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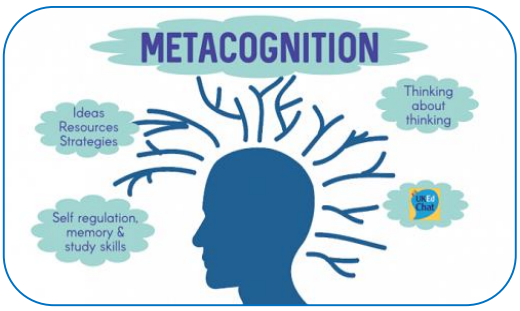
INFLUENCE OF METACOGNITION ON INTELLIGENCE OF HIGHER SECONDARY STUDENTS OF KERALA

Anas K.

ABSTRACT:



It is developing one's self-knowledge and ability to 'learn how to learn' resulted in Metacognition being awarded a high status as features of learning. The ground for developing such an interest proved particularly fertile, especially because of a constantly changing technological world when not only it is impossible for individuals to acquire all existing knowledge, but it is also difficult to envisage what knowledge will be essential for the future. The subsequent calling for the inclusion of Metacognition in the development of school curricula, therefore it seems fully justified. It is proposed that good schools should be 'hotbeds of metacognitive development' because of the opportunities they offer for self-conscious learning. It's like a first-order cognition, a type of situated cognition. Metacognition works, in part by controlling the interaction of person and world. It is a component in the dynamic coupling of agent and environment. Metacognition, from a distributed and situated approach, is concerned with managing resources. These resources may be processes involved in internal cognitive functioning, but as likely as not, they are objects and processes in one's immediate environment.

KEYWORDS: *Metacognition, Intelligence, Higher Secondary Students.*

INTRODUCTION :

The term 'Metacognition' was introduced by John Flavell in the early 1970s based on the term 'metamemory' previously conceived by the same scholar (**Flavell**, 19785). He viewed Metacognition as learner's knowledge of their own cognition, defining it as 'knowledge and cognition about cognitive phenomena' Metacognition is often referred to in the literature as thinking about one's own thinking' or as cognitions about cognitions. It is usually related to learner's knowledge, awareness and control of the processes by which they learn (**Brown** 1987, **Garner** & **Alexander** 1989) and the Metacognitive learner are thought to be characterized by the ability to recognize, evaluate and, where needed, reconstruct existing ideas (**Gunstone**, 1991). **Flavell's** (1971) definition was followed by numerous others often portraying different emphases on (different understanding of mechanisms and processes associated with Metacognition. Paris and his colleagues (**Cross** and **Paris** 1988, **Paris** and **Winograd** 1990) identified two essential features in their definition of Metacognition: 'Self appraisal' and 'Self-management' of cognition. Self-appraisal of cognitions comprises reflections about learners understanding, abilities and affective state during the learning process, while self-management refers to 'Metacognitions in action that is, mental processes that help to orchestrate aspects of problem-solving' (**Paris** & **Winograd**, 1990).

Brown (1987) pointed out in a review of the origins of Metacognition, 'Processes Metacognitive' have been recognized and advocated by educationists such as **Dewey** (1910) and **Thorndike** (1914) well before the emergence of the term 'Metacognition' especially in the area of reading and writing. **John Locke** (1924), for instance used the term 'reflection' to refer to the 'perception of the state of our own minds' or 'the notice which the mind takes of its own operations' (**Locke**, 1924). The importance of the concept of reflected abstraction to human intelligence was later discussed by **Piaget** (1976), who pointed out the need for making cognitions explainable and available to consciousness. At that point, they can be worked on and further extended (**Campione**1987). Notably, the work of **Piaget** (1976) was introduced to many in the United States by **Flavell** (1963), maintaining a profound impact on **Flavell**'s (1963) writings and the development of his notion of Metacognition. 'Introspection, a technique used by early Psychologist.

In searching for the origins of Metacognition others go far beyond the twentieth century. As **Spearman** (1927) pointed out, such a cognizing of cognition itself was already announced by Plato. Aristotle likewise posted a separate power whereby, over and above actually seeing and hearing, the psyche becomes aware of doing so, designating the processes of cognizing one's own cognition by several specific names. Much later, special stress was laid on this power of 'reflection' as it was now called by **Locke** (1923).

