CHAPTER 6 Metacognition and Constructivism

LEARNING OUTCOMES

After studying this chapter, you should be able to:

1. Define the concept of constructivism;

2. Explain the origins of constructivism;

3. Describe types of constructivism pertaining to cognitive constructivism and social constructivism;

4. Describe the used of constructivism in the classroom teaching;

5. Define the concept of metacognition;

6. Distinguish between novice learner and expert learner; and

7. Describe several strategies to encourage metacogniton in the classroom.

INTRODUCTION

According to Henson;

Constructivism is a theory of how learning occurs.

(Henson, 1996)
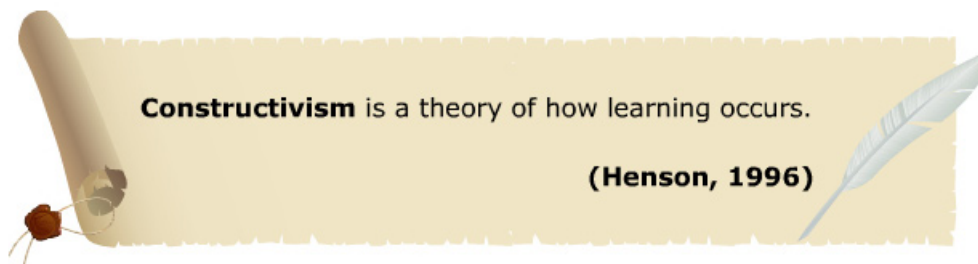
Its philosophical roots suggest that if learning is viewed as important to the lives of learners, they will be intrigued by learning enough to seek their own understandings and insights. Learners will seek meaning via the questioning of their own knowledge and new discoveries.

Thus, from this perspective and in the words of Bransford et al. (cf. Saunders, 1992; p 136);

"Wisdom cannot be told."

(Tan, 2003)
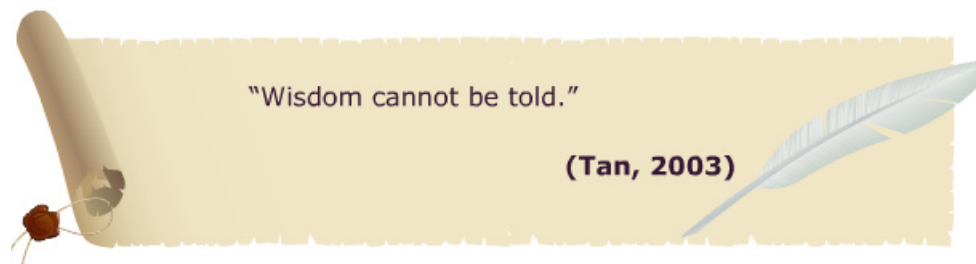
In this chapter we will discuss the origin and features related to cognitive constructivism learning theories as illustrated in Figure 6.1.
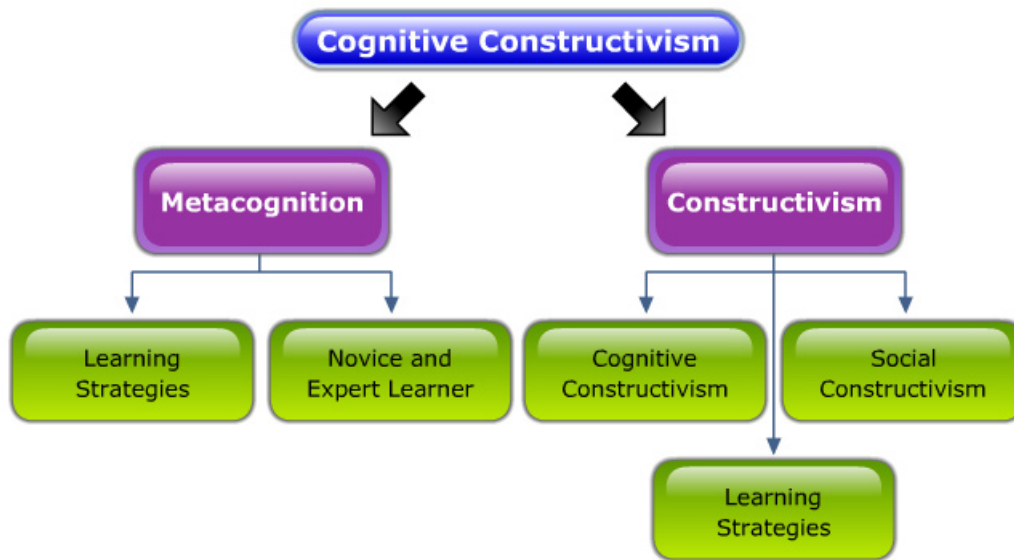

Figure 6.1: Cognitive constructivism learning theory covered in this chapter

6.1   DEFINITION AND THE ORIGINS OF CONSTRUCTIVISM

6.1.1   Definition of Constructivism

Borich and Tombari (1997) define constructivism as;

> "… An approach to learning in which learners are provided the opportunity to construct their own sense of what is being learned by building internal connection or relationship among the ideas and facts being taught."
>
> **Borich and Tombari (1997)**

So, the constructivist perspective emphasizes the learning occurs only when learners actively engage their cognitive structures in schema building experiences (Yager and Lutz, 1994; Fosnot, 1996).

From another constructivist perspective, learners try to make sense of the world by relying on their pre-existing schemas. Learning is aided by social interaction with peers and teachers and via real world experiences. There are theoretical parallels to be drawn between the recent constructivist movement and the work of previously studied cognitive psychologists such as Jean Piaget, Lev Vygotsky, and Jerome Bruner.

Eggan and Kauchak agreed with those studies and define constructivism as:

"... A view of learning that says learners use their experiences to actively construct understandings that makes sense to them, rather than have understanding delivered to them in already organized form."

Eggan and Kauchak (1997)

Constructivists believe that knowledge is the result of individual constructions of reality. From their perspective, learning occurs through continual creation of rules and hypotheses to explain what is observed. To create new rules and formulate, new hypotheses occurs when student's present conception of reality are thrown out of balance by disparities between those conceptions and new observation (J.Brooks, 1990, p68).

Giambatista Vico is one of the early constructivist philosophers, who said,

"... One only know something if one can explain it"

(Yager, 1999)

His view was supported by Emmanuel Kant who said,

" Human are not passive information receiver. Human are active information receiver, they build network of information with their previous information and they assimilate or accommodate new knowledge with the old information in order to build their own understanding of the new information."

(Cheek, 1992)

6.1.2   The Origin of Constructivism

Originally, constructivism is a part of cognitive revolution. It is not a new approach. It is rooted from philosophy just like sociology, ethnography and cognitive psychology. Cognitive revolution began in the 1950s and increasingly deliberated in the late 1960s. The term "**cognitive revolution**" began to be used to take advantage of an analysis of scientific revolution in general that was developed by Thomas Kuhn (Royer, 2005). Following this analysis, cognitive revolution has impact on education.

Constructivism is a part of cognitive revolution.
It's not a new approach.
It's rooted from philosophy just like sociology,
ethnography and cognitive psychology.

According to Miller (2003 in Royer, 2005);

- One of the principal instigators of the cognitive revolution began on September 11, 1956.
- The occasion was a symposium at the Massachussetts Institute of Technology concerned with information theory.
- Miller remembers papers that day was presented by:
  - Newell and Simon (logic machine),
  - Nate Rochester from IBM (his work to test Donald Hebb's theory on cell assembly),
  - Noam Chomsky (new theory of language syntax),
  - G. C. Szikali on perceptual recognition, and
  - Swetts and Birdsall on the use of signal detection theory.
- Miller mention that, the revolution was initiated that day, or at least in that time period, involved a clear paradigm shift in psychology, replacement of a psychological science dominated by the view that the correct subject of psychological investigation was observable behaviour, with one dominated by the view that psychology should be about explaining the internal workings of the mind.
- And, as Miller foresaw, very early on the new science morphed into cognitive science, an umbrella that encompassed psychologists, linguists, computer scientists, and later, neuroscientists.

Cognitive psychology has an impact on educational psychology whereby constructivist's approach came to the lime light especially in the instruction of mathematics and science subjects(Richard Mayers and Eugini Etkins et al in Royer, 2005: 6). Educational psychologists such as Gagne, Bruner, and Ausubel lay the framework for constructivist teaching theories.

SELF-CHECK

Explain the origin of constructivism?

6.2 TYPES OF CONSTRUCTIVISM(COGNITIVE CONSTRUCTIVISM AND SOCIAL CONSTRUCTIVISM)
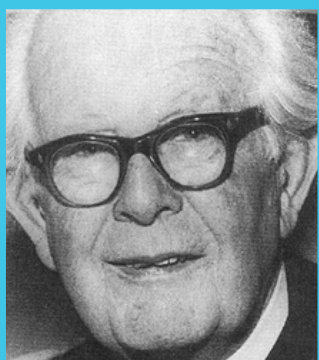
Fowler indicate that;

Although Piaget and Vygotsky disagree on some point, they were both constructivist in their orientation.

(Fowler, 1994)

Vygotsky views on constructivism focus on the transmission of the tools of knowledge – namely culture and language.

Piaget views on constructivism more strongly emphasized each individual's creation of new knowledge.

Regardless of philosophical differences, however, all views of constructivism imply that all teachers need to go beyond lecturing and telling as teaching method. So we will discuss here the 2 most popular constructivism, they are Cognitive Constructivism and Social Constructivism.

6.2.1   Cognitive Constructivism

Several researches that focused on cognitive constructivism, made by psychologists are as follows:

> "Piaget's work is most often described as the impetus for the current constructivism movement."
>
> (Kami, 1981; Valsinger, 1996; Wadsworth, 1996; Byrnes, 1996).

> "Piaget (1954) proposed the formation of schema or cognitive structures, which constitutes the meaning, and understanding of an individual's world. Schemata serve several functions in learning that are categorizing, remembering, comprehending and problem solving."
>
> (Byrness, 1996).

> "Schemata or prior knowledge links categorize our experiences more efficiently for processing. This categorization of information facilitates the processes of remembrance (recall), and comprehension (understanding), all of which make problem solving more productive."
>
> (Byrnes, 1996).

> "Alba and Hasher suggest that schema facilitates the selection of information based on our interests. Further, once selected, the schema enable the selected material to be organized abstractly and assist the individual in the processes of interpreting and integrating the new material, based on what he or she knows already."
>
> (cf. Benjafield, 1992)

6.2.1.1   Structure and Discovery

Bruner (1956 in Woolfolk, 2004) translate cognitive constructivism principles in teaching and learning in the classroom through **discovery learning**. Jerome Bruner's early researches on teaching approaches encourage concept learning and development of thinking. Bruner's work emphasized the importance of understanding the structure of a subject being studied (subject structure), the need for active learning as the basis for true understanding, and the value of inductive reasoning in learning. Figure 6.2 explain the term of subject structure and discovery learning emphasized by Bruner.a

Figure 6.2 explains the term of subject structure and discovery learning emphasized by Bruner.

Subject structure → Refers to the fundamental ideas, relationships, or patterns of the fields that connect all of the essential information. According to Bruner, learning will be more meaningful, useful and memorable for students if they focus on understanding the structure of the subject being studied.

Discovery learning → The teacher presents examples and the students work with the examples until they discover the interrelationships between the subject's structures.
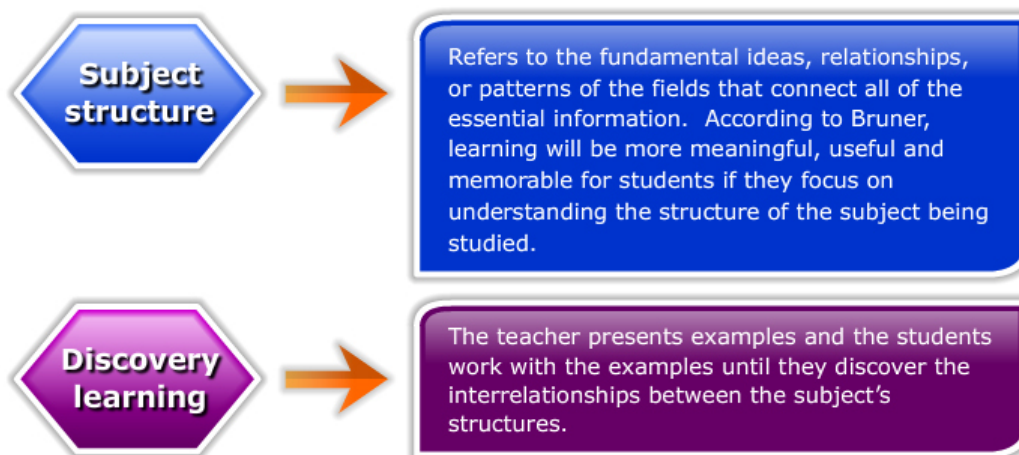
Figure 6.2: Term of subject structure and discovery learning emphasized by Bruner

Thus, Bruner believes that classroom learning should take place through **'inductive reasoning'**, that is, by using specific examples to formulate a general principle. Figure 6.3 explains an example of Bruner's teaching technique.

Firstly, you must present examples and non-examples of the concepts you are teaching.

Examples:
1. Give examples that include people, kangaroos, whales, cats, dolphins, and camels as examples, and chickens, fish, alligators, frogs, and penguins as non-examples.

Secondly, help students see connections among concepts.

Examples:
1. Ask questions such as these:
   - "What else could you call this apple?" (Fruit)
   - "What do we do with fruit?" (Eat)
   - What do we call things we eat? (Food)
2. Use diagrams, outlines, and summaries to point out connections.

Thirdly, pose a question and let students try to find the answer.

Examples:
1. How could the human hand be improved?
2. What is the relation between the area of one tile and the area of the whole floor?

Fourthly, encourage students to make intuitive guesses.

Examples:
1. Instead of giving a word's definition, say, "Let's guess what it might mean by looking at the words around it."
2. Give students a map of ancient Greece and ask where they think the major cities were.
3. Don't comment after the first few guesses. Wait for several ideas before giving the answer.
4. Use guiding questions to focus students when their discovery has let them too far astray.

Figure 6.3: Bruner's teaching technique
Source: Woolfolk (2005, p281)

6.2.2 Social Constructivism

Social constructivism is rooted from Vygotsky's psychosocial theory that knowledge is not transferred from teacher to student but constructed in student's mind. Social constructivism approach emphasizes the social contents of learning and that knowledge is mutually built and constructed (Horowitz et. Al 2005; Rust, O'Donovan & Price, 2005).

In one analysis of the social constructivist approach, teacher was being drawn to look at learning through the eyes of children (Oldfather et. al, 1999).

SELF-CHECK

What are the differences between cognitive and social constructivism?

6.3 EXAMPLE OF CONSTRUCTIVISM PRINCIPLES IN CLASSROOM TEACHING

Nowadays, teachers use many teaching approaches whilst teaching in the classroom. Constructivism suggested teachers to use student centered approach and '**learning by doing**' or '**learning through experience**' whereby students play as active learners.

In Table 6.1, we outline teacher's role and student's role in constructivist classroom.

Table 6.1: Teacher's and Student's Role in Constructivist Classroom

Teacher's Role	Student's Role
Teacher encourages students to explain their thinking or idea and show appreciation when they do so.	Student should take the initiative to question whatever issue being discuss in the classroom, analyse the facts until they find the answer.
Structure lesson to challenge student's thinking.	Students are discouraged to discuss subject with teacher and peers. Give the students the opportunity to pour their ideas and listen to others so that they can build their own understanding.
Guide the student awareness of the importance of curriculum to their lives.	Students must always question the connection between curriculum and their lives.
Evaluate subject learned through the student's usage of it in everyday life.	Students must gear their thinking towards the usage of subjects learned in school in their everyday life.
Encourage students to do assignment pertaining to problem solving, analyse, predict, provoke and building hypothesis.	Students are encouraged to use critical and reflective thinking in their assignment and problem solving.
Encourage students to explain their answers in more detail.	Students are encouraged to explain their answers and their thinking.
Encourage student discovery through questioning and ask them to question their peers on something they don't know.	Equip the students with learning techniques such as questioning, mind mapping, SQ4R and other techniques and encourage them to use it.
Give students ample times to think of answers after teacher give them questions.	Students

Give students ample time to make connection between previous and new ideas.	
Encourage cooperative learning and group discussion among students.	

Here is a list of some characteristics of social constructivism classrooms:

- An important classroom goal is construction of collaborative meaning
- Teachers closely monitor student's perspective, thinking and feeling.
- The teacher and students are learning and teaching.
- Social interaction permeates the classroom.
- The curriculum and the physical contents of the classroom reflect student's interest and are infused with their culture.

The listed characteristics are important assumptions in social constructivism approach. They refer to the idea that thinking is located in social and physical contents, not within an individual's mind. Social constructivism approach emphasizes that teacher and peers contribute to students' learning. There are 4 tools for making this happen, the tools are scaffolding, cognitive apprenticeship, tutoring and cooperative learning as illustrated in Figure 6.4.
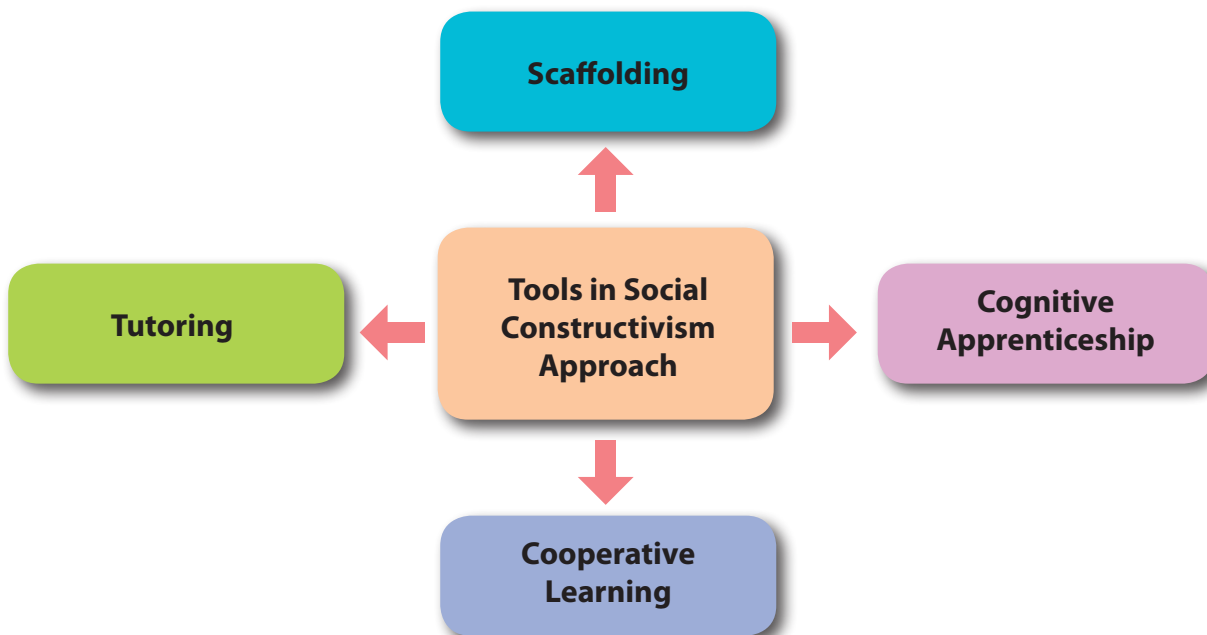
Scaffolding

Tools in Social Constructivism Approach

Tutoring

Cognitive Apprenticeship

Cooperative Learning

Figure 6.4: 4 tools in social constructivism that contribute to student's learning

The descriptions for the tools used in social constructivism approach are explained as follows:

(a) Scaffolding

Scaffolding is a technique that involves changing the level of support for learning. A teacher or more-advanced peers adjust the amount of guidance to fit the student current performances. When the teacher teaches a new issue, the teacher might be used direct instruction. As the student competence increase, the teacher provides less guidance. The scaffolding provides support when needed, but it gradually removed as the bridge approaches completion. Researchers have found that:

" When teacher and peers use scaffolding in the collaborative learning, student's learning benefits."

(Krajcik and Blumenfeld, 2006; Peery, Truner & Meyer, 2006; Pressley et al., 2001; Yarrow & Topping, 2001).

(b) Cognitive Apprenticeship

Barbara Ragoff(1990), the developmental psychologist believes that cognitive apprentice-ship is an important tool of education. Cognitive apprenticeship is a technique in which an expert stretches and support novice's understanding and use of culture's skills. The term apprenticeship underscores the importance of active learning and highlights the situated nature of learning. Cognitive apprenticeships are important in classroom. Researchers have found that:

" Student's learning benefit from teachers who think of their relationship with a student as a cognitive apprenticeship, using scaffolding and guided participation to help student learn."

(Englert, Berry & Dunsmore, 2001; Leonard; Beauvais & