

## Common misconceptions of critical thinking

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In this paper, the first of two, we analyze three widely-held conceptions of critical thinking: as one or more **skills**, as **mental processes**, and as sets of **procedures**. Each view is, we contend, wrong-headed, misleading or, at best, unhelpful. Some who written about critical thinking seem to muddle all three views in an unenlightening *mélange*.

Apart from the errors or inadequacies of the conceptions themselves, they promote or abet misconceived practices for teaching critical thinking. Together, they have led to the view that critical thinking is best taught by practicing it. We offer alternative proposals for the teaching of critical thinking. Critical thinking is a subject of considerable current interest, both in terms of theory and pedagogy. A great deal is written about critical thinking, conferences on the subject abound, and educational initiatives aimed at fostering critical thinking proliferate.

It is our view that much of the theoretical work and many of the pedagogical endeavors in this area are misdirected because they are based on faulty conceptions of critical thinking. Critical thinking is frequently conceptualized in terms of **skills, processes, procedures and practice**. Much of the educational literature either refers to cognitive or thinking skills or equates critical thinking with certain mental processes or procedural moves that can be improved through practice. In this paper we attempt to explain the misconceptions inherent in such ways of conceptualizing critical thinking. It is important to note that much of the literature contains a pervasive miasma of overlapping uses of such terms as skill, process, procedure, behavior, mental operations, etc. We thus find similar kinds of error and confusion about critical thinking under superficially different ways of talking. We have tried to focus on plausibly distinct uses of skill, process and procedure in our critiques. Our arguments will lay the groundwork for offering a new conception based on different foundational assumptions in the following paper on this theme.

### Critical thinking as SKILL

Many educators and theorists appear to view the task of teaching critical thinking as primarily a matter of developing thinking skills. Courses and conferences focus on the development of thinking skills and references to skills appear in much of the literature.

Even leading theorists in the area of critical thinking conceptualize critical thinking largely in terms of skill. Thus, for example, Siegel (1988: 39, 41) writes of the critical thinker as possessing 'a certain *character* as well as certain skills', and makes reference to 'a wide variety of reasoning skills'. Similarly, Paul (1984: 5) refers to critical thinking skills and describes them as 'a set of integrated macro-logical skills'. The Delphi Report on critical thinking (Facione 1990), which purports to be based on expert consensus in the field, views

critical thinking in terms of *cognitive skills* in interpretation, analysis, evaluation, inference, explanation and self-regulation. It is important to note that the term `skill' can be used in a variety of senses and that, as a consequence, some of the discussion of skills in critical thinking is relatively unproblematic. In some instances `skill' is used to indicate that an individual is proficient at the task in question. It is used, in this context, in an achievement sense. As skilled reasoner is one who is able to reason well and to meet the relevant criteria for good reasoning. The use of skill in this context focuses attention on students being capable of intelligent performance as opposed to merely having propositional knowledge *about* intelligent performance. Thus, someone who is thinking critically can do more than cite a definition for *ad hominem*. He or she will notice inappropriate appeals to an arguer's character in particular argumentative contexts. Clearly, being a critical thinker involves, among other things, having a certain amount of `know-how'. Such thinkers are skilled, then, in the sense that they must be able to fulfill relevant standards of good thinking. Conceptualizing critical thinking as involving skill in this achievement sense is relatively benign. However, some of the discussion of skills in the context of critical thinking is more problematic. There is a strong tendency among educators to divide educational goals or objectives into three distinct kinds: knowledge, skills (i.e. abilities), and attitudes (i.e. values), and to assign critical thinking to the category of skills.

Conceiving of critical thinking as a skill in this sense implies more than simply that an individual is a competent or proficient thinker. **It is based on a conception of skill as an identifiable operation which is generic and discrete.** There are difficulties with both of these notions. We will begin with the problems entailed in viewing skills as generic, i.e. once learned, they can be applied in any field of endeavor; the problems involved in viewing skills as discrete will be dealt with later.

