The Integration of Extrarational and Rational Learning Processes: Moving Towards the Whole Learner

Tom Puk
Lakehead University

The polemical debate between rationalists and nonrationalists need not occur. The paper briefly traces the evolution of information processing theory as it pertains to the emerging emphasis being placed on the psychological unconscious in classroom learning. Theory and practice are then synthesized, resulting in the development of a strategy which emphasizes extrarational learning processes (i.e., processes which occur at the unconscious level of the human mind) as well as a strategy which integrates rational and extrarational processes. It is felt that the self-directed whole learner must and can be taught to make inner connections between these two levels of the human mind.

La polémique entre les rationistes et les non rationalistes est nécessaire. Cet article retrace brièvement l'évolution de la théorie du traitement de l'information en relation avec l'actuelle importance mise sur l'apprentissage inconscient en salle de classe. Une synthèse de la théorie et de la pratique est présentée et cela suggère le développement d'une stratégie qui privilégie les processus d'apprentissage extrarationnels (i.e., les processus qui interviennent au niveau inconscient de l'esprit humain). Cela suggère aussi une stratégie qui intègre les processus rationnels et extrarationnels. Cela signifie que l'on peut et que l'on doit enseigner à l'apprenant, dans sa totalité d'apprenant, à faire des liens entre les deux niveaux de l'esprit humain.

The controversy over the relative emphasis that should exist in educational psychology between theory and the practical application of theory is not new. It has been suggested that a balance is required and that more emphasis should be placed on the practical application of theory as it applies to the classroom (Samuels & Terry, 1977; Constas & Ripple, 1987). This paper takes a more inclusive position between theory and practice by using certain theories of cognitive psychology to create learning strategies which will improve classroom practice.

Education has long been a source of atomistic approaches to learning – atomistic in the sense that knowledge has consistently been divided into separate domains and distinct divisions of subject-matter (i.e., the

disciplines). Much has been said recently about the emphasis which has been placed on the disciplines and the resulting limitations which have plagued schooling (Hargreaves & Earl, 1990). Many jurisdictions are currently experiencing a restructuring of curriculum which encourages the integration of subject-matter (Ontario Ministry of Education, 1995a).

Not as much emphasis however has been placed on the integration of learning processes. Learning for the most part has emphasized the rational and analytic processes which reside at the conscious level of the mind. Those processes which reside at the unconscious or preconscious levels have not received as much attention. (One only has to reflect on the terms "nonrational processes" and "irrational processes" to understand the devaluing of processes which are "not rational." The implication has been that because they are "not rational," they are not as important and in some instances are viewed as being unsound, silly, or even somewhat peculiar.) The author believes that this negative categorizing of unconscious processes is due, in part, to the limitations of classical information processing theory which left little room for the existence of the unconscious. More recent elaborations of information processing theory however have allowed for the possibility that what occurs at the unconscious and preconscious levels of the human psyche might have a direct bearing upon higher mental processes and might in fact influence thought and action at the conscious level. "Human rationality is a thin, fragile facade which the unconscious keeps bursting asunder" (Sarup, 1989, p.18). Even when *nonrational* processes have been emphasized in curriculum development efforts, they have been presented as being disconnected from rational processes, that is, as alternatives to rational processes. Thus the dichotomy between rational and nonrational levels of the mind have been sustained in the classroom as well.

In this paper, I will a) review various cognitive psychology theories which have affected learning; b) review and analyze various learning procedures which have resulted from these theories; and c) suggest a new direction in designing instructional strategies which emphasizes the integration of two equals, *rational* and *extrarational* learning processes.

Why do we Need to Integrate Learning Processes?

As has been found in previous research (Puk, 1992), the level of aspiration for schooling appears to be far below what is possible given our present state of knowledge. This low level of aspiration is in part due to the treatment of learning as being made up of disparate viewpoints. One traditional perspective has been the belief that learning involves rational processes to the exclusion of all else (Miller & Seller, 1990). In this perspective, it is felt that if only the child would spend more time on the

basics (i.e., learning facts and skills presumably delivered through rote learning) this will result in an educated person. Another currently popular perspective which emphasizes rational learning processes is that schooling should be devoted to the acquisition of analytic problem-solving skills. However, common sense and current research indicate there is more to learning than the involvement of the rational mind. Other perspectives (although still monistic in nature) focus on single qualities such as possessing a spiritual nature (e.g., developed through various religious perspectives), knowledge of self (e.g., through personal narrative), or possessing creative abilities (e.g., through a single focus on the arts). The problem with these monistic perspectives is that each exemplifies either a single valued human quality (e.g., possessing subject-related knowledge) or a small grouping of qualities (a more eclectic viewpoint). However, it is the position of this paper that the whole child is composed of all these qualities and more and that a pluralistic perspective needs to be identified. Traditionally, there has been little effort made to show the connections between different perspectives.