Challenging as it might be to pinpoint the exact origins of Metacognition, it is by far easier to reach agreement over the fact that recent attention in Metacognition has resulted in the reawakening of interest in the role of consciousness, awareness or understanding in thinking and problem solving (**Campione** 1987)

DEFINITIONS OF METACOGNITION

Flavell (1978) was the first to define Metacognition when he said it was knowledge that takes as its object or regulates any aspect of several cognitive endeavours. **Brown** and **Baker** (1984) further defined the idea of Metacognitive knowledge by emphasizing differences between static and strategic knowledge. Static knowledge, according to **Brown** and **Baker** (1984) is what people are able to verbalize about cognition; whereas strategic knowledge consists of the strategies that people use to regulate a particular cognitive activity. These strategies consist of (1) planning - figuring out how to begin or continue; (2) predicting-estimating how much will be remembered or understood or how much time it will take to complete a particular cognitive task; (3) guessing - hypothesizing an answer before reaching a complete cognitive solution; and (4) guessing - hypothesizing an answer before reaching a complete cognitive solution, and (5) monitoring - continually deciding how well progress is being made towards the accomplishment of some cognitive goal. **Baker** and **Brown** (1984) later modified their definition of Metacognition claiming that it is an awareness of what skills, strategies, and resources are needed to perform a task effectively; and the ability to use self-regulatory mechanisms to ensure successful completion of a task. Although, originally, **Flavell** (1978) used the term Metacognition to describe the awareness of "knowing" in relation to the memory, more recently **Baker** and **Brown** (1984), based on the preceding theoretical work of themselves, have presented a model for Metacognition related specifically to the reading task. They claimed that certain strategies had been traditionally taught as comprehension, critical reading, and study skills, but now are re-labelled as Metacognitive skills because they can be consciously invoked by the reader to aid in focusing on the important content in monitoring comprehension.

These skills include the following acts by the reader: (1) consciously intending to control the reading act; (2) establishing the goal of the reading act; (3) focusing on Metacognitive knowledge; (4) planning the regulation and monitoring of the reading act; and (5) periodically assessing reading success. **Brown** and **Baker** (1984) claim the advantage in viewing these skills Metacognitive is that the reader must assume more responsibility for this knowledge and control.

Perhaps the most straight forward definition of Metacognition is that it is thinking about thinking (**Flavell**, 1999; **Bogdan**, 2000; **Metcalfe**, 2000) however, this definition requires further elaboration because Metacognition also involves knowing how to reflect and analyses the thought and how to conclude that analysis, and how to put what has been learned into practice. In order to solve problems, students often

need to understand how their mind functions. In other words, they need to perceive how they perform important cognitive tasks such as remembering, learning and problem- solving.

Kluwe (1987) refined the concept of Metacognition by noting two characteristics: the thinker knows something about their own and others thought processes and the thinker could pay attention and change their own thinking. This latter type of Metacognition was called by 'executive processes'. **Hacker** (1998) pointed out the difference between 'cognitive tasks' (remembering things learned earlier that might help with the current task or problem) and 'Metacognitive tasks' (monitoring and directing the process of problem-solving), stressing the importance of learning more about thinking. **Cornoldi** (1998) emphasizes the role of learner's beliefs about thinking and makes the point that if students feel confident that they can solve problems. They tend to do better work. In defining Metacognition as thinking about thinking or second-order cognition, **Weinert** (1987) acknowledges that purpose, conscious understanding, ability to talk or write about tasks and generalize ability to other tasks are also important factors in determining whether a given task is Metacognitive. This viewpoint is supported by **Brown** (1987), who agrees that Metacognition requires the thinker to use and describe the process of mental activity.

Many other researchers also make the point that Metacognition is best defined by acknowledging that it is the knowledge about and control over thinking processes (**Allen** & **Armour,** 1991)

COGNITION AND METACOGNITION

Thinking takes place in a variety of ways. Where thinking is purposeful and is based on experiential data, we call it cognition. So where the objects of purposeful thinking are real objects (as perceived by the individual concerned) or are abstractions of real objects and their properties, then the thinking is cognition. In this sense, cognition mediates between the learner and the experiential world and the objects of cognition are real objects, ideas and abstractions. Hence learners can be engaging in cognition when they are working with parallel lines, whether or not a drawing of parallel lines exists in their sight.

Another form of purposeful thought, and one that is also involved with problem-solving, is Metacognition. Metacognition mediates between the learner and their cognition. While cognition can be considered as the way learner's minds active in the real world, Metacognition is the way that their minds act on their cognition.

