Approaches to Teaching Thinking

Toward a Conceptual Mapping of the Field

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Abstract

The objective of this article is to suggest a conceptual map of the field of teaching thinking in order to help those who want to understand and implement it to know their way around. According to this map, the field of teaching thinking is divided into three approaches – the skills approach, the dispositions approach, and the understanding approach. Each one defines the key terms of the field – thinking, good thinking, and teaching thinking – differently. After presenting this typology and analyzing its various dimensions, the article tries to cope with two essential questions: why three approaches, and which approach is more effective one.

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Yoram Harpaz

"There are an awful lot of theories around."

Robert Sternberg

"With so much controversy in the air, it's understandable that only a few teachers and schools make the attempt."

David Perkins

"Mind Workers Unite!"

Arthur Costa

When you examine the educational literature appearing in the past two decades, you will be struck by the flood of publications and intensity of interest in the field of teaching thinking. One only has to enter the combination "teaching thinking" into the computer of an updated academic library in order to ascertain this fact. Sternberg and Spear-Swerling rightly remarked that "it would be difficult to read anything at all in contemporary literature of education without becoming aware of this new interest in teaching thinking." (Sternberg & Spear-Swerling, 1996, p. 102).

But what exactly is it "teaching thinking"? Do all the many theories and programs of teaching thinking speak of the same "thinking," "good thinking" and "teaching thinking?" I claim here that there is actually not one "teaching thinking" but three: three approaches to teaching thinking that compete with each other for control of the field. A conceptual mapping of the approaches to teaching thinking will, I hope, enable further theoretical development of this field and its more effective application in teaching.

The formula of teaching thinking

At the beginning of the 1940s David Russell, a Professor of education at the University of British Columbia in Canada, discussed the definition of "critical thinking" in two articles published in the periodical *The School*. At the end of the fifties he summarized his position on this issue in an article in the *Encyclopedia of Educational Research*. During the period in which Russell attempted to define "critical thinking," this concept occupied but a marginal place in educational discourse. One generation later it became the focus of a far-reaching and influential educational movement - the movement for critical thinking. This movement is at the

center of another educational movement, broader and less focused - the movement for teaching thinking. Russell himself is hardly ever mentioned in the discourse of the movement for critical thinking and that for teaching thinking. The modest journal *The School* in which his articles were published has ceased to appear, and the encyclopedia in which he summarized his position became obsolete. Yet the concise definition he offered for critical thinking is a fertile definition. I shall refer to it here, after minor changes, as *the formula of teaching thinking*, and attempt to map the field by means of this "formula."

Russell's articles in *The School* appeared between a monthly review of the events of World War II and notices about events ongoing and cancelled due to the war. The journal was recruited for the war effort. Russell himself also recruited the idea of the teaching of critical thinking for the benefit of the war. "Correct thinking," that is critical thinking, he wrote, is a central element of democratic life. In parallel to the empowerment of the armed forces and the planning of the economy by the appropriate authorities. "Education must defend the spiritual bulwarks of democracy and therefore it must be concerned with a right-thinking citizenry" (Russell, 1941, p. 188).

What, then, is "right thinking" or "critical thinking?" Russell based it on what seemed to him at the time as the main ingredient - the habit of thinking. The development of habits of critical thinking, he wrote, is more important than the transfer of knowledge or of facts, as the latter tend to be forgotten while the former tend to persist. In another article published in the same journal he based "critical thinking" on four components, only one of which is the habit of thinking: knowledge of the field or fields in which thinking is being done; attitude and habit of questioning and suspending judgments; the application of logic and scientific method to the problem situation, and taking action in light of this line of thinking (Russell, 1943, p. 746). In a third attempt to define critical thinking, under the entry "Critical Thinking" which he wrote for the *Encyclopedia of Educational Research*, Russell cut short the fourth component - the element of action, not included by definition in the concept "thinking" - and offered a concise definition: "This [critical thinking] seems to involve attitude plus knowledge of facts plus some thinking skills" (Russell, 1960, p. 651).

I would like to construct from this definition the "formula for teaching thinking." If we substitute "good thinking" for "critical thinking," "disposition" for "attitude" and "understanding" for "knowledge" (substitutions that will be understood later), we arrive at the formula *Good thinking = thinking skills + thinking dispositions + understanding of knowledge*. This "formula" is implied in the writings of various theoreticians of teaching thinking, and suggests a key to initial mapping of various theories and programs included in teaching thinking.

The crucial question - and three approaches

The approaches to teaching thinking present an answer to the crucial question in this field: *What is good thinking*, and *how is it developed?* Or more precisely: What is the foundational element that constitutes good thinking, and how can it be taught? The

two parts of the crucial question are interconnected, thus forming one question. The second part derives from the first; for teaching the foundational elements of good thinking derives from the elements' very nature; thus, the "how" to teach derives (to large extent) from the "what" to teach. The first part of the crucial question depends on its second part, which steers the first into the realm of education. This steering prevents this part of the question from becoming a general theoretical question devoid of any practical or instructional dimension.

The crucial question is "crucial", because any theory or program for teaching thinking tries to answer it, explicitly and implicitly. In order to expose it, one must perform an "archeology of questions." archeology of questions is done by directing the question, "What question does the information at hand come to answer?" at theories and programs for teaching thinking. By directing this question at theories and programs for teaching thinking we discover in them the "residues" of the crucial question.

The field of teaching thinking does not offer one answer to the crucial question, as often apparent to its conceivers and followers, but three. These answers reflect three different approaches to teaching thinking: *the skills approach*, *the dispositions approach*, and *the understanding approach*.

The answer to the crucial question by *the skills approach* is: The foundational element that constitutes good thinking is thinking skills. Thinking skills turn thinking into good thinking (in David Perkins' words, skills are "the right stuff", or the "mindware," of good thinking). Thinking skills are developed by means of *the pattern of impartation*.

The answer given by *the dispositions approach* is: The foundational element that constitute good thinking is thinking dispositions. Thinking dispositions turn thinking into good thinking (Dispositions are the "right stuff," or the "mindware," of good thinking.) Thinking dispositions are developed by means of *the pattern of cultivation*.

The answer given by *the understanding approach* is: The foundational element that constitute good thinking is understanding the thought-about topic. Understanding turn thinking into good thinking (understanding is the "right stuff," or the "mindware," of good thinking). Understanding is developed by *the pattern of construction*.

The division of the field of teaching thinking into three approaches is commensurate with our own intuitions. After all, what makes a person into "a good thinker" (or "intelligent," "smart," reasonable," etc.) if not techniques, strategies, tools - in short, thinking skills; in addition to attitudes, character traits, inclinations - in short, thinking dispositions; and in addition to education, knowledge, expertise in the thought-about topic - in short, understanding?

Let us direct our "lantern of thinking" (an ancient metaphor to thinking to which Dewey was opposed [Dewey, 1933/1998, p. 46]) toward the approaches to teaching thinking. First I shall present them as answers to the crucial question; then I shall discuss some of their aspects; and lastly, I shall try to deal with two "essential questions" arising from the proposed description and analysis.

The foundational elements of good thinking and the patterns of teaching them

The skills approach

At the beginning - historical and ideological beginning - there was the skills approach. This approach challenged traditional education, which focused on the transmission of knowledge. Changes in the *condition* and the *picture* of knowledge undermined traditional education and paved the way for the skills approach. This approach claimed that in an era in which knowledge explodes (doubles itself in short intervals), becomes obsolete (new findings lay a basis for new theories, and vice versa), and becomes accessible to all (via the Internet and other sources), it is useless to focus on the transmission of knowledge. Moreover, in the (postmodern) era in which knowledge is conceived as relative - dependent on interests, perspectives and frames of reference without any objective justification - there is no longer any need to sanctify it and commit future generations to it. Instead of imparting bodies of knowledge, we must impart to our students abilities of good thinking, i.e. thinking skills. These claims - teach thinking, not knowledge; good thinking is skills - swept educational discourse; and the "educational market" (first and foremost the American market) was filled with thinking skills of various qualities e.g. skills of critical thinking, of creative thinking or of effective thinking.

Let us define the term "thinking skills," and then suggest a basic differentiation between types of thinking skills. In the discourse of teaching thinking, the term "thinking skills" is probably the most common; but particularly in the context of this discourse the term seems to be a bit obscure. In the context of teaching thinking, the term has two basic meanings, which we will refer to as "internal (or subjective) meaning" and "external (or objective) meaning." Using the second (external) connotation, thinking skills embody the various *thinking means* (strategies, heuristics, algorithms and the like) that render thinking processes more effective. Using the first (internal) connotation, thinking skill is the *good use* of thinking means, i.e. fast and precise use, consuming a minimum of "mental energy." In the literature of teaching thinking, the term "thinking skills" sometimes has an internal connotation, sometimes external, and sometimes both. This creates the sense of ambivalence that often accompanies it (in other fields, thinking means are not included in "skill." When we say that a driver is skilled, we don't include the vehicle in his skills). Combining the two connotations, we may say that good thinking is skilled thinking, and skilled thinking is that which implements thinking means in a fast and precise way.

  Within the discourse on skills in teaching thinking, a fundamental differentiation divides between simple or basic skills and higher order thinking skills. The former (e.g. classification, grading, comparison) serve as a basis for the latter (e.g. decision-making, problem solving, concept formation). The former are recommended for teaching in primary grades, and the latter - in higher grades or in college. Although

there is some sense in this differentiation, it is found wanting in two basic aspects: (1) simplicity and complexity of skills are mostly "in the eye of the beholder." It is possible to make skills simple or complex in accordance with the aims of the person using them; (2) skills are intertwined and difficult to arrange in a linear hierarchy. It is true that a higher skill such as decision-making requires mastery of simple skills; but even simple skills require mastery of complex skills (e.g. decision-making in order to make a comparison).

Instead of, or in addition to, the above traditional differentiation, we shall suggest another differentiation between types of skills - *neutral skills* and *normative skills*. The first come to render more efficient those thinking processes that people carry out anyway - identify, focus, classify, grade, discriminate, compare, select, generalize, summarize, ask, choose, assume, conclude, solve (problems), decide, etc. Since there are many such activities, we may focus on some of the more important among them and render them more efficient by means of "selected" thinking skills. (Since in any case people carry out those thinking processes that the neutral thinking skills come to improve, Frank Smith believes that imparting thinking skills is actually superfluous - Smith, 1990). The second type, the normative skills, come to *mold* thinking processes which people do not naturally tend to carry out; therefore, according to their proponents, they are worth carrying out. Thinking processes such as breaking conventional thinking patterns, devising problems, exposing basic premises, discovery of biases (mainly in one's own thinking), are processes not usually carried out by people. It is these that normative thinking skills come to create or to mold.

