Vygotsky's Zone of Proximal Development
as a Theoretical Foundation
for Cooperative Learning

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The work of Lev Vygotsky (1896-1934) provides a sound theo-
retical foundation for investigating the rationale underlying
various instructional strategies. This article integrates Vy-
gotsky's construct of the zone of proximal development with
the instructional strategy of cooperative learning. The zone of
proximal development provides a conceptual basis for explain-
ing the five basic tenets of cooperative learning: positive
interdependence, face-to-face interaction, individual account-
ability, small-group and interpersonal skills, and group
self-evaluation. Following a discussion of the relevance of Vy-
gotsky's ideas to cooperative learning, the article presents a
series of guidelines or suggestions for using cooperative learn-
ing.

Over the past decade, teachers, teacher educators, and educational psychologists have developed an acute interest in the ideas and works of Russian psychologist Lev Vygotsky (1896-1934). According to Wertsch and Tulviste (1992), this interest stems from several sources, including increased access to Vygotsky's writings due to new translations of his work; an increase in the exchange of scholarly ideas between American and Russian psychologists; the direct relevance of Vygotsky's ideas to current educational issues in the United States; and the desire, within American psychology, for a new theoretical perspective toward educa-tion. In the wake of this current interest, Vygotsky's ideas have been successfully applied to curriculum development (Burkhalter, 1995), lan-guage development (Shotter, 1993; Stone, 1993), teacher education

(Manning & Payne, 1993; Stremmel & Fu, 1993), inclusion (Mallory & New, 1994), creativity (Ayman-Nolley, 1992; Smolucha, 1992), and play (Nicolopoulou, 1993; Smolucha, 1992). In addition, Vygotsky has become a major influence in the emerging field of constructivism (Fosnot, 1996).

The purpose of this paper is to address the relevance of Vygotsky's ideas to the instructional strategy of cooperative learning, which has become one of the premier instructional strategies in education today (Johnson & Johnson, 1991; O'Donnell & O'Kelly, 1994; Slavin, 1996). Vygotsky's construct of the *zone of proximal development* provides a sound framework from which to understand the potential contributions of cooperative learning.

Vygotsky's Zone of Proximal Development

Vygotsky formulated a theory of cognitive development that is based on a student's ability to learn how to use socially relevant tools (such as money, pencils, and computers) and culturally based signs (such as language, writing, and number systems) through interactions with other students and adults who socialize the students into their culture. According to Vygotsky (1978), children first develop lower mental functions such as simple perceptions, associative learning, and involuntary attention. Through social interactions with more knowledgeable others, children eventually develop higher mental functions such as language, logic, problem-solving skills, moral reasoning, and memory schemas.

Vygotsky emphasized the process of *internalization*, by which a student first experiences an idea, behavior, or attitude in a social setting and then internalizes this experience so that it becomes a part of the student's mental functioning. As he says, "The internalization of socially rooted and historically developed activities is the distinguishing feature of human psychology; the basis of the qualitative leap from animal to human psychology" (1978, p. 57). Addressing Vygotsky's concept of internalization, Blanck (1990) states, "humans are internalized culture" (p. 47).

Internalization, as defined by Vygotsky (1986), does not involve merely the transferring of reality from teacher to student. As he states, "... [scientific, or school-based] concepts are not absorbed ready-made ..." (p. 161). Rather, internalization involves the student's actively processing an experience, modifying the experience based on past experiences, and then integrating this experience into his or her way of thinking in such a manner that the old way of thinking is changed (or developed).

That is, mental functioning is not merely absorbed or transmitted verbatim from teacher to student but actively constructed by the individual as the result of social experience. It is for this theory of cognitive development that Vygotsky has become known as a major contributor to the discussion of constructivism.

Central to Vygotsky's theory of cognitive development is his construct of the zone of proximal development. Vygotsky believed that an individual's immediate potential for cognitive growth is limited on the lower end by that which he or she can accomplish independently, and on the upper end by that which he or she can accomplish with the help of a more knowledgeable other such as a peer, tutor, or teacher. This region of immediate potential for cognitive growth between the upper and lower limits is the zone of proximal development (Vygotsky, 1978; see Figure 1). Figure 1 shows that the dynamic nature of the zone of proximal development is represented by the zone moving past the task to be learned.

