It was compared with one version that presented the texts with factual and inferential questions and a control version that presented only the texts (p. 620). Posttesting was carried out in two stages. The first stage was conducted 10 days after termination of the reading session. Subjects received selected metacognitive reconstruction tasks and the second version of the reading comprehension test. The second stage was conducted one month after termination of the reading sessions. Subjects were given an essay writing task. The study's hypotheses were supported, which suggests that a computer tool can serve as a "more capable peer" in a learner's zone of proximal development and can thus facilitate the development of competency (p. 620).

Diaz, Neal, & Vachio (1991), "Maternal teaching in the zone of proximal development: A comparison of low- and high-risk dyads" This study was designed to gain a clearer understanding of the dynamic processes that occur when mothers teach within the ZPD (Diaz, Neal, & Vachio, 1989, p. 84). Fifty-one three-year-olds were randomly assigned to one of two groups. One group worked on a selective attention task which required the child to find the particular dimension, shape or color, that makes two objects alike (p. 90-91). The other group worked on a task which required the sequencing of cards into a story (p. 91). Prior to each child's beginning either task, the experimenter briefly showed the child how to "play the game" with two examples. The child then was asked

to work on the task independently to obtain baseline performance data. After the child completed the independent task, the child's mother was asked to teach the child a similar, but different task. The mother was shown how to complete the task and was instructed to assist their child with the task in a way that the child could do the task alone later. A third session was also included. In this last session, the child worked again by him/herself with the original set of cards.

Moore, Mullis, & Mullis (1986), "Examining metamemory within the context of parent-child interactions" Based on Vygotsky's zone of proximal development, it was proposed that children acquire more sophisticated cognitive skills through social interaction (Moore, Mullis, & Mullis, 1986, p. 39). The Peabody Picture Vocabulary test was administered as a pretest to each 9- and 10-year-old child. A structured block-design task was used to elicit verbal and non-verbal problem-solving strategies from children and their parents during dyadic interactions (p. 39).

Prior to beginning the tasks, parents and children acknowledged whether the block design to be used in the task was unfamiliar to them. This was done to ensure that both parent and child would approach the task on equal footing (p. 41). Following a brief introduction, the parent was presented with a 16-block design and was told to instruct the child in completing the design. On completion of the problem-solving task, children were administered the picture vocabulary test again to obtain a measure of their verbal ability. This testing procedure was conducted twice, with

tests occurring approximately one year apart. Analysis of videotaped data recorded in the families' homes during the sessions support the Vygotskian view that children acquire more sophisticated cognitive skills through social interaction.

No Pretest

McNaughton & Leyland (1990), "The shifting focus of maternal tutoring across different difficulty levels on a problem-solving task" This study extends research into maternal tutoring which employs concepts of a "zone of proximal development" and "scaffolding" (McNaughton & Leyland, 1990, p. 147). It examines the effects of different difficulty levels of a jigsaw task on mothers' tutoring sessions with their 3-year-old children. A set of 18 jigsaw puzzles comprising three puzzles at six levels of difficulty was created. A two-stage procedure was used to develop the levels (p. 149). The study reports specific difficulty levels for each child were determined, but it is not explained how these levels were determined. For this reason, it is included in the category of not providing a pretest, because it is likely that the difficulty levels were set based on more general data (e.g., child's age). Two observation sessions occurred, one week apart. During the first session the mothers were asked to work through the graded puzzles, making sure they did an unfamiliar puzzle at each level. They were told to keep the child on-task during the session. They were also encouraged to give assistance where needed. In the second session the mothers brought their children to an observer who had been present but impassive in the first

session. They left and the observer asked the child to work through the same set of puzzles but choosing unfamiliar ones (p. 149). If necessary, prompts were given to get the task going, but help was given from that point on. Non-contingent feedback and encouragement was provided. On the second (independent) session the highest level at which a child could complete a puzzle successfully was obtained (p. 150). This zero level was used to define the lower bound of the zone of proximal development for the collaborative sessions. The upper bound obtained from the first (collaborative) session was defined as the highest level at which a puzzle was completed and the mother placed fewer than 50 per cent of the puzzle pieces (p. 150). As McNaughton and Leyland point out, with this type of design some care should be exercised in interpreting findings. Since children participated in an independent session only after a collaborative session, a sequence effect may have operated introducing unknown effects on the calculation of the difficulty level (p. 153).

