# THE POTENTIAL OF VYGOTSKY'S CONTRIBUTIONS TO OUR UNDERSTANDING OF COGNITIVE APPRENTICESHIP AS A PROCEESS OF DEVELOPMENT IN ADULT VOCATIONAL AND TECHNICAL EDUCATION

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## Abstract

The work of Vygotsky has steadily grown in influence in North America since the 1980s. As one of the leading figures that have influenced modern constructivist thought, Vygotsky's work has had increasing influence, not only on modern psychological and sociological thought, but also on education. An important concept in his theory is the idea that the potential for cognitive development is limited to a certain time span, which he calls the *Zone of Proximal Development* [ZPD]. This article analyzes Vygotsky's ZPD concept, and it links his work on the ZPD to Lave and Wenger's (1991) views on situated learning and communities of practice, and constructivist theory in general. From the review and analyses of these distinct but not separate approaches to training and development, the article explores the potential implications of the ZPD concept for our understanding of cognitive apprenticeship as a process of development in adult vocational and technical education. Lave and Wenger's labels for roles and status of apprentice development, underpinned by four ZPD figures, are offered as useful representations of Vygotsky's work. The article concludes the ZPD concept has implications for the theory and practice of vocational and technical education.

## Introduction

As instructors of vocational and technical education programs, our view of training and development is shaped by the conceptual tools we have available to construct a learning experience for our students and ourselves. In a review of the contribution of cognitive science to training and development, Quinlan and Song (1998) offered the view that apprenticeship has been seen largely as a tool for the development of motor skills, with little to no attention being paid to the ways in which apprentices develop the requisite competence or knowledge base to become members of a community of practice. The authors constructed an argument that vocational educators need to better understand the nature of cognitive apprenticeship and the linkages among education, training, learning and knowledge production if they are to, in turn, better

understand the development of competence and their role in the process. As Brown, Collins, and Duguid (1989) describe it, "cognitive apprenticeship methods try to enculturate [learners] into authentic practices through activity and social interaction in a way similar to that evident…in craft apprenticeship" (p.37). The authors argue that conventional approaches to education and training do not provide authentic activities and, therefore, are not fully productive for useful learning to occur. Cognitive apprenticeship is thus proposed as an alternative to conventional approaches to education and training (Shambaugh & Magliaro, 1997).

By understanding the nature and contribution of cognitive apprenticeship to the development of competence in skills apprenticeships, educators and trainers can create education and training activities that come as close as possible to real work activities where problems do emerge, to be solved by the learner. As Quinlan and Song (1998) explained, the central issue in cognitive apprenticeships is to produce graduates with equal thinking and performance capabilities. Given equal focus to skills development in traditional trades-based apprenticeships, cognitive apprenticeship encourages learners to form their own ideas and help them become conscious and reactive in their engagement in education and training activities (Brown, Collins, & Duguid, 1989). By its very nature then, cognitive apprenticeships attempt to make learning take place within the links of a community's activities, knowledge and culture (Brown & Duguid, 1991).

According to Merriam and Cafarella (1999) some of the key aspects involved in the implementation of successful cognitive apprenticeships relate to the selection of appropriate real-world situations or tasks that are grounded in learner needs, finding the right scaffold builder to do the modeling, and facilitating the development process. Brandt, Farmer, and Buckmaster suggest that successful cognitive apprenticeship instructional models must assist learners to "…express the essence of their thoughts, which may otherwise be unspoken, while they demonstrate how to do a particular aspect of the task" or solve a specific problem (as cited in Merriam & Cafarrella, 1999, p. 245). Merriam and Cafarrella relate that coaching and guiding students as they work through the situations or tasks is also a helpful facilitating process, as well as regulating the task difficulty and providing the necessary support. The authors suggest the outcomes of cognitive apprenticeship are twofold. First, learners internalize what they have learned to enable them to do the task or solve the problem on their own. Second, learners are able to generalize what they have learned to help them to apply their learning to identical contexts and to serve as a starting point for further learning.

In their review of learning in the workplace, Marsick and Volpe (1999, 1997, 1990) note our traditional approaches to training and education are seen as insufficient in that they focus too much on the role of formal and non-formal approaches and undervalue the potential of informal learning. What we need, say Marsick and Volpe, is for organizations to pay more attention to, and foster informal learning in today's workplaces. Marsick and Volpe (1999) note that organizations are beginning to regard formal training programs as only one learning tool. These organizations are acknowledging that informal learning has always been the most pervasive type of learning in the workplace. Informal learning occurs in all settings of human life, for both individuals and collectives. Indeed, the idea that "unplanned, unorganized learning experiences represent the majority of all adult learning" (Rossing, 1991, p. 45) has wide support. Bruce, Aring, and Brand (1998) have cited evidence that skills for worker and company productivity, acquired by informal learning, comprise as much as 70 percent of all workplace learning. As Wenger (1998) illustrates in his development of a social theory of learning, informal

learning underpins all forms of vocational and technical education and training, including cognitive apprenticeships.

To assist us to better understand the role of informal learning in vocational and technical education and training, especially apprenticeship training, this article focuses on the untapped wealth available in the conceptual tools developed by Vygotsky and Lave and Wenger (Little & Quinlan, 1998). Vygotsky created the concept of a Zone of Proximal Development (ZPD) as a way for psychologists and educators to think about children's development and how they learn and develop the problem-solving abilities required to perform a range of developmentally-related tasks (Ormrod, 1995). Vygotsky's zone of proximal development connects a general psychological perspective on child development with a pedagogical perspective on instruction. The underlying assumption behind the concept is that psychological development and instruction are socially embedded; to understand them one must analyze the surrounding society and its social relations. While some reviews of Vygotsky's work on children's development have been carried out (e.g. Wertsch, 2000, 1991, 1985; Van der Veer & Valsiner, 1994, 1991; Woolfolk, 1998), little analyses has been conducted on the ZPD and its utility in vocational and technical education and training. Such analyses may help us to understand how adults learn, develop, and maintain the competence to perform the tasks required in their communities of practice.