The second part of the crucial question is how to teach thinking skills. We do this by means of the *pattern of impartation*. What constitutes this pattern? In order to answer this question we must first know what is included in the pattern of instruction in general. Let us define instruction as *education through knowledge*. In formal education, where instruction takes place, between instructors and instructed, between teachers and students - knowledge is to be found, organized in the curriculum, in lesson plans etc. (In informal education, such as within the family, between instructors and instructed, parents and children, there is a relationship.) Thus, instruction is constituted of three basic components: teacher, student and knowledge; or more specifically - organization of knowledge, specific actions of the teacher and specific actions of the students. Instruction includes of course much more than that; but these three components are the "atoms" from which instruction is constructed.

What, then, constitutes the pattern of impartation - the teaching pattern meant to impart thinking skills? A pattern of impartation is constituted of an *ordering* of thinking skills meant for teaching - the organization of knowledge; of a *demonstration* of activity using the skill meant for teaching - a specific teacher activity; and of *practice* - a specific student activity.

We may present the pattern of impartation mechanically (meaning no disrespect): The pattern of impartation breaks thinking into a series of steps; corrects (or upgrades) each thinking step through an appropriate skill; brings the corrected thinking

processes back to the thinking apparatus; and conducts quality control (Barry Beyer, the most direct and energetic spokesman of the pattern of impartation, expresses himself so. Cf. Beyer, 1988, p. 52; Frank Smith attributed this mechanistic way of teaching skills to the logistic model that he believes has taken over American education - Smith, 1998, p. 67).

The pattern of impartation is aimed at imparting *thinking skills*. As such, it belongs to the pattern of teaching aimed at imparting skills *of any kind*. Zvi Lamm refers to this pattern as the pattern of imitation (Lamm, 1976) - a pattern based on the students' imitation of the teacher's behavior. Mortimer Adler included the pattern of impartation in "column two" of teaching - a column based on coaching, exercises and supervised practice (Adler, 1982, p. 23). Gary Fenstermacher and Jonas Soltis (1986) have called this pattern of teaching "the executive approach" - an approach based on strict and goal-oriented management of the class by the teacher.

The teaching pattern aimed at the impartation of skills in general and thinking skills in particular is usually vilified (in theory; in practice it's the dominant pattern of teaching). It arouses intense metaphoric action among its critics. Dewey (1933/1998), for example, likened it to a system of pipes for drawing and pumping; while Freire (1970) likened it to "banking" concept and activity. Other pejorative expressions are not lacking (drill and kill, talk and chalk, sage on the stage, jug and mug, stand and deliver, etc.). Yet there is no fault with the teaching pattern as such, but with the context within which it is applied. When skills are forced upon students detached from their own aims and choices, the pattern by which they are imparted does indeed harm their development through its overt and covert messages. But when students show an interest in the skills offered to them, this pattern of teaching is the most efficient for their impartation. Since school children usually have no interest in the skills (and knowledge) offered to them, the criticism is justified - especially in reference to the pattern of impartation which aims at educating for critical, creative and independent thinking.

The pattern of impartation has been undermined not only due to "external" criticism but also, and mostly, due to "internal" criticism: criticism stemming from the discourse of teaching thinking, or more precisely - stemming from the alternative discourse of the dispositions approach.

The dispositions approach

The dispositions approach accept the criticism of the skills approach of traditional education - education focused on the transmission of knowledge - but rejects the reduction of "good thinking" to particular skills. According to the dispositions approach, the foundational element of good thinking is thinking dispositions and not thinking skills.

The dispositions approach grew out of criticism of the skills approach, in two stages. At the first, or "the dependent stage," thinking dispositions were conceived as "energy suppliers" for thinking skills - a link connecting skills and action. Such a link is vital,

as people may possess thinking skills but no motivation or disposition to implement them. At this stage, thinking dispositions were extracted from thinking skills: each skill was given an appropriate disposition, e.g., the skill of seeking reasons was attached to a disposition to seek reasons (cf. Ennis, 1987). At the second stage – "the independent stage" - the dispositions approach demanded a "self-definition," i.e. seeing in the term a "thinking disposition," a "unit of analysis for cognitive behavior," or an "explanatory construct" of cognitive activity (Perkins et al., 1993a, p. 3). At this stage, "thinking dispositions" were construed as the main factor constituting and explaining "good thinking." As a result, thinking dispositions were henceforth extracted from a general cultural image of "a good thinker" (and not of specific skills), and became an end in and of themselves - independent of the skills they were supposed to implement.

Let us first define the concept "thinking disposition," and then suggest a basic differentiation between types of thinking dispositions. When we discern a pattern of cognitive actions expressed by physical behavior that is seen or heard, such as oral or written expressions, we say that the person exhibiting this pattern has a disposition to think according to this pattern. For example, when we note that a person is seriously weighing positions different from his own, examining his own positions and changing them after deliberation - we say that this person has a disposition toward open-mindedness. Open-mindedness is a pattern we identify in his cognitive behaviors (as expressed in his "physical" behaviors). Why do we say of that person that he "has a disposition toward open-mindedness" and not that he is "open-minded?" (That is, we add to an invisible entity another invisible entity said to cause the former.) We do this because the concept "thinking disposition" renders the thinking pattern "human," something dependent on the will, the choice or the reflection of the person. Thinking patterns are not attributes independent of will/choice/reflection, such as the solubility of sugar (Harvey Siegel's analogy is therefore problematic: "Just as sugar has the disposition to dissolve in water while still in the sugar bowl, so does the critical thinker have the dispositions… while not engaged in reason assessments or other rational actions" - Siegel, 1988, p. 41). Thinking dispositions, at least as far as educational discourse is concerned, reflect human decisions.

  We can observe the source of thinking dispositions (and dispositions in general) from two points of view. According to the first, thinking dispositions stem from "below," from unconscious sources - primordial impulses, repressed feelings, or other mechanisms shaping the mental world, including its cognitive "tip of the iceberg." According to the second, thinking dispositions stem from "above" - from opinions, positions, values, decisions etc. that the individual has formed or chosen after some degree of deliberation. Actually, dispositions stem both from "below" and from "above," as well as from a network of connections between them; but teaching thinking strives to strengthen the second - the thinking dispositions stemming from conscious choice, a considered preference and a reasoned   attitude. A "thinking disposition" is therefore a reasoned motivation for a certain thinking pattern, a

thinking quality (open-mindedness, depth, systematic thinking, etc.) imbued with motivation from "above." We may define our definition of a "thinking disposition" as a definition in the "strong sense," for it also includes an approach, position, attitude, choice, reasoning - in short, "the human dimension" of thinking (Thus it is different from the disposition of sugar to dissolve in water, or from Gilbert Ryle's well-known example of "the disposition of glass to be brittle" – Ryle, 1949, 43)

Founders of the field of teaching thinking use various concepts to describe the dispositional dimension of thinking. Dewey (who is definitely the founding father of the field) wrote of three *attitudes*: open-mindedness, whole-heartedness and responsibility (Dewey, 1933/1998, pp. 29-33). Costa and Kallick (2000) wrote of sixteen *habits of mind* (persisting, managing impulsivity, listening with understanding and empathy, thinking flexibly, etc.). Sternberg listed twenty *personal qualities* that qualify "successful intelligence" (self-motivation, control of impulses, knowing when to persevere, translating thought into action, etc. - Sternberg, 1996, pp. 251-259. In Sternberg's books written with Spear-Swerling (1996) and with Grigorenko (2000), the "negatives" of these personal qualities are mentioned - negative thinking dispositions, termed *stumbling blocks*.) Richard Paul listed nine *traits of mind* or *rational passions* of the critical thinker (independence of mind, intellectual curiosity, courage, humility, empathy, integrity, perseverance, faith in reason and fair-mindedness - Paul, 1992, pp. 151-156). Siegel wrote of the *critical attitude* or *critical spirit* of the critical thinker (Siegel, 1988, pp. 39-42). Perkins listed seven *dispositions* (to be clear, broad, deep, sound, curious, strategic and aware - Perkins, 1995, pp. 284-285). Jonathan Baron also wrote of *a disposition* - he regarded good thinking, rational thinking, as founded on one basic disposition, "active open-mindedness" (Baron, 1985). Although all these concepts overlap to a certain extent and are used indiscriminately by the writers, there seem to be marked differences as well. Each concept illuminates a certain aspect of the dispositional dimension of thinking. The concept "thinking disposition in strong sense" - a disposition as "a thinking quality imbued with motivation from 'above'" - captures most, if not all of these aspects.

However, we must weaken somewhat the "thinking disposition in the strong sense," at least in two dimensions: (1) *depth*: Thinking dispositions do not affect the whole personality; they are not character or personality traits. Intellectual traits and character traits are inter-related in a complex fashion; they do not necessarily lie along the same continuum. A person may be intellectually bold and yet a coward by character (he may offer revolutionary theories or write hair-raising science fiction, yet be afraid to leave his home). (2) *breadth*: Thinking dispositions do not affect the whole of thinking. A person may be disposed to deep thinking in his scientific occupation but to superficial thinking in the political realm. Thinking dispositions are context-dependent.

