Cultural-Historical Activity Theory:
A Conceptual Analysis of Curriculum and Instruction

by

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B.A., Simon Fraser University, 1992

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

In the
School
of
Education

Diversity in Curriculum and Instruction

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SIMON FRASER UNIVERSITY

Summer, 2005

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Abstract

A thesis presented on the need to reconsider current educational orthodoxy in light of the potential utility of CHAT to provide a more logically coherent, potentially superior framework for the conceptualization of curriculum and instruction. The Vygotskian foundation of the CHAT framework is examined, and its potential benefits to current educational practice are clarified with suggestions for implementation in the middle-school classroom. It is argued that implementation of CHAT educational practice should result in enhancements to curriculum and instruction, and will produce significant benefits for students' intellectual development as well as a superior ability to engage in theoretical thinking. The thesis also contends that the CHAT framework is a useful tool for the assessment and improvement of classroom activities to ensure that the activities selected by the teacher result in legitimate learning activities for the students.

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Chapter One: Vygotsky and Cultural-Historical Activity Theory

In the field of Education, Vygotskian theory finds itself in a rather peculiar position because although it is widely *known of,* it is very poorly *understood,* and this is perhaps one of the reasons why activity theory has not yet made many inroads into North American educational discourse. Vygotskian theories have only been introduced into North America in the form of very watered down and only superficially understood notions of the Zone of Proximal Development (Daniels, 2001, p.56) and of vague notions of the internalization of knowledge (Daniels,2001, p. 41), and these are often confused with elements of developmental constructivism. Because Vygotsky's theory is poorly understood (if understood at all by many educators) it is possible that many teachers and theorists have difficulty in distinguishing the profound differences between Vygotsky's theories of psychological development and the theoretical frameworks of Piaget and Constructivism, and therefore see no real need or value in examining Cultural Historical Activity Theory (hereafter referred to as "CHAT") in detail. Because of this lack of clear understanding of Vygotskian theory, many educators and theorists may be incapable of understanding the potential that CHAT holds for transforming Western notions of curriculum and instruction into a much more powerful and effective

system for effective teaching and learning. It has been pointed out by one author, commenting on the subject of discourse on activity theory in the 1990s, that despite the development of activity theory and successful application of the framework in educational environments over many years in Eastern Europe and Scandinavia, "in the Western and, more specifically, the Anglo-Saxon literature, the activity theory was virtually unknown" (Roth, 2004). Although there is some indication that interest in activity theory has grown in North America since the late 1990s, limited understanding of the Vygotskian theories upon which the framework is founded results in a conceptual impasse that prevents many educators from achieving a clear and useful understanding of CHAT. It is therefore essential that Vygotsky's theories on the development of higher psychological functions as a result of the mediating action of internalized psychological tools and the role of concept formation in development be clearly understood in order to appreciate the how activity theory incorporates these concepts into a framework that educators can use as a powerful tool for constructing effective and engaging learning activities.

The first Vygotskian concept that needs to be clearly understood is the notion of thinking as a mediated action and its role in ontogenesis. Mediated action as a psychological activity involves the use of indirect

methods of accomplishing a mental objective by making use of symbols and signs or tools. A very simplified example of tool use to complete an objective could be the use of a calculator to find the sum of a list of numbers. The difference between using a calculator and the kinds of tools Vygotsky was referring to is that Vygotsky was concerned with mental activity involving psychological tools. Vygotsky (1978) believed that mental functions could be divided into two broad categories: lower psychological functions determined from stimuli arising from the immediate environment and closely associated with biological function, and higher psychological functions which are result of uniquely human, artificially created stimuli that are the genesis and mold of complex mental behaviour. Vygotsky was adamant in his writings that the use of tools and signs as a psychological activity forms the basis for human thinking and results in uniquely human mental functions, and that, "use of artificial means, the transition to mediated activity, fundamentally changes all psychological operations..." (Vygotsky, 1978 p. 55). It is from this concept that Vygotsky created his famous model depicting the change from a simple stimulus-response line to a triangle that indicates the use of a mediator or mediated act to complete the operation. In describing the use of the mediator, Vygotsky points out that,

> the simple stimulus–response process is replaced
> by a complex, mediated act...In this new process the
> direct impulse to react is inhibited, and an auxiliary
> stimulus that facilitates the completion of the operation

by indirect means is incorporated (Vygotsky, 1978, p.40).

It is essential to understand that the use of mediators in psychological activity does not simply result in faster cognition or enable a person to connect thinking to the objective world, but results in qualitatively different modes of psychological activity because the psychological process itself has been altered. In the words of Vygotsky, the, "system of signs restructures the whole psychological process and...reconstructs [the process]...on a totally new basis" (Vygotsky, 1978, p. 35). The acquisition of mediators (or cognitive tools) results in a qualitative transformation of the higher psychological processes and because of this, the psychological mediator has an effect not on the environment but on the individual's mental activity. From this perspective it becomes clear that without an adequate mediator available for an individual to use, it may be extremely difficult if not impossible for an individual to accomplish an objective. This is important because it implies that there may be more than one adequate mediator for any given psychological function, and it also implies that one mediator may be superior to another in some ways and inferior in others. The significance of mediation lies in the fact that the availability of effective mediation may be a key element in the degree of success achieved in performing a mental activity, or to put it another way, the mediator that is employed will impact the form and quality of cognition that results. The logical conclusion from this perspective and

one that is critical to understanding the relationship between mediation and mental development is that rather than biological development being the determinant of the quality of cognition that is possible, an individual's higher psychological functions may be developed by the purposeful introduction of appropriate mediators.

Internalization, Mediation and the *Soroban*

To illustrate this point, it might be useful to examine the use and efficacy of two tools for performing mathematical computations; the calculator and the abacus. In North America, the use of a calculator is considered to be a useful skill to acquire in elementary school. In British Columbia, many school districts such as Maple Ridge and Langley include a calculator in the list of recommended school supplies for students entering grade four. Students are taught how to use the calculator to complete basic addition, subtraction, multiplication and division, and students rely on the calculator for completing computations in various subjects. While the calculator is a very convenient apparatus for completing mathematical problems, it is not a mediator because it does not have any impact on the inner psychological processes associated with mathematical operations. Many teachers bemoan the fact that if students do not have a calculator, many of them are incapable of completing basic arithmetical calculations. In contrast to this situation in North America, in Japan many children attend evening classes to learn

how to use the abacus (called "soroban" in Japanese). Students are not permitted to use calculators in elementary or middle school however they are permitted to use the soroban. Learning to use the soroban is initially a time consuming activity that begins with students learning to represent numbers by positioning wooden beads in the appropriate positions on the soroban. From there, they learn how to manipulate the beads to perform basic addition and subtraction, and then move on to do multiplication and division as well. While the calculator and the soroban are outwardly similar in that they are both used to perform computations, there is a profound difference in the psychological activity occurring in the students. In the case of the calculator, children learn the correct order in which to push the buttons on the calculator, but the Japanese students are learning how to symbolically represent numbers as arrangements of beads on the soroban.

The impact of the soroban on students' mental activity supports Vygotsky's argument that mediation alters higher psychological functions because in the absence of a real soroban, Japanese students can perform complex arithmetic by creating a mental image of a soroban and imagining the changes in the pattern of the beads in order to complete the task. It is imperative to understand that this is a mediated action because the students are not physically counting beads, but are

converting numbers into patterns, manipulating the patterns on the

mental soroban and then converting the pattern back into numbers.

Because the students are relying on the image of a soroban, it is clear

that the tool has shaped the nature of the psychological processes

involved in performing arithmetic calculations and transformed those

higher psychological functions into a unique format. It is worth noting

that younger students often perform these mental calculations while

moving their fingers over the imaginary beads, so the mental calculation

is done accompanied by external indications of the mediation involved in

the mental activity.

The second Vygotskian concept involved in ontogenesis that plays

a central role in activity theory is the process of internalization and its

relationship to psychological function. It must be emphasized that the

Vygotskian concept of internalization is not the same as the Piagetian

notion of the construction of knowledge that serves as the basis for

mainstream constructivist theories of internalization. Piaget's theory

claims that children go through a process of accommodation and

assimilation that results in the addition of new knowledge schema or the

modification of existing schema to explain or understand the objective

world around them. According to Piagetian theory,

> major cognitive advances take place as children act
> directly on the physical world, discover the shortcomings

of their current ways of thinking, and revise them to
create a better fit with external reality (Berk, 2000, p. 221).

This model of development focuses on the interaction of the individual in

isolation with his or her environment, and therefore the model excludes

social interaction and communication as essential elements of

development. Cognitive development in the individual child occurring as

a product of the child's experience with the concrete environment results

in the development of psychological structures that create domain-

general changes in cognition, and biological development is deemed the

primary limiting factor on the rate of mental development and the types

of mental activities that are possible for the child. From this perspective,

the child's empirical observations based on everyday experiences with the

surrounding environment combined with natural biological development

are the primary factors in cognitive development.

Vygotsky (1978, 1986) viewed the social domain as the source of all

higher psychological processes and he argued that psychological tools are

initially external to the learner but are gradually internalized and

become the mediators for mental activity. Vygotsky considered the

internalization of language to be the most vital process in the

development of the human mind, and pointed out that while the

development of communication begins with single words and then

progresses through telegraphic speech and simple sentences to finally

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arrive at the production of complex utterances (in other words, develops

from the phonetic to the semantic) the psychological process begins with

complete, albeit simple ideas encapsulated into single-word utterances

(from the semantic) but as the understanding of language develops, the

child can begin to divide and separate the idea into more refined and

differentiated units. According to Vygotsky,

> A child's thought...is born as a dim, amorphous
> whole...As his thought becomes more differentiated,
> the child is less apt to express it in single words...
> Conversely, progress in speech to the differentiated
> whole of a sentence helps the child's thoughts to progress
> from a homogenous whole to well-defined parts
> (Vygotsky, 1986, p. 219).

Development of language therefore results in the ability to make finer

and finer distinctions regarding the nature of the ideas and thoughts that

a child has in a similar way that the increasing resolution of better and

better microscopes allows someone to understand the world in finer and

finer detail. The result of this internalization of language is qualitatively

different thinking as speech, initially external to the individual,

gradually becomes internalized and has a profound impact on higher

psychological function.

Vygotskian theory asserts that the internalization of other

mediators that are initially external to the individual would also result in

a qualitative transformation of psychological processes related the

potential function or purpose of the mediator. Vygotsky firmly asserted

that the development of higher psychological functions was the result of

the internalization of mediators through social interaction and that,

> An interpersonal process is transformed into
> an intrapersonal one. Every function in the child's
> cultural development appears twice: first, on the
> social level, and later on the individual level; first,
> between people (interpsychological), and then inside
> the child (intrapsychological) (Vygotsky, 1978, p. 57).

From this perspective, the development of psychological processes is not

simply a matter of memorizing facts or making empirical observations

and gathering data in isolation or the simple transmission of information,

but the exposure to and internalization of mediators through the

transformational function of signs in a social environment that result in

the development of the ability to perform qualitatively different mental

activities. Effective psychological development therefore has as an

implicit prerequisite a social environment where students internalize the

psychological mediators that will enable them to participate and function

more and more effectively in the intellectual activities in which those

around them are engaged.

The third Vygotskian concept that must be understood in order to

understand CHAT is the role of spontaneous and scientific concepts in

ontogenesis. Vygotsky contrasted the nature of scientific concepts and

spontaneous concepts by indicating that spontaneous concepts are

context-bound and, "emerge on the basis of children's experience in the everyday world" (Wertsch, 1985b, p. 103) whereas scientific concepts are, "mediated from the start by some other concept...[and] the very notion of scientific concept implies a certain position in relation to other concepts" (Vygotsky, 1986, p.172). In other words, the child develops an understanding of the world based upon personal experience in everyday life and the result of this process is knowledge that is situation-dependent, is not systemic or generalized knowledge and is typically applied unconsciously and may contain many errors and contradictions. Scientific concepts on the other hand represent theoretical knowledge which is organized and mediated through conceptual relationships with other bodies of theoretical knowledge and is employed as a conscious mental activity. Access to scientific concepts begins when children are exposed to formal education and begin to engage in the study of systems of knowledge. Vygotsky indicated that while everyday concepts are well-known to the child, "Scientific concepts are introduced by the teacher...even before the pupil has any concrete experience with what stands behind them" (Luria, 1987, p. 366). Vygotsky (1986, 1931) argued that while the origins of these two different modes of thought are different, the key to ontogenesis and the development of higher psychological functions lies in the effective interaction between these two modes of understanding. To illustrate the difference between these

concepts it might be useful to consider the origin and nature of two forms of communication: the spoken word and writing. Speech is often accomplished in the everyday world without conscious attention and often without attention to understanding of the underlying grammar upon which the language is based. The result is speech that may contain contradictions in meaning or subject verb agreement for example, or inaccurate use of words and expressions, or sentence fragments. Formal writing, on the other hand, involves the conscious selection of vocabulary, attention to the structure and grammar of the sentences, and it forces the author to be cognizant of and attend to the writing because particular attention is devoted to the essential elements of formal writing.

In analyzing the relationship between writing and the spoken word, it has been articulated that,

> Writing...provides the model for the production of speech
> (in reading) and for the introspective awareness of speech
> as composed of grammatic constituents, namely, words
> (Olson, 1995, p. 106).

It is through engagement in formal writing that pupils focus their conscious attention on the form and organization of the sentences they are producing, and this enables them to become more aware of the relationship between form, content and meaning in the use of language. The developing awareness of the nature of language on a conscious level fosters advances in the spoken forms of language as well because the

conscious awareness of language results in the ability to consciously

manipulate spoken language in order to employ it reflectively and in

alignment with one's intentions or purposes (in other words

meaningfully), rather than simply using it unreflectively and

spontaneously. In describing the dialectic relationship between

spontaneous and scientific concepts and their role in ontogenesis,

Vygotsky argued that,

> It is our contention that the rudiments of systemization
> first enter the child's mind by way of his contact with
> scientific concepts and are then transferred to everyday
> concepts, changing their psychological structure from
> the top down (Vygotsky, 1986 p.172-173).

With regard to spoken and written communication, it becomes clear that

the effective development of formal writing should logically have an

impact on the child's conceptual understanding of the nature of language

and should change his or her understanding of everyday speech and

enable the child to become aware of, and consciously use, the spoken word

much more effectively, for,

> According to Vygotsky, the development of scientific
> concepts has great significance for the evolution of higher
> mental processes because these concepts necessarily involve
> conscious realization and hence voluntary control. In contrast
> to earlier, context-bound forms of functioning supported
> by spontaneous concepts, the decontextualization inherent
> in scientific concepts makes possible these properties
> of higher mental processes (Wertsch, 1985b, pp.103-104).