This article explores the ways in which Vygotsky's ZPD concept might provide the basis for learning and instruction in adult vocational and technical education and training (Van der Veer & Valsiner, 1994, 1991). The focus of the article is Vygotsky's potential contribution to our understanding of cognitive apprenticeship as a process of development in adult informal vocational and technical education. The work starts with an overview of literature on the ZPD and its potential relationship to Lave and Wenger's (1991) work on situated learning, and constructivism in general. Lave and Wenger argue that learning, especially learning through apprenticeships is primarily a social activity, rather than an individual phenomenon, and that knowledge is a matter of practical competence gained through participation and engagement in the social enterprises of particular communities of practice. Through the learning process, newcomers or learners gradually move toward full participation in a community of practice, and eventually become part of their community of practice.

The article cites the labels by Lave and Wenger (1991) to represent the levels of development or roles that status apprentices are ascribed in the instructional and learning process. These labels and accompanying figures created by the author are intended to help us start to think about what Vygotsky might have said and drawn if he were asked to describe or depict his Zone of Proximal Development. In particular, the labels and figures speak to the ways Vygotsky's work may relate to the learning and instructional process in adult vocational and technical education and training, especially in learning in cognitive apprenticeship programs. The article concludes that the ZPD concept has implications for the theory and practice of vocational education and training.

In this article, the terms *vocational and technical education and training* as well as *apprenticeships* are used interchangeably to depict all forms of education, training and development where competent practitioners lead the development of learners. While *Zone of Proximal Development* represents Vygotsky's ZPD concept, the term *range of development* is used to depict Lave and Wenger's concept of status and labels that learners or apprentices acquire in the process of becoming experts in their communities of practice.

## Literature Review

The value of Vygotsky's theory is that he sought to find alternate views to other psychologists like Piaget who said that human development occurred in stages and that learners did not or could not see the world through the eyes of others (Woolfolk, 1998; Van der Veer & Valsiner, 1994). According to Zebroski (1994), "…Vygotsky argues that Piaget overemphasizes the intellectual, the biological, the evenness and universality of developmental stages, the evolutionary character of development, the centrality of the individual, and the essential independence of thought and language" (p.195). Vygotsky argued that development was not a cognitive process that occurred inside a person's head and was separate from the external world in which people lived. Rather he saw development as a continuous learning process that linked one's current mental networks of association with new experiences gained through contact in, observations about, and reflections on the activities of everyday life. To Vygotsky, teaching and learning were an integrated process in human development. During the teaching and learning process students are expected to actively participate in their own learning through the use of language and interactions with their colleagues and instructors. In describing the Vygotskian concept of the teaching and learning process, Wells (2000, 1999, 1994) states that learning takes place in the context of a purposeful and meaningful activity as learners and teachers work together to create a product that has its own intrinsic value. This purposeful and meaningful activity is viewed as a social process, with the students bringing to the process their own lived experiences as grounded in their own socio-cultural contexts.

According to Wink and Putney (2001), Vygotsky conceptualized the zone of proximal development as a way of viewing what children are coming to know. He noted that children were able to solve problems beyond their actual development level if they were given guidance in the form of prompts or leading questions from someone more advanced. This person, the more capable peer, could be another student, a parent, a mentor, a coach, a guide or a teacher. Vygotsky defined the ZPD as:

> 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 (as cited in Wink & Putney, p.86).

As Wink and Putney relate, when students receive instructional support from a more capable peer who happens to be more capable in that particular context, they internalize the new information and will be more able to perform independently in the next similar problem-solving situation. The authors suggest this notion takes into account individual differences among students, and focuses on the communicative nature of learning in which the students come to an understanding of the operations they are performing.

Vygotsky believed that cognitive structures "originate in social activity and, as they develop, are inextricably linked with language, which is itself a social construct. It is through social interactions…that children learn the cognitive and communicative tools and skills of their culture" (as cited in Hodson & Hodson, 1998, p.36). In addition, he understood learning to be a lifelong process within which learners are constantly constructing, deconstructing, and reconstructing their knowledge base and skills required to function in the world. Vygotsky believed that teachers should focus on teaching students within the ZPD as the best learning is that which is in

advance of the development (Hodson & Hodson, 1998). According to Wertsch, (2000, 1991), Vygotsky argued that development is enhanced by instruction as instruction creates the zone of proximal development.

Like Vygotsky, Lave and Wenger (1991) argue that learning is a function of the activity, context and culture in which it occurs (i.e. it is situated), rather than something that occurs within the minds of individuals as cognitive psychologists have traditionally argued. Learners become involved in a *community of practice*, which is viewed as a broad characterization encompassing all social relations contained within a community of workers who share similar activities and identities (Wenger, 1998), and who get things accomplished when they come together around mutual engagement in an endeavour (Little & Quinlan, 1998). The term serves as a conceptual tool for understanding learning across different methods, historical periods, and in social and physical environments and, like Vygotsky's ZPD concept, it plays a major role as experienced professionals or journeypersons go about their day-to-day work activities and newcomers observe and interact with them. On the situated learning view of development, the journeypersons' task is to provide newcomers with a series of leading activities which, when carried out under their watchful eye, will take the newcomers just outside their current zone of development and cause them to re-think their current views and practices. Communities of practice include unions or other collectives of workers who share a common interest (e.g. industrial arts teachers in a high school, a baseball team, trade instructors in a college, and nurses in a hospital service area) to broader cultural communities (e.g. activists and street-wise youth). In each instance, a community of practice represents a negotiated "set of relations among persons, activity, and [the] world, over time and in relation to other tangential and overlapping communities of practice" (Lave & Wenger, 1991, p. 98).