Our dependence on polarized viewpoints (as represented in the various monistic perspectives) has resulted in the inability of both practitioner and student to see the connections between learning processes. From a postmodern perspective (Doll, 1993), more emphasis needs to be placed on the interconnections between all of the valued human qualities which represent the whole learner rather than certain aspects. Some research seems to indicate that there are interconnections between many processing units in the mind and that "each unit, when activated, excites and inhibits others along a rich network of associative links" (Kihlstrom, 1987), that is, there is a pattern of mutual influence throughout the entire system. It is the position of this paper that learning procedures should emphasize these connections.

What are the Theories Utilized in this Paper and How do They Work?

The classic information processing model of human cognition was based on the computer. In this model, there are mechanisms for delivering information and mechanisms for processing information (Lindsay & Norman, 1977). Information is contained in sensory registers and is then analyzed by processes known as "feature detection" and "pattern recognition" (Kihlstrom, 1987). Only when this information receives attention is it then passed on to primary or short-term memory. Information in primary memory is then combined with information already residing in secondary or long-term memory, a response is generated and some of the information is permanently encoded in long-term memory. In this theory, unconscious processes are identified with those products of the perceptual system which do not receive attention and thus are not encoded in secondary memory.

> The implication of this is view is that unattended percepts and unretrieved memories make no contact with higher mental processes, and thus cannot influence conscious experience, thought, and action. Thus, the classic information-processing model, by regarding attention and rehearsal as prerequisites for full-fledged cognitive analysis of the stimulus, and by implicitly identifying consciousness with higher mental processes, leaves little or no room for the psychological unconscious. (Kihlstrom, 1987, p. 1446)

A second theory of information processing is based on Anderson's ACT* (Adaptive Control of Thought). In this theory (Anderson, 1976), there is only one single unitary memory storage which contains both declarative knowledge (general and specific factual information) and procedural knowledge (skills, rules, strategies). Perceptual inputs create representations of structures in the external environment which are combined with preexisting declarative, and procedural knowledge. Resnick (1986) has stated that "except in special circumstances, it is not the message itself that is represented but its reference" (p. 131). An individual can become aware of declarative knowledge depending upon the strength of the representations. However, this theory holds that procedural knowledge can not be consciously extracted.

> Thus, procedural knowledge appears to be unconscious in the strict sense of the term. We are aware of the goals and conditions of procedures, and the products of their execution, but not of the operations themselves. In this way, ACT* and similar revisionist models afford a much wider scope for the cognitive unconscious than did classic statements. (Kihlstrom, 1987, p. 1446)

However there is a third variation of information processing theory which provides a major place (from a theoretical point of view) for nonconscious mental structures and processes. Parallel distributing processing theory (PDP) holds that rather than there being one single central processing unit (e.g., working memory), there are in fact a large number of processing units which influence each other throughout an interconnected network. Because information about an object is spread throughout the processing network, that information does not need to be consciously acknowledged in order for it to influence thought and action. Traditional theories have postulated the existence of a central agent (i.e., executive or executive function) in control of processing (Robinson, Ross & White, 1985; Luckner, 1990) and that this executive acts upon a single set of rules. In PDP models, it is postulated that there are various systems which operate independent of each other (perhaps each unit has a mini executive). One other important difference between PDP models and traditional models is that the traditional theory has been that new information is processed in an organized and sequenced manner at the

conscious level (Gagne, 1985). However, the implication of PDP theory is that information is processed in a less systematic (yet effective) manner at the unconscious level.