Vygotsky's research on scientific concepts were initially limited to the

understanding of words, but Neo-Vygotskian theorists such as Repkin

(2003), Karpov (2003), and, Hedegaard (2002) have advanced the notion

of scientific concepts as representing theoretical and conceptual

knowledge that is intentionally introduced to children in order to enable

the development of conceptual understanding and theoretical thinking

that will ultimately replace their contextualized, subjective

understanding of the world and thus enable them to exert conscious

control over their higher psychological functions. As stated in "Lectures

on Psychology" in *The Collected Works of L.S. Vygotsky: Volume 1*,

(Rieber & Carton, eds., 1987),

> The mental functions undergo a change, when...thinking
> leads to...meaningful interpretation, to a situation where
> the child begins to relate rationally to his mental activity.
> As a consequence, functions whose action had previously
> been automatic, now begin to act with consciousness and
> logic (Rieber & Carton, 1987, p. 324).

It is interesting to note that this level of functioning described by

Vygotsky has a number of remarkable similarities to the notion of meta-

cognitive awareness wherein individuals are described as conscious of,

and therefore being able to direct their attention to focus on, their own

thinking processes and thus able to monitor their own internal thinking

and problem-solving activities. For example, it has been shown that when

math experts are faced with a problem, "their mathematical plans

precede and frame their behaviour" (Frawley, 1997, p. 167). In Vygotsky's

model, conceptual thought is the result of the intellectualization of

thinking wherein the conscious application, analysis and synthesis of

theoretical concepts become possible. When this occurs, the result is a

profound developmental change in the nature of the psychological process

in the individual because,

> It represents a qualitatively new phenomenon which
> cannot be reduced to more elementary processes...
> Concept thinking is a new intellectual mechanism. The
> intellect is able to find a new and unprecedented modus
> operandi in this particular activity and a new function
> becomes available within the system of intellectual
> functions which is distinctive both in its composition and
> structure as well as in the way it functions (Vygotsky, 1931).

Ironically, while many educators refer to scaffolding and the ZPD,

they fail to understand that the ZPD is demarcated at the lower end by

the child's everyday concepts, while the upper end of the ZPD is

demarcated by the child's ability to understand, with the assistance of a

knowledgeable instructor, the relationship between an instantiation of a

theoretical concept and the scientific concept itself. The vital aspect of

Vygotskian theory to which most educators are oblivious when they enter

into discussion of the ZPD is that it is not an autonomous concept. It is

only with an explicit understanding of spontaneous and scientific

concepts that the ZPD can be defined and that effective learning can

occur. The ZPD is meaningless when isolated from notions of concept

development and the learning that results when spontaneous concepts

interact with scientific concepts that function as conceptual points of

reference for the development of conceptual understanding and thinking.

Access to scientific concepts and the opportunity to investigate the nature

of the relationship between theoretical models and their instantiation is

therefore an essential element in the development of theoretical thought

and the ontogenesis of higher psychological functions. The relationship

between spontaneous concepts and scientific concepts plays a vital role in

the CHAT framework for education, and is one of the principal reasons

why CHAT education stands in marked contrast to the current orthodoxy

in curriculum and instruction.

Chapter Two: The Two Pillars of CHAT Education

Vygotsky's work was left incomplete when he succumbed to tuberculosis in 1934, but his research on the role of mediators, internalization and concept development in the ontogenesis of the individual served as the starting point from which his successors pursued investigations into different possible implications of his theory. As a result of this, CHAT, as it is currently understood, is the product of numerous authors, each focusing on a particular facet of Vygotskian theory. Fortunately, the CHAT framework has two primary conceptual pillars upon which it is founded, specifically, the notion of learning as an activity and the notion of developmental teaching. Each of these two pillars is an extension of Vygotskian theory and therefore the CHAT framework has a clear and logical conceptual basis, and when used as a framework for the assessment of educational practice it can provide valuable and practical recommendations for the development of educational programs and thus has great potential value in contributing to the understanding of education in general and curriculum and instruction in particular.

Although the philosophical arguments for activity theory have been traced back through Marx to the writings of Hegel, activity theory as a framework for educational purposes was established by the work of

Leont'ev, who studied under Vygotsky but who focused primarily on the

relationship between internalization and the role of mediation in the

development of human conscious behaviour. Vygotsky articulated the

basic premise of activity theory by arguing that,

> The mastering of nature and the mastering of behavior
> are mutually linked, just as man's alteration of nature
> alters man's own nature (Vygotsky, 1978, p. 55).

Leont'ev pursued this perspective in his research and narrowed his

investigations to center on the role of the internalization of mediators in

shaping the human psyche as a result of engaging in activity, and he

suggested that, "consciousness...first appears in man in the process of the

organization of work and social relations. Consciousness from the very

beginning is a social product" (Leont'ev, 1978, p. 17). Rather than

assuming that consciousness and personality are pre-existing human

conditions, Leont'ev asserted that external objects are internalized

through language into mental representations (Leont'ev used the terms

"psychic reflection" and "impressions") and are thereby transformed into

thoughts. By asserting that consciousness has a social origin, Leont'ev

concentrated on refining and elaborating Vygotsky's notions of

internalization and mediation as the mechanisms for the development of

higher psychological processes that arise from mediated subject-object

interaction. He set out to demonstrate that activity is defined by a society

of individuals and that man's higher psychological processes originate in

activities that are initially external to the individual. The objects of these

activities are a key factor in determining the mediators that are

ultimately internalized, and thus serve as afferent factors in human

development.

Leont'ev defined activity as, "a unit of life, mediated by mental

reflection, by an *image*, whose real function is to orientate the subject in

the real world" (Leont'ev, 1977) and he proposed that the mediators a

person acquires are,

> ...means and methods transmitted to him by the people
> around him in the process of cooperative work in common
> with them. But to transmit a means or a method of carrying
> out one process of another is impossible except in an external
> form- in a form of action or in the form of external speech
> (Leont'ev, 1978, p. 59).

The focus of activity theory is the argument that, "Consciousness appears

as a reflection by the subject of reality, his own activity, and himself"

(Leont'ev, 1978, p. 59). According to Leont'ev, the human psyche is

created as a reflective product of the conscious participation in socially

constructed activities, and he established as his goal the elucidation of

the process wherein activities external to the individual are subsequently

internalized to produce uniquely human forms of psychological processes.

The central issue that Leont'ev sought to address was, "...what...

processes...mediate the influences of the objective world reflected in the

human brain" (Leont'ev, 1977). The value of Leont'ev's development of

activity theory as a framework for understanding the dynamics of human

development (and the subsequent incorporation of activity theory into the

CHAT framework for education), is in its power to explain the nature of

goal-directed activity, and the components and conditions that are

necessary for effective education to occur.

In outlining the structure of activity, Leont'ev emphasized that any

genuine activity has the important quality of being conscious, goal-

directed behaviour. The importance of activity being a conscious

behaviour has direct implications for education for it is possible for

students to complete an assigned task without having any real

understanding of the task, or, alternatively, they may have an agenda

that is completely at odds with or completely unrelated to the intended

goal of the activity. For example, an individual may have any number of

reasons for reading a book: it might be to research something of personal

interest, to prepare for an exam or to simply read for pleasure. Leont'ev

pointed out that in such cases, the nature of the activity is completely

dependent upon the goal of the activity in which the individual is

engaged, and for this reason, he argued that, "the concept of activity is

necessarily connected with the concept of motive" (Leont'ev, 1978, p. 62).

To illustrate his point, Leont'ev argued that a pupil may write, but for

one child the purpose of writing may be different than for another child

and therefore, although the pupils may be assigned the same task, the

results, both internal (the operation developed) and external (the

product), may be quite different because,

> ...let us...assume that from one motive or another a goal
> appeared before him: to inform, to express his thought in
> writing. Then the subject of consciousness will be just this
> thought, its expression in words. Of course, here the pupil
> will perceive the formation of the letters he writes, but
> this will not at the given moment (that is, actually) be the
> subject of his consciousness, and the letter, the word, or
> the sentence for him subjectively only appear as written
> in one way or another, well or poorly. Let us now suppose
> that in the same activity his goal has become something else:
> to write beautifully, calligraphically. Then the actual subject
> of his consciousness will become precisely the formation
> of the letters (Leont'ev, 1978, p. 153-154).

Clearly, in order for a learning activity to be effective, the goal of the

activity must be made explicit and must also be incorporated into the

basis of the activity in which the individual is expected to engage. The

impact of the activity on the individual and nature of the resulting

development of the psyche is dependent on the goal because the goal is

what becomes the focus of the action. In other words, the goal becomes

the motivation for an action and therefore one of the key elements of

activity is conscious and intentional goal-directed behaviour.

The implication of this for the CHAT educational framework is

that it becomes essential to the success of any learning activity that the

child is acting with intent and with a specific purpose. In attempting to convey the role of goals in activity, particularly in regard to education, it has been pointed out that,

> There is a famous parable about the three builders
> of the Temple. The first is serving out a sentence
> at forced labor, the second is trying to make money,
> and the third is raising the Temple. Only in the last
> case does activity take place (Repkin, 2003).

It should come as no surprise to any experienced educator that there are times when a classroom activity or assigned task may appear on the surface to be teaching and learning in action but that is, in reality, a case of "jumping through hoops" by the students who may, for example, be motivated not to learn but rather to obtain an "A", or simply get the task finished so that he or she can socialize with friends, or avoid getting into trouble with parents, and therefore no genuine learning occurs.

Activity theory suggests what every educator should know: in order for genuine intellectual development to occur, pupils must be engaged in a legitimate learning activity. The vast majority of educators are aware that learning must be something that engages the students in active learning. The problem facing many of these educators, however, is that while they may be able to identify pedagogically unproductive tasks, they are unable to define the essential elements of legitimate learning activities and the role these elements play in educating the student. The

result of this situation is their inability to intentionally and knowledgeably create legitimate learning activities that are necessary for real learning and development to occur. Fortunately, Leont'ev defined the nature and structure of activity in a manner that is easily understood and that can be applied to the analysis of educational programs and the creation of genuine learning activities.

Leont'ev identified several key elements that are essential for creating a legitimate learning activity, and his contributions to the understanding of the role of objects in development of the subject, as well as the definitions and descriptions of the function of the constituents of activity have great pedagogical value. When describing the essential elements of activity, Leont'ev argued that, "a constituting characteristic of activity is its objectivity" (Leont'ev, 1978, p. 52). To make sense of this statement, it is important to have a clear understanding of the terminology used by Leont'ev. In this case, objectivity refers to the production and existence of a concrete object: a product of activity. In the tradition of dialectic materialism, Leont'ev envisioned a relationship between object and subject that was dynamic in a sense that there is kind of dynamic transformation that occurs as a result of the interaction between the subject and the object. In explaining this dynamic, Leont'ev pointed out that,

The object of activity is twofold: first, in its independent
existence as subordinating itself and transforming the
activity of the subject; second, as an image of the object,
as a product of its property of psychological reflection
that is realized as an activity of the subject and cannot
exist otherwise (Leont'ev 1978, p. 52).

To illustrate this argument, it would be useful to provide a concrete

example of the relationship between the object and the subject as

proposed by Leont'ev. Poetry, for example exists as an object of literary

activity, and the essential nature of a poem has a distinct impact on the

activity of poetry-making. In the words of one author on Activity Theory,

activity is molded by the world...thus also 'absorbing'
and embodying the world in its dynamics and structures.
On the other hand, activity crystallizes in its product—
human subjectivity and self...which develop as essential
components of activity (Stetsenko & Arievitch, 2004, p.10).

To put it another way, a poem is the external product of internal poetic

activity: the poem as the object therefore has an implicit influence on the

internal activity, and a qualitative change in the internal activity will be

reflected in the future production of the object.

From a pedagogical point of view, exposure to poetry as an activity

results in the formation of poetic sensitivities that create and shape the

internal poetic activity that in turn is employed in the activity of

producing poetry. Through this process of two-way feedback between the

object and the subject, the object becomes reflected in the psyche of the

subject and determines the nature of the mental activities occurring in

the subject's psyche that are then used to produce and reflect on a poetic product. This dynamic relationship between external objects and internal conditions that results in the production of new objects establishes an upward spiral of development which is perhaps best described as a co-evolution of subject with object through the qualitative development of mediators specific to the activity.

While many teachers teach poetry by having students learn to identify poetic devices and read various styles of poetry, many teachers (perhaps a majority) do not have an adequate conception of poetry as literary activity. Teachers indoctrinated into orthodox teaching methodologies lack the conceptual understanding that knowledge of poetic devices, while necessary for poetry, is not sufficient for these processes to develop because the components that constitute poetry-making are not being appropriated as functional units of poetic activity. As a result, their instructional strategies may enable students to identify certain poetic devices and certain styles of poems, but leave them incapable of engaging in poetry-making. The impotent pedagogy employed in the teaching of poetry results in students observing poetry rather than becoming agents in poetry-making activity, and may in fact serve to impede their ability to develop poetic sensitivity because the learning that has occurred results in students developing an

understanding of the goal of poetry as nothing more than a search for, and identification of, poetic devices. When incorporated into a learning activity as something necessary for completing an action, the study of poetry results in the development and conscious application of poetic thought processes by pupils.

Activity theory suggests that there is a kind of reciprocal-transformational relationship occurring between any object of activity and the internal activities of the subject necessary for its production. It is for this reason that Leont'ev argued that, "It is exactly the object of an activity that gives it a determined direction" (Leont'ev 1978, p. 62). Thus, when creating an educational program, it is important that educators understand the critical relationship between the object of the learning activity and the activity of learning itself because the nature of the object has a direct influence on the nature of the constituents of activity and therefore the nature of the psychological development that occurs. Directing his comments specifically at education, Leont'ev clearly stated that the inability to understand the nature of learning and activity often results in educators creating lessons which contain inherent incompatibilities between the subjects and the object of instruction, for the instruction of the teacher, "decidedly does not correspond with how

the activity of the pupils develops under the influence of the...[content] material itself" (Leont'ev, 1978, p. 161).

In describing the structure of activity, Leont'ev identified the essential components of activity and he specified and defined their role in an activity in a manner that is of great use for educators. First of all, he established that any activity subjugated to a task would be defined as an action. Actions, in turn are composed of operations which represent the necessary intermediary methods for accomplishing an action. Operations are,

> a completely determined content of activity...by which an
> action is realized... [that] respond not to a motive and not
> to a goal of action but to those conditions under which the
> goal is assigned, that is, the task (Leont'ev, 1978, p. 164).

The nature of operations is established by the task that has been assigned and consists of socially developed methods and means of action.

It was Leont'ev's argument that because conscious human behavior is an "instrumented" activity (Leont'ev 1978, p. 59) the internalization of the operations is a major influence on the development of psychological processes and this is how objects are reflected in the psyche of the individual. The similarity between Leont'ev's description of operations and Vygotsky's psychological tools is not simply coincidence, for Leont'ev referred to operations as the "tools of action" (Leont'ev, 1978, p. 164). In

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this light, the selection of an explicit assignment or task results in the establishment of a set of operations necessary to realize that task, and the result of the action is the development of mediated mental activities specific to the operations that have been carried out in a meaningful manner and that have been developed and internalized not as discrete units, but as part of a system of activity. The important aspect of Leont'ev's work is that he enabled what were once considered to be holistic and continuous activities to be defined into units of analysis in order to understand how the system functions. It has been acknowledged by authors outside the field of education that activity theory provides an indispensable method for the analysis of dynamic systems because,

> Actions are fundamental elements through which one
> can recreate holistic activity. Each action has separate
> conscious goals that must be reached to attain the overall
> goal of the task. The initiation of goal formation constitutes
> the starting point of any action. The conclusion of action
> occurs when the result of the action is evaluated in relation
> to the established goal. This allows for a continual flow of
> activity, divided into individual units delimited by both the
> intermediate and terminal goals associated with the activity
> (Bedny, Seglin & Meister, 2000, p. 175).