In a community of practice, social relations are created around work, and knowledge and its production becomes part of individual identity and takes its place in the community. As opposed to being created to carry out a task, the shape and membership of a community of practice emerges in the process of activity as people work and learn collaboratively. The structures of communities implicitly and explicitly lay out the terms and conditions for the members' legitimate participation, and define and set boundaries around their learning. Communities of practice provide an essential context for the social production of knowledge, as well as the interpretative frames necessary for engaging in problem solving and problem finding to make sense of the world. Within the process of developing the knowledge base to become full members of a community, learning is a student's continuous negotiation with communities of practice, which ultimately gives direction to both the student and the practice. In a sense therefore, the ZPD could be perceived as a boundary for members who are at various levels of competence or learning in a community of practice.

Lave and Wenger (1991) used the term *old-timer* to represent journeypersons who are competent in their field; not the oldest members in the community of practice. The term is used to identify those with the most expertise in the issue at hand and, on occasion, these roles shift as the journeypersons become newcomers, and newcomers temporarily assume the role of journeypersons. An example of role shifting would be when a police department installs a new computerized communications system in patrol cars and the 25-year service Staff Sergeant is assigned responsibility for technology he or she knows little or nothing about. The Staff Sergeant might ask a young officer to come outside for a minute to discuss some issue. Once away from other journeypersons or professionals, the Staff Sergeant asks the newcomer, likely in an indirect

way, to get in a car and explain how the new technology works. In this scenario, the new officer's exposure to, and understanding of computer technology allows him/her to lead the development of the journeyperson who temporarily occupies the newcomer role.

In this scenario of development outlined in the paragraph above, the young officer serves as Vygotsky's *scaffold builder* and provides instruction, advice and guidance to the Staff Sergeant as s/he acquires the requisite knowledge about and skills to use the technology. Upon completion of this role-shifting scenario, the young officer reverts to the newcomer role and continues to develop the competence required to become a full member of the police community of practice, and the Staff Sergeant resumes the control and command function of the rank. As noted previously, the young officer would have to be careful not to take his newcomer too far outside the zone of proximal development, as it would lead to failure on the part of the newcomer.

The works of Vygotsky and Lave and Wenger (1991) are linked to constructivism which, according to Abdal-Haqq (1999) is a theory of learning and meaning-making, not teaching, that offers an explanation of the nature of knowledge and how humans learn. A fundamental principle of constructivism is what we learn is associated with the interpretation of our experiences in relation to new information and how it connects to old information. Learning occurs as individuals construct their own new understandings or knowledge through interaction with and reflection on what they already know and believe, balanced against the ideas, events, people and activities they have contact with in their day-to-day activities. Abdal-Haqq notes constructivist approaches are regarded as producing greater internalization and deeper understanding than traditional methods, and the focus of this paper is on this social constructivism associated with Vygotsky, not psychological constructivism as articulated by Piaget.

As noted in the introduction, Brown, Collins, and Duguid (1989) have argued that conventional approaches to education and training do not provide authentic activities and, therefore, are not fully productive for useful learning to occur. Cognitive apprenticeship, whose techniques are based on putting learners into authentic practices through activities and social interactions, is proposed as an alternative to conventional approaches to education and training (Shambaugh & Magliaro, 1997). On this view of learning, memory is always under construction as a series of interactions and by assembling prior knowledge relative to the issue at hand. The focus of learning is on reflection and the use of cognitive tools that reflect the wisdom of culture and the insights and experiences of participants. Through interaction with others and by linking the internal and external worlds, humans create meaning themselves, and any interpretation or meaning is always under re-construction. Knowledge emerges in contexts in which it is relevant—the experience must be reflected on to understand what has been learned—and concepts continually evolve with each experience and new use of knowledge. For Shambaugh and Magliaro, learning involves the use of three crucial factors: activity (practice), concept (knowledge), and culture (context), and it is facilitated by authentic tasks that are anchored in meaningful contexts such as workplace learning and on-the-job training. Accordingly cognitive apprenticeships are representative of both Shambaugh and Magliaro's views of learning and the Vygotskian zone of proximal development in which tasks are slightly more difficult than students can manage independently, requiring the aid of their peers and instructor to succeed.

While cognitive scientists were focusing on *metacognitive* knowledge, which is an individual's knowledge about her or his own knowledge, skills and abilities, and the processes associated with their development (Brown, 1987), could it be that Vygotsky was focusing on *metadevelopment?*

Metadevelopment may be seen as the development of individuals' cognitive structures and processes so they understand how they develop their own way of thinking, problem solving, and other higher order cognitive processes. As noted earlier, a central tenet of Vygotsky's ZPD is that development is preceded by a set of leading activities in which experienced adults or capable peers guide students along a pathway from incompetence to competence (Little & Quinlan, 1998; Werstch, 2000, 1985). In addition, Wink and Putney (2001) report Vygotsky defined the ZPD as the distance between a child's level of actual development as determined by their ability to independently solve problems, and the higher level of potential development as determined through problem-solving skills developed under the guidance of competent adults or with capable peers. This instruction, however, is good only when it precedes development as it awakens and arouses an entire set of functions or observations which are maturing and which lie in the ZPD (Werstch, 2000, 1985). Ormrod (1995) uses the term *competent individual*, rather than adult or peer, while Van der Veer and Valsiner (1994) say Vygotsky used the term *social other*. The role of the adult or capable peer is to build scaffolds, or provide a series of leading activities, which guide the learner's development process from where he is to, as Wertsch (1985) describes it, "what he not yet is" (p. 67). Vygotsky proposed that "children's early efforts on difficult tasks (those within the zone of proximal development) are more likely to be successful when they are scaffolded — that is, when those efforts are guided and supported by a more competent individual" (as cited in Ormrod, 1995, p. 368) through the learning and development process. According to Woolfolk (1998), Jerome Bruner coined the term *scaffolding* to describe the function Vygotsky saw for adults or capable peers in the development of children's thinking and problem solving skills. 'Scaffold builders' must be careful, however, to not take the learners too far outside their zone of proximal development because that will create too much tension, the learners will not be able to make sense of things, and they will likely fail. Alternatively, too little tension can lead to boredom and, again, no development occurs. Bruner described the use of scaffolding this way:

> Where before there was a spectator, let there now be a participant. One sets the game, provides a scaffold to ensure that the child's ineptitudes can be rescued by appropriate intervention, and then removes the scaffold part by part, as the reciprocal structure can stand on its own (as cited in Hodson & Hodson, 1998, p.37).