### *Skills as generic*

The identification of critical thinking with skill in the tripartite division of educational goals separates critical thinking from the development of knowledge, understanding and attitudes. *Critical thinking is seen to involve generic operations that can be learned in themselves, apart from any particular knowledge domains, and then transferred to or applied in different contexts.* Thus, for example, Worsham and Stockton (1986: 11, 12) claim that `there are some skills that are basic and common to most curriculum tasks (for example, gathering information, finding the main idea, determining meaning)'. They further state that: Most curriculum materials at the high school level require that students analyze, synthesize, and evaluate as well as to [*sic*] create new `products', such as original oral and written pieces and artistic creations. Students are expected to apply the appropriate thinking skills to accomplish these tasks.

In a similar vein, Beyer (1987: 163) makes reference to discrete thinking skills and claims that:

To be proficient in a thinking skill or strategy means to be able to use that operation effectively and efficiently on one's own in a variety of appropriate contexts. The separation of knowledge and critical thinking is fraught with difficulties however. If the claim that critical thinking skills are generic is taken to mean that these skills can be applied in any context regardless of background knowledge, then the claim seems clearly false. **Background knowledge in the particular area is a precondition for critical thinking to take place.** A person cannot analyze a particular chemical compound if he or she does not know something about chemistry, and without an understanding of certain historical events a person will be unable to evaluate competing theories regarding the causes of World War I.

Many theorists acknowledge the necessity of background knowledge for critical thinking but still maintain a *separation* between knowledge and the skill or skills of thinking critically. For example, Nickerson *et al.* (1985: 49) contend that: recognizing the interdependence of thinking and knowledge does not deny the reality of the distinction. *It is at least conceivable that people possessing the same knowledge might differ significantly in how skillfully they apply what they know.*

We argue, however, that the distinction is itself untenable. **Skilled performance at thinking tasks cannot be separated from knowledge.** The kinds of acts, such as predicting and interpreting, which are put forth as generic skills will, in fact, vary greatly depending on the context, and this difference is connected with the different kinds of knowledge and under common misconceptions of critical thinking standing necessary for successful completion of the particular task. Interpreting a graph is a very different sort of enterprise from interpreting a play. The former involves coming to an understanding of the relationships among the plotted entities based on understanding certain geometric conventions; the latter involves constructing a plausible meaning for the play based on textual evidence. Both of these differ again from the case of interpreting someone's motives, which involves imputing certain beliefs or attitudes to an individual based on reading verbal and bodily cues as well as on past knowledge of the person. Similarly, predicting how a story will end calls upon very different understanding than does predicting the weather. It makes little sense, then, to think in terms of generic skills, which are simply applied or transferred to different domains of knowledge.

**Becoming proficient at critical thinking itself involves, among other things, the acquisition of certain sorts of knowledge.** For example, the knowledge of certain critical concepts which enable one to make distinctions is central to critical thinking. Understanding the difference between a necessary and a sufficient condition is not just background knowledge but is very much a part of what is involved in thinking critically.

**Similarly, proficiency in critical thinking involves an understanding of the various principles which govern good thinking in particular areas, and many of these are domain specific,** as McPeck (1981) has pointed out.

Barrow (1991: 12) makes the point in this way:

What is clear, what is contradictory, what is logical, and so forth, depends upon the particular context. . . . To be logical in discussion about art is not a matter of combining logical ability with information about art. It is a

matter of understanding the logic of art, of being on the inside of aesthetic concepts and aesthetic theory. The capacity to be critical about art is inextricably intertwined with understanding aesthetic discourse. Facione (1990: 10) sums up well this general point: This domain-specific knowledge includes understanding methodological principles and competence to engage in norm-regulated practices that are at the core of reasonable judgments in those specific contexts. . . . Too much of value is lost if CT [critical thinking] is conceived of simply as a list of logical operations and domain-specific knowledge is conceived of simply as an aggregation of information.

An additional difficulty with the identification of critical thinking solely with skills to the exclusion of knowledge and attitudes is that it fails to recognize the central role played by **attitudes** in thinking critically. **Critical thinking involves more than the ability to engage in good thinking. It also involves the willingness or disposition to do so.** Siegel (1988) refers to this aspect of critical thinking as the critical spirit and sees it as of equal importance to the reason-assessment component. Ennis (1987) includes a list of dispositions in his conception of critical thinking, and dispositions, and values and traits of character are central to Paul's (1982) notion of a 'strong sense' of critical thinking.