The zone of proximal development is a dynamic construct that addresses not only cognitive development but also human learning. Early in the learning process, a student will require much assistance in accomplishing a task that is in the upper end of his or her zone. With practice and experience, however, the student's zone will move, as the result of cognitive growth and development, in the direction of the instruction. Later in the learning process, the student will be able to accomplish independently what he or she was able to accomplish before only with much assistance. (Note in Figure 1 that the degree of difficulty of the task to be learned remains constant while the skill of the learner increases.) Vygotsky (1987) has stated, "What lies in the zone of proximal development at one stage is realized and moves to the level of actual development at a second. In other words, what the child is able to do in *collaboration* today [he or she] will be able to do independently tomorrow" (p. 211). A full appreciation of the zone of proximal development and its educational implications requires an understanding of three aspects of the zone: the use of whole, authentic activities; the need for social interaction; and the process of individual change (Moll, 1990).

The Use of Whole, Authentic Activities

Vygotsky believed that educators need to study, teach, and learn higher mental functions as *whole and authentic activities*, or those activities that involve applying learned knowledge and skills in the completion of a real-world task within a meaningful cultural context, as opposed to activities that reduce mental functioning to a decontextualized component

Figure 1
Vygotsky's Zone of Proximal Development
(Doolittle, 1996, p. 35)
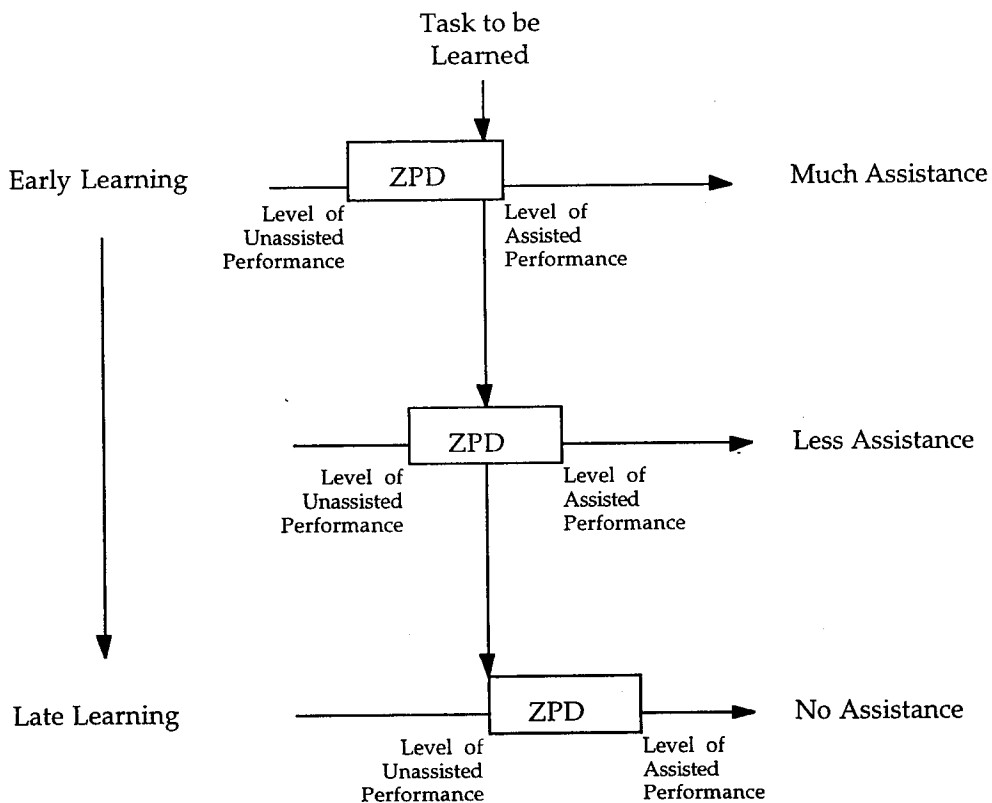
skill. He disagreed with a reductionist view of inquiry and teaching, concluding that as cognitive tasks are reduced to a sum of their parts, their very essence is lost:

> A psychology that decomposes verbal thinking into its elements in an attempt to explain its characteristics will search in vain for the unity that is characteristic of the whole. These characteristics are inherent in the phenomenon only as a unified whole. Therefore, when the whole is analyzed into its elements, these characteristics evaporate. (1987, p. 45)