Clearly then, constructivism serves to bridge Vygotsky's ZPD and the practice of apprenticeship as revealed by Lave and Wenger (1991). In apprenticeship, the journeyperson, as the experienced adult, conveys the necessary new knowledge to the apprentice, and shows him/her how things are done. Over time, the apprentice develops the problem-solving and problem-finding skills required of a journeyperson through the enactment of a series of roles, and they construct meaning for themselves as they move toward being seen as competent in the trade (Lave & Wenger, 1991). The learning process moves from passive to active and the development of knowledge may be seen as moving along a continuum from knowing how, to knowing what, to knowing when, and knowing why. Said another way, the apprentice uses their declarative knowledge and procedural knowledge and, in the process, s/he develops the contextual or conditional knowledge (Woolfolk, 1998) required of a journeyperson.

McGilly (1994) defines declarative knowledge as knowledge about the world and its properties, while procedural refers to knowledge of how to do things. The third form, contextual or conditional knowledge, is knowledge experts have about context that apprentices do not yet have. In other words, contextual knowledge involves knowing when and where to use declarative

and procedural knowledge (Woolfolk, 1998). When we combine these three forms in the expert role, we have the journeyperson moving the apprentice along a continuum from knowing-what, to knowing-how, to knowing when, where and why activities are performed. Understanding these types of knowledge, and how they fit with the ZPD concept, is important for vocational and technical educators because it is the expert's ability to lead the apprentice's development that will shape the learning experience and help determine the learner's rate of development and range of occupational competence. Obviously, a more effective way of gaining knowledge requires that the acquisition of declarative, procedural and contextual or conditional knowledge should not be separated, and the acquisition of one type of knowledge is interwoven with the others.

Using a situated learning approach to development and the concept of a community of practice, Lave and Wenger's (1991) research on apprenticeship offers one view on how the ZPD can help us construct or re-construct our view of development and the function of educators in the development process. With apprenticeship as their focus, Lave and Wenger set out to better understand situated learning theory as a conceptual tool for education and instruction. They were interested in how competence is developed in communities of practice as journeypersons provide newcomers with leading activities situated in real time and in real settings. Contrasted with official instruction, which is based on preplanned activities that occur in classrooms and training rooms in contrived time, this organic approach to instruction is based on day-to-day work activities that occur in the workplace in real time (Little & Quinlan, 1998). The key to organic instruction is that we do not want the journeypersons to stop working and start instructing newcomers because the organic approach promotes informal or accidental learning in it purest form. The journeyperson's primary function is to provide a series of leading activities designed to bring the newcomer's level of understanding and performance beyond their current level, and the focus of learning is on the newcomer, rather than the focus of instruction being on the journeyperson.

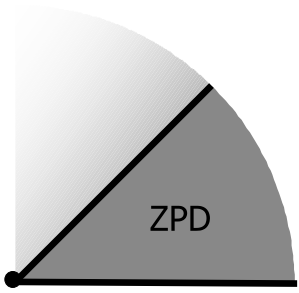
Although Vygotsky never created a graphic of the ZPD, following are four graphics intended to get us thinking about the implications of the Zone for instruction in vocational and technical education and training. The focus of the discussion in the four graphics is cognitive apprenticeship as an instructional process in apprentice development. Using Lave and Wenger's (1991) framework of roles and status ascribed apprentices as they move from novice to expert in their occupation, the figures are labeled *Status Subordinate*, *Learning Practitioner*, *Sole Responsible Agent for a 'Minor' Part in the Performance*, and *Aspiring Expert*. Lave and Wenger used the terms *old-timer* and *newcomer* to depict the master-apprentice or expert-novice relationship, and to differentiate between the journeyperson who provides the leading activities and the apprentice who is operating in her or his zone of proximal development.

## Vygotsky's ZPD as a Conceptual Tool for Our Understanding of Cognitive Apprenticeship

The four figures presented in the succeeding pages of this article are graphic representations of Vygotsky's ZPD. The angle lines in each of the figures are intended to serve a purpose similar to the *border crossings* Wenger (1998) uses to denote the crossing points of communities of practice. The lines are not used to suggest each individual fits into the particular *range*. The dark shading is used to depict the idea that an individual's current ZPD is comprised of a solid base

of current knowledge and skills, while the fading-away area serves to indicate individuals are moving outside their ZPD; if taken too far across the *border crossing* they may become incompetent

.Figure 1 represents the initial range of development Vygotsky might have been thinking about in developing the ZPD concept. In apprenticeship, Lave and Wenger (1991) labeled this range of development as *Status Subordinate* to portray the role and status apprentices hold in the training process. The status subordinate role both requires and allows newcomers to step back and observe the journeypersons in action without being burdened with assignments they are yet unable to fulfill, and the newcomers are not held responsible for any part of the community's operational activities. In this role, the apprentices may begin what Vygotsky coined as *self-talk and inner speech* (as cited in Ormrod, 1995) to help guide and direct their own behaviors through difficult tasks and complex maneuvers in much the same way as their journeypersons have guided them. To rephrase Ormrod's (1995) statement, 'Do they begin to build their own scaffolding?'