#### *Skills as discrete processes*

Another major difficulty with the equation of critical thinking with skill is that **it assumes the existence of certain discrete processes, procedures or operations. It is assumed that acquiring a skill involves becoming proficient at these processes.** Thus, Chuska (1986: 25) distinguishes between the 'ways of thinking (the processes involved)' and 'thinking skills (the proficiency a person demonstrates in using the processes)'. In some cases these processes are thought to involve certain mental processes or operations, and in others these processes are conceived of in terms of procedures or steps. The difficulties with both these conceptualizations are dealt with below.

#### **Critical thinking as mental processes**

**It is a common assumption in discourse about critical thinking that being good at critical thinking is basically a matter of being proficient at certain mental processes.**

These processes are generally thought to include such things as *classifying, inferring, observing, evaluating, synthesizing and hypothesizing*. Kirby and Kuykendall (1991: 7, 11), for example, hold that 'thinking is a holistic process in which different mental operations work in concert' and allude to 'intellectual skills training'. It is our view that a purely 'processes' conception of critical thinking is logically misleading and pedagogically mischievous.

In medicine, talking about processes as outcomes makes some sense. An obstetrician may give a newborn infant an appropriately sound smack to start up certain vital processes. May we not suggest that teachers

should seek to do something analogous? If we do, we are presumably not suggesting that they should seek the occurrence of *physical* processes such as synapse-firing in the brain, but that they should seek the occurrence of such *mental* processes as analyzing or translating. Should they not, then, seek to invoke mental processes?

**Talk about mental processes has a logic very different from the logic of talk about physical processes.**

Physical processes, such as baking or synapse-firing, can, at least in principle, be observed and identified *independently* of any product they may have. *Mental processes can be identified only via their products; observing them directly is a logical impossibility.* For example, we suppose that a translating 'process' has occurred in some person only because the person has succeeded in producing a translation.

Descriptions of translating and classifying 'behaviors' are not descriptions of behaviors at all but descriptions of upshots or accomplishments such as converting poetry to prose. When someone succeeds in such a conversion there is no doubt that *something* must have gone on 'in' that person which enabled him or her to succeed. To identify this 'something' as a particular mental process is to assume that the *same* sort of thing goes on within a person in every case in which he or she translates something.

There is no reason to suppose this is the case. **The so-called 'processes' are hypothesized, and then reified after the fact of these upshots.**

Mental processes are differentiated from one another not by observing features of the processes, but by distinguishing among kinds of upshots or accomplishments. The number of different kinds of processes we identify depends upon how we decide to differentiate upshots. For some purposes we may wish to lump them all together. For instance, we may lump together all of the upshots that represent successful application of conventional meaning rules and standards, and then we might talk of 'the process' of translation that all have in common. We may, on the other hand, want to subdivide student successes on the basis of the different kinds of meaning conventions they fulfill. In either case, we will be less inclined to reify and confound categories if we talk about enabling students to fulfill the conventions and standards rather than about their exercising mysterious processes presumed to lie behind such accomplishments. No useful pedagogical aim is served by postulating such processes.

**Regardless of the conceptual hazards, people interested in critical thinking, and in education in general, are prone to talk about processes** - the thinking process, the reading process, the creative process. What makes this way of characterizing teaching and learning so attractive? In part, the attraction may arise from the *ambiguity* of the term 'process'. In part, it may also occur because it seems to offer a promising *answer* to the question, 'Are critical thinking abilities transferable?'

Broadly speaking, a process may be any course of events that has an upshot or a result of some sort.

However, there are at least three distinct ways that courses of events relate to their upshots. In the first instance, they may relate as that course of events people now call 'natural selection' relates to its upshot,

the evolution of a species. In the second, they may relate as running a race relates to finishing the race. In the third, they may relate as facing an object relates to noticing it. We may characterize these, for the sake of convenience, as: **(1) process-product, (2) task-achievement, and (3) orient-reception relations**. Process-product pairs are used to pick out situations in which a series of changes or a particular relation produces an identifiable upshot. Task-achievement pairs are used to talk about what people *do* to bring about upshots. Tasks differ from other 'processes' in that tasks are things people do on purpose in an effort to succeed at something.

There are doubtless thousands of task words in most natural languages. Words like 'look', 'search', 'race' and 'teach' can all be used as task words. Their use in this way reflects the fact that many things people seek to accomplish are difficult to bring off. They can try and fail.