> Parallel processing permits a large number of activated units [at the unconscious level] to influence each other at any particular moment in time, so that information can be analyzed very rapidly. Both the number of simultaneously active processing units and the speed at which they pass information among themselves may exceed the span of conscious awareness .... By virtue of massive parallelism, processing systems tend to reach a steady state very rapidly, within about a half second. At this point of relaxation, the information represented by the steady state becomes accessible to phenomenal awareness. (Kihlstrom, 1987, p. 1446)

The implications of PDP in regard to nonconscious processes are significant. In traditional information processing theories, the cognitive unconscious has been restricted to elementary perceptual operations which have little affect on higher mental functions. PDP models seem to elevate unconscious processes to being the basis of all conscious thought. The implications of this research will be used later in the paper to examine the kinds of new learning strategies required. First however existing learning strategies which feature either rational or nonrational processes will be reviewed.

What are the Variations in Teaching/Learning Strategies?

The history of instructional design in terms of rational learning processes and nonrational learning processes has been such that development has progressed in two ways: Type 1) where rational procedures have been developed in a homogeneous manner; and Type 2) where both rational and nonrational processes have been linked in a sequence in which one process *follows* the other.

The work of John Dewey might be used as the starting point to examine historical developments in teaching/learning strategies. Dewey (1916/1966) developed a problem-solving procedure which was an elaboration of the scientific method. In general terms, the steps of his procedure were: a) to develop a kind of dissonance in the mind about the topic being attended to, b) to develop a tentative interpretation of the known elements, c) conduct a careful survey of all known data in order to precisely define the problem, d) develop a tentative hypothesis, and e) test the hypothesis against experience. For the most part, this has been considered a Type 1, rational, pragmatic method of problem-solving (Miller, 1988) which emphasized hypothesis-testing and was utilized for decision-making.

An Interdisciplinary Skills List was first proposed by Robinson, Tickle and Brison (1972) and then again by Robinson and Hedges (1982) consisting of: a) developing a focus, b) developing a framework, c) collecting information, d) using a data summarizing algorithm, e) interpreting the summary data, and f) translating the results into a message others can understand. (A variation of this Type 1 procedure was also developed by Ross and Maynes (1982.) The Robinson and Hedges model utilized the notion of "looping" to describe the nonlinear aspect of analytic problem-solving (i.e., that any individual learner may loop back to a previous step as new insights are developed. It could be argued that looping involves intuitive insights and thus is a Type 2 version).

Puk (1990) further developed a Process of Inquiry Model which emphasized analytic thinking, looping, and reflective components. This sequence consists of four global stages (developing a focus, developing a framework, developing a product, and reflection on the process and product) as well as fourteen specific steps:

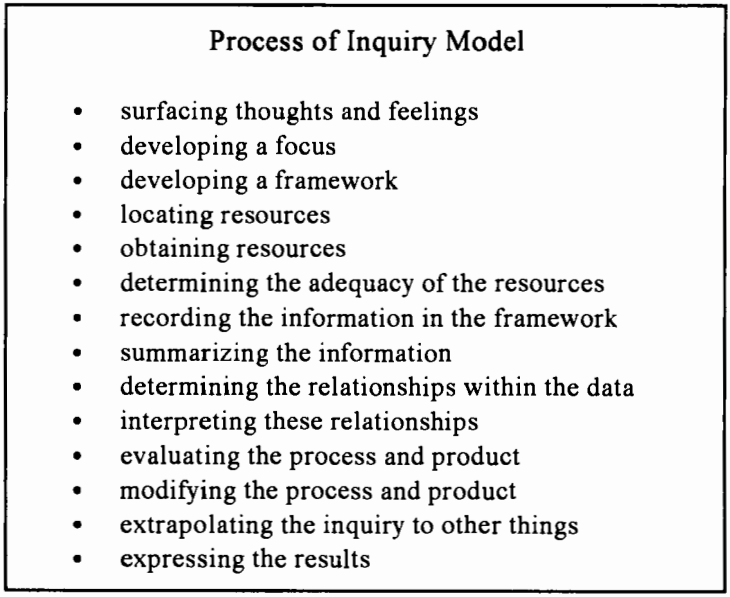

Figure 1

This list (as with all previous variations) is used to solve problems such as making comparisons, determining correlations, conducting cause/effect experiments, making decisions, defining concepts, and in developing

conceptual models (Puk, 1991, 1993, in press; Ontario Ministry of Education and Training, 1995a, 1995b).