Zone of Proximal Development

*Figure 1*. Status Subordinate

If, say, an outsider were to observe journeypersons going about their day-to-day routines they might seem to be neglecting the newcomers. This benign neglect, however, is a recognition of the newcomer's ZPD and it allows the newcomer to observe the journeypersons in action and participate peripherally in the community of practice without the threat and anxiety of being asked to take on prematurely assigned tasks and responsibilities. At this early point in their development, status subordinates are expected to gain an understanding of community culture, to begin taking on the identity of the community, and to develop the sense of knowing where and when not to interrupt the work and ask questions. The newcomer's function at this point in time is to note puzzling aspects of the practice as the journeyperson goes about the work and bring them up later at an appropriate time and space. It is in this initial ZPD that emerging members begin to identify with the community of practice.

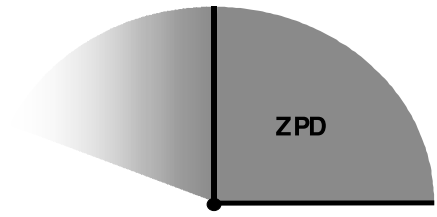
In police service organizations, for example, newcomers or new employees may start to take on the language, dress, body stance, and actions that typify a full member, and then begin to internalize the values that commit one to engage in the practice. The duties assigned new officers may appear to be menial at first glance, but they place them in contact with experienced officers and in situations where they become privy to an unending stream of stories about the community and its practice. The benefit of this approach is it allows the experienced professionals to go about a detachment's operational activities in an uninterrupted way that serves as a natural observation model for new officers who are interested in developing the identity and knowledge base and to engage competently in policing activities.

As Status Subordinates in communities of practice, newcomers develop the ability to act appropriately by *paying their dues* and by being willing to abide by commonly accepted rules and customs of how members are supposed to act within the community. When members join a fire department, for example, they take on its trappings in order to participate and make sense of things; however, once these new members have the lay of the land they begin to put their own brand on things (Little & Quinlan, 1998). This approach to development reflects current demands for training and development to focus on situating activities in real world contexts and promoting informal learning through coaching and mentoring, using multiple perspectives and collaborative approaches, and promoting social negotiation and reflection. There is also an emphasis on recognizing the learner's knowledge and competence to manipulate and apply information, and on the need for information to be presented in different ways and at different times relative to purpose, process and readiness of learner (Quinlan & Song, 1998). Are these not tenets of the ZPD concept? In line with the constructivist approach, the emphasis is on learning processes which use and promote the development of problem finding and problem solving skills, and which advance the view that knowledge resides within a community of practice and not in any one individual's head.

Having met the journeyperson's requirements for the Status Subordinate role, the apprentice is invited into the next range of development, *Learning Practitioner*. The moving into this next range of development serves as an indicator that the newcomer's ZPD has expanded and s/he will gain closer contact with the journeypersons as they go about their day-to-day activities.

Figure 2 represents the second or succeeding range of development Vygotsky might have been thinking about in developing the ZPD concept. Lave and Wenger (1991) labeled the role and status ascribed to the apprentice in this range as *Learning Practitioner*. The transition into the learning practitioner role makes it possible for newcomers, after their initial period of simply

observing the journeypersons in action as Status Subordinates, to perform routine tasks in concert with them. To occupy the newcomers' time and mind, and to give structure to their experience and development, the journeypersons assign these seemingly insignificant tasks that can be performed without any prerequisite capabilities, other than having previously observed the journeypersons performance of the same or a similar task.




Zone of Proximal Development

*Figure 2*. Learning Practitioner

This initiation into practice enhances the newcomer's capacity to more closely observe the community's practices and creates other opportunities for informal participation in productive activities. By helping with certain minimal aspects of the work, newcomers gain a more intimate understanding of organizational practice, and the direct engagement serves to further develop the newcomers' identity with the community as they use the tools, wear the artifacts, and develop the social and occupational norms associated with the practice. As a learning practitioner, the apprentice may advance in the use of self-talk and inner speech as they actually engage in parts of the duties and are being guided toward participation in more difficult tasks and complex maneuvers.

The benign neglect that was observed in the status subordinate role is less evident in this range of development as journeypersons, while going about their day-to-day activities and engaging the newcomers in them, are able to unobtrusively assess the newcomer's potential for taking on more responsible tasks. This focus on potential dovetails with Vygotsky's view that "it is just as crucial, if not more so, to measure the level of potential development as it is to measure the level of actual development" (as cited in Wertsch, 1985, p. 68). Although not being solely responsible for the completion of essential tasks in this stage, the learning practitioner gets to

assist in performing them and, in so doing, expands their zone of proximal development. By virtue of being involved in some of the work, the newcomer is better positioned to make sense of the lunchroom stories and to, on occasion, add a minor note or explanation to them. This engagement can serve to build on the newcomers' understanding of organizational culture and their knowledge base about the community and nature of work, while expanding the zone of proximal development.

Two questions arise here for us to think about in terms of our view of development:

1. Do we see development as a verb? Is it the journeyperson who expands the newcomer's ZPD?
2. Alternatively, do we see development as a noun? Is the expanded ZPD a result of the newcomer's growing ability to use and further develop problem solving and problem finding skills as an outcome of being directly engaged in work activities?

Like status subordinates, learning practitioners continue to observe and note aspects of the practice and bring them up for questioning and examination at a later and appropriate time and place. By this point in time the apprentice has gained some insight into the hands-on aspects of the practice and has been involved peripherally in the problem-solving processes associated with work. Reflection on practice is an ongoing aspect of work by now as the apprentices engage in discussions with journeypersons and further develop their cognitive capacities through the use of *self-talk* and *inner speech* as tools for development. As the apprentice's ZPD expands into a third and next range of development, that of *Sole Responsible Agent for a 'Minor' Part in the Performance*, the journeyperson has to decide if and when to give the newcomer a *knowing wink and nod*. This very significant signal serves as an indicator of the journeyperson's informed judgement about the newcomer's apparent readiness to make the transition and to more fully engage in the activities of the community of practice.