Although thinking dispositions do not appear in great numbers as do thinking skills (Sternberg assesses the number of thinking skills at near one thousand - Sternberg, 1987, p. 251), it is appropriate to propose a basic distinction between two types of

dispositions (and add it to another basic distinction made by Perkins, between thinking dispositions that *specifically* affect thinking, and dispositions that *also* affect thinking. The latter are character traits, such as perseverance, that may also affect thinking; the former, such as depth, affect thinking only and are purely cognitive. Perkins' distinction was influenced by Israel Scheffler's concept "cognitive emotions" (Scheffler, 1991). We distinguish between *thinking dispositions* and *dispositions to think*. This is not a clear-cut distinction, for thinking dispositions include or encourage the disposition to think; yet it has a conceptual and practical justification. Thinking dispositions as we define them are a reasoned motivation (from "above") to think in a specific manner, to be involved in thinking and to invest in it. Dewey believed this to be the most important trait of "reflective thinking." He mentions it in the first page of his book, *How We Think* "…reflective thinking: the kind of thinking that consists in turning a subject over in the mind and giving it serious constructive consideration" (Dewey, 1933/1998, p. 3). A disposition to think is an act of devotion to think, of "retreating" from current thinking oriented toward practical goals to thinking about the goals and about thinking. This is a different quality or level of thinking. This characterization has a very important practical meaning, for school leaves no room for thinking of this type (Michael Barber quotes a dialog: Teacher to student, "What are you doing?" Student to teacher, "I'm thinking." Teacher to student, "Well, stop it and get on with your work." - Barber, 1997, p. 180. John Holt remarked that "children in school are simply too busy to think." – Holt, 1982, p. 155. Adults are also too busy to think. Hanna Arendt has written that the lack of a disposition to think, "to stop and think," is the main source of evil in our world - Arendt, 1971, pp. 3-16). Only a school that allots time to thinking of this kind and encourages it - that fosters the disposition to think - may be considered a school that enables and teaches thinking. Such a school is an essentially different institution from the conventional one.

Let us now turn to the second part of the crucial question: How do we teach thinking dispositions? Thinking dispositions are taught by means of the *pattern of cultivation*, a pattern intended to foster thinking dispositions or intellectual character molding. The pattern of cultivation is different from that of impartation not only in its composition but in its very essence. The pattern of impartation is a *direct* teaching pattern; that of cultivation is an *indirect* teaching pattern. We have defined teaching as "education through knowledge;" knowledge has but a marginal role in the pattern of cultivation. John Passmore, in his classical article "On Teaching to be Critical," in which he defines critical thinking as a thinking disposition ("Being critical is indeed more like the sort of thing we call a 'character trait' than it is a skill"), states that lectures about critical thinking will not help much to turn students into critical thinkers, just as lectures on decency will not make them more decent. Dispositions are cultivated in people's cognition indirectly, not by the transmission of knowledge but by a comprehensive "culture of thinking" that transmit in various ways the cultivation of thinking dispositions (Passmore, 1967).

The pattern of cultivation consists of a *personal example* by the teacher - specific activity for the teacher; *cultivating activity* - specific activity for students; *explicit dealing* with dispositions - organization of knowledge. Personal example is different from modeling of behavior. Within the framework of the pattern of cultivation, the teacher must embody in his personality and behavior the dispositions toward which he wishes to educate (otherwise, says Sternberg, he is like a person advocating non-smoking while he himself is smoking). A cultivating activity is activity by the learners that cultivates the desired dispositions. For example, if we wish to encourage the disposition to deep thinking, we must replace traditional tests by research papers. As already stated, the pattern of cultivation is largely indifferent to knowledge (it is possible to cultivate thinking dispositions through dealing with any type of knowledge), but not to knowledge of one specific type - thinking dispositions themselves. Dealing explicitly in the latter, in various ways, enhances their cultivation.

The pattern of cultivation aims to cultivate cognitive traits; thus it belongs to the teaching pattern that aims to cultivate all types of traits or to educate the character. Lamm called this "the pattern of molding" - a pattern molding character traits (Lamm, 1976). Fenstermacher and Soltis (1986) referred to this pattern of teaching or approach as *the liberationist approach,* an approach liberating a person from unwanted traits. This teaching pattern has also been vilified, in the climate of opinions of the last decades, as indoctrination or "an attempt to play God." The cultivation approach claims in its defense that although it aims to mold dispositions, these are dispositions to critical, creative and effective thinking - that is independent thinking - and thus it is cleared of these accusations.

The understanding approach

The understanding approach differs from the dispositions approach in that it does not accept verbatim the criticism of the skills approach about traditional education - education focusing on the transmission of knowledge. It rejects the dichotomy between teaching knowledge and teaching thinking, between teaching *what* to think and teaching *how* to think; it acknowledges an internal connection between knowledge and thinking, between the "what" and the "how." The quality of our thinking, claims this approach, depends on our knowing the thought-about topic; or more precisely - on our understanding of it. The understanding approach is therefore the product of a dialectic development: it preserves the basic intuition of traditional education that knowledge and good thinking are interconnected, but does not see in traditional education teaching thinking as it does not provide conditions for understanding (rather at best, retention of knowledge). When knowledge is held in memory only, it is "fragile knowledge" - inert, naive and ritual knowledge (Perkins, 1992, pp. 21-27). Fragile knowledge does not contribute to thinking, and may even harm it. But when knowledge is non-fragile - i.e. understood - it is a necessary and

possibly sufficient prerequisite to good thinking. The understanding approach therefore explicates the conditions under which knowledge becomes understanding.

The understanding approach grew out of the two main disciplines feeding the field of teaching thinking: philosophy and psychology. In the field of teaching thinking these two disciplines are not correlated, or even presenting two different perspectives on teaching thinking (Paul, 1993). But in our case they are actually correlated: the two dig the tunnel of understanding from opposite directions.

The philosophical argument for the function of (understood) knowledge in good thinking is expressed by John McPeck, who repeatedly states in his books and articles the "so obvious and commonsensical" ideas that (1) there is no generalized thinking, only thinking about something; (2) a good thinker on one matter is not necessarily a good thinker on another matter; (3) the quality of thinking depends on knowledge of the thought-about topic and on the discipline to which it belongs; (4) teaching thinking must focus on teaching for understanding of the theoretical disciplines. In other words, good thinking of any sort - critical, creative or effective - is "parasitic upon the *knowledge* component" (McPeck, 1994, p. 111). The psychological argument arrives at a similar conclusion, but on the basis of empirical studies. These studies - especially studies of expertise aimed at answering the question what is the main factor in the good thinking of experts - conclude that this factor is knowledge, or rather the understanding of knowledge (cf. Perkins & Salomon, 1989).

The inclusion of understanding among the foundations of good thinking may be surprising. We invest in thinking skills and in thinking dispositions in order to arrive at good thinking; good thinking "produces understanding;" understanding is therefore the product of good thinking, and not vice versa. This is "an isolating line of thought," according to which there is knowledge "out there" and there is a mind "in here." The mind creates activity - thinking - that is transmitted out to knowledge. Thinking acts upon knowledge in order to bring it into the mind. When this is done successfully, it results in understanding. Thinking is therefore a pure activity, knowledge is pure content, and understanding is an outcome of successful thinking activity upon knowledge. A different line of thought serves as the basis for the understanding approach; we will call it here an "integrating line of thought." It claims that thinking and understanding are inseparable (although it is sometimes useful to distinguish between them). Thinking is not a pure activity but activity with knowledge; and when this knowledge is understood, thinking activity is more generative (creates better solutions, decisions and ideas). Understanding, therefore, is not (only) a product of good thinking but (also) its source.

Let us define understanding, and propose a basic distinction between two types of understandings essential for good thinking. Three conceptions of understanding appear in the literature of teaching thinking, possibly having a common basis: *the*

representations concept of understanding. Possibly, but not necessarily: a "radical" version of the third conception denies the necessity of a common basis.

Upon examining the literature on teaching thinking, we may speak of *understanding as location, as application, or as performance.* According to the first conception, "to grasp [to understand] the meaning of a thing, an event, or a situation is to see it in its *relation* to other things: to note how it appears or functions, what consequences follow from it, what causes it, what uses it can be put to" (Dewey, 1933/1998, p. 137). According to the second conception, "an individual understands a concept, skill, theory, or domain of knowledge to the extent that he or she can apply it appropriately in a new situation" (Gardner, 1999, p. 119). According to the third conception, "in a phrase, understanding is the ability to think and act flexibly with what one knows" (Perkins, 1998, p. 40). Examples of "understanding performances" are explanation, exemplification, justification (Perkins, 1992, p. 77. We may consider the second conception of understanding as part of the third. In such a case application is "the ultimate" or "the privileged" understanding performance).
  These three conceptions of understanding may have a common basis: the assumption that understanding depends on the presence of appropriate representations in the mind. When a concept/representation is well connected to other concepts/representations (understanding as location), it is better understood. The better a concept is located in a system of other concepts, the better its application (understanding as application); and the better a concept is located and applied, the easier it is to apply it for understanding activities (understanding as activity). Yet, "people can have flexible performance capability without any representations at all in any useful sense of representation" (Perkins, 1998, p. 51). That is, a person may carry out thinking processes with knowledge (understanding activity) without having a complete representation map in his head.

Understanding of the thought-about topic is a necessary but insufficient prerequisite of good thinking. Good thinking needs another type of understanding. I distinguish between two types of understanding that together form - according to the understanding approach - necessary and sufficient conditions for good thinking. I shall term them *substantive understanding* and *reflective understanding.* The first is understanding of the substance of thinking. It may be pre-disciplinary, disciplinary, inter-disciplinary or meta-disciplinary. As it climbs up the disciplinary ladder, it becomes a higher-order understanding. The second is understanding relating to thinking itself or, more exactly, to the fundamentals and conditions that make for good understanding. (Perkins' idea about "knowing your way around the realms of thinking" illustrates well the meaning of the term *reflective understanding* - Perkins, 1995, pp. 267-297).

We teach for understanding through the *pattern of construction*. This pattern endows the fundamentals of teaching with the following content: organization of knowledge -

"big ideas" (or "the main insight," or "enduring understanding"); special teacher activity - stimulating or undermining; special student activity - investigative learning. The organization of knowledge in "big ideas" has an *acculturative justification* and a *cognitive justification.* As for the first, the understanding approach aims at constructing ideas of cultural depth and a broad cultural capacity (Gardner expresses this idea well in *The Disciplined Mind*, 1999). As for the second justification, to understand means to put in context, in a whole, in a gestalt. Therefore the teacher must concentrate upon or aim at the general (see for example Brooks & Brooks, 1993). The explicit role of the teacher in teaching for understanding is to arouse motivation for investigative learning by arousing interest or undermining basic premises and taken-for-granted beliefs. Since understanding is constructed and not absorbed, the essential activity of students in classes for understanding is active investigation - asking a question and searching for knowledge to answer it ("Understanding is more simulated than learned. It grows from questioning oneself or from being questioned by others, such as teachers." - Sizer, 1984, p. 117).