Osborn (1953) and Parnes (1981) developed models which ultimately culminated in the Creative Problem-Solving (CPS) Model which involves: a) mess finding, b) data finding, c) problem finding, d) idea finding, e) solution finding, and f) acceptance finding. Although Miller (1988) has classified this model as being holistic in nature (which implies the inclusion of the unconscious and preconscious processes), in the author's mind it more closely resembles a Type 1 procedure which for the most part emphasizes rational thinking.

A true example of a Type 2 procedure is that of the Wallas Model (Wallas, 1926) which was based on work done by Helmholtz (Rigano, 1923). Helmholtz described three stages in the formation of a new thought: a) the problem is "investigated in all directions," b) conscious thinking about the problem ceases, and c) the appearance and the preceding associated feelings of the "happy idea" (i.e., the solution) occur. Wallas later named these stages a) preparation, b) incubation, and c) illumination, and added a fourth stage of verification. Wallas also described "intimation" as a moment within the illumination stage when the thinker "knows" that a solution is fast approaching. Wallas described this as "the state of rising consciousness which indicates that the fully conscious flash of success is coming" (Wallas, 1926, p. 97). In this resulting four step Wallas model, intuitive insights are sequenced *in between* rational processes (i.e., preparation and verification are conducted in the rational mind while incubation and illumination are conducted in the unconscious mind). Miller (1988) developed a variation of the Wallas Model which consists of: a) uncertainty/ambiguity, b) problem clarification, c) preparation/frameworking, d) incubation, e) alternative search, f) illumination/alternative selection, and g) verification. Again, intuitive insights and rational thoughts are arranged in an alternating sequence. It is important to note that this model, like the Process of Inquiry Model, is not meant to work in a linear, step-by-step process, but rather in a more fluid manner.

Bloom's Cognitive Taxonomy (Bloom, 1956/1971), although not originally intended to be used as a problem-solving procedure, might also be classified as a Type 1 procedure. In fact, the development of the cognitive, affective, and psycho-motor taxonomies which Bloom and his associates created might be a reason why there has for the most part, been an emphasis on the separation rather than the connections between rational and nonrational processes. Krathwohl's (1964) Affective Taxonomy might in fact be classified as an example of a Type 3 procedure in that it focuses primarily

on nonconscious processes. The instructional design of a Type 3 procedure will be the focus of the next section of this paper.

What Kind of new Instructional Designs Would Serve Teaching and Learning Better?

In the discussion above it has been noted that for the most part, learning processes have been developed that fall into two categories, one which focuses primarily on rational thinking and one which alternates rational thinking with nonrational processes. The ultimate quest of this paper is to indicate the requirements of a learning procedure which fully integrates both rational and nonrational processes. However, before we proceed with that endeavour (i.e., developing a Type 4 procedure), there is still some work to be done to strengthen Type 3 procedures.

Developing Type 3 models: The extra-rational learning procedure. To this point, nonconscious processes (i.e., those processes which exist at the unconscious and preconscious levels) have been referred to as being nonrational. However, as has been shown through our review of the PDP model of information processing theory, nonconscious processes may in fact be the foundations of rational thought. "PDP models seem to consider almost all information processing, including the higher mental functions involved in language, memory and thought, to be unconscious" (Kihlstrom, 1987, p. 1446). Thus, in the remainder of this paper the term *extrarational* will be used to describe those processes which are working at the unconscious and preconscious levels but which appear to be able to affect phenomenal awareness.

The research has also found that the unconscious can not be directly influenced through rational thought. However, it is the position of this paper that students can be taught meta-processes which can be used indirectly to manage and influence extrarational processes.