Figure 3 represents the third and continuous range of development Vygotsky might have been thinking about in his ZPD concept. Lave and Wenger (1991) labeled this range as *Sole Responsible Agent for a 'Minor' part in the Performance* to portray the role and status of apprentices as their ZPD expands and their competence advances to a new level. As Little and Quinlan (1998) found in their research into the development of competence in fire departments, the *sole responsible agent for a 'minor' part in the performance* role unfolds when the journeyperson decides the newcomer has the basic level of competence to be assigned responsibility for a minor part of the work. The transition from the learning practitioner into the *sole responsible agent* role means that the journeyperson has deemed the newcomer competent enough to be assigned some responsibility for the sole performance of certain aspects of the work. By this point in time, the newcomer has acquired this capacity largely by standing back and watching the journeyperson going aboutthe work and thinking about how they might do it – *self-talk* and *inner speech* working again! Eventually, by being assigned and successfully completing small tasks associated with a major activity (e.g. washing and placing pistons in the cylinders of an engine the mechanic is rebuilding), and demonstrating the right mix of thinking and acting skills at the appropriate time, the newcomer is invited to perform a task alone and can do so to the required standard (e.g. install the engine's crankshaft and connect the pistons with minor supervision). From the ZPD perspective, the journeyperson, after extensive interaction with newcomers in the task and social contexts of work, is able to use this third range of development as a basis for constructing or assigning the tasks that will lead to the newcomers' development within their current ZPD.

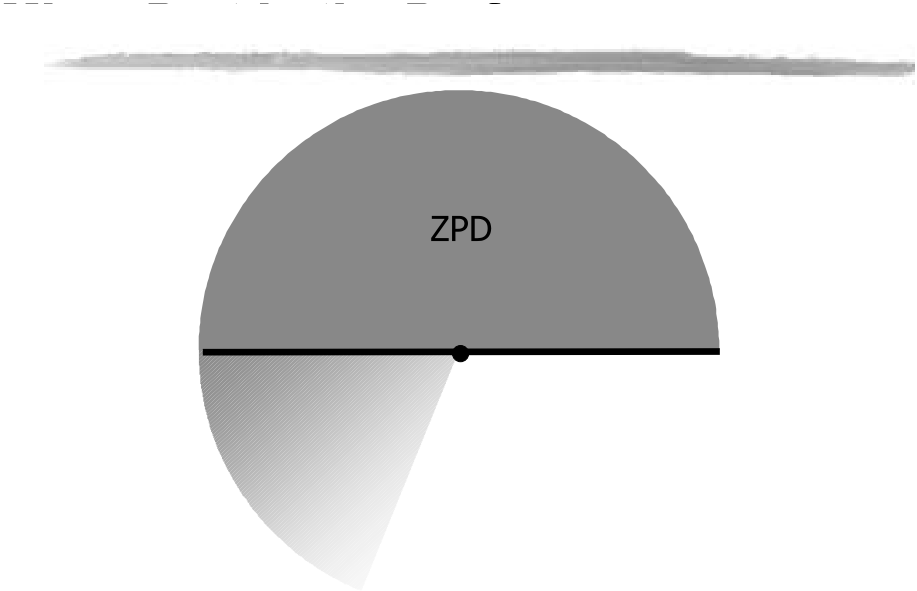



*Figure 3*. Sole Responsible Agent for a 'Minor' part in the Performance

As Figure 3 depicts, by using Vygotsky's notion of scaffold building, and gradually assigning an increasing number of minor parts in the performance of work activities, the journeypersons continue to nourish the newcomers' understanding and internalization of the community and its culture and identity. The journeypersons also continue to promote the development of higher order problem solving and problem finding skills by now engaging newcomers in *juryrigging* and *bootstrapping* operations (Little & Quinlan, 1998). The introduction to juryrigging and bootstrapping at this point in their development places a whole new set of performance

expectations on the apprentice, and this demand for higher order thinking and development dovetails neatly into Vygotsky's scheme of development.

Problem solving scenarios, or juryrigging incidents, emerge when journeypersons are faced with an immediate operational problem and the newcomers observe them as they draw on their current knowledge and competence to come up with a solution and take immediate action to resolve the problem. Development in the problem-finding mode, or bootstrapping situation, occurs as journeypersons gather in some time or location away from day-to-day activities and begin to talk and think about how work gets done and how they resolved the latest problem in action. By drawing on ideas gained through these discussions, and through knowledge gained from memberships in other communities of practice, the journeypersons find problems they never knew existed and devise new ways to perform the work or to deal with old problems (Little & Quinlan, 1998). As the newcomers observe, listen to, and make *minor* contributions to these various activities and discussions, they develop an increasing level of competence and continue to develop and expand their problem solving and problem finding skills, structures and processes. As the ZPD expands, the *sole responsible agents* begin their transition into the fourth and next role and status, that of the *Aspiring Expert*. Having assigned newcomers responsibility for the sole performance of certain activities and engaging them in helping to resolve immediate problems as they arise, the journeyperson has encouraged the acquisition and development of the practical skills and higher order mental functions required in the aspiring expert role.

The final figure in this article, Figure 4, represents the fourth in a continuum of development Vygotsky might have been thinking about in developing the ZPD concept, and Lave and Wenger saw as the final stage of apprenticeship. Lave and Wenger (1991) labeled this stage *Aspiring Expert* to communicate that an apprentice had achieved the community's required level of competence as a journeyperson, expert practitioner, or professional, and is now recognized by other experience professionals or journeypersons as a peer holding similar roles and status. The transition into the aspiring expert role makes it possible for the former newcomer to lead the development of the newest newcomers and to operate side by side and on par with other journeypersons.

