Title	Metacognition and metalearning essential differences
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METACOGNITION AND METALEARNING
ESSENTIAL DIFFERENCES

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In recent years, research in the domain of cognitive psychology has provided us fresh insights into student thinking and learning. Of particular significance to the classroom teacher are new concepts such as metacognition and metalearning because of their impact on pedagogy and the curriculum. Advances in cognitive science have encouraged educators to pay more attention to students' thought and learning processes. We have come to realise that students will be better equipped for the future if they are good thinkers and effective learners. Many thinking programs have subsequently emerged based on metacognition and metalearning. The purpose of this brief paper is to provide a clearer definition of both these terms and to describe their essential differences or similarities and to clarify their relevance to classroom instruction.

The word "meta" is derived from the Greek, meaning after, amidst and over and above . In case of metacognition , it would refer to transcending our thinking or thinking about thinking. However in the definition of metalearning it is not so simple as learning about our own learning or thinking about our learning.

METACOGNITION

Of the two terms, metacognition has been defined in more numerous ways than metalearning from the literature on cognitive psychology. "Thinking about thinking" consists in some type of mental activity which the mind seems to perform when thinking. Thinking can be described in terms of mental operations of which there are two types: cognitive and metacognitive. Cognitive operations consist of those operations used to generate or find meaning. These operations include a variety of complex strategies such as decision making, problem solving or conceptualising as well as less complex strategies like analysing and synthesizing. Metacognition on the other hand, consists of those operations by which we direct and control these meaning-making strategies and skills. In directing one's efforts to find or make meaning, the major operations of planning, monitoring and assessing one's thinking are included. Both cognitive operations (ie operations designed to produce meaning) and metacognitive operations (ie operations that direct how that meaning is produced) are combined in any act of thinking.

Metacognition in other words is one of two important mental operations involved in thinking. Thinking generally is the mental process by which individuals make sense out of experience. There are many key components of thinking out of which metacognition is one of them. (Figure 1)

The term metacognition came from Flavell (1976) a developmental psychologist who refer to it as "one's knowledge concerning one's own cognitive processes ... and the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear" (p 232)

Some researchers describe metacognition as the highest, most sophisticated level of thinking. Many conceive of it as the executive function of the mind, that function by which individuals manage and control how they go about using their minds. (Beyer 87. p 192) The key operations in metacognition are

1 Planning
- Stating a goal
- Selecting operations to perform
- Sequencing operations
- Identifying potential obstacles/errors
- Identifying ways to recover from obstacles/errors
- Predicting results desired and/or anticipated

2 Monitoring
- Keeping the goal in mind
- Keeping one's place in a sequence
- Knowing when a subgoal has been achieved
- Deciding when to go on to the next operation
- Selecting next appropriate operation
- Spotting errors or obstacles
- Knowing how to recover from errors, overcome obstacles

3 Assessing
- Assessing goal achievement
- Judging accuracy and adequacy of the results
- Evaluating appropriateness of procedures used
- Assessing handling of obstacles/errors
- Judging efficiency of the plan and its execution

What is represented here is a rather idealized picture of what happens in one's mind when engaging in thinking most effectively and efficiently. John Barrell (1991) identified similar processes associated with metacognition. He noted them as planning, monitoring and evaluating of our thinking. This self-questioning, reflecting and regulating may be the essence of metacognitive awareness and control.

It has been argued that metacognition is not something that one should expect young students to be able to do initially. Metacognitive abilities take time to develop and it is doubtful if all students can engage in such thinking before the formal operations stage. According to Brown (1980) and Markman (1977)

metacognition is a developmental skill that does not automatically increase with age. Hence supplementing teaching with metacognitive aspects would benefit most early learners towards a higher level of competence.

METALEARNING

There are not too many definitions of metalearning in the literature compared with numerous interpretations of metacognition, although in recent years both have gained increased importance as explanatory concepts in student learning. A great number of studies have been conducted aiming to seek ways to provide students with metacognitive instruction and metalearning strategies to enhance learning. (Lorna Chan 1987)

According to Biggs and Telfer (1987) when a student is aware of himself as an active agent in the process of learning, metalearning is said to have taken place. The student will be able to select the learning strategies to suit his motives and purposes. He will no longer be concerned with just WHAT to learn in order to achieve his educational goals. Once metalearning strategies are part of his knowledge repertoire, he would be able to adopt or adapt and apply these strategies to any problem-solving situation beyond his school years.

This activity of "deliberately becoming aware of, monitoring, and controlling our learning" includes the ability to :

* estimate and monitor his competence in finishing a task
* plan and organise strategies to solve a problem
* select and apply appropriate strategies
* identify and correct his mistakes
* evaluate his overall performance on completing a task

Students who engage in metalearning activities, according to Lorna Chan(1987) frequently reflect on their motives and goals of learning, their selection and adaptation of strategies, and their monitoring of their performance. High levels of metalearning activity indicate a DEEP APPROACH to learning or superior metacognitive skills. It has been suggested that unlike metacognition, metalearning is probably easier to introduce to younger students to help them consciously plan, implement and evaluate their own strategic approaches to learning.