> One thing is now clear: consciousness is not to be identified with any particular perceptual-cognitive functions such as discriminative response to stimulation, perception, memory, or the higher mental processes involved in judgment or problem-solving. All of these functions can take place outside of phenomenal awareness. (Kilstrom, 1987, p. 1450)

In the development of a type 3 procedure, we first need to identify stages of extrarational processes which might be further elaborated upon and placed into a sequence. These stages are a) meditation, b) imaging, c) directed playfulness, d) aesthetics, e) directed incubation, f) relaxation, and g) aesthetics. Although there are many kinds of ***meditation*** (Wallas, 1926; Miller, 1988), in this sequence the author is referring to a clearing of the

mind in order to eliminate extraneous influences which might detract from the task at hand. This may have implications for the amount of noise in the learning environment which is acceptable for meditation to occur. *Imaging* (or visualization) attempts to draw representations from the preconscious levels into consciousness. This might include creating an image of the whole procedure which the learner is about to undertake as well as creating mental images of the particular structure being studied. Kneller (1966) used the term "intellectual playfulness" to describe the actions which a creative person might employ in order to toy with ideas. In this paper, the term "directed playfulness" is used to describe the "purposive doodling" a learner might employ in order to set up the situation whereby the preconscious can observe (beyond conscious control) new associations. Puk (1990, 1995) has previously described the integrated learner as one who playfully manipulates existing or known structure in order to create new associations. The learner would continue to do this until all intuitions have been exhausted. As the learner is playfully manipulating structure, she or he would be employing preconscious "aesthetic senses" to determine whether or not these new structural associations "feel right;" that is, do the findings exhibit balance, elegance, or logical simplicity? Einstein used the term "logical simplicity" to describe one important quality that all new theories should contain (Posner, et al, 1982). It is the author's belief that students can be taught how to employ this aesthetic sense in conjunction with directed playfulness.

Wallas (1926), Kneller (1966), Miller (1981), and Puk (1990, 1995) have all described the use of incubation in learning procedures. During incubation, unconscious processes take over during which time (as has been previously described in PDP) a great deal of activity is taking place. Although this activity may be lost to conscious awareness, PDP research holds that some very high level problem-solving is occurring. Most people, if they were to reflect on how they learn, would probably agree that quite often they will have left a particular problem that they have been thinking about without any resolution and at some later time the solution or some component of the solution will occur to them. Although most people experience this phenomenon, seldom do we teach students how to incorporate this into their learning in a more deliberate manner. During "directed incubation" (Puk, 1990), the learner summarizes and reviews what she or he knows about the task/problem at certain stages in the development of the problem and solution and then tries to indicate to the unconscious a variety of leads or directions for future exploration. In order to allow the unconscious to work unfettered by conscious thought, the learner would now move into the phase of *relaxation*. During this phase, the learner deliberately tries to slow down or hinder conscious thought by undertaking activities which do not tax

cognition. Activities such as listening to music, running, chopping wood, observing nature, and snoozing are examples of relaxing activities that can be deliberately employed to derail the conscious mind.

> Although inspiration [occurring during incubation] cannot be summoned to order, favorable conditions can be laid for it. To this end many writers and thinkers have adopted highly bizarre devices. Schiller, for example, filled his desk with rotten apples; Prost worked in a cork-lined room; Mozart took exercise; Dr. Johnston surrounded himself with a purring cat, orange peel and tea ... Those who write, think, or create all have their own methods of stimulating their creative [extrarational] powers. (Kneller, 1966, p. 5)

Again, the point is that students may be able to learn to employ similar kinds of assistance to stimulate the unconscious. How long the stage of directed incubation will take can not be predetermined.

The concept of directed incubation has significant implications for the way learning is organized in our schools. If incubation is a valuable aid to learning, it would seem to indicate that self-directed learning does not occur in 40-70 minute blocks of time and that the process of inquiry will continue beyond the school walls (e.g., during sleep). At some point, mental representations will begin to formulate and the learner will need to isolate and retain those images.

In summary, whenever complex problems or tasks are undertaken, the learner would: first go through a clearing of the mind (meditation); attempt to develop a mental image of what it is that is under considerati/on (imagery); record the image externally and then playfully manipulate the existing structure in order to allow the unconscious to observe new relationships (directed playfulness); decide whether the new structures feel right (aesthetics); deliberately leave the task having indicated to the unconscious what it might look for (directed incubation); participate in relaxing activities which take the cognitive mind off the task at hand (relaxation); allow new images to appear and then decide once again whether these new images feel right (aesthetics). Further expansion of these stages has resulted in the development of the Extra-Rational Learning Procedure (figure 2). It should be understood that this procedure follows a very loose sequence. At any point in the procedure, the learner may need to loop back to a previous step before proceeding to other steps. The learner may also need to loop ahead in the sequence at particular times and for particular problems. The Extra-Rational Meta-Learning Procedure is not an algorithmic process.