   Since understanding is not transferred from mind to mind but must be constructed in the mind of each individual (nobody can understand for you), the pattern of construction, like the pattern of cultivation, is an indirect pattern of teaching. It is difficult to locate this pattern of teaching in the typology of Lamm or of Fenstermacher and Soltis; but it does appear in Adler's typology as "column three," which is "Maieutic of Socratic questioning and active participation" (Adler, 1982, p. 23). It also appears in Scheffler's typology, that includes "three philosophical models of teaching:" "the impression model," "the insight model," and "the rule model" (Scheffler, 1989). The second pattern includes all the components of the pattern of construction.

The pattern of construction is more immune to criticism than the others, because it is very difficult to oppose. (It would be strange to hear a teacher say, "I'm teaching the Civil War now, but I don't want the students to understand it;" yet although no reasonable teacher would say this, many teachers act as if his were their aim.) Also, because it manages to walk "between the drops" - between curriculum-centered education and child-centered education: the understanding approach respects cultural contents on the one hand and primary motivation and personal creativity on the other. (We may say metaphorically that this approach is based on the guiding principle of Do-it-yourself Hardware Stores: Buy the elements and construct on your own.)

Additional aspects of the approaches to teaching thinking

We have seen that the field of teaching thinking offers three answers, or approaches, to the crucial question. In order to better understand these three approaches, let us examine them from four different aspects: ideological, interpretative, metaphorical and practical. Such examination will enhance the main argument of this paper: teaching thinking is not homogeneous as it may seem to its founders and proponents,

but a heterogeneous field in which are imbedded three approaches or "worldviews" about teaching thinking.

The ideological aspect

Presenting the approaches to teaching thinking as answers to the crucial question misses an important aspect in all of them - the ideological aspect. It would appear from such a presentation that the controversy between the approaches is primarily ontological, focusing on the question, what is the element that constitutes good thinking. This presentation of the approaches is indeed partial, and will be distorted unless we add to it the ideological dimension.

Lamm (in press) shows that educational theories have a structure similar to that of an ideology and not to that of a scientific theory. Ideology is constituted of four parts: *utopia* - an image of the ideal world; *diagnosis* - a description of the actual world; *strategy* - the means to turn the actual world into an ideal world; *collective* - the target population at which ideology is aimed and which is expected to adopt and to realize it. In the ideological structure these four parts do not appear separately but are *welded* into each other, and this causes their distortion. Thus, the diagnosis of an ideology is strongly biased by its utopia; and thus, the strategy of an ideology turns into a dogma, and its essence as the adjustment of means to an aim is distorted.

Educational theories have a structure similar to that of an ideology. Their utopian component is expressed in the image of "the educated person;" their diagnostic component is expressed in theories on "the nature of the child" (good or bad from birth), the nature of society, the nature of knowledge, etc.; the strategic component is expressed in didactic measures; and the collective component is expressed in expecting society, parents, teachers and students to cause a change in education. When we wish to understand the nature of an educational theory, we must ask what utopian image of an educated person directs it.

Teaching thinking is directed by an explicit image of *the educated person as a good thinker.* As there is not one teaching of thinking but three, we must ask what content each teaching ascribes to the image of *the good thinker.*

The skills approach is directed by a utopian image of the good thinker *as the efficient thinker.* The efficiency of the good thinker in the skills approach has an "internal dimension" and an "external dimension." According to the first, the good thinker conducts cognitive activities efficiently: makes decisions, solves problems, makes generalizations, comparisons, gradings, etc. with maximum speed and precision. According to the second dimension, efficient thinking aids the good thinker in reaching his practical goals - the efficient thinker is also *the practical thinker*. The principle of efficiency affects the conception of the main modes of thinking that teaching thinking aims to promote - critical thinking and creative thinking - both of which are not necessarily "efficient:" their aim is not to reach practical goals. When critical thinking and creative thinking undergo reduction to skills, the principle of efficiency implicit in the term "skill" takes over them. (See for example the definition of Michael Scriven and Dian Halpern of "critical thinking" as efficient thinking

helping to achieve practical goals in life – Scriven, 1993, p. 34; Halpern, 1996, p. 5. Their definition is closer to that of the ancient Sophists than that of their rival Socrates, the ultimate symbol of critical thinking. Also, cf. the way Edward de Bono views creative thinking. All his books contain an overt and covert message: if you foster my thinking tools you will succeed, i.e. you will make much money.)

The dispositions approach is directed by a utopian image of the good thinker as *the wise thinker.* The wise thinker is assessed (mainly) by his habits of mind or attitudes, not by cognitive abilities (recognizable through psychometric tests.) He is motivated by intellectual properties of intrinsic or internal value not necessarily connected to the efficiency of thinking activity or to achieving practical goals in life. The thinking dispositions of the wise person contain values appreciated by the surrounding culture. Contemporary western culture, for example, cherish values such as creativity, criticism, open-mindedness, depth, systematic thinking, awareness, empathy, etc. Thinking dispositions, unlike thinking skills, are not neutral means for achieving something of value; they are valuable in themselves. They may stand in contrast to certain goals desired by a person, which "the practical thinker" knows how to achieve. (In philosophical terms, the skills approach is mainly utilitarian, and the dispositions approach is mainly deontological, i.e. affected by "absolute" values in a given cultural context.)

The understanding approach is directed by a utopian image of the good thinker as *the learned thinker* - versed in the topics about which and through which he thinks, but not only in them (as he is more than an expert), but also in topics "valuable" for the given culture. The *learned thinker* is therefore a product of two trends - cognitive and acculturistic. According to the first, understanding is a cognitive prerequisite to good thinking; according to the second, some topics are worth understanding from the cultural point of view. These two trends are inter-connected, as a "good thinker" does not think in a vacuum; he is "a good-thinker-in-a-given-culture." Therefore, when he is versed in the central ideas of that culture, he is a better thinker.

The approaches to teaching thinking therefore have an inevitable "ideological bias" toward a certain concept of "good thinker," part of a general concept of "a good person" and "the good life." The controversy between these approaches to teaching thinking is therefore not only ontological but also, or perhaps even mostly, ideological. People choose one or the other approach also, or mainly, for its "ideological vista." Ideological decisions in education are not irrelevant to the whole thing; they *are* the whole thing.

The interpretative aspect

The approaches to teaching thinking are interpretative wholes through which the main issues of teaching thinking are viewed; or in other words, the approaches interpret according to their own logic central issues in teaching thinking. Let us demonstrate on three issues: thinking shortfalls; metacognition; intelligence and elements of good thinking.

Thinking shortfalls: The recognition that people do not think as well as they could and that they suffer from typical thinking shortfalls, are basic starting points of the field of teaching thinking. All approaches to teaching thinking share these premises, but characterize thinking shortfalls differently - each according to its own perspective.

When good thinking is claimed to be based on thinking skills, faulty thinking is considered as a lack of thinking skills or their faulty application. Thinking shortfalls are perceived by the skills approach as *faults*. Skills approach theories and programs of teaching thinking usually caution against a series of thinking faults.

When good thinking is claimed to be based on dispositions (or habits of mind, attitudes, etc.), thinking shortfalls are viewed as based on character flaws or on a "weak ego." Thinking shortfalls are viewed by the dispositions approach as *weaknesses*. Dispositions approach theories and programs of teaching thinking caution against a series of such typical weaknesses.

When good thinking is claimed to be based on understanding the thought-about topic, thinking shortfalls are claimed to be based on a lack of such understanding. Thinking shortfalls are viewed by the understanding approach as *misunderstandings*. Understanding approach theories and programs of teaching thinking caution against various types of misunderstandings.

Metacognition: Teaching thinking owes its existence to this special trait of human cognition: the ability of thinking to reflect upon itself and to manage itself (Man as a *metacognitivus*). Metacognition does not only construct the field of teaching, but is also considered by the approaches to teaching thinking as a most critical skill/disposition/understanding for good thinking, and teachable and learnable through impartation/cultivation/construction.

The skills approach bases metacognition upon a series of skills. Mastering these skills ensures an efficient implementation of thinking about thinking in order to manage it. Since metacognition is done by everyone at one time or another (and always and necessarily accompanies every act of cognition whether covertly or "pre-reflectively," according to Sartre), metacognitive skill is therefore "a neutral skill."

The dispositions approach includes metacognition in its list of dispositions. A disposition toward metacognition is a central element in the intellectual character of a good thinker. According to this approach, people need a special disposition in order to think about their thinking and manage it. Everyone possesses ability for metacognition, but not everyone has the disposition to implement it.

The understanding approach reasons that metacognition is possible, or at least generative, when it is equipped with a new understanding through which former understandings are seen, corrected and improved. Metacognition, like cognition, cannot be an empty activity; it is always and necessarily bound with certain content, and is valuable only when this content is understood.

Intelligence: "Intelligence is the stuff of thought" (Halpern, 1996, p. 21). What is this "stuff" made of? Every approach to teaching thinking believes that its foundational

element - skills/dispositions/understanding - is the "crucial" element of human intelligence. Skills and understanding conform to the traditional or "classical" conception of intelligence (intelligence as a inherited, fixed, and measurable entity), and also with conceptions that rebelled against it (e.g., Sternberg's "triarchic theory of intelligence" or Gardner's "multiple intelligences" theory). Skills and understanding may be "translated" to abilities constituting the essence of human intelligence according to its "old" and "new" conceptions. These conceptions did not base intelligence on thinking dispositions. The dispositions approach therefore aims to revolutionize the conception of intelligence, and base it on intellectual dispositions (from IQ to IC - intellectual character). Such a shift in the conception of intelligence, claim Perkins (1995), Costa & Kallick (2000), Tishman (2000) and Ritchhart (2002), will have a far-reaching impact on teaching thinking, and on teaching as a whole.