No Posttest

Pellegrini, Brody, & Sigel (1985), "Parents' teaching strategies with their children: The effects of parental and child status variables" The intent of the study was to examine the effects of parental (mother and father) and child (gender and communicative status) features on the teaching strategies used by parents on a paper-folding task (Pellegrini, Brody, & Sigel, 1985, p. 509). The Weschler Preschool and Primary Scales of Intelligence (WPPSI), was used administered prior to the study to match children

for intelligence in this study. Each child worked on an origami task with his/her parent. The parent was told to teach the child to make a boat or airplane by folding the paper. The child-parent interaction was videotaped and analyzed. According to the authors, this research was guided by Vygotskian theory, which suggests that adults talk to and teach children according to children's level of competence (p. 518). However, without a posttest of the child's independent work on the activity, it becomes difficult to know what effects the adult guidance during the paper-folding sessions had on increasing the child's task competence.

Braun, Rennie, & Gordon (1987), "An examination of contexts for reading assessment" In this study, fifth-grade children were tested in three varying contexts to determine the effects of adult support and regulation on their ability to read words in isolation and to read connected discourse (Braun, Rennie, & Gordon, 1987, p. 283). The children used as subjects in the study were judged by their teachers to be the lowest readers in the class. Comprehension scores on the Canadian Gates McGinitie Reading Test (Level D) ranged between grades 3.1 and 3.9 (p. 284). The children in this study manifested varying zones of competence in reading words in isolation and in reading connected discourse under conditions assumed to be supportive, and conditions which involved considerable interaction. These conditions did lead to the evaluation of cognitive processes and permitted investigators to see growth and change as opposed to fossilized or automated processes of states of cognition (p. 285). Subjects were assessed

over a series of days and there was no posttest per se. However, because this work deals primarily with assessment, it can be thought of as exploratory. Further research in this area, however, should include some posttest so that improvement could be more readily measured.

Moss (1990), "Social interaction and metacognitive development in gifted preschoolers" According to Moss (1990, p. 16), Vygotskian theory suggests that the use of planning, monitoring, and evaluation strategies which characterizes the independent performance of gifted school-age children may be most evident during the preschool period in social learning contexts in which metacognitive functions are largely controlled by adults. The three- to four-year-old children in this study were initially assessed as being gifted or of average intelligence based on their Stanford-Binet IQ scores. Moss then observed and recorded the verbal exchanges between mothers and their children during semi-structured play interactions. Although results are said to be interpreted in terms of the ZPD, no posttest was performed to check the childrens' new level of maturity following the mother-child interaction tasks.

Henderson (1984), "Social support and exploration" The exploratory activities of 97 children, ages 3-7, in independent and adult support sessions was compared (Henderson, 1984, p. 1246). The children's initial levels of exploration were assessed during a battery of tests using three novel objects. Subjects were assigned to high, medium, and low exploratory levels based on the pre-

assessment. Children participated in independent sessions that were conducted in the same way as the pre-assessment. The children then participated in a focusing session, where the adult modeled exploration of a novel toy and encouraged the child to become actively involved in the task. Henderson attempts to discuss the results as they relate to the ZPD, but once again, without a final independent test, it is impossible to assess a child's gains within his/her ZPD.

No Pretest and No Posttest

Pellegrini, McGullicuddy-DeLisi, Sigel, & Brody (1986), "The effects of children's communicative status and task on parents' teaching strategies" The two goals of the study were to examine factors affecting parents' teaching strategies with their children and to identify the effectiveness of different teaching strategies for engaging children in tasks (Pellegrini, McGullicuddy-DeLisi, Sigel, & Brody, 1986, p. 240). Each of the 120 families included a target child (M = 4.5 years old), a mother, and a father; 60 families had a communicatively handicapped child and 60 matched families had a non-communicatively handicapped child (p. 240). Each parent performed two tasks with their children: an origami task and a story-reading task (p. 244). Parents were instructed to "go through" the book as they would at home. For the origami task, parents were told to teach the child to make a boat or plane by folding the paper. Sessions were videotaped and interaction between parents and children was analyzed. The authors attempt to bring in Vygotsky's theory of the ZPD when analyzing results, but

this study is not set up well to move into a Vygotskian analysis. Without a pretest and a posttest of some sort, there is no way to evaluate a child's progress through the ZPD. It is probable that the researchers believed the child's communicative status could serve as a baseline, but that status may not effect problem-solving ability in a book-reading or an origami task.