Extra-Rational Learning Sequence - Figure 2	
(Looping:	Be prepared to spontaneously loop back and forth throughout the sequence whenever the need arises, but generally progress towards the end of the sequence)
Meditation	• Develop a quietness in the mind by blocking out external stimuli
Imaging	• Develop an image of what you are going to do and review in the mind
	• Form an image of the current structure being attended to
	• Mentally manipulate the structure and observe new relationships
Directed Playfulness	• Retrieve the internal image and record externally (i.e., paper, computer, instrument, etc.)
	• Playfully rearrange the external structure until all intuitions are exhausted
Aesthetics	• As you playfully rearrange the structure, observe new relationships and determine whether they "feel right" or not (i.e., do the findings exhibit balance, logical simplicity, elegance, etc.?)
Directed Incubation	• Identify what you would like your unconscious to work on
	• Review those findings until they are internalized
Relaxation	• Purposively leave the problem and engage in activities which allow the conscious to relax and which stimulate the unconscious
	• As parts of structure begin to surface, isolate in the mind
	• Retain these mental images until they can be recorded
Aesthetics	• Again, as you observe new relationships, determine whether they "feel right"

Integrating Rational and Extrarational Meta-Learning Procedures (Type 4)

To summarize, it has been noted that while unconscious processing is not directly observable by phenomenal awareness, both conscious and unconscious processes can occur simultaneously and don't require one executive to be in control. Rather, processing may involve a number of interconnected units. As well, unconscious processing appears to be the foundation of higher level thinking involved in, for example, inquiry. How then can practitioners take advantage of these findings and attempt to make stronger the connections between the two and how can we teach students to use both rational and extrarational processes to their utmost?

In an earlier section, it was noted that many of the learning strategies developed to this point are either type 1 or 2. Thus, even in type 2 procedures, where rational and extrarational processes are mixed into one procedure, these processes are either not truly integrated, that is, they are still treated as separate, occurring in a one-then-the-other arrangement (e.g., Wallas/Miller Model) or they are not explicitly identified (e.g., Creative Problem-Solving). Seldom have rational and extrarational processes been shown to occur *simultaneously*.

The concept of reciprocal permeation has been used as a metaphor to explain how simultaneous integration might occur (Puk, 1990). One might think of rational and extrarational processes being separated by a permeable membrane. As the need occurs, as each rational process is being utilized, extrarational processes flow through the membrane and work in conjunction with rational processes. There might also be times when an extrarational process is being utilized and this draws a rational process through the membrane. We can not predict with any certainty when the learner will need to use either rational or extrarational processes or when she or he will utilize them simultaneously; however, we can arrange the learning procedure so that the learner can visualize the path she or he might take. This brings us to the development of a conceptual model which will describe the integration of the conscious and unconscious worlds.

In order to develop this model, two sets of processes are required, one representing the rational and one representing the extrarational. Earlier in the paper, the analytical problem-solving procedure pioneered by Robinson and Hedges and elaborated upon by others was reviewed. Field testing of these elaborations have demonstrated significant increases in problem-solving ability (Robinson, Ross & White, 1985; Ross, 1981; Ross & Maynes, 1985; Puk, 1987). In figure 3, the four global stages of this rational procedure (figure 1) have been integrated with the Extrarational Learning Procedure (figure 2) to develop a model which explains how integration is achieved. Figure 3 also demonstrates the concept of reciprocal permeation. The line separating the two sets of processes acts as a permeable membrane through which either set of processes "flow" as the need arises during any particular learning episode. It should be noted that not every learner will use all of the extrarational processes with each of the rational skills.

The result of this model has been the development of a learning procedure which students can be taught in the classroom. The Strategy for Integrative Learning (figure 4) links the specific skills of rational problem-solving/inquiry with the extrarational processes which have been identified in this paper.