Mutual reduction: The approaches to teaching thinking interpret differently not only the central issues in the field of teaching thinking but also the essence of the rival approaches. Each approach strives to make a reduction of the others to its own concepts and products. We may talk about *conceptual reduction* and *product reduction*. In the first, each approach tries to demonstrate that the central concepts of the rival approaches are actually contained in its own central concept: The skills approach tries to prove that the concepts "disposition" and "understanding" are included in the concept "skill." The dispositions approach tries to prove that the concepts "skill" and "understanding" are included in "disposition;" and the understanding approach tries to show that the concepts "skill" and "disposition" are included in "understanding." The reduction of the second type tries to prove that the product of impartation/cultivation/construction of skill/disposition/understanding is the actual basis of the rival approaches. If, for example, we impart to students skill in making a comparison, we will be cultivating the disposition to make comparisons and also construct in their minds an understanding of the contents compared. Since the mind is a whole - skills, dispositions and understanding are all manifestations of one mind, and are subject to a partial overlap. This overlap induces us to reduce; yet the very existence of three separate approaches to teaching thinking proves the fact that reduction has not been successful. The attempt of each approach to reduce the others to its own concepts and products stems from a healthy theoretical disposition to base phenomena (in our case good thinking) on as few principles as possible; and also from a practical attitude to help teachers by proposing one theory and program of teaching thinking.

The metaphorical aspect

"Metaphor is for most people a device of the poetic imagination and the rhetorical flourish - a matter of extraordinary rather than ordinary language," wrote George Lakoff and Mark Johnson; but "the way we think, what we experience, and what we do every day is very much a matter of metaphor" (Lakoff & Johnson, 1980, p. 3). Thus, for example, thinking is thought, experienced and done by us through four

fundamental metaphors: *thinking as moving* (wandering, reaching a conclusion, arriving at a point, etc.); *thinking as perceiving* (seeing, shedding light, deaf to opposite ideas, etc.); *thinking as object manipulation* (playing with an idea, turning over an idea, exchanging ideas, etc.); *thinking as eating* (swallowing an idea, digesting, chewing, etc.) (Lakoff & Johnson, 1999, pp. 235-244).

Sternberg claimed in *Metaphors of the Mind*, 1990, that in order to understand the theories and the questions they pose and answer, we must look for the principal metaphors directing them. He distinguished between different conceptions of intelligence by the principal of the constituting metaphor of each. Let us follow Sternberg and try to discover the principal metaphors constituting the approaches to teaching thinking.

The main metaphor of the skills approach is the *toolbox*. The mind is conceived as a kit of tools suitable to dealing with given problems: strategies, tactics, heuristics, methods, routines, etc. Skilled thinking is achieved by the proper use of thinking tools. This metaphor of good thinking as the skilled use of tools contained in the mind often appears in the writings of theoreticians of teaching thinking, even those who don't strictly hold to the skills approach. Thus, Treffinger and colleagues wrote about the strategy of creative problem solving as a "tool kit" (Treffinger, Isaksen & Dorval, 1994); Lipman, the father of Philosophy for Children, wrote: "The basic reasoning equipment possessed by adults is rather like a kit of tools" (Lipman, 1991, p. 28). The key to "higher order thinking," he wrote, "is not using the thinking skills-tools separately, but coordinating or orchestrating them" (Lipman, 1991, p. 35). De Bono wrote that his favorite analogy of a good thinker is to a carpenter (De Bono, 1992); Perkins compared the "mindware" - the "software" of the mind, the "stuff" that makes good thinking - to kitchenware, the tools of a well-equipped kitchen (Perkins, 1995, p. 13). Stephen Reid related to thinking itself as a tool to which a good manual - his book - must be attached (Reid, 2002, p. x. The thinking-as-muscle metaphor which is included in the title of Reid's book - is an old one, and was refuted by Dewey and others). Another metaphor at the background of the skills approach is thinking as a knowledge processor and the mind as a computer. Frank Smith called it "an ugly metaphor" (Smith, 1990, p. 12), and Neil Postman - "a metaphor gone mad" (Postman, 1992, p. 112). Both indicated that this metaphor turns human beings into machines.

The main metaphor of the dispositions approach is *deep currents*, invisible and with a definite direction, sweeping our intellectual behaviors. This metaphor is not explicit, but this does not detract from its strength; on the contrary, invisible metaphors are more powerful than plain or explicit ones, as they cannot be criticized or restrained. The whole principle of the dispositions approach attests to the existence of this metaphor. According to it, thinking as a cognitive activity is a sort of a "surface phenomenon" underneath which stirs a more basic existence - dispositions, habits, attitudes. In order to educate thinking one must direct one's action toward these deep currents and not toward thinking actions themselves.

The central metaphor of the understanding approach is *net*. To understand something is to locate it in a web of concepts on the thought-about topic. The more closely-woven the net, the more flexible the thinking. Good thinking is the ability to play with ideas and manipulate them in the net in which they are bound. The ability to do so depends on the amount and depth of inter-relations that one establishes between concepts - i.e., on the density of the net. Robert Fisher wrote: "In teaching children to think we are aiming for children to make as many connections between concepts as possible, to perceive relationships, to build structures of understanding and thereby to provide them with more opportunities to pattern future experience" (Fisher, 1990, p. 85). Marzano et al. wrote: "A useful metaphor for the comprehension process is that of weaving a tapestry - taking what we already know abut the topic and integrating it with new information presented in the text in order to create a new 'picture' of the topic" (Marzano et al., 1988, p. 42). Salomon and Perkins wrote about understanding as a "network of bites and pieces of information" (Salomon and Perkins, p. 117).

The practical aspect

Theoreticians as well as many supporters of teaching thinking, are motivated by a vision of a school concentrating totally on developing thinking - "The school as home for the mind" (Costa, 1991). They conceive of school as an empty space into which one can introduce educational aims, curricula and teaching methods as one wish. However, school is not an empty space; it is a "space" teeming with concept-laden patterns of action; school *is* concept-laden patterns of action - about teaching, learning, knowledge and so on. Seymoure Sarason (1982) called these patterns "regularities." The most central pattern of action of school, deriving from its structure (not from a pedagogical logic), is the pattern of teaching. Lamm referred to it as "the pattern of imitation" (the teacher demonstrates and the students imitate him), and Carl Bereiter and Marlene Scardamalia reduced it to a "basic unit": "teacher initiates, student responds, teacher verifies" (Bereiter & Scardamalia, 1993, p. 209).When other concept-laden patterns of action try to infiltrate school, those constituting the school take them over and assimilate them (similarly to the cognitive mechanism described by Piaget, only that here the schemes - the school's patterns of action - assimilate and do not accommodate). This mechanism explains school's great stability, its being a robust institution that survived "a century of reforms" (Ravitch, 2000).

Let us try out a thought experiment (*Gedankexperiment*), in order to try to answer the question what will happen to the approaches to teaching thinking and their patterns of teaching when they attempt to infiltrate school. The answer is probably that any approach to teaching thinking that will try to infiltrate school and integrate its dominant pattern of teaching will be subject to a "standard deviation" - a deviation from its standard logic. Every approach may also be subject to a *typical* "standard deviation" caused by the meeting between its own core and the core of the school's pattern of teaching. Now to the experiment:

When *the skills approach* with its *pattern of impartation* will attempt to infiltrate school and change its pattern of teaching, it will be deviated from its proper course. Let us call the typical standard deviation of the skills approach and its pattern of impartation - *taming*. Under the pressure of the school structure and the pattern of teaching prevalent in it, the pattern of impartation will become a pattern of teaching that will impart to the students thinking skills through blatant behavioristic means - re-enforcements for desirable behaviors and sanctions for undesirable behavior. "Thinking lessons" imparting thinking skills will be forced upon the students, like all other lessons. The students will exercise the material, be tested on it, and will not transfer it to new areas of knowledge or to their own experience. Their minds will be stuffed by inert skills meant to be forgotten immediately after the test.

When *the dispositions approach* with its *pattern of cultivation* attempts to infiltrate school and change its pattern of teaching, it will be deviated from its proper course. Let us call the typical standard deviation of the dispositions approach and its pattern of cultivation - *preaching*. Under the pressure of the school structure and the pattern of teaching prevalent in it, the pattern of cultivation will attempt to curtail the lengthy and complex process of cultivating dispositions by means of intensive preaching aimed to structure dispositions "from below" - without explicit and critical discussion of them. The school's prevalent patterns of action and teaching cannot cultivate thinking dispositions such as the disposition to deep, open-minded, creative thinking and the like. When asked to adopt this aim, schools can only preach toward them and try to impart them directly like knowledge and skills, i.e., through conventional punishments and rewards. The cultivation of thinking dispositions requires other patterns of action and teaching, contradictory to those prevalent in school education.

When *the understanding approach* with its *pattern of construction* attempts to infiltrate school and change its pattern of teaching, it will be deviated from its proper course. Let us call the typical standard deviation of the understanding approach and its pattern of construction - *lecturing*. Under the pressure of the school structure and its prevalent pattern of teaching, the pattern of construction will attempt to curtail processes: instead of trying to construct understanding of concepts and ideas - a lengthy personal process not given to complete management from the outside - this pattern will lecture or impart them based on the (magical) assumption that hearing them is equal to understanding them. The school's patterns of action and teaching - the need to "cover material," the many school subjects, the many topics included in a school subjects, the examinations testing for the ability to recycle detailed information, frontal teaching etc. - are not structured toward teaching for understanding. If they adopt this goal, they must distort it.

The conclusion from this thought experiment, called "What would happen to the approaches to teaching thinking when they attempt to infiltrate school?" is the following: The vision stimulating theoreticians and advocates of teaching thinking of "the school as a home for the mind" - an educational institute which is a successful infusion of the prevalent teaching and teaching thinking - is impractical. It is impossible to deal with teaching thinking, through any approach, in "a place called

school" (Lipman wrote that a cynical commentator might say that "people send their children to school to learn in order to keep them from thinking" - Lipman, 1991, p. 1. Perhaps people have a better intention but the result is the same). School as the place that develops thinking must be different essentially and structurally from the prevalent school. Such a school is still awaiting its developers.