Vygotsky (1978) went on to state that the need for learning these whole activities must be relevant to the student and that he or she must feel a need for development to occur. With regard to learning culturally relevant writing skills, he stated,

> Teaching should be organized in such a way that reading and writing are necessary for something. . . . Reading and writing must be something the child needs. Here we have the most vivid example of the basic contradiction that appears in the teaching of writing . . . that writing is taught as a motor skill and not as a complex cultural activity. . . . Writing must be "relevant to life." (1978, pp. 117-118)

According to Vygotsky, students are endowed as readers and writers when they can use reading and writing in situations that engage them in purposeful and meaningful uses of language. These authentic situations, or whole activities, establish the environment in which the zone of proximal development is embedded.

The Need for Social Interaction

Vygotsky concluded that students learn through interactions with others. Students internalize the knowledge and skills first experienced during these interactions and eventually use this knowledge and these skills to guide and direct their own behavior. Thus, social interaction between those who are less experienced and those who are more experienced is an essential component of the zone of proximal development. The inherent social nature of the zone of proximal development demands that educators conceptualize the learning environment—and the interactions that take place within it—as specific collaborative activities carried out within specific social contexts. Discussions of learning must not limit themselves to *only* the student's perspective or *only* the teacher's perspective. The essence of the zone of proximal development is the

interdependent social system in which cultural meanings are actively constructed by both the student and the teacher. It is this interdependence that is central to a Vygotskian view of the educational process.

The Process of Individual Change

Vygotsky believed that the goal of cognitive development is change in the individual. Thus, the purpose of instruction, whether formal or informal, should be to stimulate cognitive growth and development. "The only good instruction received in childhood," he asserted, "is the one that precedes and guides development" (1987, p. 48). Vygotsky believed that the zone of proximal development is always undergoing change. As the student learns and develops, his or her collaborative interactions with another individual, be it an adult or fellow student, lead to the development of culturally relevant behavior.

These three aspects of the zone of proximal development—whole and authentic activities, social mediation, and individual change—all influence functional pedagogy. For Vygotsky, formal education was a catalyst for the transmission of cultural ideas, values, and behaviors. Within an academic setting, students are provided with an organized structure from which to experience and internalize their culture. Vygotsky's ideas concerning the role of the zone of proximal development in cognitive development provide strong support for the inclusion of cooperative learning strategies in college classrooms.

The Zone of Proximal Development and Cooperative Learning

The zone of proximal development may be used to provide a theoretical base from which to understand cooperative learning. Cooperative learning is a form of small-group instruction in which students work together in a social setting to solve problems (Slavin, 1991, 1996). Although the essence of cooperative learning is easily understood, educational theorists are less in agreement as to what specifically constitutes cooperative learning. The theoretical consensus, however, indicates that five factors are paramount in a cooperative learning experience: (a) positive interdependence, (b) face-to-face interaction, (c) individual accountability, (d) small-group and interpersonal skills, and (e) group self-evaluation (Johnson, Johnson, Holubec, & Roy, 1984; Sharan, 1990; Slavin, 1996).

Cooperative learning has proved to be a successful instructional strategy in many domains, including regular education (Cohen, 1994; Shachar

& Sharan, 1994), special education (Dugan, Kamps, Leonard, & Wakins, 1995; Stevens & Slavin, 1995), gifted education (Coleman & Gallagher, 1995; Ellett, 1993), middle schools (Ferguson, Forte, Regan, & Alter, 1995; Ross & Cousins, 1995), and college classrooms (Dees, 1991; Hagen & Moffatt, 1992; Keeler & Anson, 1995; Klein & Pridemore, 1992; Purdom & Kromrey, 1995). The following sections discuss each of the five basic components of cooperative learning in light of the tenets of Vygotsky's general sociogenetic theory, with particular attention to the zone of proximal development.

Positive Interdependence

The first element of cooperative learning, *positive interdependence*, is achieved when each group member comes to understand and value the need for group cooperation in the attainment of his or her personal goals, the other group members' goals, and the goals of the entire group. Positive interdependence may take several forms, including goal interdependence, task or labor interdependence, resource interdependence, role interdependence, or reward interdependence (Johnson et al., 1984). The result of achieving positive interdependence is that students will be more highly motivated to work cooperatively when successful completion of the task depends on the participation of other group members.