It was noted that learners need to know how to learn, how to use what they have learned and how to communicate what they have learned. They must be able to define the problem, get the facts, analyse the facts, weigh alternative solutions and determine how to evaluate the chosen solution, thus providing feedback for the future decisions.

The goal of the Early Metalearning project is to foster this ability in the primary schools. The research team members have defined metalearning generally as an awareness of one's employment of learning strategies which covers

1. knowledge of
2. monitoring of
3. control of and
4. reflection on the purposes of learning.

For example in the process of problem solving, characteristics of a meta learner would include

1. learning to solve the problem
2. learning through problem solving and
3. learning as problem solving itself.

Specifically, metalearning involves an AWARENESS of one's knowledge of the particular tasks at hand , an understanding of the requirements of the tasks and the regulation and control of the processes in completing the tasks. The knowledge required in the solution of problems can be categorized into DECLARATIVE knowledge (what) PROCEDURAL knowledge (how) and SITUATIONAL or CONDITIONAL knowledge (when and why)

The regulation of processes in problem solving includes

1. selecting suitable strategies
2. planning and organising the sequence of steps in the solution
3. monitoring the on-going activity
4. reviewing the progress of the task and
5. making modifications when necessary.

A very important characteristic of metalearning is the ability to TRANSFER knowledge, skills and solutions to related situations (transsituational). The other important characteristic is the prefix of SELF because we want each student to become increasingly able to engage in these processes willingly, capably and consciously. In fact, a major part of metalearning is enabling the students to take more responsibility for their own learning.

In the attempt to clarify the differences between metacognition and metalearning, it is important to distinguish clearly between the two terms commonly used to describe them - particularly SKILL and STRATEGY. The word skill has several connotations - it can mean an ability to execute or perform a task rapidly and accurately in expert fashion or an ability to think well such as recalling and analysing. Skills are often discrete, thinking operations such as clarifying, detecting bias, synthesizing whereas strategies describe much more complex, sequential operations such as problem-solving and decision making.

In a simple sense, metacognition involves more skills whereas metalearning embodies more strategies. Thinking however includes both operations - skills and strategies and two important metalearning strategies which the research team has focussed on are Problem-Solving and Concept Mapping. (to be elaborated in the next paper) There are of course many other

types of metalearning strategies which can be developed and taught to help children improve in the way they manage their studies.

IMPLICATIONS

Research in the field of metacognition and metalearning has provided evidence that the competent learner responds to internalized strategies for thinking and problem solving that results in consistent steady performance. One important aspect of metacognition and metalearning is that they develop primarily through social interaction with adults and other children. The child's experiences become modified through feedback and suggestions. An awareness of the need for self-regulation normally comes about as a result of such interpersonal transactions. Such specific mediated learning experiences can be most beneficial and these are to be highly encouraged in the classrooms. (Feuerstein 1980)

Too often in schools, the teacher tends to concentrate on one simple competence like the ability to perform addition or subtraction. It is taught, practised and then evaluated. If this performance is acceptable, then the next skill is taught and so on. The main kinds of knowledge taught are the declarative and procedural types (knowing what and knowing how). In the light of research on metacognition and metalearning, classroom instruction can be enhanced by incorporating strategic behaviour instead of skilled behaviour into the conditions of learning. Students can develop strategic, self-controlled behaviour and the ability to adapt to changing conditions. Feuerstein identified two important notions of Intentionality and Meaning on the part of the learner and the teacher in the mediation process.

Schmitt and Newby (1986) advocated that instruction should incorporate "learning of conditional knowledge (ie knowing when a skill or strategy is appropriate and why) as well as learning of task-relevant strategies for planning, monitoring and revising. ... Several aspects of design such as learner and task analyses, performance objectives, and evaluation instruments would be affected and would need to be adapted accordingly."(p 31) Instructional stategies would therefore have to be changed.

There are several positive effects on the learner in terms of overall performance if metalearning strategies are fostered and developed. Generally learners become more motivated, more efficient in their learning, more enhanced in their level of achievement and they learn to be extra strategic and reflective as they plan and monitor their own learning. In addition, they quickly gain confidence in their own abilities to use appropriate strategies eg a child who believes in her own competence will deal with a mistake as a temporary obstacle, a challenge to be overcome by changing strategies. She will slow down, think about what she did wrong, rethink assumptions and so on.