Ambiguity in the term 'process' lends a spurious sort of plausibility to the processes conception of critical thinking because it makes it plausible to suppose that all upshots of human activity have the same relation to the activity as products of combustion have to the process of combustion.

Because processes are routinely named after their products, it is natural to suppose that achievements and receptions must also have corresponding processes. The result, of course, is unwarranted reification reading back from outcomes to mysterious antecedent processes.

The process conception is also bolstered by the fact that the same happening may be spoken of as both a process and a task. When one bakes a loaf of bread the changes in the loaf may be seen either as a natural function of heating and of the chemistry of its constituents, or as what the cook does- heating the oven to the proper temperature and so on. The same happenings are, thus, characterized differently. Baking, the chemical process, is a causal occurrence; baking, the task, is a procedure (or an art) intended to bring about the chemical process in proper degree, so that the result is not pasty, or charred, or leaden. Because such words as 'baking' may be ambiguous, it is easy to neglect the difference between the process and the task. Such reception verbs, as 'see', 'notice' and 'realize' refer to upshots of a special kind. First, they involve either (or both) our literal perception apparatuses (eyes, ears, etc.) or our mental abilities. Secondly, although there are tasks we can carry out to position ourselves to see (e.g. sit where we can watch the horizon) or prepare ourselves conceptually (e.g. acquire the concepts of truth and validity), these tasks cannot guarantee that we will have the desired upshot. As White (1967: 69) puts it: We can ask someone how he [*sic*] 'would' discover or cure, but not how he 'would' notice, although it is as legitimate to ask how he 'did' notice as it is to ask how he 'did' discover or cure. For the former 'how' question asks for the method, but the latter for the opportunity. Although appropriate schooling and practice can put us in a condition to notice what we used to miss, people cannot be taught nor can they learn how to notice, as they can be taught or can learn how to detect. Noticing, unlike solving, is not the exercise of a skill.

For those interested in teaching students to become better at critical thinking, the moral is clear. We cannot teach students the process of noticing fallacies, for we have no grounds for believing there is such a process. The most we can do is orient them, and this, it seems, we do in at least three ways.

1. . We teach the person certain concepts - for instance, the concept of a valid argument. This enables them to notice fallacies they would otherwise have overlooked - but does not, of course, guarantee they will notice them.
2. . We motivate the person to care that arguments are valid and to be on the lookout for invalid arguments.
3. . We teach procedures that enable the person to orient himself or herself where certain kinds of reception are sought.

The second reason why people become advocates of critical thinking processes is that they want schools to provide curricula such that students learn to do certain things across the curriculum - and into their non-school lives - abstract, analyze, classify, evaluate, sequence, synthesize, translate, etc. **These 'processes' are believed to be common to all critical thinking situations and to a range of activities beyond.** To educators this means that in teaching them they can economize on instruction because there will be transfer of training. Someone who learns the forehand smash in tennis is likely to learn the forehand smash in squash with less difficulty than a person novice to both. Are we then to suggest that someone who learns, for example, to *abstract* in the writing of a preface will be able, *because of that prior learning*, to *abstract* in depicting a house, or that one who is able to evaluate cars will *thereby* be able to evaluate hypotheses? What else can we make of talk of processes as general abilities? Critical thinking situations may well have common features, but speaking of processes is of no value; it is, indeed, either otiose or misleading, and we almost certainly risk losing more than we gain. We risk falling into a monochromatic and wholly misleading view of the teaching of critical thinking.

### **Critical thinking as procedures**

Another common misconception of critical thinking sees it as basically a matter of following a general procedure, described usually in terms of a set of steps, stages or phases. We contend that developing students' competence in thinking is not, at heart, dependent on teaching them steps or procedures to follow. We begin by clarifying what we believe is implied by those who characterize critical thinking as following step-by-step procedures. Next, we compare this view with an account of thinking as the exercise of judgment.

#### *Thinking as procedure*

Although there is no consensus about the general procedures that constitute thinking, the three most frequently discussed are **inquiry** (i.e. 'the scientific method'), **problem solving**, and **decision making** (Wright

1993). Some writers refer to critical thinking and creative thinking as separate procedures (Marzano *et al.* 1988: 32, Overgaard 1989: 9). By some accounts, there are as many as eight general thinking procedures: concept formation, principle formation, comprehension, problem solving, decision making, research, composition, and oral discourse (Marzano *et al.* 1988: 32± 33).