The construct of interdependence is a concept so basic to Vygotsky's sociogenetic theory that it is often overlooked. Vygotsky's theory rests upon the principle that a student's or adult's development is dependent upon interactions with other students and adults. That is, each member of a society is dependent upon other members of that society to provide the resources necessary for individual development. Valsiner (1988) has stated that the sociogenetic theory provides for the "interdependence of the process of child development and the socially provided resources for that development" (p. 145). Students and adults are developmentally dependent and, thus, interdependent.

The zone of proximal development provides a basis from which to discuss this theory of interdependence. According to Vygotsky, each student has a particular zone of proximal development for each social context that he or she encounters. A student's development is based on activities that stimulate the student within his or her zone of proximal development. Effective teaching consists of presenting these activities, stimulating the student within his or her zone of proximal development, and then providing the resources necessary for the student to succeed, achieve, and develop.

Face-to-Face Interaction

The second element of cooperative learning, *face-to-face interaction*, works in conjunction with positive interdependence. Face-to-face interaction involves individual group members' encouraging and facilitating other group members' efforts to complete tasks in order to achieve group goals. According to Johnson and Johnson (1991), face-to-face interaction is characterized by students providing each other with assistance, exchanging needed resources, and offering feedback.

Face-to-face interaction is identified within the Vygotskian framework as *social mediation* and *enculturation*. Social mediation involves the acquisition of knowledge and skill through a student's social interaction with others. Vygotsky (1987) wrote, "The central fact about our psychology is the fact of mediation" (p. 116). Leontiev and Luria (1968), peers of Vygotsky, have stated that social mediation provides the "main means of mastering psychological processes that have a decisive influence on the formation of [a person's] psychological activity" (p. 342). Vygotsky believed that the academic environment provided the preeminent environment for exposure to the tools and signs of a particular culture. He termed this learning of the signs and tools relevant to one's own culture *enculturation*. Thus, enculturation refers to *what* is learned, whereas social mediation refers to *how* it is learned. The zone of proximal development provides the vehicle through which enculturation, with the assistance of social mediation, takes place. A social encounter creates a zone of proximal development within which learning, development, and enculturation can occur.

Individual Accountability

The third basic element of cooperative learning, *individual accountability*, involves holding each student accountable for mastering relevant material. It refers to both completing one's task within the group and supporting the work of other group members. According to Johnson et al. (1984), "The purpose of a learning situation is to maximize the achievement of each individual student. Determining the level of mastery of each student is necessary so students can provide appropriate support and assistance to one another" (p. 8). Individual accountability also prevents situations in which select group members do most of the work and other group members become freeloaders.

Within the framework of Vygotsky's theory, individual accountability would be reflected in each group member's being responsible for

developing within his or her unique zone of proximal development. The essence of instruction, according to Vygotsky, is to provide the means and resources necessary for each individual to develop beyond the task to be learned. In other words, each group member's zone of proximal development must move in the direction of instruction and eventually go beyond the task at hand (see Figure 1). Whereas several group members may be engaged in a collaborative effort, Vygotsky would assert that each member should grow and develop toward being able to do individually today what he or she could do only in collaboration yesterday.

Small-Group and Interpersonal Skills

The fourth basic element of cooperative learning involves teaching students how to use the *small-group and interpersonal skills* that are necessary to perform competently with others. The acquisition of social skills in cooperative learning is what Vygotsky referred to when he stated that humans use sociocultural signs (for instance, words and images) and tools (for instance, money and computers) to mediate and navigate their interactions with others. The theory of the zone of proximal development was an attempt by Vygotsky to provide a framework or method with which to understand how individuals learn or develop these signs and tools. Vygotsky first developed the concept of using signs and tools as a component of his theory of cognitive development. Then, toward the end of his life, he conceived the zone of proximal development as a means of developing and constructing these culturally relevant signs and tools, through which he argued that human development was mediated.

Vygotsky believed that acquiring signs and tools was necessary for successful social mediation and, in turn, that successful social mediation also taught more complex and socially relevant signs and tools:

Signs and words serve children first and foremost as a means
of social contact with other people.... The specifically human
capacity for language enables children to provide for auxiliary
tools in the solution of difficult tasks, to overcome impulsive
action, to plan a solution to a problem prior to its execution,
and to master their own behavior. (1978, p. 28)

Thus, Vygotsky's sociogenetic theory posits that the development of social skills is a necessary, although not an entirely sufficient, criterion for human development and growth.