It is worth noting that Metacognition comes into play when cognition becomes problematic. Metacognition becomes essential when tasks are more challenging. This may occur at any stage in a contemplative situation from the beginning to the end. Hence Metacognition has been strongly linked with problem-solving where problems are usually not of any standard type.

Metacognitions are second-order cognitions: thoughts about thoughts, knowledge about knowledge, or reflections about actions. However, problems arise when one attempts to apply this general definition to specific instances. These problems concern whether Metacognitive knowledge must be utilized whether it must be conscious and verbalizable and whether it must be generalized across situations.

In an attempt to make such a distinction, **Flavell** (1976) suggested that cognitive strategies 'facilitate' learning and task completion, whereas Metacognitive strategies 'monitor' the process to use a clear-cut example by **Flavell** (1976), asking oneself questions about this article might function either to improve one's knowledge (a cognitive function) or to monitor it (a Metacognitive function), hence demonstrating co-existence and interchangeability of cognitive and Metacognitive functions. For **Pressely** and **Waller** (1984), cognition is referring to the actual processes and strategies used by the learner. In contrast, Metacognition is referring to what a person knows about his/ her cognitions and to the ability to control these cognitions. **Watts** (1998), on the contrary, views Metacognition in a hierarchical relationship to cognition. It is a meta-language, he says, which permits individuals to talk about what is happening in their first level of feedback governed learning, representing second-order change.

COMPONENTS OF METACOGNITION

According to the classic models, Metacognition primarily consists of Metacognitive knowledge (a declarative component) and regulation (a procedural component). Metacognitive knowledge refers to knowledge about cognitive tasks. Strategies and knowledge learners possess about themselves and people (**Flavell**, 1979). Regulation refers to the monitoring and control of one's cognitive processes during learning (**Nelson** & **Narens**, 1990).

- **Metacognitive knowledge**

Metacognitive knowledge is the first component of Metacognition. Knowledge about cognition corresponds to what students know about themselves, strategies, and conditions under which strategies are most useful. Declarative, procedural, and conditional knowledge can be thought of as the building blocks of conceptual knowledge.

- **Declarative Knowledge**

Declarative knowledge is the factual knowledge the learner needs before being able to process or use critical thinking related to the topic. This is knowing about, what or that. It is knowledge of one's skills, intellectual resources and abilities as a learner. Students can obtain knowledge through presentations, demonstrations and discussions.

- **Procedural Knowledge**

Procedural Knowledge is the application of knowledge to complete a procedure or process. It is the knowledge about how to implement learning procedures. It requires students know the process as well as when to apply the process in various situations. Students can obtain this knowledge through discovery, cooperative learning, and problem-solving.

- **Conditional Knowledge**

Conditional knowledge is the determination under what circumstance of specific processes or skills should transfer. It is knowledge about when and why to use learning procedures. This is the application of declarative and procedural knowledge with certain conditions presented. Students can obtain this knowledge through simulation.

DEVELOPMENT OF METACOGNITION AMONG CHILDREN

Research shows that all these Metacognitive components develop with age. Children show a developmental trend in understanding the effects of task difficulty and strategy use on memory performance and that, by age 11 or 12, knowledge of most facts about memory is well developed (**Schneider** & **Lockle**, 2002). The capability of using cognitive strategies appears to develop by the age of 10 or 12 (Schneider, 1985). Children of 10 and 12 years old are above up to regulate their learning by devoting more time to studying hard items than easy items when compared to 6 and 8 year old children (**Dufresne** & **Kobasigawa**, 1989). The 10 year olds did better than 7 year olds in judgements of learning (**Pressley** et al. 1987) and ease of learning judgements improved from young to late elementary school years (**Schneider** et al. 1990). The 11 to 12 years olds were more likely to reflect on their own performance and evaluate or control their cognitive abilities compared to 7 to 8 year olds (**Schunk** & **Rice** 1987).

MEASUREMENT OF METACOGNITION

Metacognition can be assessed in several ways, but one of the most popular methods currently in widespread use in schools, colleges and universities worldwide is through the use of questionnaires which require students to report their perceptions about their thinking and problem-solving skills and strategies. It is generally accepted that most students who struggle at university could improve their performance considerably if they understood the learning process better. **Weinstein** (1987) pointed out that poor grades

begin to rebound when students learn the trick of pinpointing the key points in lectures and assert that learning is more effective when we engage in thinking about the process of learning, thinking and problem-solving. As a result of Weinstein's work in the field of strategic learning at the University of Texas at Austin, the Learning and Study Strategies Inventory (LASSI) was developed, which is now one of the most widely used learning inventories. The LASSI measures students, perceptions of their study, learning strategies and methods. In other words, it is a measure of the students thinking about their thinking or Metacognition.