It would be prudent to be mindful of the fact that certain terms employed by Leont'ev may not coincide entirely with the English terms used in the translation, and in some cases the words employed have been assigned a specific definition by Leont'ev himself. For example, while the western notion of transmission generally results in equating Leont'ev's

statements with the tabula rasa image with respect to the development of

the individual, Leont'ev was actually arguing for a more dynamic model

of appropriation, for he indicates that the process of development is not

simply the process of socialization or the filling of an empty vessel with

cultural knowledge when he writes,

> ...the idea of development...particularly during
> the post-Spenserian period...was not widely used for the
> solution of problems about the nature of the human psyche
> so that the psyche continued to be considered as something
> preexisting and only "being filled" with new content
> (Leont'ev, 1978, p. 17).

Rather than simple transmission, Leont'ev's model of internalization as a

result of activity mirrors the arguments of Vygotsky regarding the role of

mediators, and this perspective is apparent when he indicates that in his

model of development of the human psyche,

> There are complex transformations and transitions that
> connect [the internal and external]...so that no direct
> information of one to the other is possible (Leont'ev, 1978, p. 51).

While Leont'ev focused on developing a concretization of one facet

of Vygotskian theory by articulating the relationship between activity

and the development of psychological processes through internalization,

other Neo-Vygotskian theorists expanded upon this work and refined the

notion of the internalization of operations while including other aspects of

Vygotsky's work. Researchers expanding on activity theory have argued

that through the mediation afforded by language,

> The action has been transformed into a mental phenomenon and has become a chain of images and concepts...So as a result of subsequent levels of abstraction (materialized-verbal-mental) the action has attained a new form: it has become "pure" thought. This form, as Gal'perin (1989b) argued, represents a qualitatively new level of psychological functioning...(Haenan, 2001).

From this theoretical framework it becomes clear that by engaging in legitimate activities, students are exposed to the psychological tools which compose the actions of the activity, and the internalization of those psychological tools (which are transmitted through language and sign systems) results in qualitative improvements in their ability to participate in that activity.

The logical extension of this argument is that the activity will become increasingly internalized and therefore may become a purely internal activity. In the example of poetry, the subject may engage in poetic modes of thought without a specific prompt or stimulus and without the intention of producing a concrete work of poetry, but because the individual is aware of certain affordances that this particular mode of thought may provide as a means of accomplishing some mental task. Oddly enough, although this theoretical perspective has direct applicability to educational contexts, it has been largely overlooked by educational theorists but has been adopted by engineers working on issues involving ergonomics, who have realized that,

Tools emerge as a sociocultural phenomenon that encodes particular types of operations, implicitly imposing constraints and prescriptions, that in turn socially determine practical actions and mental operations, transcending individual psychological features (Bedny, Seglin & Meister, 2000, p. 170).

In the case of the development of the human mind, the ability to engage voluntarily and consciously in a certain action in order to accomplish a goal is, according to CHAT theorists, the genesis of will and the source for the development of agency in the individual. With regards to the education and intellectual development of children, it has been indicated by nearly every major author on education that students need to be educated in such a manner that they will become *life-long learners*. This motto for education implies that pupils must be educated so that they are capable of dealing with future problems- issues and ideas that do not yet exist- and for this reason many authors emphasize the need for "transferability" of problem solving skills. An emphasis on creating life-long learners has been a common topic of discussion in education circles for some time now, probably because it has become obvious that an education that simply provides factual knowledge is not sufficient for success in the modern world. It has been generally acknowledged that,

It is becoming clear that a person cannot function successfully unless he arms himself constantly with new and complex knowledge...nowadays learning is becoming a necessary form of life itself (Repkin, 2003).

While many educators admit that there is a need to develop skills that are transferable, there is little consensus on how to establish an

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educational program that will produce students who are capable of adequately dealing with novel situations. Often, the debates rage over which subject areas are best suited to the development of knowledge that can be generalized and transferred to new situations.

From the perspective of activity theory and CHAT, these discussions have missed the mark entirely because in these kinds of discussions the content material often becomes identified as the ends of education programs in the hopes that the development of conceptual thinking will emerge as a byproduct of studying certain domain-specific content. From the CHAT perspective, the domain-specific content is the means by which students engage in the activity of learning and as a result of this activity they directly and consciously engage in the requisite operations and processes and thereby appropriate the necessary psychological tools to develop the ability to learn. The learning activity is therefore necessary as a method for developing in pupils the ability to learn, not by focusing solely upon learning the content, but on the activity of developing an understanding of the course content. In a sense, the ends of orthodox education are the means for genuine learning activities. The explicit goal of the learning activity must be centered on the conscious development of conceptual understanding, and the operations must also be consciously acquired as necessary and functional means to accomplish

the actions necessary to develop that understanding. When acquired in this manner, the operations are not simply memorized facts or isolated skills, but are functional units of an action that enables the student to participate more and more fully as an agent in the activity of learning. Through the development of agency in the pupils, the activity of learning becomes a, "mode of existence by which organisms establish themselves as subjects of their life processes" (Fichtner, 1999, p. 55). Only in this way can students develop the motivation, tools and "traits" identified by educators as essential for life-long learning.

The notion of 'learning as an activity' has formed the basis for the conceptualization of education by some authors such as Rogoff (1995) as *participatory appropriation, guided participation* and *apprenticeship* in which learners are initiated into the activities of people engaged in various practices, and over time become part of a community of practice. It is interesting to note that some authors have indicated that the notion of learning as an activity may have more in common with the principals espoused by Dewey than the current orthodoxy does, for the works of Dewey emphasize that,

> The living creature is a part of the world, sharing its
> vicissitudes and fortunes, and making itself secure
> in its precarious dependence only as it intellectually
> identifies itself with the changes about it, and,
> forecasting the future consequences of what is going
> on, shapes its own activities accordingly. If the living,

experiencing being is an intimate participant in the
activities of the world to which it belongs, then
knowledge is a mode of participation...
(Rogoff, 1995, p. 151).

Although historically it was possible for pupils to be taught a set of static

skills and rote knowledge that would sustain them for a lifetime, this is

no longer the case. The pace of technological advance and innovation,

accompanied by the expansion of knowledge and the resulting changes in

society in terms of the demands placed upon individuals, has increased to

the extent that education must not focus on the acquisition of factual

knowledge by students (which is soon rendered obsolete) but must find

some method to prepare students to enter a world where novel concepts,

situations and problems are commonplace. In a sense, education must be

productive rather than reproductive. If the learning activity rather than

the content-knowledge is made the explicit focus in the educational

process, students will be performing actions that have as an explicit goal

the development of understanding of a concept through exposure to, and

appropriation of, specific operations that will mediate their ability to

engage in the process of learning itself. The presence of learning activities

in which students are consciously engaged in the action of learning is

therefore a critical element in the education of the child if he or she is to

become a genuine life-long learner, capable of dealing with novel

situations and information.

The essence of learning activity is the emphasis on not acquiring

skills as independent procedures, but as the acquisition of actively

functional psychological tools in an authentic learning context that result

in qualitatively superior modes of instrumented psychological function for

the specific purpose of developing the ability to learn as a conscious

activity and thereby assume conscious control of one's own developmental

path.

Vygotsky argued that, "learning is a necessary ...aspect of the

process of developing...specifically human psychological functions"

(Vygotsky, 1978, p. 90). This often-quoted section of Vygotsky is a

favorite of many advocates for the value of education however the real

significance of these words is often overlooked. The key to understanding

the real implications of Vygotsky's statement lies in the fact that by

enabling children to become the agents of their own learning, they

become agents of their own development: a properly organized

educational environment results in a shift of agency from the teacher to

the students as the primary agents of learning, and it is for this reason

that Vygotsky contended that,

> an essential feature of learning is that it...awakens a
> variety of internal developmental processes...[and] they
> become part of the child's independent developmental
> achievement...From this point of view...properly organized

learning results in mental development and sets in motion
a variety of developmental processes...(Vygotsky, 1978, p. 90).

Although the notion of the learning activity is a novel concept in North America, the use of the CHAT framework for effective pedagogy is well- established in Scandinavian and eastern European countries where,

> Thirty years of experimental verification of this hypothesis have shown that the systemic performance of extended learning activity by elementary school students is more effective at fostering in them the foundations of theoretical awareness and thinking than is the system of organizing the teaching-upbringing process that is customary...in which the specific components of learning activity are not conceptualized adequately (Davydov, Slobodchikov & Tsukerman, 2003).

There is clear empirical evidence that carefully organized educational programs based upon the learning activity framework are effective. The clear, logical structure of the learning activity with respect to the subordination of operations to an action that is defined by a goal is a valuable resource for educators in providing a means to discuss and assess the structure of the educational activities that are occurring in the classroom. It also provides a means to organize learning activities in a manner that results in the development of conceptual thinking and the emergence of theoretical awareness. The structure of learning activity is, however, only one facet of the CHAT framework, and its potential benefits are substantially weakened if it is not appropriately harnessed

with the second pillar of CHAT education: the notion of developmental teaching.

Developmental Teaching

While the concepts of activity theory are founded upon an extension and elaboration of Vygotsky's theories on the impact of internalization on the individual and the social environment, the notion of developmental teaching is a direct product of Vygotsky's belief that, "the developmental process lags behind the learning process" (Vygotsky, 1978, p. 90) and this methodology has as its foundation Vygotsky's theories on the relationship between spontaneous and scientific concepts. Developmental teaching has as its explicit purpose the development of theoretical thinking that allows students to become much more independent of concrete experience and to eventually become capable of formal-logical thought. Specifically, developmental teaching is the conscious application of the reciprocal relationship between spontaneous and scientific concepts with the intention of developing in students the ability to engage in conceptual mental operations and theoretical thinking. The basic principle of developmental teaching is deceptively simple, for it entails the development of concepts: the investigation of relationships between theoretical knowledge and concrete examples. Upon closer examination, however, it becomes clear that developmental teaching requires significant insight into the key elements of this

particular methodology, solid theoretical understanding of the curriculum

content, and a well-developed understanding of the role of curriculum

and instruction in relation to learning in this form of pedagogy.

The fundamental component of developmental teaching is the

learning activity in which students are faced with the task of reconciling

general theoretical knowledge with concrete examples of the concept

being studied. Although the notion of activity originated from the work of

Leont'ev, the goal of the learning activity is not to produce some change

in a discrete object, but to empower the student as a learner. In a sense,

the learning activity has as its goal the qualitative change in the subject

in the form of psychological development resulting in an individual who is

a competent and motivated agent in learning. In the words of one author,

> The learning task differs from other kinds of tasks in
> that its result is not a change in the object with which the
> student operates but a change in the student himself as an
> agent, and this change consists in the mastery of definite modes
> of action (Repkin, 2003).

The reciprocal relationship between spontaneous and scientific concepts

articulated by Vygotsky is at the core of the learning task in this

educational framework. Concept development, according to Vygotsky is

one of the key elements in the development of higher psychological

functions, and therefore the development of concepts is the method by

which education can promote intellectual development. The goal of

education from the Vygotskian perspective is to promote concept development to the point that theoretical thinking becomes the modus operandi of the mind. The organization of developmental instruction therefore centers upon maximizing students' exposure to and appropriation of suitable mediators necessary for concept development to occur. It is therefore logical that the process of learning be in synchronicity with the development of concepts and therefore has, at its core, the explicit investigation of both concrete knowledge and scientific concepts simultaneously. Learning activity, if it is to be effective in promoting development, must therefore be, "connected with mastery of the theoretical generalization of knowledge-of the concepts, laws and principles on which knowledge is based" (Repkin, 2003).

If teaching is to be effective, it is essential for children to have access to systems of knowledge and to be able to employ both their spontaneous concepts and the scientific concepts that they are taught in school to develop their understanding of concepts and higher psychological functions. It is for this reason that Vygotsky asserted the importance of exposing students to theoretical knowledge when they begin formal schooling, and developmental teaching relies heavily upon ensuring that students are attempting to understand both the spontaneous concepts and scientific concepts in light of each other. Using

theoretical knowledge to understand concrete examples has been labeled "theoretical learning" and stands in diametrical opposition to the phenomenon of empirical learning. There is, however, some confusion among certain theorists over the relationship between developmental teaching and theoretical learning. Theoretical learning has been described by some authors as,

> based on supplying the student with psychological tools: general and optimal methods for dealing with certain classes of problems that direct the student toward the essential (not simply the common) characteristics of the problems of each class. This psychological tool is then used for solving concrete problems. In the course of its use, the processes underlying the tool are mastered and internalized by the student (Karpov & Bransford, 1995).

This description of theoretical learning could be misinterpreted to infer that students are engaging in rote learning of theories and then simply applying them to solve real-world problems until they become automated processes. Learning as an activity is not a simple transmission of procedures to students who then practice them until they become automatic, but is actually a form of active inquiry in which students are presented with a problem situation wherein their understanding of a concept is shown inadequate and therefore they are required to reconsider their current understandings and find an adequate mode of action to solve the problem. In this respect, developmental teaching draws directly on Vygotsky's theories of concept formation because,

> Concepts are always formed during a process of finding

> a solution to some problem facing the…thinking process.
> The creation of the concept is dependent on a solution to
> this problem being found (Vygotsky, 1931).

As a result of this type of inquiry-based learning, students develop their understanding of both the theory as well as the concrete examples they are considering. It is critical to keep in mind that the students are not solving these problems in isolation, but are engaging in a collective activity of inquiry, and it is the teacher who must monitor both the degree of students' understanding and the nature of the relationship between the example or issue that is being examined and the scientific concept upon which it is based in order to introduce to the students a problem or contradiction with their current points of view. As a part of the learning activity,

> In the clash of various opinions, it is revealed that
> each of them is partial and limited. It is the limits of
> each partial point of view that comprise the object of
> discussion. In the course of the argument, those who
> hold or support each point of view become convinced
> that their knowledge and modes of action do not suffice
> to solve the set task. The need arises to coordinate the
> points of view that have formed, to work out a common
> mode of action (Davydov, Slobodchikov & Tsukerman, 2003).

Rather than simply examining concrete examples and attempting to piece together a generalization (as in the constructivist model of education), the students have access to the general theory and are, in a sense, working in the zone between the concrete example and the theoretical knowledge in

order to come to a deeper and more elaborate understanding of the relationship between the two. For this reason, this type of education has been referred to as moving from the abstract to the concrete in that students begin the activity with only an abstract (general and vague) understanding of the concept, but by the end of the activity have developed an ability to understand the scientific concept and its instantiation with greater conceptual acumen, and have also appropriated the psychological tools necessary to mediate the learning activity. When students have resolved one deficiency in their understanding, the teacher may reveal another problem space: a new learning task is identified, and a new cycle of inquiry begins.