CONCLUSION

In conclusion, both metacognition and metalearning appear to "involve knowledge and regulation of cognitive processes resulting in strategic and adaptive behaviour on the part of the learner."(Schmitt and Newby, 1986, p33). Research on these two constructs is relatively recent and is usually confounded by operational definition problems and the accompanying methodological setbacks. In general, there is a tremendous opportunity to consider each construct not only from its own conceptual perspective but also from the standpoint of its wider potential practical import. While studies have been extensive and intensive in metacognitive research, investigations into metalearning have stressed more upon the awareness and dispositional aspects of learning strategies. The area of thinking and learning is much too wide for any one general strategy or a set of skills to cover adequately.

This brief paper hopes to illuminate the essential differences between these two conceptions, but more importantly is to point out the necessity to incorporate these aspects into the conditions of classroom teaching, in order to enhance the learner's competence in thinking and learning at a higher level.

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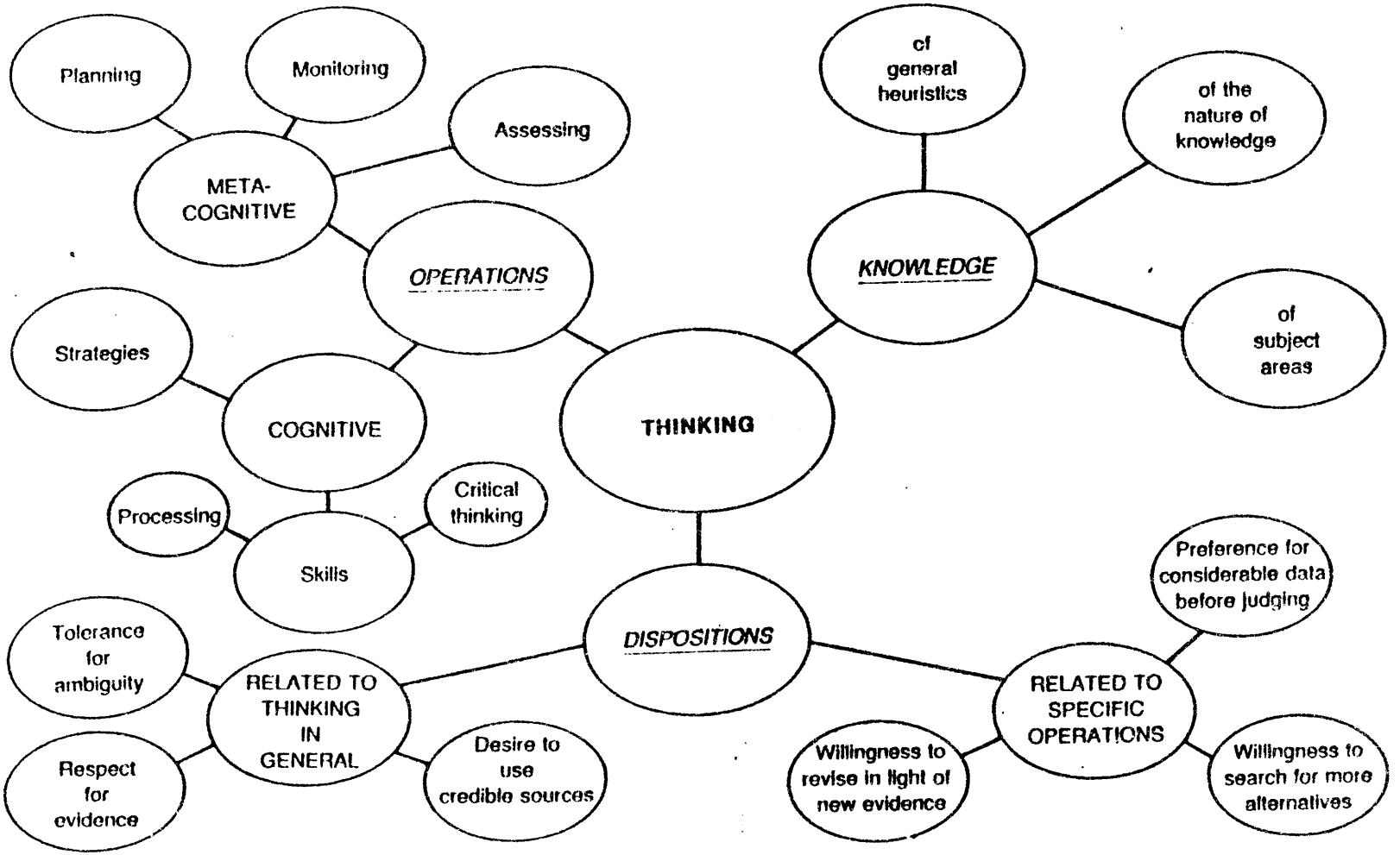

Figure 1.1 Key Components of Thinking

(from Beyer, B.K. Practical Strategies for the Teaching of Thinking. Allyn and Bacon. 1987. Page 18)