Each of these is distinguished by the type of conclusion or result produced (e.g. clarification of a concept, a decision about what course of action to take). Proponents of thinking as procedure, by definition, believe that **procedures are at the heart of promoting thinking**. An important variable in this view of thinking is the formality of the sequence of steps involved in these general procedures. There is a range of opinion on this matter, spanning what we will call the algorithmic and the heuristic views of thinking as procedure.

According to Nickerson *et al.* (1985: 74), algorithms and heuristics are two types of procedures: an algorithm is a step-by-step prescription that is guaranteed to accomplish a particular goal; an heuristic is a procedure that is merely reasonably likely to yield a solution.

Proponents of an algorithmic view of thinking as procedure hold that: (1) there is a manageable number of highly reliable procedures that, taken as a whole, can address the range of situations that students need to resolve, (2) the steps in these procedures form a fixed order, and (3) mastery of these steps is the central challenge in learning to think.

Supporters of the heuristic view hold a less stringent set of assumptions:

(1) there is a potentially large number of procedures helpful across the range of situations that students need to resolve, (2) the order of the steps in these is not fixed, and (3) mastery of these steps is a pre-eminent, but not necessarily the only, challenge in learning to think.

Although it is difficult to find much support for the algorithmic view of critical thinking, many academics, particularly psychologists, appear to accept the heuristic view. Thus, after reviewing a representative range of programs to promote thinking, Glaser (1984: 96) notes that 'most of these programs place emphasis on the teaching of general processes, general heuristics and rules for reasoning and problem solving, that might be acquired as transferable habits of thinking'. Marzano *et al.* (1988: 34) suggest that the procedures should not be taught as 'prescribed procedures' but rather as 'repertoires or arrays of alternatives' that are 'semi-ordered' or are 'working hypotheses about the best way to accomplish a goal, general procedures to be used flexibly by teachers and adapted by students'. For others, however, the sequence of steps to be followed is more significant (e.g. Beach 1987: 146± 147).

It is intuitively appealing to describe critical thinking in terms of how an individual is to go about it. **The procedure approach, by reducing critical thinking to steps, seeks to provide operational or task descriptions of the building blocks of such thinking.** Consider the following example- the 'Decide Model' by E. Daniel Eckberg. This conception holds or assumes that critical thinking comprises a set of steps characterized as follows:



*D. Define the dilemma*

What's the problem?

Why does it concern me?

What's the basic issue?

*E. Examine electives*

What are all sorts of possible ways of solving the problem?

What choices do we have?

What are our alternative courses of action?

What hypothesis can we make?

*C. Consider consequences*

What happens if we try each choice?

*If we do this, then what?*

How will things change if I choose this one?

What data can I collect and consider in considering these consequences?

*I. Investigate importance*

What principles are important to me here?

What things do I most value?

How will these values influence my choice?

What am I assuming to be true?

What are my preferences and biases?

*D. Decide direction*

In the light of the data, what's my choice?

Which choice should now be chosen?

Which hypothesis seems to be the best?

Based on the evidence, what course of action should I take?

*E. Evaluate ends*

How can I test my hypothesis?

Was my course of action correct?

What are the consequences of my choice?

Has a tentative hypothesis been proven or disproved?

What are my conclusions?

As one can see, the model attempts to characterize critical thinking as a set of procedures to be carried out.

None of the steps directly raises the underlying normative questions. Even in asking, 'Was my course of action correct?', the schema refers to what has been completed- are` action back.

Thus, the fundamentally normative and ongoing nature of critical thinking is ignored or masked. Critical thinking is not simply a retrospective undertaking.

It might be suggested that a more appropriate description of the 'decide direction' step is 'make an informed, fair-minded decision'. We agree, but this no longer describes a procedure to be performed, rather it identifies norms to be fulfilled. As such, it is not characteristic of the procedure view.

Although some educators may use the term 'step' to refer to achievement of standards, the focus is overwhelmingly on strategies and heuristics. We do not wish to quibble over conceptual territory; rather we draw attention to the dominant (possibly, paradigmatic) use of the term 'step' so as to expose the inadequacies of this view of critical thinking as following general procedures.