Developmental teaching does not place the teacher as a direct source of knowledge or information, but rather has the teacher acting to direct the attention of the students to a problem space, where there is a conceptual deficiency in understanding the concrete in terms of the theory, or a deficiency in a mode of action. When this is discovered, it then becomes the task of the students to inquire into the source or nature of the deficiency and attempt to identify a means to eliminate it.

Learning activity is an immersion into conceptual frameworks and inquiry into concrete instantiations of conceptual models through real

activities which themselves are composed of operations involving the use and internalization of psychological mediators which, first of all, must be understood at the theoretical level in order to accomplish the task, and second, create in the pupil a new orientation for engaging in learning activity. Qualitative changes in cognition result in more elaborate examination of the conceptual relationships under study and therefore increasingly theoretical thought. With increasingly theoretical thought, the students become capable of understanding the concrete in a more profound manner and, as a result, understand the concept in all its complexity because they understand the theoretical underpinnings and relationships behind the concrete examples that they have been presented in the curriculum content. It is therefore a highly dynamic, mentally challenging and personally engaging method of instruction. If developmental teaching is to be carried out effectively however, the teachers must be competent in the subject area to the point that they are capable of engaging in subject-matter analysis in order to identify conceptual relationships in the content-area, develop models based upon theoretical concepts and be capable of selecting appropriate content-material that can be used in the classroom as "raw material" for students to work with. The teachers also must understand the relationship between the students' spontaneous concepts and the scientific concept that is to be understood, and be able to intentionally stimulate the

students' academic activity by designing tasks in such a way that the students become aware of the incompatibilities, inconsistencies and insufficiencies in their understanding of a concept. Teachers also must be capable of understanding the necessary operations and modes of thought that are required by the students to eliminate conceptual deficiencies through collective inquiry, investigation and discussion.

As an analogy for the CHAT educative process, it might be useful to consider the methods for navigating a ship. The ship's position is monitored relative to a known way-point (the scientific concept) and then a relative position can be established. The progress of the ship is monitored by referring to the way-point and any corrections that are necessary are decided upon and accomplished, and then another reading is taken. Once the ship reaches a certain way-point, it then monitors its position in relation to the next way-point. In the same way, once the students reach one conceptual way-point, they will be presented with another and so a new problem faces them. As a result, the pattern of learning activity has been described variously as an *upward spiral* and as an *expansive circle*, with the students exhibiting a "qualitatively new level of psychological functioning" (Haenen, 2001) with each cycle of learning activity. This continuous cycle of learning has been described by one author as "productive incompleteness" (El'Konin, 2002) because as a

student's theoretical understanding of a concept develops, it becomes apparent that the development of understanding of one aspect results in the recognition of inadequate modes of action or understanding with regard to other aspects of the concept. The phenomenon of becoming more cognizant of the unknown as one gains more knowledge has been articulated as, "the more you know, the larger appears to be the realm of the not known...The more extensive knowledge is, the more extensive and substantive the PS [problem space] is and the more acutely it is experienced" (Repkin, 2003). As concept development progresses, pupils become more acutely aware of problem spaces. At the same time, they are increasingly able to engage in theoretical thinking in a manner that results in qualitatively superior modes of action that enable them to resolve the deficiencies in understanding, and as a result, become active and competent agents (or navigators) in their own intellectual development.

Research has shown (Karpov & Bransford, 1995; Karpov, 2003; Hedegaard, 2002) that pupils who have experienced educational environments where developmental teaching has been employed have demonstrated significant advantages over their cohorts who have not participated in such educational programs. Students educated in CHAT educational environments exhibit superior meta-cognitive strategies

because their theoretical understanding allows them to engage in cognitive planning and monitoring, and it has been shown empirically that these components of self-regulation foster superior academic performance (Haenen, 2001). Other programs employing these teaching strategies have shown that the learning that occurred,

> was meaningful and broadly transferable…[and]
> children… understood…concepts at their most abstract
> level and were likewise able to generalize them to new
> and unfamiliar situations (Karpov, 2003. p. 72).

There is substantial evidence that this methodology is effective and the educational results obtained by these programs support Vygotsky's predictions regarding the impact of effective concept development on general intellectual development. The CHAT framework for education, with its two pillars of learning as an activity and developmental teaching, has many advantages over current orthodox methods of instruction because the CHAT framework has consistency in its internal logic, is based on Vygotskian theories of development which themselves are logical and are gaining recognition based on increasing empirical support, and it has proven to provide significant intellectual benefits to students. In order to fully appreciate the strengths of Neo-Vygotskian CHAT theory, which has been recognized for its, "integralness…and approach that guarantee the relevance and constructiveness of [Vygotsky's] ideas" (Luria, 1987, p. 373), it is necessary for educators to be educated, or

perhaps *re-educated*, not only on the strengths of Vygotskian theories of development, but on the topic of constructivist theories of development as well, for it is only when one attains an understanding of both educational frameworks that CHAT can be understood as having great potential to improve the quality of the educational methodology employed in North American classrooms.

Chapter Three: A Need to Re-examine Orthodox Methodology

The field of Pedagogy currently consists of a potpourri of concepts from a diverse array of fields of knowledge, and contains elements of Philosophy, Behavioural, Social, Cognitive and Developmental Psychology, and Linguistics, among others. Progressivist liberal education was the dominant force in educational theory for most of the Twentieth Century, and Neo-Piagetian theories of education, which include information-processing models of the mind and constructivist theory, have come to dominate the methodologies employed by the majority of educators since the early 1980's. Over the last decade, while Piaget's theories of development have come under increasing criticism, much discourse on education has continued to revolve around issues of how knowledge can be *constructed* and the types of activities the constructivist model of education may suggest for implementation in the classroom. The problem with this situation is that many educators seem oblivious to the fact that constructivism emerged from Piagetian and Neo-Piagetian theories of cognitive development and therefore nearly all western theories of education share a number of implicit assumptions about the nature of learning and development that may be flawed and therefore render the theories invalid. The legacy of Piagetian concepts in modern educational theory that make implicit assumptions about the

nature of learning, development and thinking, combined with the ubiquitous nature of Chomsky's theories on language and the brain have done much to impede the ability of educators to understand the logical relationships between curriculum and instruction, and between teaching, learning and thinking. It has been pointed out that over the last decade or so there has been increasing interest in alternative theories such as cultural-historical theories of development and that this trend may indicate growing dissatisfaction with the current orthodoxy. One author suggests that if these theories, "are receiving more attention now, it may reflect the inability of currently dominant or popular traditions to resolve their own objectives in satisfactory ways" (Chaiklin & Lave, 1993, p. 382). In order to fully appreciate why cultural-historical activity theory may have much to offer in the field of curriculum and instruction, it is necessary to identify the weaknesses in current models of orthodox instruction that have yet to be sufficiently recognized and acknowledged by the vast majority of educators.

The theories of Piaget penetrated into nearly every aspect of the North American education system (de Ribaupierre, 2001) and served as the framework for everything from designing and equipping classrooms to teacher preparation programs and academic discourse on the nature of psychological development. These theories owe much to the work of

Rousseau who is generally credited as being the one who introduced to western culture the notion of childhood in the eighteenth century. He asserted that children were not simply blank slates that needed to be filled with knowledge, but that children underwent a natural pattern of growth and development. In Rousseau's opinion, any attempt by adults to force education on children in a manner that was not sensitive to the thoughts and feelings of the child would result in impaired development. Rousseau's theories contained elements of thought which were incorporated into many modern theories, including those of Piaget (Egan, 1997). One of the key concepts incorporated into modern theories of education is the notion of maturation, wherein individuals undergo a biologically determined, naturally progressing course of growth. An important part of Rousseau's theory of maturation, and one that had a significant influence on the work of Piaget, was that he saw it as a discontinuous, naturally determined, unified course of stages.

Piaget's Cognitive-Developmental Theory suggests that as children interact with and explore their environment, they actively construct knowledge, and that children's cognitive development takes place in discrete stages that are domain-general, and qualitatively different from each other. According to Piaget, as children move through the stages of cognitive development, they construct knowledge structures (Piaget called them schemas) through the processes of accommodation and assimilation.

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Cognitive-Developmental Theory provided two principles for education that were widely implemented in North American schools; an emphasis on discovery learning and sensitivity to children's readiness to learn. Since these two principles coincide very well with Dewey's recommendation that children be engaged in the learning process and that they learn through hands-on experiences, Piagetian theory was incorporated into and became an integral part of North American education. Piagetian educational theory permeated every facet of education to the extent that it became such an implicit part of educational theory that most educators became blind to its presence in shaping educational programs and instructional practices (Egan, 1997). Piagetian theory, in a sense, became *the* educational theory (de Ribaupierre, 2001).

While his work is credited with providing a theoretical justification for child-centered approaches to education, Piaget's theory has come under increasing criticism for emphasizing the child acting on the environment as the major mode of knowledge construction while neglecting other important means of learning. Of greatest significance is the fact that biological development is of primary importance in learning and development, while language and social environment are notably absent in Piaget's theoretical framework as critical modes of learning. Piaget's

theory served as a foundation for other theories of Psychology, such as Cognitive Psychology, and as a result the implicit assumption of the primacy of biology in cognitive development (Rousseau's *nature*) was also incorporated into the vast majority of theories in the Social Sciences. It has been pointed out that one of the major concerns with theories like those by Rousseau and Piaget (including neo-Piagetian theories) is that they include implicit assumptions about the nature of the mind, for, "according to this nativist, domain-specific perspective, we begin life with well-defined, special purpose knowledge systems, hardwired into the brain" (Berk, 2000, p. 258). This perspective, when employed as the foundation for theories of development in an educational setting results in the following:

1) The belief that development will occur naturally and without the need for direct, explicit instruction in the domain, and will progress through the maturation process to the biologically predetermined end state, provided that the individual is not placed in an impoverished environment.

2) The belief that any attempt to increase the rate of development will result in failure or with unsatisfactory results because the natural progression through stages of development can not be altered in any appreciable way by outside influences such as deliberate instruction.

3) The nativist perspective assumes the existence of special-purpose structures and therefore does not critically examine their formation or development, but focuses instead on theories that concern themselves with how the structures function.

The obvious issue that arises from the perspective of educational theory is that if it is the case that psychological development is a naturally occurring event, then of what practical use is a teacher, and what is the purpose of

formal education? Piagetian theory asserts that the mind functions

naturally and develops as the result of a child's experience with his or her

environment, and therefore, development is a necessary prerequisite for

learning. Vygotsky was aware of this issue and commented that,

> Because this approach is based on the premise that learning
> trails behind development...it precludes the notion that
> learning may play a role in the course of the development
> or maturation of those functions activated in the course of
> learning (Vygotsky, 1978. p. 80).

In this case, education may be thought of as a means of simply ensuring

that the student is in an environment that allows this natural

development to occur without impediment.

When neo-Piagetian notions of development were employed in the

1960s and 1970s, it was believed that the key to educational success was to

have the students engaged in a wide array of experiences in a well-stocked

classroom with minimal didactic interference from the teacher.

"Enrichment" and "Discovery" programs were touted as the key to

cognitive development and academic success, even for students in low SES

environments. Long-term assessment of these educational programs,

however, began to cast some doubt on the educational effectiveness of such

classrooms on students (Hart & Riseley, 1995). One researcher, keen to

find a method to improve achievement of low SES students by providing

them with an enriched environment admits that the, "results, however promising at the start, washed out fairly early and fairly completely as children aged" (Hart & Riseley, 1995). The researchers were forced to conclude that their attempts to provide the missing schemas and knowledge that should, according to Piagetian theory, have rectified the situation had no real impact on the academic trajectory of low SES students in the classroom.

Despite the questionable success of educational programs based on Piagetian theories of development, the nativist notion of psychological processes has been further entrenched by the works of Chomsky in his refutation of the Behaviourist notions of language development. Behaviourism was a dominant force in explaining the development of linguistic ability for the first half of the twentieth century but this changed when Noam Chomsky successfully defeated the argument that association of word and meaning combined with reinforcement was the principle factor in language development. Chomsky's theories had a profound effect on modern notions of language acquisition and function, and, like Piaget, his theories promoted certain assumptions regarding the nature of the relationship between thinking and learning. Chomsky argued successfully that humans are capable of creating rich and novel linguistic utterances that could not possibly be explained by Behaviourism. From the Chomskian perspective, language must be much more complex than the

Behaviourists believe, and he posited a nativist explanation that regards language as a biologically based accomplishment that is unique to humans (Chomsky, 1968). Chomsky (1968) proposed that language is not repetitive (as the Behaviourist position suggested), but is generative, and therefore operates as a process of language production, and he introduced a critical concept into discourse on language and thinking that had a significant impact on research into computer languages when he suggested that sentences exist on different levels: specifically, at the level of an evident surface structure, at the level the idea, and at the level of the deep structure. In such a system, "changing the sentence from one level to the next is a matter of applying different sets of rules to the sentence, moving it along toward its eventual spoken form" (Ashcraft, 1998, p. 259).

Chomsky's theories have contributed much to the study of cognitive and computer science and his theories were harmonious with Piaget's nativist bias and because of his tremendous impact across a wide range of disciplines, including the Social Sciences, the biological basis of cognition became an unquestioned assumption (de Ribaupierre, 2001). Chomsky claimed that there must be, "an innate structure [that] appears to be a species-specific capacity that is essentially independent of intelligence..." (Chomsky, 1968). This structure is referred to by Chomsky as the *Language Acquisition Device* (LAD). It is Chomsky's argument that the LAD and transformational grammar are innately human capacities and

therefore are universal. In one of his more famous works he asserts the position that:

> it is reasonable to suppose that a generative grammar is a system of ...rules of several different types, organised in accordance of certain fixed principles of ordering and applicability and containing a certain fixed substructure which, along with the general principles of organization, is common to all languages" (Chomsky, 1968).

The biological basis of the process of thought is one of the foundations of Chomskian theory, and it implies that the external world has little direct control over these internal, predetermined processes. This assumption theoretically would apply to intentional instruction as well and so the belief that natural development of the mind must precede instruction was reinforced through Chomsky's theories. Although some of Chomsky's ideas have come under scrutiny (particularly his claims for a universal grammar of human languages) the nature of the relationship between communication, information and thinking has not changed in modern cognitive theory (Frawley, pg 16, 1997).