No Guided Problem-solving Activity and No Posttest

Pellegrini, Perlmutter, Galda, & Brody (1990), "Joint reading between Black Head Start children and their mothers" This study examined the behaviors of black Head Start children and their mothers around a series of experimental joint reading contexts in their homes (Pellegrini, Perlmutter, Galda, & Brody, 1990, p. 443). Prior to the reading sessions, 13 children were administered the Peabody Picture Vocabulary Test. Vocabulary scores were used as a measure of children's task competence because participation around books is a linguistic task (p. 446). The mother-child dyads were videotaped in their homes while interacting around a series of texts in different genres and formats. Mothers were given no specific instructions on how to go over the reading material with the child. An analysis of the communicative strategies used by the mothers during the sessions show that mothers adjusted their level of teaching to children's level of task competence. These results are discussed in terms of Vygotsky's notion of the zone of proximal development. However, the ZPD is not an appropriate level of analysis in this study. Since the mothers were not told they should "teach" the children, there is no guarantee that the way

they conducted themselves during the session was indicative of their "teaching behavior" with their child. Also, without a posttest, we have no measure of a child's progress through the ZPD.

Pellegrini, Brody, & Sigel (1985), "Parents' book-reading habits with their children" This study attempted to document the extent to which parents were cognitively demanding and directive of their children in book-reading tasks (Pellegrini, Brody, & Sigel, 1985, p. 334). Parents' interactions with children of different ages and different levels of communicative competence were analyzed. Researchers then examined the relation between these parental interaction variables and children's verbal IQ. Results of the study were analyzed in terms of the ZPD. But, as in the study above, the parents were only told to "go through" the book with the child. This is not a reasonable assessment of parental assistance in a guided, problem-solving activity. Also, no posttest was taken, so there was no possibility of assessing a child's movement through the ZPD as a result of parental interaction.

Henderson (1991), "Describing parent-child interaction during exploration: situation definitions and negotiations" A coding scheme based on Wertsch's (1983) extension of Vygotsky's ideas about adult-child interaction in the zone of proximal development was used to analyze parent-child interaction during exploration (Henderson, 1991, p. 79). Sixty 3- to 6-year-old children were identified as having a high, medium, or low tendency to explore independently on the basis of their responses to a battery of

assessment tasks. Children and parents were videotaped while exploring a set of four toys at the child's school about one month after the original assessment (p. 82). Toys were placed on the floor and parents were asked to allow the child to select one toy at a time and bring it to a table. Parents and children were told to relax and act as they might if the child had received a new toy at home (p. 82). Although a Vygotskian framework was used, the task was rather vague and there was no posttest. Parents were not told to encourage the child to explore with the toys. Researchers did comment, however, that most parents tended to interpret the task as a "teaching" task. With no posttest, it is difficult to assess the adult's effect on the child's level of development.

Henderson (1984), "Parents and exploration: The effects of context on individual differences in exploratory behavior"

Study #1: In the first study, children were identified as high, low, or moderate in their level of exploration by completing a battery of tasks developed to assess individual differences in tendency to explore novel objects. Approximately one month after the initial exploration assessment, the child and the parent came to a familiar room at the school and were seated at table. In a set of standard instructions, parents were asked to bring over toys selected by the child one at a time, to keep the child at the table, and to relax and act as they would if their child had received a new toy at home (Henderson, 1984, p. 1239). Exploratory behavior was videotaped and analyzed.

Study #2: Individual differences in exploration were again assessed with the Henderson and Moore (1980) assessment tools (p. 1241-1242) and children were rated as high, medium or low in exploring novel objects. The sessions of Study #2 were the same as in Study #1, but this time during the experimenter-child sessions, the experimenter did not initiate interaction. Results of both were analyzed in terms of the ZPD. Unfortunately, neither version of the study had a well-defined problem-solving task and no posttesting was conducted in order to legitimate the use of the ZPD as a theoretical framework.