Group Self-Evaluation

The fifth basic element of cooperative learning involves *group self-evaluation*. The purpose of group self-evaluation is to clarify and improve the productiveness of all group members as contributors to achieving the group's goals. Group self-evaluation provides for a type of group metacognition, a process of evaluating the group's own processing. Group self-evaluation should result in describing which group members' actions were beneficial or detrimental and which group members' actions should be continued or changed. For Vygotsky, an important part of instruction involves the constant monitoring of each student's growth within his or her zone of proximal development. That is, a student's development is not only the responsibility of that student, but also of those members of society who are engaged with that student (group members, parents, teachers).
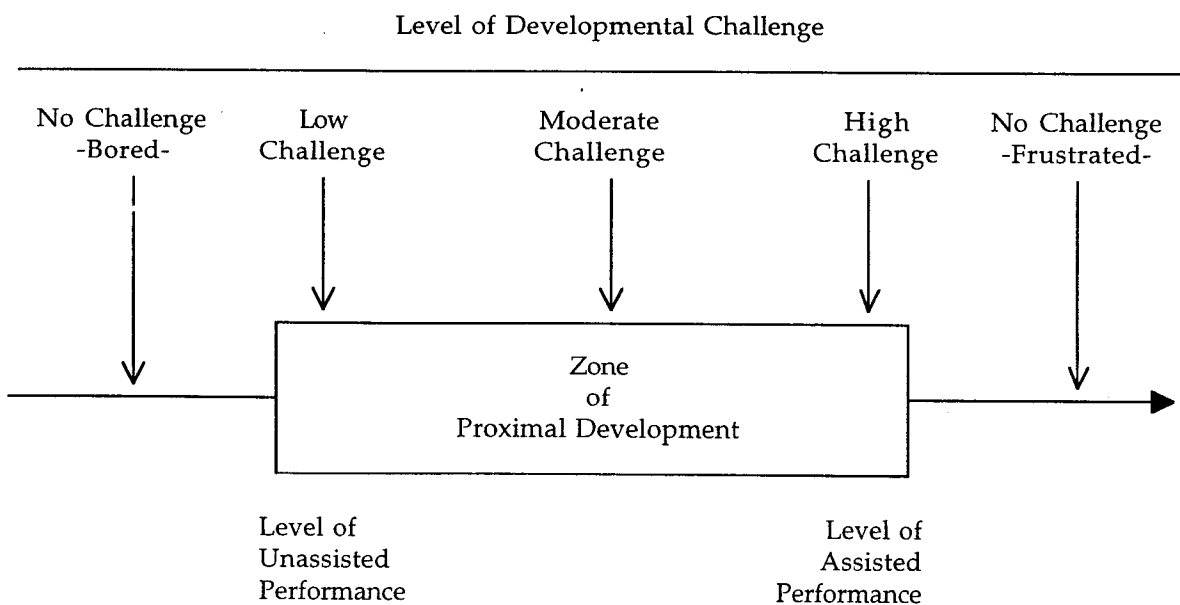
In group self-evaluation, the teacher, the student, and the student's group members all are actively engaged in the learning process, making it possible to monitor how current instruction is affecting each student's zone of proximal development. Instruction or an activity that is below the lower end of the zone of proximal development will have already been mastered by the student, and the student will be bored (see Figure 2). Instruction or an activity that is above the upper end of the zone of proximal development will be beyond the student's capacity, and the student will be lost and frustrated. Only instruction that is *within* the student's zone of proximal development will be effective toward advancing growth and development. Thus, constant self-evaluation and for monitoring is necessary for groups to continue to be successful and for individuals to be constantly challenged within their zones of proximal development.

Suggestions for the Use of Cooperative Learning

Learning theories, such as Vygotsky's theory of the zone of proximal development, provide a basis for explaining and predicting learning and instruction. In addition to providing a theoretical foundation for the major tenets of cooperative learning, Vygotsky's theory suggests a series of recommendations for its effective use.