### *Concerns with 'thinking as general procedures'*

Although we believe that heuristics serve a useful role in learning to think critically, we do not regard them as the central feature of good thinking: there are two basic reasons why the general procedures view is an inadequate way of conceiving of critical thinking. We believe it misrepresents the major obstacle to good thinking, and grossly understates the significance of contextual factors in deciding how to proceed in any particular case of critical thinking.

On the general procedures view, the performance of certain tasks is seen to be a highly reliable means of achieving the desired results of thinking. The educational challenge is, therefore, to equip students with repertoires of procedures they can employ across the range of thinking situations. In our view, the mere performance of certain procedures identified in descriptive terms is insufficient to ensure that what has happened counts as critical thinking.

The performance of tasks such as thinking of reasons for and against a position, or of brainstorming alternatives, does not guarantee that an individual is thinking critically. The pro and con reasons that the individual comes up with may address only the most trivial aspects of the issue; so, too, the brainstorming of alternatives may miss the most sensible alternatives.

Learning to engage in such activities has little educational merit unless these things are done in such a way as to fulfill **relevant standards of adequacy**. Students have, after all, performed these sorts of tasks for much of their lives. The educational goal must be to teach them to do such tasks *well* by increasing their capacity and inclination to make judgments by reference to criteria and standards that distinguish thoughtful evaluations from sloppy ones, fruitful classification schemes from trivial ones, and so on. A general procedures approach that does not teach standards of good thinking is unlikely to sharpen students' critical judgment. It is for this reason we have suggested that critical thinking should be characterized not in terms of procedures to be carried out, but in terms of the standards a performance must fulfill to count as successful.

Critical thinking is a polymorphous or multi-form enterprise; there are numerous activities that may be helpful in solving a problem or reaching a decision. What steps are appropriate is determined both by the nature of the problem and its context. They are context-bound. For example, in deciding whether any particular government should support international military intervention in 'civil' wars, it is hard to imagine how one set of steps, or any limited set of procedures, could be appropriate for all such circumstances. Nor could the same sequence of problem-solving steps usefully be applied both to fixing a failing relationship and to fixing a civil war. Identifying both these situations as 'problems' masks the very different factors that need to be considered in deciding what should be done in each case.

Given the diversity of problems and problem contexts, we believe that any account of the steps involved in problem solving or decision making will either be so vague as to be largely unhelpful, or they will be so specific that they will have little generalizability beyond a specific class of problems or decisions.

To a considerable extent, what we should do in solving a problem is determined by the standards that must be met for the solution in the particular case to be successful. In the case of a failing relationship, it may be lack of honesty with oneself that is the problem. In deciding whether a government should participate in an international intervention may involve honesty, but it often involves considering the effect on the lives of many innocents and very large economic effects. Following the decision-making model listed above may simply be an occasion to rationalize the self deception that gave rise to the personal problem in the first place- or the international problem in the first place. Nurturing open-mindedness may be the only 'step' needed to repair this situation.

We are not claiming that teaching about general procedures is a completely inappropriate way to promote critical thinking. Rather, we emphasize that the effectiveness of any procedure depends on its efficacy in helping students meet the relevant standards for good thinking: there are no inherent or highly reliable connections between learning to think well and performing particular operations. Put another way, what drives increased competence in thinking is greater mastery of the standards for judging an appropriate tack to take in a particular context, not learning preprogrammed, supposedly generalizable, procedures.

### **Critical thinking and the pedagogy of practice**

We have reviewed three conceptions of critical thinking: skills, processes, and procedures. All three have been used to promote the idea that competence in thinking critically is gained primarily through practice. Thus, although we will focus in this section on the skills-conception as a source of the pedagogy of practice, we could just as well focus on either the process or the procedures view. Nickerson *et al.* (1985) discuss learning thinking skills as analogous to two ways of learning physical skills - one when a person practices a particular skill to strengthen it; the other where, by appropriately directing intellectual energy, teachers

replace the novice's inefficient movements with more efficient ones. Practice is seen as exercising the skills of critical thinking so that improvement will take place.

Students may, for example, be given frequent opportunities to make comparisons in a variety of domains so that the 'skill of comparing' will be exercised, and this aspect of critical thinking improved. We contend, however, that critical thinking is not promoted simply through the repetition of 'skills' of thinking, but rather by developing the relevant knowledge, commitments and strategies and, above all, by coming to understand what criteria and standards are relevant. Repetition does indeed have some role to play, but only if it takes place in the context of the development of such knowledge, criteria, commitments and strategies.