The most salient example of nativist bias in theories of mental development can be seen in Cognitive Psychology which has recommended to modern educational theory an information-processing model of the mind. In this model, the brain functions as the central processing unit where the computing function occurs. The concern of the teacher in this model is to be aware of the individual components that support the CPU in carrying out its function, and therefore educators employing this

framework for curriculum and instruction view teaching as the process of ensuring that students are given information that connects to previously covered material in order to facilitate the efficient construction of schemas, to present the information in manageable chunks in order to avoid overwhelming the students' attention capacity and short term memory reserves, and to ensure that the information is practiced and reviewed in the right format in order for the students to acquire and retain the information in their long-term memory. One text on instructional psychology advises that, "Formal instruction should provide learners with organizational schemata that permit easy encoding and retrieval of knowledge" (Glover et al. 1990, p. 180). The constructivist educational framework relies on the basic principle of transmitting concrete factual information to students and then providing them with opportunities to engage in *hands-on* activities that, in theory, should enable students to make empirical observations that result in connecting various schema to produce a more elaborate understanding of the theoretical principles behind that content. Studies have indicated that this model of cognition is popular among the majority of educators (Strauss, 1993) but there are concerns that have been raised about the use of this particular model for instruction because of the increasing realization that,

> human cognition is radically different from both "information processing" in computers and from cognition in animals. This means the demise of one of the fundamental assumptions

in cognitive psychology-the computer metaphor-that has
dominated cognitive psychology until recently...There is a
growing understanding that describing "knowledge structures"
that are somewhere "inside" the individual has become a burden,
and that it prevents us from seeing the true nature of human
cognition (Arievitch, 2003).

Unfortunately, because of the ubiquitous nature of constructivism in education and teacher education programs, while there have been questions raised in certain academic journals and texts, many educators are completely ignorant of these concerns because, "few critiques of its epistemology have appeared in the educational literature" (Matthews, 1992). This problem has not gone unnoticed, however, by some Constructivists who have attempted to divorce themselves from "mainstream" constructivism tainted with neo-Piagetian theory by adopting the label of Social-Constructivists. This is a relatively recent development as shown by the comments made by Bresler and Davidson (1995) who, as contributors to the journal *Educational Theory* acknowledged that,

> The bifurcation between [the authors of the articles in this issue
> of the journal]...is representative not only of a difference in their
> orientation toward art, but also, on a more fundamental level, of
> a difference in their epistemological orientations...[They]
> are examples of a divide in constructivism that may
> be more important than that between modernity and
> postmodernity, and that is the divide between a view
> of constructivism based in experience and one based on
> the word (Bresler & Davidson, 1995).

The authors went on to admit that,

> we have always viewed their epistemological outlooks
> as complementary, [but] reviewing this work...raised
> our awareness of significant distinctions between their
> positions (Bresler & Davidson, 1995).

This lack of awareness of the growing dissatisfaction with the constructivist framework founded upon Cognitive-Developmental Theory is the second legacy of Piaget's work that must be examined and made explicit.

The assertion that assimilation and accommodation are responsible for the construction, augmentation and refinement of schema remains a pillar of modern neo-Piagetian, information-processing and mainstream constructivist models of psychological development. These models of instruction maintain that students use personal observation and hands-on experience to construct their understanding of the content under study. Current science courses have students making hypotheses, thinking of ways for classifying objects, making and recording observations and drawing conclusions based on their new-found knowledge. Teacher education courses encourage student teachers to employ this methodology and in many ways the more that teachers have students engaged in these sorts of activities, the more effective and competent they are deemed to be

by supervisors and peers, and many professional development seminars and classes are focused on advancing this type of instruction even further. Although it is easiest to see this method of instruction at work in science classes, this method of actively constructing knowledge has been incorporated into mathematics, Social Studies and, in many ways, Language Arts methodology as well. While this notion of having students actively involved in various activities and projects has many advantages over methodologies which place students as passive recipients of information, there is an inherent problem that Vygotsky pointed out long ago with this model of knowledge construction and that some western researchers critical of current instructional methodologies have recently touched upon but many educators are not yet cognizant of: specifically, the significance of the inherent weakness of empirical learning that serves as the cornerstone of current curriculum and instruction.

Empirical Learning

The basic principal of constructivism is that knowledge is constructed by students as they engage in classroom activities and from these experiences and observations they are able to make connections between concrete facts and examples and this should, in theory, enable them to understand the higher principles involved. In many ways, the constructivist framework for learning is intended to mirror the activities of

scientists engaging in research. For example, constructivist theory asserts that by actually performing an experiment to find out what kind of items float and what kinds of items sink, children should be able to construct a general framework for understanding the principle of buoyancy. This kind of activity is a model example of constructivism in action, for it includes students actually involved in carrying out the experiment (*learning by doing*), it requires students to classify, observe and infer (*the active construction of knowledge*) and because students generally respond in a positive way to participating in a laboratory experiment, the activity is considered to be a good way to connect students to the curriculum. While the description of the activity and the justification for this kind of lesson make it seem like an excellent plan to teach the students science, a more careful examination of the structure of the activity, the nature of the process of learning and the type of learning that is actually occurring is in order.

In the aforementioned experiment, a teacher might introduce a pin, a pebble, a marble, a paperclip, a coin, a block of wood and a sealed empty bottle. Students might be instructed to predict which objects will float and which will sink, and then do the experiment and record their results. Following the experiment, the lesson might be extended to include a list of objects that the students will have to classify as "floaters" or "sinkers",

based on their observations during the lab. The problem with this activity becomes obvious if one understands that the logic of the activity does not coincide with the psychological process of learning. The students, for example, may observe the objects in the experiment that sink and come to the conclusion that *small objects sink*. While this is an erroneous conclusion, it is logical within the context of the concrete examples with which the students are conducting the experiment. Alternatively, more advanced students might assume that the floating objects are the ones that contain air. This is also a logical assumption based on their observations, but is also erroneous. The problem with this form of instructional strategy is that it does nothing to move students away from their everyday concepts (spontaneous concepts) and in fact might actually reinforce students' misunderstanding of the scientific principle that was supposed to be learned by forcing them to concentrate on only one aspect of a complex concept. In fact, many people educated with this type of methodology may continue to believe that objects float because they contain air, and are at a complete loss to explain why a bowling ball (that contains no air) will sink in the Pacific Ocean, but float in the Dead Sea (In true Piagetian fashion, I asked my own daughter to explain this phenomenon, but being the product of constructivist Science education, she was unable to do so!).

The impact of this kind of instruction is questionable because the methodology employed by the teacher may result in the students focusing on a salient feature of the objects presented that is common to the objects in one particular context but is not the essential feature that relates to the concept they are supposed to understand. To clarify the weakness of constructivist methodology, it would be prudent to examine this flaw first of all from the perspective of Cognitive Psychology (because, ironically, the field of Cognitive Psychology which served as a source for constructivist theory can be used to elucidate the flaw at the heart of constructivist education) and then from the Vygotskian perspective, for in this way it should be evident that the criticism of constructivism by Neo-Vygotskian theorists is not simply a matter of opposing philosophical platforms but a genuine problem in the logic of constructivist theory itself.

In Cognitive Science there are two processes that are deemed to be extremely vital in the roles of facilitating understanding and meaning-making, and therefore are directly related to learning and instruction. The first process is that of data-driven processing (also known as "bottom-up processing") in which the individual pieces of information are used to generate meaning. In 1959, Selfridge posed the Pandemonium model of data processing in which "relationships among the features are...important..." (Ashcraft, 1998, p. 51). In this model of cognition,

similarities between stimuli are noted and passed up the cognitive chain to be re-processed at the next higher level of cognition. It is this process that is used to recognize similarities between objects and letters and at the top of this data-driven process, a decision is finally made regarding how the data should be interpreted and therefore a decision is made regarding the meaning of the data that has been received. This method of cognition places heavy demands on cognitive resources, is time-consuming, prone to error and very inefficient because a slight variation in the concrete samples under observation is likely to result in attention directed to non-essential but salient aspects common to the examples being observed. The second process that plays a vital role in other models of cognition is that of conceptually-driven processing (or "top-down processing"). In top-down processing, the presence of existing context and knowledge is used to interpret the data that is being received and to influence the meaning-making process. This process is generally considered to be much less time-consuming and much more efficient, however the drawback is that because the cognition is not focused on the individual bits of data, it is easy for the individual to miss minor errors (such as spelling mistakes in a sentence that go completely unnoticed) and, more importantly, the possibility exists that an inappropriate or erroneous concept will be employed and the result will be errors in understanding or problem-solving (see Chapter One: *Scientific & Spontaneous Concepts*).

The current models of cognition that have been endorsed by researchers in Cognitive Psychology combine top-down and bottom up processing into a connectionist model of cognition. In this model of cognition, data provides the stimuli that determine the node (a structure synonymous with Piaget's schema) employed for top-down processing of the operation, resulting in an efficient balance between the two processes. Two critical points that must be kept in mind are that;

1) these models of cognition do not claim to be able to explain how higher nodes are created in the human mind in order to allow top-down processing but simply assert that they exist as part of the system, and;

2) they are based on computer models of cognition and in computers the top-down processing is accomplished through computer programs that are external to the computer's system but that control the lower operations that occur.

In the case of each of the points above, it is important to be aware of the fact that the higher nodes exist as an implicit assumption of the model as a functional system, and the computer programs that control the processes operating the computer are derived from a source external to the machine.

In the case of the second point, Vygotsky's argument for the internalization of knowledge and the role of scientific concepts in thinking seems to have

anticipated certain key aspects of Cognitive Science and Cognitive Psychology.

It is the connectionist model of cognition that has been adopted by constructivist theorists in generating the theories for constructivist instruction and curriculum and serves as the principle upon which "discovery learning" and "guided discovery" are based. The educational model differs in one critical aspect, however, from the original connectionist model in that it assumes that the nodes which control top-down processing must be constructed by bottom-up processes, and because cognition is assumed to occur, then all that is required is to expose the students to the appropriate data in order for the mind to create higher-level nodes. In theory, discovery learning is based upon students engaging in open-ended activities that are intended to provide the students with information that they can then assimilate into their schemata and develop and refine their understandings of the world around them in an increasingly complex manner. In this model of learning, the students should eventually acquire schemata of sufficient sophistication to become aware of the relevant principles and laws which govern the content to which they are exposed.

The problem with discovery learning as it was conceived and implemented relates directly to the problems associated with data-driven processing: it was time-consuming, inefficient, and children's understanding of the concepts was often incomplete and/or erroneous. In fact, without an understanding of a general concept to guide their activities, it is possible that students immersed in such an educational program may never discover the principle or concept they logically should be able to find. In such a situation, students would not have the essential concepts required for top-down processing and the result would be the inability to employ top down processes in meaning-making and problem-solving. This condition in theory would likely manifest itself as learning that would be highly context specific, poorly organized and of limited general utility because the students would exhibit a lack of transfer of understanding to novel situations. Some research has shown that this indeed has been the case, for

> it is clear that most of what students (and teachers and
> scientists) know about science was taught to them, rather
> than discovered by them. Empirical challenges come from
> studies demonstrating that teacher-centered methods using
> direct instruction are highly effective...Finally, most develop-
> mental and cognitive theories predict that many of the
> phenomena associated with discovery learning would make
> it a relatively ineffective instructional method... [because]...
> children in discovery situations are more likely than those
> receiving direct instruction to encounter inconsistent or
> misleading feedback, to make encoding errors and causal
> misattributions, and to experience inadequate practice and
> elaboration (Klahr & Nigam, 2004).

In order to address general dissatisfaction with discovery learning as an educational activity and to facilitate children's learning, discovery learning was augmented to become "guided discovery", and the teacher was placed in the role of "guiding" students to the desired conclusions without actually providing any answers. This program is still very much entrenched in many classrooms, but there are some serious flaws that remain because the constructivist system relies primarily on empirical learning and does not provide the students with the necessary conceptual knowledge to engage in conceptually-driven processing. The weakness of this framework for education has been identified very concisely by one critic, who writes,

> ...guided discovery advocates often draw an analogy between a group of students involved in guided discovery, and a group of scientists solving a scientific problem. This analogy has two weaknesses. First, the process of solving a scientific problem may take years, which is hardly acceptable in the case of school instruction. Second, research scientists possess methods of scientific research and analysis that were taught to them in special university courses or that they have developed during many years of research experience. School students are unlikely to possess these methods. Actually, as was shown earlier, the principal method of "scientific research" that they use in the situation in which they need to solve a problem in the absence of necessary scientific knowledge is empirical learning. Being based on consideration of common salient features of phenomena...this learning often results in misconceptions (Karpov, 2003, p. 75).

Clearly, although Cognitive Psychology has shown that for the connectionist model of cognition to work, there must be an interaction between data-driven processing and top-down processing (which seems in some respects to concur with Vygotsky's claims regarding the role of spontaneous and scientific concepts in concept development), this has been overlooked by mainstream constructivists who persist in the belief that students should be able to construct their own conceptual knowledge through exposure to concrete, empirical examples in spite of the fact that the theories the constructivists claim to be employing indicate otherwise. More and more, western educational researchers themselves are beginning to recognize that although Constructivist education claims to employ established theoretical frameworks drawn from the social sciences, the educational application of the theory,

> ...seems to reflect significant departures from the cautions,
> delimitations, and recommendations announced in the
> research literature... Detached from their original
> discourses and purposes...those principles are sometimes
> distorted beyond recognition (Davis & Sumara, 2002).

Even if one were to concede the nativist assumption that higher psychological processes (higher-order thinking) occur as a natural process, the argument that guided discovery should result in conceptual understanding is rendered unsustainable by the research done by cognitive

psychologists on the issues of problem solving and higher order cognition. According to cognitive scientists, problem-solving has two basic formats; algorithms and heuristics. Algorithms are defined as a set of rules which, if followed correctly, will furnish the correct answer. Heuristics, on the other hand, are informal strategies developed through subjective experience which work under certain circumstances but that may not furnish the correct answer because they are highly context-specific. The problem with empirical learning is that because students do not have access to the concepts they are supposed to be constructing, they are forced to adopt problem-solving and meaning-making strategies that are bound by the limited context of the immediate examples to which the students are exposed. Students then initiate the generation of a *rule-of-thumb* for inferring meaning or for problem-solving in the given context and are therefore creating heuristics which are often erroneous, limited in their utility and do not connect with other contexts. The result is dysfunctional and ineffectual knowledge (see Chapter 2: Developmental Teaching).

The Vygotskian argument against the constructionist framework, although couched in different terminology than that employed by Cognitive Psychology, addresses similar issues but in a much more elaborate fashion. In describing the psychological process of concept formation, Vygotsky (1931, 1986) outlined three prerequisite stages in the formation of

scientific concepts; Heaps, Complexes and Pseudoconcepts. Vygotsky performed several experiments to investigate how children's thinking changed in the process of learning a new concept, and these eloquent investigations revealed that when children begin with very little or no understanding of a concept, they tend to rely completely on their own subjective impressions of the information presented to them and this results in the vague notions of what a particular concept (Vygotsky's focus was on word meaning) might be, and as a result of this amorphous understanding of the sign,

> ...word meaning denotes nothing more to the child than a
> vague syncretic conglomeration of individual objects that
> have somehow or other coalesced into an image in his mind.
> Because of its syncretic origin, that image is highly unstable
> (Vygotsky, 1986, pg 110).

The child's ability to create meaning in this case is entirely dependent upon the immediate context of the situation and governed completely by the child's immediate subjective impressions of the objects, and if the context is modified even slightly, the heap takes on different meaning for the child.