1. Teach using whole and authentic activities. Larger, authentic activities can often be constructed so that they subsume smaller activities and concepts that the teacher desires the students to learn. These activities also should be based in real life (for instance, writing a computer program or conducting an experimental study), not contrived or artifi-

Figure 2
Effects of Instruction on the Individual's Zone of Proximal Development

Level of Developmental Challenge

No Challenge -Bored-   Low Challenge   Moderate Challenge   High Challenge   No Challenge -Frustrated-

Zone of Proximal Development

Level of Unassisted Performance

Level of Assisted Performance

cial. For example, teaching research design is often reduced to the teaching of components (literature review, sample selection, statistical analysis), followed by a final research proposal project. This approach allows students to discuss each element in isolation but rarely results in an understanding of the entire research process. A better approach is to assign student teams to a term research design project encompassing all phases of research (topic creation, background research, planning, design, data collection, data analysis, and reporting of results), which the teams must submit for publication. This project allows students to experience the entire breadth of the research process. Furthermore, students are introduced to the vital components (such as planning a literature review, creating hypotheses, writing a properly formatted report) needed to understand and conduct quality research.

2. Create a "need" for what is to be learned. In order to increase motivation and *positive affect*, or the positive feelings students have toward a particular activity, teachers must help students see the *need* for learning material. A frequent comment instructors hear from students is, "When am I ever going to need to know this?" Vygotsky addressed the idea that students must be shown a need for learning:

> Our studies show that the child has little motivation to learn writing when we begin to teach it. [He or she] feels no need for it, and has only a vague idea of its usefulness. In conversation, [however,] every sentence is prompted by a motive. Desire or need lead to request, question to answer, bewilderment to explanation." (1986, p. 181)

Although the quotation above refers to a child's learning of writing, it could easily apply to a college student's learning of thermodynamics, aquatic entomology, abnormal psychology, or structural geology.

The assignment of the team research design project, with the stipulation that it be submitted for publication, creates the need for students to know the specific design features of the research. Once the team has formulated a research question, the need to know these specific elements becomes evident, even to novice researchers. This need will then foster the motivation and desire in students to attain the knowledge necessary to complete a quality project.

3. Utilize activities or exercises that require social interaction. Cooperative learning activities should be just that—cooperative. Activities should be structured to foster interaction between group members. In addition, these interactions should be developmental; that is, student engagement in cooperative activities should have as its primary goal the attainment of new signs and tools.

In the research design project, the use of research teams inherently fosters social interaction. In addition, the instructor can promote the teams' interactions with experts in the field in which they are carrying out their research. He or she may direct teams to consult with colleagues, both on campus and off, in developing a research question, clarifying design elements, performing data analysis, or determining the significance of their findings. The use of the World Wide Web, listservs, and e-mail can greatly facilitate this type of interaction.

4. Provide opportunities for verbal interactions. Language provides the conduit through which ideas and behaviors become internalized. It allows us to plan behaviors, to understand another's thinking, to elaborate on that to which we are currently attending, and to restructure our mental functions. Often, group work is designed such that each member of a group has a "duty" that he or she carries out individually, and the only verbal interaction is reporting the progress or completion of this task to the group. Cooperative learning, however, requires that group members be interdependent. This interdependence must be nurtured through group meetings at which members plan, discuss, and reach consensus on topics related to the activity at hand. Students working on the team research design project should be allowed sufficient time and resources both in and out of class to brainstorm; to consult with the teacher, other students, and subject area experts; and to formalize their ideas. Providing opportunities in class for groups to present their work for discussion and evaluation also establishes an excellent forum for meaningful verbal interaction.

5. Monitor student progress. Teachers need to monitor students in cooperative groups closely for two main reasons: first, to insure that each student is being sufficiently challenged (that is, to see that students are given tasks that lie within their zones of proximal development), and second, to determine that each student is learning the intended material. When allowing the research teams in-class time to work on their projects, the instructor must circulate from group to group, answering questions, providing guidance, and assessing the groups' progress and functioning. Even the most motivated cooperative learning groups can degrade into social discussions or get bogged down in discussions of minutia. The instructor should make informal evaluations as to which group members are contributing to the group and which are "along for the ride." In addition, the instructor may find it beneficial to schedule teacher-group meetings outside of class to evaluate students' involvement in the research project and to verify that each student is both challenged and developing.