The rite of passage to aspiring expert status is typically the result of having successfully performed an assigned range of sole-performance tasks. The newcomer, with experience in performing work activities, and having been deemed competent by a journeyperson, is now able and accepted to converse about matters of practice, in both organic and official settings. On the ZPD view of development, these advanced-level discussions represent constructive critiques of the practice and lead to further development of problem solving and problem finding skills, structures and processes.

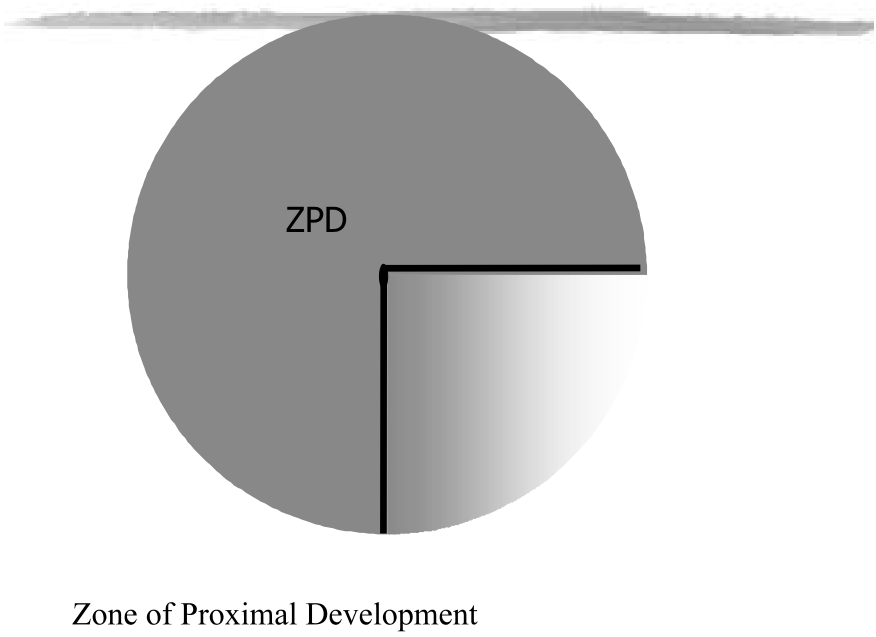



*Figure 4*. Aspiring Expert

Lave and Wenger (1991) carefully chose the term *Aspiring Expert* to communicate that people never become *expert*. In the process of using our skills and knowledge to perform some aspect of work or everyday life, we discover both what we know and do not know. It is the *aspiring* to know what we do not know that provided Lave and Wenger the label to represent their view of journeyperson development. The unclosed graphic in Figure 4 depicts this view that, just as the journeypersons as *experts* think they have it figured out, they temporarily return, over and over, to the newcomer role and status as they continue their development of occupational competence. In this way, the aspiring experts' zones of proximal development never close as they go about the business of acquiring new skills and sensitivities required in the performance of work.

A final note to this view of development is that, by the fourth stage of development, the journeypersons have reproduced themselves in the newcomers and, in so doing; they reproduce the community of practice. The newly-confirmed journeypersons, in turn, take new members under their wing and the process of re-producing both the membership and the practice continues. The newly-confirmed journeyperson has also gained the privilege of contributing to the repertoire of stories by adding new ones and embellishing those that already comprise the community's identity, culture, and legacy.

## Some Implications of the ZPD Concept for the Theory and Practice of Vocational and Technical Education

As a conceptual tool for understanding the education and training process in today's institutions and workplaces, the article has explored the ways in which Vygotsky's ZPD concept might provide the basis for instruction in adult vocational and technical education and training. The focus of the article was Vygotsky's potential contribution to our understanding of cognitive apprenticeship as a process of development in adult informal vocational and technical education and training. Cognitive apprenticeship emphasizes teaching learners different ways of thinking about whatever they are learning, as well as any skills associated with the apprenticeship. Based on a study of different forms of cognitive apprenticeships, Brandt, Farmer, and Buckmaster (1993) have offered a clear description of cognitive apprenticeship as a process of instruction. A model developed by Farmer, Buckmaster and LeGrand suggests cognitive apprenticeship "starts with deliberate instruction by someone who acts as a model; it then proceeds to model-guided trials by practitioners who progressively assume more responsibility for their learning (as cited by Merriam & Cafarrella, 1999, p. 243). This view dovetails neatly with the ZPD concept, which suggests instructors and other scaffold builders should focus on teaching students within the ZPD as the best learning is that which occurs in advance of the student's development. It is in the ZPD that scaffolding plays a key role as it enables the instructors to present new ideas in advance of the student's development, and to create opportunities for students to use and take control of those ideas (Hodson & Hodson, 1998). The discussion of the four figures in the preceding pages indicate that Vygotsky's zone of proximal development is potentially a useful and effective conceptual tool or model for instruction in cognitive apprenticeships in vocational education programs. Knowing about the ZPD's untapped value in informal learning is essential if we are to maximize the development opportunities that exist *on the factory floor* of our communities of practice. Accordingly, a comprehensive analysis of the ZPD might reveal exciting ways for looking at the theory and practice of training and development in vocational and technical education.

In addition to cognitive apprenticeships in informal adult vocational education programs, the ZPD concept can be applied also to instruction in other forms of formal and non-formal vocational and technical education and training programs, including anchored instruction. Anchored instruction "provides a way to recreate some of the advantages of apprenticeship training in formal educational settings" (as cited by Merriam & Cafarella, 1999, p. 245). Merriam and Cafarella relate the purpose of anchored instruction is to create situations in which learners, through sustained experiences, can grapple with the problems and opportunities that experts or experienced professionals encounter in the workplace. The goal of anchored instruction is to have learners "experience what it is like to grow from novices who have only rudimentary knowledge…to relatively sophisticated experts who have explored an environment from multiple points of view" (as cited in Merriam and Cafarella, p. 245). Like in the ZPD concept, it is important that learners do not remain dependent on the scaffold of instructor assistance. In addition, it is critical that instructors are able to judge when learners are ready, and when they need to take control of some aspects of their learning. As Hodson and Hodson (1998) relate, this requires some sensitivity on the part of the instructor to each student's current learning needs.