Model of Integrative Thinking/Learning - Figure 3

Developing a Focus		Developing a Framework		Developing a Resulting Product		Reflection	
↑		↑		↑		↑	
-surface thoughts & feelings -establish a focus	Meditation Imaging Playfulness Aesthetics Incubation Relaxation	-establish a framework -obtain resources -determine adequacy -record data	Meditation Imaging Playfulness Aesthetics Incubation Relaxation	-summarize data -determine relationships -interpret relationships	Meditation Imaging Playfulness Aesthetics Incubation Relaxation	-evaluate process/ product -extrapolate -communic. results	Meditation Imaging Playfulness Aesthetics Incubation Relaxation

Stragegy for Integrative Learning - Figure 4

	Meditation	Imaging	Playfulness	Aesthetics	Incubation	Relaxation	Aesthetics
Surfact thoughts & feelings							
Develop a focus							
Develop a framework							
Locate & obtain resources							
Determine adequacy of information							
Record data							
Summarize data							
Determine relationships							
Interpret relationships							
Evaluate process/product							
Modify process/product							
Extrapolate beyond inquiry							
Communicate results							

For each skill in the rational list, the student might need to clear his or her mind, develop an image of the intended structure, playfully rearrange the structure and allow the preconscious to observe new relationships, leave the problem for a period of time and allow the conscious mind to relax until new images begin to formulate once more. It is hoped that with further research we might be able to determine which extrarational processes would be used most often with specific rational skills. However, it is doubtful (and probably undesirable) that we could ever determine anything more than probabilities of integrative linkages rather than absolute connections.

What are the Practical Implications of this Research to Teaching and Learning?

Some of our school classrooms as well as the educational system as a whole do not appear to be managed in a way which would be most conducive for the integration of extrarational and rational processes. The following are some implications of the findings in this paper:

- In order to incorporate the concept of directed incubation, we would have to reexamine what constitutes a teaching/learning episode. Learning can not be confined to 40-70 minute time slots. Attempting to force learning to occur in such a manner is not the most optimum arrangement. Use of the processes of incubation and relaxation also imply that the learner needs to be able to move fluently from a very focused learning episode to one which does not tax the conscious mental processes as much.
- It is important to keep in mind that for some learners, being able to handle multiple tasks or problems is desirable and energizing. This implies the need to allow for individual programming on a scale not yet common in most schools.
- The conducting of meditation, incubation, and relaxation will require a degree of quietness in the learning environment which is often absent from the modern vocally-active classroom which stresses verbal communications as a kind of obsession.
- The development of an aesthetic appreciation to be able to recognize new and fruitful associations in the generated data will require much more attention to be given to the arts and then to how these aesthetic learnings can be utilized within all subject-matter.
- The extrarational sequence found in figure 2 does not always need to be integrated with inquiry/problem-solving. The completion of any task would benefit through the use of these processes. Artistic endeavours such as painting, developing a schema for writing, creating music, designing a choreography, and so on, all employ these processes whether

they are used intuitively or purposively. Students need to internalize this flexible sequence so that these processes become a natural part of thinking and reflection.

- The current preoccupation towards self-congratulatory efforts to demonstrate that students are mastering the basics, by developing national evaluation standards, distracts from a focus on what Elmore (1992) has referred to as teaching for "conceptual understanding" or Perkins (1991) has referred to as teaching for "insight." The whole learner needs to master more than just the basics; she or he needs to learn to make connections between conscious, preconscious, and unconscious processes. Modern society, for some time, has been a much more complex place where reliance only on the basics would suffice. But neither should we fall victim to the perpetual polemical debate similar to product versus process. The basics can and should be attended to within the larger employment of complex learning strategies.
- How much of the school day should involve schema development, that is, creating, designing, planning, inquiring, problem-solving versus simply doing? Doing may in fact involve these processes but the difference is that students involved in just doing are following someone else's schema rather than having been taught how to and being able to develop and follow their own. If the goal of schooling is to develop the whole learner, than most of the day should involve the teaching of and the conducting of schema development.
- Teachers do not receive adequate inservice (and perhaps preservice) training in regard to complex learning processes. Even if teachers are made aware of such learning processes, it is difficult to master them on the job while attempting to deal with classroom management. Much more systematic support will be required before the dependency on teaching the traditional basics can be ameliorated.

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Tom Puk is an Associate Professor in the Faculty of Education at Lakehead University. He has written articles on process of inquiry, technology education, design processes, a meta-model of educational processes, analysis of curriculum guidelines, epistemological implications of training social science teachers, and gifted education. Current research involves examining grace as a form of nurturing in teaching and self-directed learning/teacher research.