6. Provide instruction that precedes a student's development. Cooperative learning activities should be designed to lead a student to new knowledge and understanding. Tasks should approach the upper end of each student's zone of proximal development so that the student must develop cognitively in order to master the task. The team research design project is an excellent activity for students who are participating in their first research design course. Those who are novice researchers will definitely find that this project tests the upper limits of their zones of proximal development. It provides a challenging experience through which students, with assistance, can develop and be successful.

The team research design project can be modified to work well with students at different academic levels—undergraduates, master's degree students, and doctoral candidates. Although the essence of the activity would remain the same, the criteria for successful completion—adherence to report format, completeness of the literature review, satisfaction of statistical assumptions, and so forth—would change dramatically. For undergraduates, whose level of research skill will probably be low, the statistical analyses could be rudimentary or even completed by a non-group member. For master's degree students, the literature review would need to be more thorough and the demonstrated degree of research skill enhanced. The statistical analysis still could be fundamental but would need to be completed by the group members themselves. For doctoral candidates, the project could become primarily an individual assignment with assistance from others. The level of research skill demonstrated would need to be significantly higher, and all analyses and interpretations would be the responsibility of the student. Thus, by simply modifying the requirements for success, one activity can be used effectively with several different academic levels to foster cognitive growth and development.

7. Use instructional scaffolding. In order for teaching and learning to be effective and efficient, students need to be continually challenged. This means that they should often be presented with tasks that require them to seek outside help or assistance. Assigning activities that lie within the student's zone of proximal development but that require the student to seek assistance will foster the learning of social mediation skills. Although students should be confronted with activities that require some type of assistance, this assistance needs to be available in order for learning and development to occur. Assigning tasks that lie beyond students' current level of ability without assistance will lead only to feelings of frustration and helplessness. In addition, as students begin to learn the task in which they are engaged, the assistance they receive needs to be

gradually withdrawn so that they may assume more of the responsibility of performing the task independently.

The practice of engaging students with activities that require assistance lies at the heart of *scaffolding*. Scaffolding is a three-component process that consists of (a) presenting a task for student completion that lies at the upper end of the student's zone of proximal development, (b) providing students with the assistance necessary to be successful, and (c) withdrawing the assistance as the student develops in the completion of the task.

The team research design project has scaffolding built in. When the research project is assigned early in the semester, students do not yet possess the necessary knowledge and skills to complete it successfully. Scaffolding occurs in the course of classroom discussions, group meetings, consultations with domain experts, and instructor-group meetings. Early in the research design process, when students are engaged in conducting a literature review and using the literature review to narrow and focus their research question and hypotheses, scaffolding may occur, for instance, in the form of an instructor-led activity on the role and process of a literature review, a student's reading of a series of literature reviews in an attempt to abstract their essence, or group discussions of the research that each group member has done. The instructor may provide the groups with relevant articles, journal titles, or search strategies. As the project progresses and the students develop in their understanding of what is involved in a literature review, the instructor will need to provide less assistance. For example, perhaps he or she will critique only the group's literature review and point out strengths and weaknesses, allowing the modification of the review to be the group's responsibility.

8. Provide opportunities for students to demonstrate learning independent of others. The ultimate goal of a cooperative learning activity is for each group member to acquire the knowledge and skill needed to perform each aspect of the activity independently. In order for students to gain the confidence to perform an activity independently, they must be given the opportunity to attempt it independently. Giving a student a task to complete independently also provides a way to determine whether the student has mastered the task.

Although having students complete both a team research project and an individual project is an optimal strategy, the constraints of a semester schedule normally prohibit it. Thus, teachers may assess independent mastery by having students read, evaluate, and critique various aspects of published articles, having each group member be responsible for writing his or her own research report, or having each student complete an

in-class essay in which the student proposes a research question and explains the process involved in evaluating that research question (for instance, a relevant literature review, an effective experimental design, the selection of subjects, the type of analysis to use in analyzing the data, and the possible outcomes of the research and their interpretations).

9. Construct activities that are designed to stimulate both behavioral changes and the cognitive/metacognitive changes upon which they are built. Student activities should be structured in such a way as to develop the ability not only to perform certain behaviors but also to plan, organize, and control behavior. Through social mediation and active engagement in whole and authentic activities, students should be encouraged to construct their own mental representations of tasks being learned. This constructivist approach leads to better elaboration, retrieval, and transfer of knowledge. In order for this construction process to be complete, the student must construct not only the knowledge itself (and its relationship to other knowledge), but also the processes necessary to use this knowledge effectively.