The ZPD concept is also applicable to on-the-job training (OJT) as well as cooperative education programs. Learning in OJT programs is guided by the view that knowledge emerges in contexts

in which it is relevant and concepts continually evolve with each experience and new use of knowledge. According to Shambaugh and Magliaro (1997), learning in such programs involves the use of three crucial factors: activity (practice), concept (knowledge), and culture (context), and it is facilitated by authentic tasks that are anchored in the contexts. As well, the acquisition of declarative, procedural and conditional knowledge in OJT programs is not perceived as separated; rather the acquisition of one knowledge type is interwoven with the others for effective learning to take place. OJT can take several forms including apprenticeship training, coaching and mentoring. Coaching involves the provision of one-on-one guidance and instruction to improve the knowledge, skills, and work performance of employees. It is usually directed at employees with performance deficiencies, and it is the coach's responsibility to successfully guide the deficient employee toward satisfactory performance (Blanchard & Thacker, 1998). Mentoring is widely perceived as an interpersonal relationship where "…a mentor is someone who helps someone else learn something that she would have learned less well, more slowly, or not at all if let alone" (Bell, 2000, p.53). All forms of mentoring relationships involve a senior person or trusted individual usually referred to as the mentor or scaffold builder, and a junior person known as the mentee, newcomer or learner. Like coaches, mentors or journeypersons usually have considerable professional and work experience and expertise in a particular area and it their responsibility to assist in the development of their mentees. Cooperative education programs seek to integrate classroom and workplace learning. Students are able to operationalize academic knowledge through relevant, paid, work experiences with discipline-specific employers. Using the ZPD concept, mentors, coaches, instructors and other individuals involved in different forms of OJT and cooperative education programs must be careful to not take the learners too far outside their comfort level in the development process. Their role is to act as scaffold builders by providing a series of learning activities to guide the learners and mentees in the development process.

A key underpinning of Vygotsky' ZPD concept is for educators, instructors, mentors, and other scaffold builders to understand that all learners have levels of competence in their fields within a certain range, and one of the key purposes of training and development in vocational and technical education is to stretch them beyond that range so they gain increased levels of knowledge and further develop the competence to engage in the activities of a community of practice. At the same time, however, educators, instructors, mentors, and other scaffold builders in vocational and technical education and training programs must be careful to not take their learners too far outside their zone of proximal development because that will create too much tension and the learner will not be able to make sense of things and they will likely fail. Alternately, too little tension can lead to boredom and, again, no development and learning might occur. In the case of the status subordinate, for example, newcomers or learners in apprenticeship programs are seen as being competent only within their *zone* and the journeypersons serve as scaffold builders by providing instruction, advice and guidance as newcomers acquire the requisite skills and competence to become full members of a community of practice. Again, using the concept of *zone* means knowing that learning involves a degree of tension and uncertainty, and the journeypersons', mentors' and instructors' role is to provide the right degree of tension so newcomers are not taken too far outside their ZPD where they feel and are seen as incompetent (Little & Quinlan, 1998). Educators in all forms of vocational and technical education and training programs must understand and use a variety of approaches to instruction and learning. They must also endeavour to understand the students within their socio-cultural contexts. According to Wink and Putney (2001), this notion suggests that educators and other scaffold

builders should take into account individual differences among students, and the communicative nature of the learning process through which students learn and develop.

To use the ZPD as a conceptual tool or model for instruction, educators and other scaffold builders should be familiar with the principles underlying the concept, particularly with respect to both an individual's current level of preparedness to engage in activities and the individual's right to become involved in or withdraw from any situation. An educator's understanding of the concept of *zone* will play a pivotal role in determining whether newcomers or learners are *engaged* or *disengaged* in the process of learning and development. In applying the ZPD concept as an instructional tool or model for all forms vocational and technical education programs including apprenticeships, mentorships, anchored instruction, cooperative education, and on-the-job training, educators and other scaffold builders can also view the students' zone of proximal development as their *zone of comfort* or *zone of competence* around their current understanding and sense of knowledge and competence to perform the work.

A few questions are worthy of some further exploration. For example, is there a community of practice Zone of Proximal Development? If so, how does it differ from the individual ZPD, and what are its implications for corporate training and development in a world that increasingly depends on advanced levels of problem solving, problem finding, and knowledge creation? Likewise, does the ZPD have application in or across boundaries of what Wenger (1998) refers to as Constellations of Practice? Second, can Vygotsky's notion of individual development be applied to community organizations? Do communities themselves have zones of proximal development? If so, how can community development and community education specialists use the ZPD in their practice? Third, in what ways can we maximize the benefits to be derived from workplace initiatives such as cooperative education, mentoring, coaching, and similar programs by using the ZPD as a conceptual tool?

Using the oilfield practice of delineation to explore the ZPD's potential for development enables the various fields and disciplines of education and training to look for aspects that hold potential for improving their own practice, while coming back to Vygotsky's central theme of development being a lifelong process. This article has suggested that the ZPD concept has tremendous potential for use as a basis of instruction in cognitive apprenticeship and other forms of formal and non-formal adult vocational and technical education and training programs such as anchored instruction, mentoring, and cooperative education programs. If elementary and secondary school vocational and technical educators, college and institute instructors, community health educators, police detachments, fire departments, seniors organizations, and other communities of practice were to pursue further analyses about the ZPD and its potential implications for training and development, we could continue the work Vygotsky began almost three-quarters of a century ago; discovering more about how we learn, develop, and maintain the competencies required for problem solving and finding; not only in today's knowledge-producing and technology-driven organization, but also in everyday life.

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