No Pretest, Guided Problem-solving Activity, and No Posttest

Vandell & Wilson (1987), "Infants' interactions with mother, sibling, and peer: Contrasts and relations between interaction systems" The role of the mother in structuring interactions with her infant child during free play was examined at 6 and 9 months. Maternal scaffolding of turn-taking exchanges was then contrasted to the forms of turn-taking apparent in sibling-infant and peer-infant observations (Vandell & Wilson, 1987, p. 177). Each mother-infant session was 10 minutes long. A shopping bag filled with age-appropriate toys was placed on the floor in the middle of the room and the mother was asked to pretend she and her baby were at home with a few free minutes (p. 178). In the sibling-infant session, the mother left the room and asked the sibling to keep an eye on the infant. And, during the peer-infant session, two infants were observed during free play time. According to the authors, the results of this study can be discussed in terms of

studies on mother-infant attachment and peer competence, maternal scaffolding, and Vygotsky's zone of proximal development (p. 176). Although this was certainly an important and ambitious study, it becomes impossible to discuss results in terms of Vygotsky's zone of proximal development. No pretesting or posttesting was undertaken to assess the infants' levels of development in terms of interacting with toys or others. Also, all three sessions were loosely defined. This was much more a conversation analysis study focusing on turn-taking, than an experimental study warranting the use of Vygotsky's ZPD.

Discussion

This review critiqued the use of Vygotsky's zone of proximal development in 15 quantitative studies. Working correctly with the concept of the ZPD requires an adoption of specific methods. For example, a study that makes claims in terms of the ZPD should include a pre-test, a guided problem-solving activity, and a posttest. Without these minimal elements, researchers are not working specifically with the ZPD.

For example, in using the ZPD as a strategy for testing, the critical difference from usual practices is that instead of presenting children with a standardized task and noting whether they succeed or fail, the adult presents the task, offering simplifying aids in a principled way until the child succeeds, omits the aids as they are no longer needed, and notes the child's ability to complete subsequent puzzles with fewer of the graduated aids (Cazden, p. 197-198).

The 15 studies reviewed were critiqued in terms of how closely they adhered to the three experimental elements important to testing in the ZPD. It was found that, despite the fact that all studies tried to use the ZPD as a method of analysis, only three studies included all three minimal elements. Studies were most frequently found to be lacking in terms of posttesting. Researchers also often failed to set up a guided problem-solving activity, and instead, asked adults to merely "interact" in a relaxed manner with children.

The purpose of this review was not to nullify the works reviewed -- the majority of studies critiqued appear to be valid overall and contain valuable ideas. In fact, most of the studies would have been more meaningful without reference to the ZPD. Instead, the purpose of this review was to highlight work that utilizes the ZPD as a means of interpreting experimental results. As Vygotsky's work has become popularized, particularly in the United States, researchers are tempted to toss mention of the ZPD into their work. It becomes problematic, however, when the ZPD is inserted into an article, almost as an afterthought. What these researchers don't realize is that Vygotsky had some very specific guidelines in mind when he introduced the idea of the ZPD. Soviet research that has worked with Vygotsky's ZPD tends to almost invariably include the three minimal elements critiqued in this review.

This does not mean that Vygotsky's work is not open to discussion or re-interpretation. As Bruner states:

> "It is not surprising that discussion of the ZPD and how it manages to shape growing consciousness with the aid of language is at times opaque. In fact, Vygotsky was muddling through as best he could. Reading him today, one cannot escape the feeling that, for a man at the head of a procession that he must at times have doubted would ever form, he did astonishingly well (1984, p. 97)."

The studies reviewed that did not work according to the original intentions of the ZPD did not include any arguments for re-interpretation, however. There was no impression given that the authors purposely were trying to bend the idea and test the implications of innovation on Vygotsky's basic idea.

This review piece is merely a step toward greater understanding of the ZPD. Clearly, the establishment of the potential for development is of major practical interest (Tul'viste, 1989, p. 50). And it is for this reason that the communication and education communities need to think before leaping. Using the ZPD as a faddish catchword to be peppered into studies not only does a disservice to its original meaningfulness, but prevents researchers from pushing further into well-though-out studies of the ZPD. And it is only by working through Vygotsky's initial ideas that we can finally find out what "potential" the ZPD holds.

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