Interim summary: The approaches to teaching thinking as meta-theories or meta-programs

We may summarize the road we have traveled so far in the following table:

Approaches / Characteristics	The Skills Approach	The Dispositions Approach	The Understanding Approach
The foundational element of good thinking	Skills: Thinking tools used efficiently - quickly and precisely - in given circumstances.	Dispositions: Motivation for good thinking which formed by reasonable choices.	Understanding: The ability to locate a concept in a context of other concepts, to implement concepts in new contexts and perform thinking processes with knowledge.
Types of foundational elements	Neutral skills; Normative skills	Thinking dispositions; Disposition to think	Substantive understanding; Reflective understanding
Patterns of teaching	The pattern of impartation	The pattern of cultivation	The pattern of construction
Ideologies: "the good thinker"	Efficient thinker	Wise thinker	Learned thinker
Typical Thinking shortfalls	Faults	Weaknesses	Misunderstandings
Meta-cognition	Metacognition is skill	Metacognition is disposition	Metacognition is understanding
Intelligence	Intelligence is constituted of skills	Intelligence is constituted of dispositions	Intelligence is constituted of understandings
Attempt at reductionism	Disposition and understanding are included in	Skill and understanding are included in	Skill and disposition are included in understanding

	skill	disposition	
Metaphors for thinking	Toolbox	Deep currents	Net
"Standard deviation"	Taming	Preaching	Lecturing
Slogan	Give the child a fishing rod!	Give the child bait!	Give the child knowledge of the fishing field!
Theories, programs, ideas - examples	De Bono – CoRT ● Ennis - Taxonomy of critical chinking ● Beyer - Direct teaching of thinking ● Perkins - Thinking frames ● Perkins & Swartz - Graphic organizers ● Swartz & Parks – Infusion ● Sternberg - Intelligence implied ● Treffinger, Isaksen & Dorval - Creative problem polving ● Johnson & Blair - Informal logic ● Chaffee - thinking critically ● Whimbey & Lochhead - Problem solving ● Feuerstein. - Instrumental Enrichment ● Lipman - Philosophy for children	Perkins - Dispositions theory of thinking ● Tishman - Thinking dispositions ● Costa - Habits of mind ● Baron - Theory of rationality ● Langer – Mindfulness ● Barrel – Thoughtfulness ● Facione - Critical thinking dispositions ● Passmore - Critical thinking as a character trait ● Siegel - The spirit of the critical thinker ● Sternberg - Successful intelligence ● Golman - Emotional Intelligence ● Lipman - Philosophy for children	Perkins - Understanding performances ● Gardner - Understanding in the disciplines ● Wiske - Teaching for understanding ● Wiggins & McTighe - Understanding by design ● Paul - Critical thinking in the strong sense ● McPeck - The reflective critical thinker ● Brown - Community of learners ● Smith - Understanding as good thinking ● Brooks & Brooks - Constructivist instruction ● Lipman - Philosophy for children ● Harpaz - Community of thinking

The many theories and programs of teaching thinking do not fall into the different approaches like billiard balls into their pockets; several simultaneously fall into two or three approaches (e.g. Lipman's "philosophy for children" situated in the above table in three columns). But even in these eclectic "'theories-programs" one dominant approach is usually reflected. The fact that two or three approaches to teaching thinking are reflected in certain theories and programs indicates that these approaches are "ideal types;" each approach is an *idealtypus* that is not fully realized in a certain theory or program, or in the practice of teaching thinking.

We may think of the approaches to teaching thinking not only as "ideal types" of teaching thinking but also as *meta-theories* or *meta-programs* of teaching thinking. The theories and programs of teaching thinking may be classified into three meta-theories/programs: the skills approach, the dispositions approach and the understanding approach. All theories/programs claiming that skills are the (basic) foundation of good thinking belong to the skills approach; all those claiming that dispositions are the (basic) foundation of good thinking belong to the dispositions approach, and all those claiming that understanding is the (basic) foundation of good thinking belong to the understanding approach. The fact that theories/programs belong to the same approach (meta-theory/program) does not exclude a conflict between them. They may side with skills or dispositions or understandings of various sorts (e.g., De Bono strongly criticizes the many theories and programs of logical-critical thinking. According to our classification, both his theory and program and that of logical-critical thinking belong to the same approach or meta-theory/program – the skills approach). The conflict in the realm of teaching thinking thus exists on two levels: between the approaches or the meta-theories/programs and between theories/programs included in the same approach or meta-theory/program (emphasizing the common illusion that teaching thinking is a field speaking in a single voice).

We may summarize the conflicts between the approaches to teaching thinking in the following way: Based on the old Chinese adage, "Give a man a fish and he will not be hungry for one day; give him a fishing rod and he will be fed for his whole life," the motto of the skills approach is, "Give the child a fishing rod!" the dispositions approach says, "Give the child bait!" the understanding approach - "Give the child knowledge of the fishing fields!" The skills approach claims that teaching thinking must give children tools (a rod) to deal with knowledge of any kind, and not with details of knowledge (fish); the dispositions approach claims that it must give children a drive or motivation (bait) to use thinking skills of various types, or to think in one way or another, or to think at all; the understanding approach claims that teaching thinking must give children an understanding of the areas of knowledge to which the topics they are thinking about belong.

Two essential questions: what to believe, and what to do

Toward the end of this journey of conceptual mapping of teaching thinking, we remain with (at least) two essential questions: what to believe; and what to do.
(1) What to believe: Why three approaches and not two - or five, for that matter? What is the justification for the "mega-theory" developed here that it is possible to classify all theories of teaching thinking into three meta-theories of teaching thinking?
(2) What to do: Let us assume that there are indeed three approaches to teaching thinking. Is it possible, or desirable, to combine them or must we choose only one; and if so, which one?

If critical thinking really as Ennis states, "reasonable reflective thinking that is focused on deciding what to believe or do" (Ennis, 1987, p. 12), then in this part of our paper we will employ critical thinking upon the conceptual mapping we have suggested.

What to believe?

Why three approaches to teaching thinking, no more and no less? (Nietsche wrote: "each time something is divided into three or seven, you should know you are being lied to." According to Nietsche, the world does not tend to divide into numbers sanctified by humans. Thus, the number three is immediately suspect). We may offer two justifications for this division: *hermeneutical* and *ontological*.

Hermeneutical justification: My interpretation of texts of teaching thinking discover (and invent to some extent) three approaches - no more and no less - to teaching thinking. There is nothing sanctified about this triad; readers are welcome to find or devise other approaches, or to find or invent better justifications for reducing the number of approaches. An "approach to teaching thinking" must comply with at least one basic criterion: it must find implicit in the literature an element of good thinking that is not latent in the elements of good thinking already found. If such an element will indeed be discovered in this literature, it will immediately be added to the known elements of good thinking, and will establish a new and fourth approach to teaching thinking. According to the interpretation proposed here, "the textual facts" point to three approaches to teaching thinking in the literature on the subject: one based on the category of "thinking skills," one based on the category of "thinking disposition," and one - on the category of "understanding."

We may indeed find in the literature of teaching thinking other approaches to teaching thinking unnoticed by the present discussion. In order to anchor the discussion upon sounder foundations, we must find an extra-textual interpretation to the textual presence of the three approaches to teaching thinking in the existence of thinking itself - in its ontology. Such a process may provide a more endurable reason for the three approaches to teaching thinking that appear in the texts on the subject.

Ontological justification: This justification for the existence of three approaches to teaching thinking proceeds from teaching thinking to a cognitive theory about the components of thinking. (The process is usually the reverse: from cognitive theories to teaching thinking.) The guiding question is: Is it possible to extract from the approaches to teaching thinking a theory about the structure of thinking? Or more precisely, which *component of thinking* does each foundational element of good thinking aim to develop? The answer is: the element of thinking skills aims to develop the *processes* of thinking; the dispositions approach aims to develop the *qualities* of thinking; the understanding approach aims to develop the *contents* of thinking (or the way they are kept in the mind). Three elements of good thinking against three components of thinking make for: thinking skills → processes of thinking; thinking dispositions → qualities of thinking; understanding → contents of thinking.

Upon following the approaches to teaching thinking we may arrive at the ontology according to which thinking is "made" of three components: processes, qualities, and contents. Each thinking activity necessarily involves these three components. Each contains *processes* such as classification, grading, discrimination, comparison, conclusion, decision, etc.; each has a certain *quality*: thinking may be deep or shallow, broad or narrow, systematic or haphazard, open or closed, critical or dogmatic, etc.; each has a certain *content* (in philosophical parlance, thinking is intentional). Each thinking activity has an object of its thinking. A thought-about object is a concept; and a concept may be present in the mind in various states.

Teaching thinking aims to improve thinking. It must therefore relate "normative" elements of good thinking to the "ontological" components of thinking. The normative elements of the approaches to teaching thinking lead us to the ontological texture of thinking. The three approaches fit the three components of thinking. Good thinking is "composed" of skills, dispositions and understandings, because thinking is "composed' of processes, qualities and contents. Teaching thinking with its three approaches provides thinking with its three components, with a portion of skills + dispositions + understanding (SDU). How exactly does the provision of thinking with SDU take place? Is it possible to teach simultaneously according to the three patterns of teaching of the approaches to teaching thinking?

What to do?

Assuming the existence of three approaches to teaching thinking (whose existence is properly justified hermeneutically and ontologically), how should we teach good thinking? Assuming that a combination of the approaches to teaching thinking is desirable (a good thinker is one who possesses skills, dispositions, and understanding), we must strive for their combination - i.e. use some sort of *combining strategy*. Yet a simple combination of the approaches to teaching thinking is impossible, or at least undesirable, both from a practical and an essential point of view.

Practically (and logically), combining the three is not possible because a teacher cannot teach simultaneously according to the three patterns of teaching thinking -

impartation, cultivation, and construction - in the sense that one cannot simultaneously perform one action in three different ways. Combination is not practical also because an average teacher cannot teach according to more than one program of teaching thinking. It is unrealistic to expect a teacher to teach in the framework of a program aimed at imparting thinking skills, at fostering thinking dispositions and at fostering understanding all at the same time.

Combining the approaches to teaching thinking is undesirable also from an essential point of view. As stated, the approaches are ideologies directed by different images of the "good thinker:" The skills approach is directed by the image of an *efficient thinker*; the dispositions approach by the image of a *wise thinker*, and the understanding approach - by that of an *learned thinker*. These images are not (only) declarations of the approaches, but also (mainly) messages implicit in their patterns of teaching. The teaching systems of the approaches to teaching thinking relay different images of the "good thinker" (actually, of "the good life"). When teaching patterns convey different messages they neutralize each other, their educational effect is cancelled and a hopeless confusion reigns in the students' minds.

We are therefore caught in a frustrating catch: On the one hand, a good thinker needs thinking skills, thinking dispositions and understanding; on the other hand, it is impossible to enact upon him the teaching patterns of teaching thinking that aim at imparting skills, cultivating dispositions and constructing understandings. What can we do? We may extract ourselves form this catch by using another strategy - the *strategy of auspices*.