The main assumption underpinning the practice view is that critical thinking consists of a variety of discrete skills that can be improved through repetition. On this view critical thinking skills are analogous to skills in an athletic endeavor such as soccer, where it is possible to practice kicking, heading the ball, passing, etc., and to develop skill at each of these constituent activities independently of ever playing a football game. One repeats the skill until it has become routinized and one no longer needs to apply conscious attention to its execution.

However, this is not an appropriate model for what is involved in becoming better at critical thinking. Unlike athletic skill, skill in critical thinking cannot be separated from understanding the nature and purpose of the task one is attempting to accomplish. Becoming better at comparing, for example, involves learning to make comparisons according to relevant criteria, making comparisons which are appropriate to the particular circumstances, comparing with a view to the reason the comparison is being made, and so on.

We argued earlier that critical thinking cannot be characterized in terms of specific mental processes, and that there are no good grounds for supposing that terms like comparing, classifying and inferring denote generic mental processes which one can improve through repetition.

Here, we emphasize that all aspects of critical thinking centrally involve judgment, and judgment cannot be made routine. Scheffer (1965: 103) makes this point with reference to chess: critical skills call for strategic judgment and cannot be rendered automatic. To construe the learning of chess as a matter of drill would thus be quite wrong-headed in suggesting that the same game be *played over and over again*, or intimating that going through the motions of playing repeatedly somehow improves one's game. What is rather supposed, at least in the case of chess, is that improvement comes about through development of strategic judgment, which requires that such judgment be allowed opportunity to guide choices in *a wide variety* of games, with maximal opportunity for evaluating relevant outcomes and reflecting upon alternative principles and strategy in the light of such evaluation.

An examination of those areas where practice is helpful- for example artistic performance makes evident that useful practice involves far more than mere repetition. Practicing the piano is not simply a matter of

continually repeating a piece in the same manner, but rather of being alert to and attempting to correct errors and continually striving for improvement according to the standards of quality performance. Dewey (1964: 201) makes the point that simply sawing a bow across violin strings will not make a violinist.

**It is a certain quality of practice, not mere practice,** which produces the expert and the artist. Unless the practice is based upon rational principles, upon insights into facts and their meaning, 'experience' simply fixes incorrect acts into wrong habits.

Howard(1982: 161, 162) also maintains that practice is not mere repetition, but claims that it is, rather, repetition which is 'guided by specific aims such as solving various kinds of problems' or 'improving acquired skills', and 'in accord with some . . . criteria of performance' which enable one to judge the level of mastery of the activity. Thus, he states: Rather than mechanically duplicating a passage, one strives for particular goals, say, of fluency, contrast, or balance. Successive repeats reflect a drive toward such goals rather than passive absorption of a sequence of motor acts.

The question arises at this point as to how critical thinking can best be developed and what role practice plays in this development. We have argued that what characterizes thinking which is critical is the *quality* of the reasoning. Thus, in order to become a (more) critical thinker one must understand what constitutes quality reasoning, and have the commitments relevant to employing and seeking quality reasoning. The knowledge necessary for such understanding includes background knowledge relevant to the context in question, knowledge of the principles and standards of argumentation and inquiry, both in general and in specialized areas, knowledge of critical concepts, and knowledge of relevant strategies and heuristics. The kinds of habits of mind, commitments or sensitivities necessary for being a critical thinker include such things as open-mindedness, fair-mindedness, the desire for truth, an inquiring attitude and a respect for high-quality products and performances. Thus, fostering critical thinking would involve the development of such knowledge and commitments.

A variety of means may be employed to promote such development, including direct instruction, teacher modeling, creation of an educational environment where critical inquiry is valued and nurtured, and provision for students of frequent opportunities to think critically about meaningful common misconceptions of critical thinking challenges with appropriate feedback. Practice may also have a role to play, but it must be understood that it is not practice in the sense of a simple repetition of a skill, process or procedure. Rather such practice presupposes the kind of knowledge outlined above, and involves the development of critical judgment through applying this knowledge in a variety of contexts.

It also involves attempts on the part of the learner to improve according to specific criteria of performance, and frequent feedback and evaluation with respect to the quality of thinking demonstrated.