The completion of the research project is not an end in itself, but rather an activity that facilitates students' growth and development. Ultimately, the team research project is designed to help students develop cognitively in such a way that they can both evaluate the validity of existing research and complete their own research in the future. Thus, the research project provides students with experience in the activities of research (library searches, data collection, writing a formatted report); the knowledge necessary to plan, construct, and complete a future research project; and the knowledge and insight required to evaluate published research.

General Examples

The nine concepts and suggestions in the preceding section may be applied to numerous cooperative learning activities, in a variety of domains, in virtually any classroom. An advantage of using cooperative learning as a classroom strategy is its remarkable flexibility and applicability to all subject areas. As a framework for cooperative learning, these suggestions should provide a guide for constructing meaningful and significant activities. The following cooperative learning activities provide some examples of how Vygotskian-based cooperative learning is currently being used in college classrooms.

In most classes it is possible to use a *scenario* approach to cooperative learning. Choi (1998) has used problem scenarios for cooperative groups

in his physics classes. One such scenario involves determining the feasibility and methodology involved in successfully completing a car stunt for a James Bond movie. In this scenario Bond is racing toward a 20-meter-wide gorge in his Viper II sports car (equipped with ejection seat) while being chased by undesirables. The problem scenario asks the groups to determine what value parameters (such as car speed, angle of takeoff, angle of seat ejection) are necessary for him to arrive safely on the opposite side of the gorge. This problem is similar to problems that real movie stunt coordinators must solve.

Another effective cooperative learning activity is the *lab* approach. Zales and Colosi (1996) used cooperative learning to facilitate a microbiology lab experience. Students in lab groups of four engaged in a "modified jigsaw" cooperative learning strategy (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978) while completing applied microbiology lab exercises on water analysis, bacteria identification, and viral specificity. One example, a lab experience designed to analyze water from a water sewage treatment plant, was divided into four components: (a) testing a raw sewage sample, (b) testing a chlorine sample, (c) testing a stream sample, and (d) coordinating and discussing objectives. First, each group assigned each of its members to become an "expert" in one of these four components. Then, each of the experts in a particular component from the groups (for instance, the four experts in testing a chlorine sample) formed into expert meta-groups and discussed that particular lab component. Following these expert meta-group meetings, the original lab groups reconvened. The groups then completed the exercise, with each expert explaining his or her component and assisting the other team members in the completion of their components.

A final general example of a cooperative learning activity is a *simulation* approach. The use of role-playing simulation in an accounting class was described by Jordan and Reichert (1998). Students were first exposed to background information on inflation accounting through reading assignments, lectures, and a videotape. Following this introduction, students were assigned to teams of four or five and given a specific business or business organization designation. In addition, students were given certain inflation-related parameters, such as the year, the average rate of inflation for the past several years, and a proposed Financial Accounting Standards Board (FASB) statement outlining the FASB's method of addressing inflation problems. The groups were then given the task of detailing testimony concerning how the proposed FASB statement related to their business. In a mock public hearing, each group presented its testimony to the FASB (represented by the class), and the FASB then questioned the group concerning its testimony.

Conclusions

Vygotsky believed that cognitive development was essentially a form of enculturation; that is, students and adults develop through the internalization of their culture via interactions within their zones of proximal development. Further, Vygotsky has stated that formal education is an important instrument of enculturation because it allows for the systematic presentation of social and cultural experiences.

Cooperative learning has proved to be an effective formal education strategy for transmitting these cultural experiences. Indeed, cooperative learning appears to be a strategy tailor-made from the cloth of Vygotsky's theory of the zone of proximal development. In addition, as a construct of human learning and development, Vygotsky's theory leads to a series of recommendations for increasing the effectiveness of cooperative learning activities.

Integrating Vygotsky's zone of proximal development with cooperative learning strategies benefits both the understanding of the zone of proximal development and the implementation of cooperative learning. This union provides an excellent fit between psychology and instruction, theory and application. Although Vygotsky may not have been familiar with the term *cooperative learning*, he was familiar with the concept. As he stated, "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (1978, p. 88).

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