According to the strategy of auspices, teaching thinking must adopt one of the three approaches, and develop within it - under its auspices - the other two elements of good thinking. We are therefore forced to make a "tragic decision:" we must prefer one approach over the others. Which approach should be preferred over the others? Which approach should we adopt in order to teach through it the three elements of good thinking? My answer to this "fateful question" is: *We should adopt the understanding approach*. Many reasons may be advanced for this choice, four of which are: *logical, theoretical, ideological and pedagogic*.

The logical reason: Educational questions must be asked in an actual context. To the question what is good thinking and how to educate for it, we must add another question: what is the target population, what is the context? Our chief target population is students in school; maybe not in the usual school, in the context of which the teaching patters of the approaches are liable to typical "standard deviations," including the pattern of construction; but in a school that conducts teaching - i.e. *education through knowledge*. In this context the argument is: the school deals with teaching, and that is necessarily the teaching of knowledge; the teaching of knowledge without understanding is a corruption of thinking; therefore teaching thinking has no choice but to teach for understanding.

The theoretical reason: It seems that the developmental process of thinking and research on the nature of good thinking have led largely back to "the fishes," or to "an knowledge of the fishing field;" i.e., to a realization of the crucial importance of understanding the thought-about topic as an element of good thinking. An increasing number of studies show the extent to which prior knowledge - understanding - is crucial for good thinking. Understanding the thought-about topic is a more effective thinking tool than general thinking tools - tactics, strategies, heuristics, routines etc. Good thinking may "go along" with understanding the thought-about topic even without thinking skills and dispositions that were imparted and cultivate; but not vice versa. It is reasonable, for example, to impart to a person thinking tools for making a comparison; but even their full mastery will not help him compare between historic eras, art works or scientific theories he does not understand. On the other hand, when he understands he will be able to make a good comparison between them even without being an expert in the general skill of making comparisons. Naturally, understanding does not ensure good thinking; but it is a prerequisite for it, and almost sufficient.

The ideological reason: In his book *Teaching is a Conserving Activity* (1979) Neil Postman proposed a "thermostatic model" as an apparatus for directing educational preferences. According to this model the role of education is to heat cultural trends that have overcooled, and to cool negative cultural trends that have overheated. In the present socio-cultural situation, culture itself (in the normative sense of the word) seems to have overcooled. Present-day education devotes itself to a utilitarian philosophy. Utilitarianism in the practical and most direct sense is the main narrative directing teaching, and certainly learning (Postman, 1996). Students study natural and human sciences not because they find them meaningful or because these may help them understand the world and themselves, but because success in these studies will help them gain a diploma (that will help them gain another diploma in an institute for "higher education"). Thus, the most wondrous cultural achievements serve a purpose irrelevant to them, and moreover - stand in contrast to the ethical and intellectual values embodied in them. In these circumstances, the "educational thermostat" must heat a more acculturistic educational approach, one that tries to draw the learners nearer to the understanding of "great ideas," not because these ideas may help them but for their intrinsic value.

Pedagogic reason: The understanding approach may be the spearhead of a new educational model - the third model. "The educational pendulum swings, inevitably though not regularly, between conventional, didactic instruction and child-centered education," wrote Bereiter and Scardamalia. "There ought to be a third alternative, but what could it be?" (Bereiter & Scardamalia, 1993, p. 199). The authors recommend a "knowledge-building community" as a third model of teaching. Barbara Rogoff (Rogoff, Matusov, and White, 1996) also recommends a new model of teaching that is not "adult-run," meaning curriculum-centered education, and also not a "children-run"

model - child-centered education. They recommend a model based on "transformation of participation" of children and adults in the process of teaching and learning. This model is similar in principle to the third model of Bereiter and Scardamalia.

Our own pedagogical sense deems the understanding approach as the best candidate to lead the third model of education, as this category has two "poles:" an "external, or cultural pole" and an "internal, or psychological pole." According to the first, understanding is connected with cultural content that is understood and worth understanding; according to the second, understanding is tied to an independently regulated inner process of building meanings. Concentration on the first pole only produces the old or traditional education, "curriculum-centered;" concentration on the second pole only produces the new or progressive education (progressive in the "radical" sense and not in Dewey's complex sense), that is "child-centered." Education according to the understanding approach does not place either the curriculum or the child at its center but the meeting between them - an active, critical and thought-laden meeting. Both the individual and the culture are constructed in this meeting. The individual constructs his identity and worldview, and the culture becomes meaningful and is enriched by new ideas. This meeting between the individual as meaning-maker and culture as the raw material for meaning-making is the crux of the third model.

These four reasons lead us to prefer the understanding approach over the other two, and to teach under the auspices of its theory and practice all the elements of good thinking. We must emphasize that the adoption of the understanding approach does not mean forsaking the imparting of thinking skills or the cultivation of thinking dispositions. The understanding approach must impart and cultivate both of these in the framework of its own aims and means. Skills must be imparted in an authentic context in which learners-researchers experience them as essential for developing their understanding; dispositions must be cultivated through embodying them in ongoing behavior, dealing with them in adequate opportunities, and experiencing intellectual activity that invites them.

Conclusion

When we introduce into teaching thinking the crucial question - the basic question dealt with by each theory or program of teaching thinking - *What is the foundational element that constitutes good thinking, and how do we develop it?* we receive three answers. Each poses as the only answer - "the correct answer;" each is an approach to teaching thinking. An approach to teaching thinking is a coherent conceptual framework aimed at directing the development of the "element" of good thinking. The approaches to teaching thinking are not self-aware or consolidated; if they were, the work done here would be a repetition of what is already known. Our work here was not meant to find approaches to teaching thinking but to try and explain the field, to map it conceptually. The need to map this field was derived from the vagueness that threatens its very existence. The conceptual map proposed here may open a space for further theoretical development of the field, and enable its more effective application to education.

References

Mortimer, A. (1982). *The Paideia Proposal: An Educational Manifesto*.
 New York: Macmillan Publishing Co., Inc.

Arendt, H. (1971). *The Life of the Mind*. New York: The Harvest Books, Hacourt
 Brace & Co.

Barber, M. (1997). *The Learning Game: Argument for an Education Revolution*.
 Great Britain: Indigo

Barell, J. (1991). *Teaching for Thoughtfulness: Classroom Strategies to Enhance
 Intellectual Development*. New York: Longman.

Baron, J. (1985). *Rationality and Intelligence*. Cambridge, MA: Cambridge
 University Press.

—— (2001). Actively Open-Minded Thinking. Arthur L. Costa (Ed.),
 Developing Minds: A Resource Book for Teaching Thinking, 3rd Edition.
 Alexandria, VA: ASCD, pp. 76-79.

Bereiter, Carl & Scardamalia, Marlene (1993). *Surpassing Ourselves: An Inquiry into
 The Nature and Implication of Expertise*. Chicago: Open Court.

Beyer, B. (1987). *Practical Strategies for the Teaching of Thinking*. Boston:
 Allyn and Bacon, Inc.

—— (1987). *Developing a Thinking Skills Program*. Boston: Allyn and Bacon, Inc.

Brooks, G. J. & Brooks, M. (1993). *In Search of Understanding:
 The case for Constructivist Classrooms*. Alexandria, VA: ASCD.

Brown, A. L., & Campione, J. (1990). "Communities of Learning and
 Thinking, or a Context by Another Name." In Deanna Kuhn (Ed.), *Developmental
 Perspectives on Teaching and Learning Thinking Skills*. Basel: Karger.

Costa, A. L. (1991). *The School as a Home for the Mind*. . Palatine, IL:
 IRI/Skylight Training and Publishing, Inc.

——, & Kallick, B. (Eds.) (2000). *Discovering and Exploring the Habits of Mind*.
 Alexandria, VA: ASCD

De Bono, E. (1970). *Lateral Thinking: Creativity Step by Step*. New York:
 Harper Colophon Books.

—— (1985). "The CoRT Thinking Program." In Judith W. Segal, Susan F. Chipman &
 Robert Glaser (Eds.) (1985). *Thinking and Learning Skill, Vol. 1: Relating
 Instruction to Research*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 363-387.

—— (1991). "The CoRT Thinking Program." In Arthur L. Costa (Ed.), *Developing
 Minds: Programs for Teaching Thinking*. Alexandria, VA: ASCD, pp. 27-32.

—— (1992). *Teach Your Child How To Think*. Miidlesex, England: Viking, Penguin
Books Ltd.)

Dewey, J. (1933/1998). *How we Think*. New York: Houghton Mifflin Co.

Ennis, R. (1987). "A Taxonomy of Critical Thinking Dispositions and Abilities." In
Joan Boykoff Baron & Robert J. Sternberg (Eds.), *Teaching Thinking Skills: Theory
and Practice*. New York: W. H. Freeman and Co., pp. 9-26.

Facione, P., Sanches, C. A., Facione, Noreen C. & Gainen, J. (1995). The

Disposition Toward Critical Thinking. *The Journal of General Education*, Vol. 44, No. 1, pp. 1-25.

—– (2000). "The Disposition Toward Critical Thinking: Its Character, Measurement, and Relationship to Critical Thinking Skills." *Informal Logic*, Vol. 20, No. 1, pp. 61-84.

Fenstermacher, G. & Soltis, J. (1986). *Approaches to Teaching*. New York: Teachers College Press.

Feuerstein, R. Jensen, M. Hoffman, M. B., & Rand, Y. (1985). Instrumental Enrichment, an Intervention Program for Structural Cognitive Modifiability: Theory and Practice. Segal, Chipman & Glaser (Eds.), *Thinking and Learning Skill, Vol.1: Relating Instruction to Research,* pp. 43-82.

Fisher, R. (1990). *Teaching Children to Think*. U.K: Stanley Thornes.

—– (1998). *Teaching Thinking*. London: Cassel.

Freire, P. (1993). *The Pedagogy of the Oppressed.* New York: Continuum.

Gardner, Howard (1991). *The Unschooled Mind: How Children Think & How Schools Should Teach*. New York: Basic Books.

—– (1999). *The Disciplined Mind*. New York: Simon & Schuster.

—–, & Boix-Mansilla, Veronica (1998). "What are the Qualities of Understanding." In Martha Stone Wiske (Ed.), *Teaching for Understanding*. San Francisco: Jossey-Bass Publishers, pp. 161-196.