With further exposure to relevant information, the child's thinking undergoes a qualitative change and he or she begins to think in terms of complexes, which are organized by the child's ability to discern a common

trait among the objects. This signifies an important transition in thinking because the child has overcome purely subjective meaning-making and instead begins to engage in objective meaning-making that is no longer based entirely upon subjective notions of meaning but incorporates limited aspects of objective elements. At this level, the child becomes capable of recognizing common qualities of objects and can begin to identify common factors in an objective manner. This allows the child to engage in a certain degree of rational thinking such as basic categorizing activities, however it is important to understand that the child is still dependent on concrete, material objects to make meaning, and as a result, the ability to engage in theoretical thinking is not yet possible due to the fact that the child's thinking is still highly context specific because,

> A complex does not rise above its elements...The elements
> of a complex enter it as perceptually concrete wholes with
> all their attributes and connections (Vygotsky, 1986, pg 117).

Neo-Vygotskian theory argues that because the perceived elements of a complex are subjective in nature and that the meaning is embedded within the context, there can be no development of higher-level *conceptual understanding*. Once a complex has been established and the individual has had considerable experience with that concept, then that understanding proceeds to the point that the individual becomes competent with it in a practical manner and is able to describe and identify the important salient concrete characteristics of that concept, but is unable

to analyze the essential elements of concepts and synthesize new meanings from them. In its most advanced form, this stage of development represents the presence of concrete domain-specific knowledge based on a significant accumulation of experience but there is an absence of context-independent conceptual thought. Vygotsky referred to this kind of understanding as a "pseudoconcept". It is important to make clear that pseudoconcepts are what compose everyday concepts where that concept has been developed to the extent that it is functional for the purposes of practical everyday experiences.

Empirical learning results in the formation of pseudoconcepts which are based almost exclusively on the accumulation of contextual, domain-specific, subjective understandings of the environment. Since Constructivist education is founded on the notion of enhancing everyday concepts, the result will be the formation of pseudoconcepts; everyday concepts that appear to be accurate even within a limited academic context, until the individual is forced to deal with a novel situation that challenges their conceptual understanding of the problem, or a situation that requires the synthesis of theoretical understanding, at which point the pseudoconcept fails. This phenomenon can be best illustrated by the example of "naïve physics" which has been researched extensively by Cognitive Psychologists who presented high school and university students

with a number of scenarios and asked the subjects to predict the outcome. It was found that a disconcerting number of subjects made erroneous predictions because, according to the researchers, the subjects' responses were, "based on informal mental models...[and] Incompleteness or misconceptions in the mental model lead to errors in reasoning" (Ashcraft, 1998, p. 380). From the Neo-Vygotskian perspective, since Constructivist education does not directly introduce the student to conceptual thinking, the best that a constructivist education can theoretically attain in those students who have the ability to engage effectively in empirical learning is the development of pseudoconcepts. While this level of cognition may be sufficient for the problems encountered within the limited context of elementary and secondary school curriculum content, the problem with this situation is that the students are not capable of dealing with novel situations in an effective manner, because they are still dependent upon the concrete examples and domain-specific factual knowledge with which they are familiar in order to understand that specific problem or concept: they are not capable of engaging in conceptual thought when considering concrete instantiations of theoretical problems or challenges and therefore in spite of (or rather, *as a result of*) their years of education at school, they default to the employment of incomplete and/or erroneous subjective heuristics to deal with the problem.

In light of the theoretical, empirical and practical criticisms of constructivist educational methodology, it behooves educators and researchers to seek out educational frameworks that are less problematic in their conception and which are not only logically valid and internally consistent, but have proven to have genuine educational benefits for the students. CHAT may be an invaluable aid that can provide educators with a useful framework for assessing the effectiveness of current instruction and curriculum content, and for constructing learning activities which have been proven empirically to have significant benefits over orthodox methodologies in promoting the development of conceptual thought in students.

Chapter Four: CHAT Education in the Classroom

Whenever a new or different methodology is introduced to teachers, the most common response they have is that they want to know *what the system looks like in the classroom* and how it differs from what they are already doing on a daily basis. Just as CHAT theories are considerably different than orthodox theories of instruction, the nature of the activity in the CHAT classroom in terms of the curriculum and instruction is considerably different than the traditional didactic methodologies or the current orthodoxy of *knowledge construction*. As has been pointed out, the two pillars of CHAT methodology result in a decidedly different educational experience for the children because the primary focus of CHAT methodology is not the transmission of information from teacher to student, or the construction of generalizations from concrete examples, but the process of learning itself as a means of acquiring the necessary psychological tools to function as adults in societal activities. The differences between the constructivist classroom and the CHAT educational process are exhibited primarily in the relationship between the course content and the strategic educational goals of learning activity, the pedagogical role of the teacher in the learning activity, and the relationship between curriculum and instruction in the educational process.

In some ways, CHAT educational programs are difficult for educators unfamiliar with the framework to envision because the CHAT framework does not make specific prescriptions for an educational program. It does recommend the presence of particular components for an effective learning activity to be established, such as the presence of theoretical perspectives to guide understanding, but these general components necessary for effective development of the child are often misinterpreted as rote learning of "dead" theory (and therefore a return to students as passive recipients of information transmitted from a didactic teacher), the introduction of procedural knowledge followed by intensive practice to internalize and automatize the skill (and therefore no different from information-processing models of instruction), or the indiscriminate use of "group activities" to promote learning. It is therefore necessary to clarify how the general principles of CHAT education can be instantiated in the classroom in order to gain a clear understanding of how the CHAT model functions in action, and to describe "*what it looks like*" in a manner that is accessible to teachers who may not have sufficient theoretical understanding of Vygotskian theory to be aware of how CHAT curriculum and instruction differ from current methodologies.

The Germ–Cell Approach

CHAT education seeks to crystallize the theories of Vygotsky and Leont'ev into learning activities which are intended to take advantage of the influence that teaching has on intellectual development. The educational goal of CHAT as a framework is the development of higher psychological functions that contribute to the development of conceptual thinking. In order develop theoretical modes of thinking, students must therefore be engaged in activities that contrast concrete examples with theoretical knowledge. In other words, the students must learn how to understand the relationship between the general (theoretical knowledge) and the specific, concrete example. This methodology requires the teacher to develop a model that serves as the theoretical focal point of the learning activities. This focal point has been dubbed a "kernel" or, more often, a "germ cell" that encapsulates a range of important concepts in a domain-specific field of knowledge. The purpose of the germ cell is not to simply provide supporting or corroborating information to the students, but rather,

> ...should bring together things that are *dissimilar, different, multifaceted,* and *not coincident,* and should indicate their proportion in this whole. Consequently, the objective connection between the universal and the isolated (the integral and the distinct) emerges as the specific content of a theoretical concept (Hedegaard, 2002, p. 31).

In other words, the teacher needs to present the students with a conceptual model which serves as source of conceptual "tension" and from which the students engage in various modes and methods of collective inquiry, discussion and discourse involving conceptual relationships. Ideally, the core model should represent, as much as possible, the theory contained within the subject content. As an example of how the germ-cell framework is employed, the relationship between animal and nature could be employed to investigate a wide range of concepts:

> In the subject domain of evolution, the germ-cell relation of animal and nature is changed and extended into modeled relationships between the concepts of species, population, and ecological niche (Hedegaard, 2002, p. 31).

Each of the concepts mentioned above can then be explored in relation to each other to provide a coherent series of learning activities that develop the students' ability to understand both the concrete examples under study as well as the theoretical and conceptual relationships that exist in a particular subject domain. The introduction of the germ cell is the method by which the teacher introduces the students to systems of theoretical knowledge, and this type of introduction to scientific concepts that the child is not yet capable of understanding but which serves to shape the development that occurs is directly taken from Vygotsky's notions of education and concept development. Presenting the curriculum in this format results in the students wrestling with, "central conceptual relations which underpin particular phenomena" (Daniels, 2001, p. 97).

It is important to keep in mind that the focus of instruction is not the content as such, but instead the content is serving as the means by which students engage in the investigation of the relationship between the specific and the general (or, in other words, between the concrete and the theoretical).

The dynamic nature of the CHAT educational framework becomes clear when one realizes that it is within the context of the examination of a dialectical relationship that the teacher serves as the source for the revelation of inadequacies or errors in understanding, and initiates the cyclical pattern of the learning activity. The nature of the germ-cell, with its implicit theoretical concepts and implications, serves as the starting point for the investigation of various concepts, and the nature of those inquiries determines the nature of the actions in which the students become engaged in their attempts to eliminate deficiencies in their understanding of the concepts. Activity theory clearly indicates that the nature (or goal) of the activity has a direct influence on the actions and therefore the operations that occur in the process of completing those actions, and this all has an impact on the learning and development that results. For this reason it is imperative that the instruction and curriculum content revolve around,

> ...a selected or constructed paradoxical situation (with the character of a miniature) as the starting point for

learning. It represents the whole complexity, but on a small scale...At the beginning, these categories are abstract and have little concrete content. But in the process of ascending from the abstract to the concrete, the categories become increasingly complex and concrete (Geist & Lompscher, 2003, p. 282).

This particular methodology results in the harmonization of both the curriculum and the instructional practice, which is often difficult to achieve in the orthodox classroom. It has been pointed out that in the traditional classroom, because of the nature of the curriculum planning, the methods of instruction that tend to be employed, and the focus on acquiring content as the ends of the educational enterprise, "children are faced with fragmented phenomena, and poorly generalized ways of dealing with them; they are supposed to learn by memorizing mosaics of unrelated facts" (Stetsenko, 1999, p. 241). Without an investigation of the paradoxical situation, the education that will likely result is empirical learning because there will be no central model or theoretical construct against which the students are able to relate and assess their knowledge and understanding.

The learning environment in the type of situation where there is a lack of a focal model or germ-cell results in the typical pattern found in most classrooms across North America wherein students flip from page to page, chapter to chapter on topics that seem to have little in common beyond the fact that they are bound in the same text. This is something

with which many educators struggle: for example, although a grade ten

Science textbook, such as *Science Probe 10* (Published by Thomas-

Nelson) which is used by school districts across British Columbia, might

include units on Biology, Chemistry and Physics, there is little to tie or

link the units together into a coherent whole, and the result is that the

instructional content plods along unit by unit, interspersed with the

occasional lab activity, with students focused on remembering formulas,

vocabulary and factual knowledge that remain fractured, discrete and

highly contextualized in nature. By employing a theoretical focal point

that serves to drive the inquiry that takes place in the classroom, the

content that is covered becomes the means necessary to address

deficiencies in understanding the model, and therefore content becomes

the means for developing operations applied as functional units in the

completion of an action that is part of the learning activity. In this way,

the content that is covered becomes functional knowledge used to develop

the children's concepts, and therefore develops their ability to engage in

theoretical thinking in the subject area.

Although many educators might wince at the thought of employing

a comprehensive model to organize the curriculum and instruction in

their classroom, it should be pointed out that in many cases, teachers

may already be employing limited versions of the germ-cell framework in

their instructional strategies. For example, if a teacher were to ask his or her students the question, "What is a Canadian?" the students would likely respond with answers such as, "I am!" or "My family are Canadians" or "My friends Jeniece, Kathleen and Jagdeep are Canadians". While these may be technically correct responses, they are not unified by any essential conceptual understanding of the fundamental question because none of the responses listed above reflect the understanding that citizenship in Canada is independent of cultural-linguistic identity: in short, they are based on everyday concepts. Attempts to construct an understanding of culture through dinners, costume parties and other such activities, while enjoyable for the students, often do not result in any genuine learning or deeper understanding of the concept, and in fact the teachers themselves may not know how to go about answering the question they are posing to their students because the inception of the activity has been accomplished without any conceptual analysis of the purpose of the activity in developing students' concepts of identity and culture.

If, on the other hand, teachers employ the notion of identity and culture as a framework for the construction of activities that investigate the relationship between identity, culture and citizenship, it then becomes possible for the children to begin to examine their understanding

of the question in light of this theoretical framework of Multiculturalism. This opens the door for children to investigate whether or not language, ethnicity, or religion has any bearing on the legal status of citizenship. Furthermore, it allows children to investigate the tensions and issues inherent in a multicultural society where there are bound to be differences in beliefs, religion, and values.

The utilization of thematic units around which to employ curricular content and instruction, such as Multiculturalism and Environmental Education, are occasionally put to use in the classroom by teachers who seek to make their curriculum more coherent and therefore more meaningful to the students. More importantly, these theoretical frameworks provide a standard set of concepts against which the teacher and students can assess, compare and evaluate their understanding of issues and concepts. The problem with thematic units is that they are often only employed for a limited duration, and once the unit is finished, the use of the systemic knowledge to frame understanding curriculum content ends. While some students may remember having done a multicultural unit, for example, the use of that particular framework to consider an issue or question has not become ingrained sufficiently to become a method of engaging in theoretical thinking, and thereby becomes non-functional as a mediator for engaging in conceptual thought.

The reason for this knowledge remaining "inert" (Whitehead, 1917) is that the use of systemic knowledge has not been sufficiently appropriated by the students to the point that the necessary operations can be consciously employed in another context. As a result, the student defaults to employing spontaneous concepts. The thematic approach to teaching students has great potential, but the temporary nature of thematic units may result in them not be sufficiently long enough to result in genuine concept development.

In CHAT education, the germ-cell remains as the focal point around which the learning activities are built over a prolonged period of time rather than only for one or two units. The students are therefore engaged in grappling with understanding conceptual relationships and dealing with problem-spaces over an extended period of time and this allows for real concept development to occur.

Although thematic approaches are, to a certain extent, employed by teachers to stitch together certain parts of the content material into a framework that allows students assess their understanding in relation to an established set of theoretical concepts, there are certain authors who advocate that much more comprehensive and substantial thematic approaches are necessary for the design of

curriculum and instruction if education is to be genuinely effective. For example, Kieran Egan, when discussing the nature of the History curriculum, has argued that orthodox methods of generating curriculum have resulted in, "an intellectually impoverished set of topics focusing on local trivia and "hands-on" activities at a point when children's imaginations are energetically alive to grasp the world" (Egan, 1997, p. 44). Egan is not alone in his criticism of the Social Studies curriculum, nor is this a new criticism of current educational practice, for other authors have voiced their concern over the fact that, despite some change over the years in the socials and History curricula, what remains is, "The regrettable mediocrity inherent in the conception of these texts... [and] events...simply appear, like Athena out of the head of Zeus. And History is just one damn thing after another" (Butler, 1981, p. 197-198). Many authorities on children's books bemoan the fact that children are not interested in the past. The reason for this lack of interest or understanding of History may be due to the fact that, according to one author, "History itself has been rendered arid" (Egoff 1981, p. 189).

Perhaps the problems originate in the fact that the word "history" refers not only to historical events, but human history as well. Unfortunately, history texts have removed most of the human drama from history and as a result, the content has been converted into a

compilation of abstract cause-effect relationships that, in the current

Neo-Piagetian educational environment that places development ahead of

instruction, are deemed as formal-operational processes and therefore

beyond the cognitive ability of the students. Egan's solution to this

dilemma is to employ long-term thematic approaches to the delivery of

curriculum and instruction by employing socially constructed frames of

reference such as binary opposites because, "binary structures are one

kind of effective grasper of new meaning" (Egan, 1997, p.43). Egan goes

on to indicate that there are numerous other frameworks which can be

used to introduce scientific concepts that may be engaging and effective

in the development of students' concepts in a variety of subject-domains.