The tool consists of ten scales, and 80 items which provide an assessment of students' awareness about and use of learning and study strategies related to the skill, will and self-regulation components of strategic learning. Research has repeatedly demonstrated that these factors contribute significantly to successful study and that they can be learned or enhanced through educational interventions such as learning and study skills course (**King** ,1991; **Letteri**, 1992; **Weinstein,** 1994; **Hanley**, 1995).

The LASSI provides standardized scores for the ten different scales and provides students with a diagnosis of their strengths and weaknesses, compared to other students, in the areas covered. It measures three main areas of 'strategic learning' as follows.

The skill component

These scales examine student's perceptions (Metacognition) of their learning strategies, skills and the thought processes related to identifying, acquiring and constructing meaning for important new information, ideas and procedures. The LASSI scale related to the skill component of strategic learning are:

- Information processing: the ability to process ideas by mentally elaborating on them and organizing them in meaningful ways.
- Selecting main ideas: the student's ability to identify the important information in a learning situation.
- Test strategies: the student's ability to prepare effectively for an examination and to reason through a question when answering it.

❖ The will component

These scales measure students' perceptions of their receptivity to learning new information, their attitudes and interest in college, their diligence, self-discipline and willingness to exert the effort necessary to complete academic requirements successfully, and the degree to which they worry about their academic performance. The LASSI Scales related to the will component of strategic learning are:

- Attitude: the students perceived motivation and interest to succeed in his/her study and willingness to perform the tasks necessary for academic success.
- Motivation: the extent to which the student accepts responsibility for performing academic tasks by using self-discipline and hard work.
- Anxiety: the degree of anxiety perceived by the student when approaching academic tasks.

❖ The self-regulation component

These scales measure student's perceptions of how they manage, self-regulate and control the whole learning process by using their time effectively, focusing their attention and maintaining their concentration over time, checking to see if they have met the learning demands for a class, assignment or test, and using study supports such as review sessions, tutors or special features of a textbook. The LASSI Scales related to the self-regulation component of strategic learning is:

- Concentration: the student's perceived ability to focus his or her attention, and avoid distractions, while working on school-related tasks like studying.
- Time management: The student's perception of the extent to which they create and use schedules to manage their responsibilities effectively.

- Self-testing: the student's awareness of the importance of self- testing and reviewing the learning material.
- Study aids: the student's perceived ability to use or develop study aids that assist with the learning process.

There is a wealth of research, making use of the LASSI as a measure of Metacognition, which identifies the value of learning to learn interventions in schools, colleges and universities (**Loomis**, 2000); however, few studies have tried to identify factors outside the learning institution that might impact upon the development of Metacognitive skills in students. In the present study, the Research used a standardised tool to measure the Metacognition of Higher Secondary School Students named as Metacognition Assessment Questionnaire (MAQ) (**Usha** & **Noushad**, 2010).

The Functions of Metacognition

Metacognition is used to refer to the awareness individuals have of their own thinking; their evaluation of that thinking; and their regulation of that thinking (**Wilson**, 2010). This definition is consistent with existing literature but also extends that literature. These three functions of Metacognition: awareness, evaluation and regulation require careful specification.

Metacognitive awareness relates to individual's awareness of where they are in the learning process or in the process of solving a problem, of their content-specific knowledge, and their knowledge about their personal learning or problem-solving strategies. It also includes their knowledge of what needs to be done, what has been done and what might be done in particular learning contexts or problem-solving situations.
Metacognitive evaluation refers to judgments made regarding one's thinking processes, capacities and limitations as these are employed in a particular situation or as self- attributes. Such an evaluate function assumes some awareness of the individual's thinking processes and anticipates the possible regulation of those processes.

Metacognitive regulation occurs when individuals make use of their Metacognitive skills to direct their knowledge and thinking. Metacognitive regulation draws upon individual's knowledge (about self and strategies, including how and why they use particular strategies) and uses executive skills (Such as planning, self-correcting, setting goals) to optimize the use of their own cognitive resources. When thinking Metacognitively, learners reflect on their existing knowledge or thought processes. Individuals may be aware of, evaluate or regulate their own thinking.