Glatthorn, A. A., & Baron, J. (1991). The Good Thinker. Costa, A. (Ed.), *Developing Minds: A Resource Book for Teaching Thinking*. Alexandria, VA: ASCD, pp. 63-67.

Halpern, Diane F. (1996). *Thought and Knowledge: Introduction to Critical Thinking*. Mahwah, NJ: Lawrence Erlbaum Associates.

Harpaz, Y. & Lefstein, A. (2000, November). "Communities of Thinking." *Educational Leadership*, vol. 58, No. 3, pp. 54-57.

—– (in press). Teaching and Learning in a Community of Thinking. *Journal of Curriculum and Supervision.*

Holt, J. (1982). *How Children Fail*. New York: Delta

Johnson, R., & Blair, A. (1994). *Logical Self-Defense*. New York: McGraw-Hill.

Lakoff, G., & Johnson, M. (1980). *Metaphors W e Live By*. Chicago: The University of Chicago Press.

—– (1999). *Philosophy in the Flesh*. New York: Basic Books

Lamm, Z. (1976). *Conflicting Theories of Instruction*. Berkeley, CA: McCutchan Publishing Corporation.

—– (in press)Ideologies and Education.

Langer, E. (1989). *Mindfulness*. MA: A Merloyd Lawrence Book.

Lipman, M., Sharp, A. M., & Oscanyan, Frederick S. (1980). *Philosophy in the Classroom*. Philadelphia, PA: Temple University Press.

—– (1988). *Philosophy Goes to School*. Philadelphia, PA: Temple University Press.

—– (1991). *Thinking in Education*. Cambridge, MA: Cambridge University Press.

Marzano, R. et al. (1988). *Dimensions of Thinking: A Framework for Curriculum and Instruction*. Alexandria, VA: ASCD.

––– (1992). *A Different Kind of Classroom: Teaching with Dimensions of Learning*. Alexandria, VA: ASCD .

McPeck, J. (1981). *Critical Thinking and Education*. New York: Martin Robertson.

––– (1994). Critical Thinking and the 'Trivial Pursuit' Theory of Knowledge. Kerry S. Walters (Ed.), *Re-Thinking Reason: New Perspectives in Critical Thinking*. Albany, NY: SUNY Press, pp. 101-117.

Passmore, J. (1967). On teaching to be Critical. Peters, R. S. (Ed.), *The Concept of Education*. London: Routledge & Kegan Paul.

Paul, R. (1987). Dialogical Thinking: Critical Thought Essential to the Acquisition of Rational Knowledge and Passion. Joan B. B, & Sternberg, R. J. (Eds.), *Teaching Thinking Skills: Theory and Practic*e. New York: W. H. Freeman and Co., pp. 127- 148.

––– (1992), Teaching Critical Thinking in the Strong Sense: Getting Behind World Views. Talaska, R. (ed.), *Critical Reasoning in Contemporary Culture*, State University of New York Press, pp. 135-156.

––– (1993). Philosophy and Cognitive Psychology: Contrasting Assumptions. Idem., *Critical Thinking: How to Prepare Students for a Rapidly Changing World*. Santa Rosa, CA: Foundation for Critical Thinking, pp. 229-236.

Perkins, D. N. (1987). Thinking Frames: An Integrative Perspective on Teaching Cognitive Skills. Joan B. B., &. Sternberg R. J. (Eds.), *Teaching Thinking Skills: Theory and Practice*, pp. 41-61.

––– & Salomon, G. (1989), Are Cognitive Skills Context-Bound?. *Educational Researcher*, 18 (1), pp. 16-25.

––– (1992). *Smart Schools: From Training Memories to Educating Minds*. New York: The Free Press.

––– (1995). *Outsmarting IQ: The Emerging Science of Learnable Intelligence*. New York: Free Press.

––– (1998). What Is Understanding. Wiske, M. S. (Ed.), *Teaching for Understanding*. San Francisco: Jossey-Bass Publishers, pp. 39-57.

–––, & Swartz, Robert (1991). The Nine Basics of Teaching Thinking. Costa, A. Bellanca, J., & Fogatry, R. (Eds.), *If Minds Matter: A Forward to the Future*, Vol. II, Palatine IL: Skylight Publications, pp. 53-69.

–––, Jay, E., & Tishman, S. (1993). New Conceptions of Thinking: From Ontology to Education. *Educational Psychologist*, Vol. 28, No. 1, pp. 67-85.

–––, Jay, E., & Tishman, S. (1993a). Beyond Abilities: A Dispositional Theory of Thinking. *Merrill-Palmer Quarterly*, Vol. 39, No 1, pp. 1-21.

–––,Crismond, David, Simmons, Rebecca, & Unger, Chris (1996). Inside Understanding. Perkins, D. Judah S, Mary W., & Wiske, M. S. (Eds.), *Software Goes to School: Teaching for Understanding With New Technologies*. New York: Oxford University Press, pp.70-87.

—–,Tishman, S. Ritchhart, R. Donis, K., & Andrade, Al. (2000). Intelligence in the Wild: A Dispositional View of Intellectual Traits. *Educational Psychology Review*, Vol. 12. No. 3, pp. 269-293.

Postman, N. (1979). *Teaching as a Conserving Activity*. New York: Delacorte Press.

—– (1992). *Technopoly: The Surrender of Culture to Technology*. New York: Alfred A. Knopf

—– (1996). *The End of Education: Redefining the Value of School*. New York: Alfred A. Knopf.

Ravitch, D. (2000). *Left Back: A Century of Failed School Reforms*. New York: Simon & Schuster.

Reid, S. (2002). *How to Think: Building Your Mental Muscle*. London: Prentice Hall.

Ritchhart, R. (2002). *Intellectual Character: What Is, Why It Matters, and How to Get it*. San Francisco: Jossey-Bass, A Wiley Comp.

Rogoff, Barbara, Matusov, Eugene and White, Cynthia (1996). "Models of Teaching and Learning: Participation in a Community of Learners." In David Olson & Nancy Torrance (Eds.), *The Handbook of Education and Human Development*. Blackwell, pp. 388-414.

Russell, D. (1941). Education for Critical Thinking. *The School*, Vol. xxx, No. 3, pp. 188-194.

—–(1943). Critical Thinking in Childhood and Youth. *The School*, Vol. xxxi, No. 9, pp. 744-750.

—– (1960) Critical Thinking. *Encyclopedia of Educational Research*. New York: The Macmillan Co., pp. 651-652.

Ryle, G. (1949). *The Concept of Mind*. England: Hutchinson House.

Salomon G., & Perkins D. Learning in Wonderland: What Do Computers Really Offer Education?. Stephen, K. (ed.), *Tecnology and the Future of Schooling: Ninety-Fifth Yearbook of the National Society for the Study of Education.* Chicago: Chicago University Press, 1996, pp. 111-130.

Seymor S. B. (1982). *The Culture of the School and the Problem of Change*. Boston: Allyn and Bacon, Inc.

Scheffler, Israel (1973). Philosophical Models of Teaching. Idem, *Reason and Teaching*. London: Routledge & Kegan Paul.

—– (1991). In Praise of the Cognitive Emotions. Idem, *In Praise of the Cognitive Emotions*. New York: Routledge, pp. 3-17.

Scriven, M. (1993). Chapter II., Michael Scriven. Esterle J., & Clurman, D. (Eds.), *Conversations with Critical Thinkers*. San Francisco: The Whitman Institute, pp. 29-49.

Siegel, H. (1988). *Educating Reason: Rationality, Critical Thinking and Education*. New York: Routledge.

Sizer, T. (1984). *Horace's Compromise: The Dilemma of the American High School*. Boston: Houghton Mifflin Co.

Smith, F (1990). *To Think*. New York: Teachers College Press.

Sternberg, J. R. (1985) *Beyond IQ: A Triarchic Theory of Human Intelligence*.
New York: Cambridge University Press.

——, Questions and Answers about the Nature and Teaching of Thinking Skills.
Joan B. B. & Sternberg, R. J. (eds.), *Teaching Thinking Skills: Theory and Practice*.
New York: W. H. Freeman and Co., pp. 251-259.

—— (1990). *Metaphors of Mind: Conceptions of the Nature of Intelligence*.
Cambridge: Cambridge University Press, 1990.

—— (1991). Intelligence Applied: A Triarchic Program for Training Intellectual
Skills. Costa, A. L. (Ed.), *Developing Minds: Programs for Teaching Thinking*.
Alexandria, VA: ASCD, pp. 79-84.

—— (1996). *Successful Intelligence: How Practical and Creative Intelligence
Determines Success in Life*. New York: A Plume Book.

——, & Spear-Swerling, Louise (1996). *Teaching for Thinking*. Washington, DC:
American Psychological Association.

——, & Grigorenko, Elena (2000). *Teaching for Successful Intelligence*. Illinois:
SkyLight.

Swartz, R. J. (1987). Teaching for Thinking: A Developmental Model for the
Infusion of Thinking Skills into Mainstream Instruction. Joan B. B. & Sternberg,
R. J. (Eds.), *Teaching Thinking Skills: Theory and Practice*. New York: W. H.
Freeman and Co., pp. 106-126.

——, & Parks, S. (1994). *Infusing the Teaching of Critical and Creative Thinking
into Content Instruction*. Pacific Grove, CA: Critical Thinking & Software.

Tishman, S. Perkins, D., & Jay, E. (1995). *The Thinking Classroom:
Learning and Teaching in a Culture of Thinking*. Boston: Allyn and Bacon.

Treffinger D. J., Isaksen S. G. & Dorval B. (1994), *Creative Problem Solving: An
Intriduction*, Center for Creative Learning, Sarasota, Florida.

—— (2000). Why Teach Habits of Mind?. Costa, A. L, & Kallick, B.
Discovering and Exploring the Habits of Mind. Alexandria, VA: ASCD, pp. 41-61.

Whimby, A. & Lochhead, J. (1982). *Problem Solving and Comprehension*.
Hillsdale, NJ: Lawrence Erlbaum Associates.

Wiggins, G. & McTighe, J. (1998). *Understanding by Design*. Alexandria, VA:
ASCD.

Wiske, M. S. (Ed.) (1998). *Teaching for Understanding*. San Francisco:
Jossey-Bass Publishers.