Other authors have argued for similar changes in the manner in which

educational activities are framed by asserting that, "Experience is

transformed into knowledge, into learning, when it is appropriated

actively…into a framework of meaning" (Hopkins, 1994, p. 360).

While the recommendations for framing curriculum and

instruction around Egan's Mythic, Romantic, Philosophic and Ironic

understandings or Hopkin's concept of narrative schooling are very new

and have yet to be researched in depth, these ideas are in alignment with

the basic premise of CHAT education, for they advocate that these

themes not be employed on a unit-by-unit basis, but for extended periods

of time. Egan suggests that,

> we could begin our history curriculum with the cosmic
> story of the struggle of life against extinction... [or for more
> recent history] It would be easy, for example, to design a
> year-long history program based on the story of the human
> struggle for freedom against oppression of various kinds"
> (Egan, 1997, p. 209).

The CHAT classroom is clearly different from the orthodox classroom in

terms of the manner in which the curriculum is constructed because the

germ-cell or some other model or conceptual notion serves to support the

learning activities in which the children are engaged and serves as a

theoretical "home base" from which the investigation of various

associated concepts can proceed. In classrooms where the orthodox

methodologies are employed, there is no such core model that provides

conceptual cohesiveness to the academic activities in which the students

are engaged and by which the teacher stimulates active learning,

academic curiosity and collective inquiry.

Patterns of Communication

The second noticeable difference between the conventional and

CHAT educational environment is in the patterns of communication that

occur in the classroom. This difference in the pattern of communication

and language use in the classroom reflects the different roles of teacher

and students in the CHAT model for education, as well as the emphasis placed on the use of oral and written communication as an explicit means of focusing attention on the process of learning and reflecting on the concepts being developed during learning activities. This shifting of ends and means is by no means a trivial difference in the educative process: it represents a significant departure in the perceived ends of the learning process and places very different demands on the type of communication that occurs between the teacher and the students.

With respect to the patterns of communication in the orthodox classroom, the type of interaction highly entrenched in most classrooms is that of the teacher posing a question to the students, who respond to the question and then the teacher evaluates, corrects and expands upon what the students have said. This pattern of inquire-respond-evaluate questioning (IRE), while a ubiquitous feature of current instructional practice, has been criticized from a number of different perspectives. First of all, it has been argued that, "traditional teacher talk focused almost solely on questioning and evaluating correct responses" (Miller, 2003, p.291) and therefore was not particularly useful in developing understanding in students. This is perhaps due to the fact that IRE sequences are Neo-Piagetian in their origin and, "presuppose...some kind of internal representation and the task is to display it in an

external...form when the teacher makes a request for it" (Wertsch, 1998, pp. 122-123). In other words, questions have typically been used by teachers not as teaching tools or as devices for generating possible topics for further inquiry, but simply as methods of informal assessment of an individual student's knowledge. Secondly, it has been argued by some authors that this pattern of questioning,

> ...makes it possible for a teacher to maintain the floor
> and cover the same material that would be covered in
> a traditional lecture format but to appear to be inter-
> active in the process (Wertsch, 1998, p. 123).

In this case, the pattern of dialogue in the classroom is merely a variant of the transmission model of instruction because the IRE sequences between teacher and students ensures that the teacher is covering the material he or she intended to introduce to the students, and therefore remains in control of the direction of the conversation and the questions that are being asked. Finally, this pattern of questioning places the teacher as the active agent in the classroom, and the students are relegated to a more passive role in that they are merely required to respond to questions as best they can.

Because the goal of education is to *engage* students in *active learning*, it seems peculiar that teachers would employ this type of practice which habituates students into passive roles which entail the simple recitation of memorized facts transmitted previously by the

teacher. In spite of the questionable value of IRE sequences in classroom

instruction, the persistence of this form of classroom communication can

perhaps be explained by the entrenched constructivist notion among

educators that the transmission of information to students, either from

the teacher or the text, in order to build the children's cognitive

structures is the primary purpose for the instruction that occurs in the

classroom. This would be in keeping with research that that has

demonstrated that,

> teachers' in-use pedagogical content knowledge is
> run by a top-down engine in which meta-assumptions
> constrain the nature of possible cognitive goals and
> the teaching strategies that can be used to achieve
> them (Strauss, 1993).

In the CHAT classroom, the focus of the learning activity is to

encourage the children to pose the questions that need to be answered in

order to eliminate a problem space or inadequacy in their understanding

of a concept. Rather than the teacher simply providing the information

that students are supposed to add to their cognitive structures, in the

CHAT classroom, the students are the ones obtaining information and

understanding. As a part of the learning activity, children are active in

the sense that, "knowledge is *obtained* by the children, not imposed by

the adults" (Moll & Greenberg, 1992, p. 326). While this may at first glace

merely seem to be a minor change in wording, it is in fact much more

significant because it indicates that the students are given agency over

their own learning and become active participants in their own learning activities. Studies have indicated that when students are playing an active role in asking questions, "the participant structure in which these questions are embedded influences students' learning significantly" (Wertsch, 1998, p.129). The teacher therefore is not a source of the information, but a member of the classroom community whose subtle influence serves to direct the attention of the students to conceptual relationships and deficiencies in understanding, and then to support the collective modes of thought and inquiry that result. The teacher's roles include that of, "guide and supporter...purposely mediated, almost hidden, embedded in the activities...who organized the environment, curriculum, and materials to provide functional uses for language, literacy and learning processes" (John-Steiner & Mahn, 1996). As a part of the educational experience, the students themselves are encouraged to engage in collective inquiry, investigation and collaborative problem-solving rather than simply waiting to have the information transmitted by the teacher.

It is an essential part of the educational program that students engage in various types of learning activities not in isolation or in independent activity but as a community for it is through exposure to other students' externalized modes of thinking that students are able to

become aware of and appropriate those cognitive tools that are being employed by their cohorts and thereby develop a more sophisticated understanding of the problem and the means to deal with it. This form of collective activity has been the topic of much discourse and has been dubbed a host of names, such as "distributed cognition", "intermental development zone", "collective thinking" and "cognitive apprenticeship" among others. Regardless of the moniker given to the activity by researchers, the key to successful learning rests on Vygotsky's argument that, "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (Vygotsky, 1978, p. 88). Results from this type of collective learning have indicated that,

> ...enculturation into the community leads participants
> to relinquish everyday versions of speech activities...
> and replace them with discipline embedded special
> versions of the same activities (Daniels, 2001, p. 120).

It seems that when children are part of a social activity such as scientific or literary investigation, they adopt the use of appropriate language and modes of thought relevant to the activity in which they are a participant, and this is a crucial step in the acquisition of mediators that eventually result in concept development to the point that the student can begin to engage in conceptual thought. The impact of language on the development of the human psyche has begun to attract the attention of North American researchers interested in the topic. These researchers

are discovering more and more that their research is merely confirming

what has been articulated decades earlier by Vygotsky and his

contemporaries:

> language plays an extremely important role in the
> formation of human cognitive processes and...speech
> makes possible that transition from sensory to
> rational analysis... It is because of language that
> humans can delve into the essence of things, transcend
> the limits of direct impression, organize purposeful
> behavior, unravel complex connections and relationships
> which are not accessible to direct perception...[and] makes
> possible the most complex forms of discursive (inductive
> and deductive) thinking. These forms are the main forms
> of human productive intellectual activity (Luria, 1982,
> pp.199-200).

If students are to appropriate the mediators necessary to engage in these

types of mental activities, it is vital that they act in the classroom as

members of a social environment where the types of activities mentioned

above by Luria are occurring explicitly as functional models of operations

to be acquired by all participants.

Although group activities and classroom discussions may be

employed by many teachers, there is a critical difference between group

activities in the orthodox classroom and collective activity in the CHAT

classroom. The fundamental difference is that in the Neo-Piagetian

activity, the students are generally engaged in displaying their

understanding of information that has been transmitted to them by the

teacher. The group activity therefore consists of the recapitulation of

information. In these types of group projects, it is often the case that the student who knows the information does the majority of the work and this does not necessarily translate into improved learning capability on the part of the other students. In fact, it might actually impede the ability of certain students to participate in the group activity: it has been pointed out that teachers who uncritically employ group work may actually be making it more difficult for the students to learn because, "Peer collaboration may, in some circumstances have negative effects on learning" (Daniels, 2001, p. 115). Specifically, group activities that rely on empirical learning strategies or recall of factual knowledge may result in conceptual foreclosure by students who take another student's word for granted, or result in unproductive and/or erroneous conversations. Research, "suggests...that peer-led talk in many instances has not resulted in students' equal rights of constructing knowledge...or productive conversations" (Miller, 2003, p. 291).

Collective Problem–Solving

In the CHAT classroom, the nature of the discussion revolves around collective inquiry and the solution to problems that have been brought to students' attention by the teacher. While this seems like a trivial difference, the impact of this shift in emphasis results in discussions among students regarding the functional utility of various operations to eliminate the problem space, and this pooling of knowledge,

understanding, perspectives, and modes of action and thought that are

brought to light during the discussions among students *make the activity*

of learning an explicit one and therefore available to all members of the

learning community. If the learning environment is properly developed,

students will engage in collective discussions and when they,

> ...participate in collective discussions...they can readily
> make the transition to abstract thinking....words become
> the principal agent of abstraction and generalization.
> At this point people dispense with graphic thinking
> and codify ideas primarily through conceptual schemes
> (Luria, 1976, p.99).

CHAT educational strategies based on the notions of learning activities

and developmental teaching do not have glaring differences that leap to

the attention of a casual, uninformed observer in the classroom. An

astute observer might recognize that there may be more discussion

occurring, and this might be attributed to the students employing their

critical thinking skills.

Upon closer examination and analysis, however, it should

become clear that the role of the students is much more active because

the learning activity is focused on the process of learning rather than its

product. The emphasis is generally concerns addressing problem spaces

and eliminating deficiencies in understanding through the explicit

activity of collective inquiry and discourse which illuminate mediators

that have a functional role in the development of concepts and therefore the development of higher psychological functions. This is generally accomplished in a visible manner through the following:

1) Question and answer sequences that are used to direct the attention of the children to weakness in their understanding and to guide the development of understanding through reflection, explanation, clarification, and direction of attention to a specific problem or paradoxical situation.

2) Acquisition of content is not the primary goal of the learning activity. Instead, the creation of meaningful understanding of the content in terms of scientific concepts and conceptual relationships as well as the appropriation of the mediators for the solving of these problems is the focus of the classroom activities.

3) Learning is treated as a social process that requires significant and meaningful communication and the explicit exchange of knowledge and ideas to build the common knowledge of the learning community in order to achieve a specific goal or complete a task as a part of the learning activity. This would include the sharing of models and methods of action (Kozulin, 1998; Hedegaard, 2002).

When these elements are incorporated into properly organized learning activities occurring in the classroom where students are active in asking and seeking answers to questions in a social atmosphere of collective inquiry, the result is theoretical learning by the students, and theoretical learning has been shown to be much more efficient in terms of mastery of content, broad transfer, the development of theoretical and conceptual thinking, and most importantly, the cognitive development of children (Karpov & Bransford, 1995; Repkin, 2003; Kozulin & Presseisen, 1995).

One issue that remains and that is somewhat problematic, however, is that there is a paucity of information regarding the level of intervention necessary by the teacher in order to sustain effective learning while students are engaged in a specific action or task (Karasavvdis, Pieters & Plomp, 2000). Part of the problem rests in the fact that although many educators may be aware of Vygotsky's principle of supporting the ZPD, the notion of 'scaffolding' as it is commonly understood, "implies too strongly that the quantity rather than quality (i.e. content) of the adult's help is the decisive influence on a child's development" (Stetsenko, 1999, p. 243). On the other hand, without sufficient teacher intervention, it is quite conceivable that the students could slip into empirical learning patterns. It has been pointed out that it may be impossible for researchers to specify exactly what a teacher should do to support this kind of learning activity because there are a huge number of variables that affect the individuals in a classroom and thereby affect the learning experience, and an inflexible and in any case, a predetermined methodology can not be taken seriously, for,

> ...until somebody establishes otherwise, we must presume
> that any and every facet of each individual's nature, of
> each individual's background, of every context, and of
> every conceivable combination of those various facets
> might be the sole or the crucial element in explaining what
> goes on (Barrow, 1984, p.154).

Because of the nature of individual zones of proximal development as well as issues of context, it is necessary for the teacher to be alert to the needs of the students and to ensure that the learning activity is being sustained. In light of the fact that learning activity is a dynamic activity, it is quite possible that the only way a teacher can be successful in employing Neo-Vygotskian strategies in the classroom is to have a solid conceptual understanding of CHAT as well as considerable practical experience in a CHAT educational environment so that he or she can respond in a flexible and efficacious manner that is specific to the immediate learning situation. In this regard, it would seem that Vygotskian theorists and certain critics of orthodox curriculum theory may have more in common than they realize.

Chapter Five: CHAT as a Lens for Assessing Curriculum

While CHAT provides a powerful framework for the construction of effective learning environments, it also has other potential value as a means by which educators can identify those elements of teaching plans that will benefit the students and in what way. While constructivist approaches to unit planning rely on ascertaining what information needs to be transmitted to the students in order to develop their cognitive schemas, CHAT can provide a means to asses the functional utility and value of specific actions and operations in which the children are engaged, and therefore enable teachers to identify productive and useful psychological tools, and in fact, this can be accomplished both in a specific context as well as in terms of cross-cultural comparisons of curriculum and instruction. This means that it may be possible for educators to identify those instructional techniques that may be appropriated from one educational context to another in a cross-cultural setting in order to enhance the quality and efficiency of learning that occurs in both contexts. In order to demonstrate how the CHAT framework can identify potentially useful instructional activities and programs, it might be valuable to assess two unit plans: one from a Canadian language arts class, and one from a Japanese middle school Language Arts class.

Canadian Language Arts Unit Plan

In the case of the Canadian language arts unit plan, the unit is intended to be a thematic short story unit on Multiculturalism in Canada and is developed with the intent to enable students to become more cognizant of issues involving and ethnicity and culture in the formation of personal identity. In order to accomplish this, the unit is organized as follows:

1) Students were first asked to explain who they are, in terms of their identity as a person. To model the kind of answer desired, the instructor described himself in terms of ethnicity, birth order, education, and other factors. It was made clear to the students that they should choose a list of factors that made each person a unique individual. This was considered vital in "constructing" the basic notion of identity.

2) Students were then instructed to use the list they had generated to make a pie-chart, with each factor making up a portion of the pie. This was described to them as an "identity circle". Once the students had done this, they were instructed to compare identity circles with each other.

3) The teacher then asked several questions to generate class discussion on students' observations of the identity circle, and in particular, to point out that students of identical ethnic backgrounds may not have identical results.

4) Students were then instructed to read three short stories taken from an anthology of British Columbian authors. The theme of the stories involved conflict over personal and ethnic identity among immigrants and their families in Canada. Students answered comprehension questions about the theme and conflict in the stories, and were required to make identity circles for selected characters in the stories.

5) The class was then divided into groups, with each group researching the history of a particular ethnic minority in Canada. The students went on to complete a "jigsaw" activity,

with the groups reforming and each student responsible for teaching the others in the group what he or she had learned, and each student was responsible for writing a response paragraph on a group (randomly assigned by the teacher).

6) The unit ended with the students writing a composition comparing and contrasting two of the stories.

In spite of the fact that this unit plan was only intended last for two or three weeks, and is based on an eclectic mix of instructional strategies, it contains a few notable strengths.

To begin with, the unit is based upon a multicultural thematic framework employing the "identity circle" which provides students with a conceptual model to use when considering questions of identity and ethnicity. This use of a model, in tandem with the multicultural theme, to illustrate the concept of identity is valuable in that it forces students to consider the concept of identity through the model, requiring students to interpret and use the model as a means of discussing the nature and meaning of identity. Identity is a concept students rarely have to consider in depth, so the identity circle may serve as a "mode of visual representation" (Wells, 2001, p.178) of the concept against which the students can compare and reflect on their own individual understanding. In other words, the model serves as way to direct their attention to the question of the nature of identity and thereby mediate the students' developing understanding of the scientific concept of identity and provide

them with the opportunity to relate the concept to concrete instantiations in literature, history, society, and their own experience. This is in accordance with CHAT theorists who advocate that students must be provided ways, "to participate in the exploration of a subject's general concepts, taking the children's epistemological questions that are linked to their experiences" (Hedegaard, 2001, p. 210). Models and graphics such as the identity circle enable students to grapple with content at a theoretical level that they may otherwise be incapable of understanding, and serve to facilitate concept development and therefore intellectual development.

The second positive aspect of this unit plan is somewhat diminished by the manner in which it is employed. The jigsaw activity in which the students focused in homogeneous groups on learning the history of an ethnic minority's experiences in Canada followed by heterogeneous grouping and reciprocal teaching is based loosely on the Vygotskian notion of concept development through social interaction with an expert peer. While this type of activity is becoming quite common in many classrooms, and may be a useful strategy in certain contexts if implemented properly, it has been shown that students must become accustomed to this type of activity before they are able to benefit from its use because, "it often takes upward of five sessions for students to use the

technique effectively" (Wertsch, 1998, p.130). The weakness of this strategy in this particular case is that the purpose of the group activity was not collective inquiry or collaborative problem solving, but the distribution of information through the activity: in essence, it was merely a variant on the transmission model of instruction that only appears on the surface to be student-centered. When considered carefully, it becomes obvious that the content has been pre-determined by the teacher and the purpose of the activity is nothing more than to ensure that all the students are being provided the information on the various ethnic groups.

The final positive aspect of the multicultural unit plan is that the students are required to encapsulate their understanding in a written format. Formal writing is a critical element in the CHAT educational framework because it serves a number of functions. First of all, the act of writing focuses the students' attention on the content of the writing, and this product of their understanding of the concept becomes an explicit object subject to reorganization, reiteration, evaluation for accuracy and it encapsulates the students' knowledge of the concept. As a result, the student is able to refine and clarify his or her thoughts and understanding of the concept and engage in what could be described as metacognition on the nature of what has been written and whether it adequately expresses the student's understanding of the concept.

Japanese Language Arts Unit Plan

In the case of the Japanese lesson plan, the intention is to incorporate the traditional art of *bunraku* puppetry into a middle-school Language Arts unit on traditional Japanese culture and language. The portion of the textbook introduced in the unit invites the students to, "imagine the lives and thoughts of the people from the things they have handed down" (Kokugo 2, 2004, p. 158)[1]. The basic plan of the unit is to introduce the students to "*The Tale of Heike and Genji*", followed by an assignment to produce a short bunraku play that reflects the lives and thoughts of people living during that period of Japanese history.

Bunraku is a form of puppetry that was developed in Japan that has no equivalent in western culture. The puppets are mechanically elaborate and often require two or sometimes three operators. The traditional stories are typically complex, lengthy, and targeted at adult audiences and often recount traditional fairy tales, folk stories and romantic historical tales. For orthodox constructivist educators, this activity would considered as fun and engaging for the students, and the puppets would be considered a good "hook" for a unit on language arts or Social Studies. On the other hand, one might come to the conclusion that through bunraku, traditional culture is being preserved and transmitted

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[1] Note:The translation is my own from the Japanese:
□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□

to the next generation of Japanese audiences. CHAT, however, can

illuminate much more complex psychological processes occurring and can

present much more powerful reasons for the effectiveness of this

particular curriculum.

The key to understanding the role of mediators in a learning

activity is what Vygotsky (1978) referred to as the "method of double

stimulation" in which,

> Two sets of stimuli are presented to the subject,
> one set as objects of his activity, the other as signs
> that can serve to organize that activity.
> (Vygotsky, 1986, pg. 103)

In the case of bunraku, the children are expected to perform a play for

their classmates. The cultural artifact which mediates the performance is

the traditional puppetry which has its own set of requirements that

shape and organize the activity. The task set before the students is to

develop an understanding of how to use the puppet to produce a

successful and effective performance that portrays the issues and

concerns of the people of the Heian era. It is essential to note that the use

of the puppet is an implicit requirement for the completion of the activity,

and not an end in itself. The steps they must take to accomplish this task

are where interaction with adult experts, teachers and more

knowledgeable peers recruited from the school bunraku club play an

important role in supporting the learning process, for the children need to

learn from the experts how to manipulate the puppets in order to convey

emotions and actions that match the dialogue and narration of the play

they are writing.

The puppets as objects place certain constraints on the activity

when using them, among which is the requirement that the students

must conform as much as possible to the standards and conventions of

traditional bunraku puppetry. The presence of these constraints is an

important aspect of the activity because the students must employ

artistic and literary conventions during the play. The fact that the

students are not just writing a play, but are engaged in producing a

bunraku play is a factor that is easy to overlook. In fact, the role of

artifacts in defining the operations that may be employed in an activity

has been neglected by many researchers, and, "the importance of 'cultural

artefacts and representations as carriers of meaning' has been

insufficiently recognized to date" (Daniels, 2001, p. 74). The bunraku

puppets are important mediators because they require the children to use

traditional expressions, proverbs and language learned in the Language

Arts classroom while manipulating the puppets. This use of artistic and

traditional linguistic expression functions as another mediator for

developing in depth an awareness of and familiarity with essential

cultural concepts related to value and belief systems, identities,

relationships and social issues. Beyond the value of the puppets as

cultural artifacts, literature has been described as a vital psychological

tool because,

> devices discovered by literary analysis become models
> in a study of everyday language. Literature helps to
> identify those possibilities of language and verbal thought
> that are obscured in the individual language. Literature thus
> becomes a tool box for a study of individual psychology
> (Kozulin, 1993).

The development of these understandings is not simply a matter of

cultural transmission, although that also is occurring, but the acquisition

of a particular set of psychological tools which may serve as mediators for

further mental development. Concurrent with development related to

language acquisition and use, the removal of the person as actor results

in the play becoming a form of drama that occurs purely in the

imagination and therefore on a higher level of abstraction than with real,

human actors. With the use of puppets, the emphasis of the activity

moves away from watching an actor and instead shifts to the semantic

realm: meaning-making becomes the focus of the activity. In Vygotsky's

opinion, a focus on meaning-making is vital in development because,

> ...operating with the meaning of *things* leads
> to abstract thought...[and] the development of
> will, the ability to make conscious choices, occurs
> when the child operates with the meaning of
> *actions*. (Vygotsky, 1978, pg. 101)

In the bunraku activity, the manner of the performance of the play and the manner in which it is received are products of the children's interaction with, and interpretation of, the original literature. The importance of meaning-making in the cultural-historical framework is founded upon the argument that literature, "serves as a tool that develops in its reader a cognitive capacity for...multidimensional comprehension" (Kozulin, 1998, p. 150). Other authors agree with Kozulin's assertion and argue that ,

> literature can serve as a prototype of the most
> advanced forms of human psychological life and
> as a concrete psychological tool that mediates human
> experience...The human being masters his or her own
> inner psychological processes with the help of symbolic
> tools-signs, symbols and texts. (Lindqvist, 2003, pg. 250)

In light of CHAT perspectives, the incorporation of bunraku into the Language Arts unit plan has the potential to turn a simple "read, interpret and respond" activity into a powerful means for developing higher psychological functions. There is also another benefit to this particular activity that is generally overlooked by most theorists who tend to focus in internalization and cognitive development: the fact that the students are also producing an object. While the process of internalization is an important part of development of the higher psychological functions, it is also true that the reverse process of

externalization also be a part of activity, for without externalization, there can be no expansive cycle of activity. In the words of one author,

> when...external modes are instantiated, they are already characterized not only...by object meaning, but by meaning in the real sense of the word (Zinchenko, 1985, p. 102).

In other words, activity is not complete unless the internalization that results in conceptual thinking is expressed in a purposeful and meaningful manner that is employed in activity that produces some kind of change or modification of the original object. This change or modification imbues the object with a different set of real or perceived characteristics and as a result, promotes another round of internalization.

Zinchenko's argument serves to remind CHAT theorists that their focus solely upon internalization and individual development has resulted in a lop-sided view of activity. In the case of bunraku puppetry, the students are engaged in the purposeful activity of creating a bunraku play that has meaning for the authors of the play, the performers, and the audience, and as a result of this activity, their understanding of Japanese history, society and cultural values will undergo qualitative development. This reciprocal relationship between internalization and externalization to create a dynamic system of evolving activity and objects of activity has been an interest of other researchers who have

observed that activity, "requires active construction of constantly changing combinations of people and artifacts over lengthy trajectories" (Engestrom, Engestrom & Vahaaho, 1999, p. 345) and that real learning and therefore affective-intellectual development through genuine activity can only occur when, "the work of language is indissolubly joined to the work of the hands" (Ilyenkov, 1974).

Because of all the traditional Japanese cultural elements attached to bunraku, it can not be dropped "as is" into the Canadian classroom, but the use of puppets as a tool for creating a rich learning activity that engages and enhances the intellectual development of the students is a workable proposition for any classroom. The key to success however is that the instructor must understand and recognize the forces at work within the learning activity so that real learning and development occur. A solid understanding of the CHAT framework can be a useful tool in identifying and selecting educational activities that have the greatest potential for promoting the development of conceptual thinking in students, and can help educators assess the curriculum and instruction that occurs in foreign cultures in order to perhaps appropriate valuable educational strategies and activities.

Chapter Six: Conclusion

The CHAT framework, with its Vygotskian foundations is beginning to attract the attention of researchers and educators who are coming to realize the inadequacies of orthodox education in dealing with the issue of developing effective educational programs that foster theoretical thinking in students. CHAT promises to be a powerful tool for educators and researchers because evidence supports Vygotsky's predictions regarding the impact of developmental teaching on children, and the competent implementation of the CHAT framework results in educational practice that unites theory and practice. On top of this, curriculum and instruction, which are often at odds with each other in the orthodox classroom, are employed in a complementary manner in support of the learning activity. There are, however, several points that must be kept in mind regarding the promises and limitations of CHAT as an educational framework.

First of all, it must be kept in mind that the Twentieth Century was dominated by Neo-Piagetian theories and as a result, there are several generations of teachers and teacher educators who have been immersed in the constructivist culture of education to the point that it may be very difficult to change the manner in which they teach and in which the children learn to learn. Because teachers are indoctrinated and

immersed into Neo-Piagetian theories and therefore are unaware of the

presence of theoretical assumptions in their methodologies, it is often

difficult for them to recognize alternatives to the current orthodoxy,

"because they do not know they have models [of instruction] that serve as

the grounding against which the alternatives exist" (Strauss, 1993).

Because learning will lead to development only to the extent that

instruction has been organized properly (Karpov & Bransford, 1995), it is

necessary to ensure that teachers are aware of and educated in the theory

and principles of CHAT education, and that they are motivated and in an

environment that is conducive to the implementation of CHAT education

and developmental teaching.

Secondly, finding or establishing an educational environment that

would be hospitable to CHAT education is a challenging task in itself

because the development of theoretical thinking is not something that

emerges after a few lessons: it requires an extended period of time in an

environment where students are engaged in theoretical learning before

the benefits of this form of education emerge. One author on the topic has

stated that, "It is not an "all or nothing" switch from everyday to scientific

conceptualization, but an intricate process" (Kozulin, 1998, p.50). Another

author has described the process as, "just as fresh cucumbers that are

immersed in brine gradually become pickled, so the child who is

immersed in cooperative position-reflexive learning is gradually made reflective" (Davydov, Slobodchikov & Tsukerman, 2003). In an educational system that is controlled or monitored at the provincial or national level, this form of education may not be possible because of regional or national requirements regarding content, pacing and performance standards (Daniels, 2001, p. 144).

A third caution is that although theoretical thinking may be a worthy educational goal, it may be the case that educators are not focusing on the right students. While there may be interest in the benefits of collaborative learning for secondary students, it is important to keep in mind Vygotsky's assertion that, "the roots of development of the processes which afterwards lead to concept formation, reach back to early childhood, but they reach maturity only in adolescence" (Vygotsky,1931). This would imply that in order for developmental teaching and CHAT educational practices to have significant positive effects on the affective-intellectual development of students, it is necessary to immerse children into learning activities at a fairly early age. In the current educational climate, this suggestion may not be well-received because the orthodox assumption is based on nativist beliefs about maturation and development and as a result, while there is a certain degree of content that is taught to the children, in most cases the

emphasis is on emotional needs and in the case of middle schools, social

development is regarded as a primary concern. If Vygotsky is correct,

then there would have to be a significant shift in the foci of elementary

and middle schools in particular in order to provide the learning

experiences necessary for children to grow into adolescence and develop

the ability to engage in conceptual thinking. Developmental teaching and

theoretical learning are not currently a part of the established curriculum

for elementary or middle school.

Finally, because there is a need to reconsider current educational

practices and theories, and it may be beneficial to modify orthodox

pedagogical theories and methodologies, there is the concern that CHAT

may become a 'hot topic' much like Vygotsky's ZPD was in the 1990's, and

this may result in a kind of "CHAT fad" sweeping through the

classrooms. An uncritical adoption of CHAT methodology by educators

who are conceptually ill-equipped to deal with such a task, combined with

the fact that children must be given time to acclimatize themselves to the

new educational environment (Schmittau, 2003, p. 231) could result in

dysfunctional educational environments. There are currently many

incompatibilities between the current educational system and the

requirements necessary for CHAT education to be successfully

implemented, so it may take some time before CHAT is endorsed by

teachers and administrators, but this is perhaps not a bad thing: it may give researchers more time to investigate questions regarding the types of psychological tools that exist in particular subject domains and the best way for teachers to provide activities that will enable children to appropriate the widest range of psychological tools they can in order to extend the powers of their mind to engage in theoretical learning and conceptual thinking and thereby become adept life-long learners.

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