Metacognition need not be studied in splendid isolation. A large group of researchers are involved in determining the complex relations between metacognitive experience, epistemological beliefs, metacognitive knowledge, self- regulation, on the one hand, motivational processes, self- efficacy and study interests on the other (**Pintrich** & **De.Groot**, 1990; **Zimmerman** & **Martinez-Pons**, 1990). Others are interested in the relationship between Metacognition and affective variables, such as test anxiety. Some focus on the role of Metacognition in learning disorders, or disabilities (**Borkowski** & **Muthkrishn**a, 1992) Learning does not take place in a void, and neither does Metacognition. How individual difference and contextual factors interact with Metacognition and its various components have to be studied. Neuropsychological research on Metacognition has been limited to highly specific Metacognitive processes. Since Metacognition is a type of situated cognition; it is crucial for an individual's ability to succeed in life. Metacognition makes aware an individual about his own cognitive processes which may act as a key to Intelligence.

RESEARCH METHOD

The researcher has followed the normative survey technique for the study. Normative survey technique describes and interprets what exist at present. In Normative-Survey method, the word 'survey'

indicates the gathering of the data, the word 'normative' is used because surveys are frequently made for the purpose of ascertaining which is the normal or typical conditions or practice.

POPULATION AND SAMPLE

Population means the aggregate or totality of objects or individuals regarding inferences is to be made in a sampling study. All the Higher Secondary School students studying in Government and Government aided schools of Kerala state as the population of the present study.

The study is conducted using a representative sample of 800 higher secondary school students selected from Kannur, Calicut, Malappuram, Trichur and Palakkad Districts of Kerala. Stratified Random sampling method is adopted for this study.

Tool

Metacognition Assessment Questionnaire was constructed and standardised by Usha and Noushad (2010) for measuring Metacognition of Higher Secondary School students. This tool is constructed and standardised tool developed in the Kerala context. This questionnaire consists of 34 items from two major dimensions of Metacognition, viz, knowledge of cognition and regulation of cognition. The items can be answered either 'Yes' or 'No'. Yes, responses yield a score of 1 and no responses 0. The total score obtained for each sample is calculated to identify the Metacognition of higher secondary school students.

RESULTS

The coefficient of correlation between Metacognition and Intelligence for the whole sample is 0.45, which is higher than the value set for significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Higher Secondary School students.* The coefficient of correlation between Metacognition and Intelligence for Male Higher Secondary School students is 0.42 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Male Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Male Higher Secondary School students.* The coefficient of correlation between Metacognition and Intelligence for Female Higher Secondary School Students is 0.45 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Female Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Female Higher Secondary School student.* The coefficient of correlation between Metacognition and Intelligence for Rural Higher Secondary School students is 0.43 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Rural Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Rural Higher Secondary School students.* The coefficient of correlation between Metacognition and Intelligence for Urban Higher Secondary School students is 0.40 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Urban Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Urban Higher Secondary School students.* The coefficient of correlation between Metacognition and Intelligence of Higher Secondary School students of Government School is 0.45 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Government Higher Secondary School students. *The result shows a substantial positive relationship between Metacognition and Intelligence of Government Higher Secondary School students.* The coefficient of correlation between Metacognition and Intelligence of higher Secondary School Students of Government Aided School is 0.43 this is higher than the value set for the significance at 0.01 level. It shows that there exists a significant relationship between Metacognition and Intelligence of Government Aided Higher Secondary School students. *The result shows a substantial positive relationship*

between Metacognition and Intelligence of Government Aided Higher Secondary School students. From the above observation shows that all the "r values are significant, so the hypothesis is notaccepted.

Students' knowledge of their own cognitive processes naturally leads to Intelligence in academic and personal endeavours. This study also concluded that there is an Influence of Metacognition on Intelligence of Higher Secondary School Students. This suggests teachers to use Metacognitive and reflective teaching strategies in classrooms. Use of discovery learning strategies, concept mapping techniques, cooperative learning strategies, information processing models of teaching, inductive thinking strategies, questioning, illustrating etc. can lead to an improvement in Metacognitive abilities of students. Therefore, it advocates the use of different Metacognitive strategies in classroom settings to reverberate the intelligence of Higher Secondary school students.

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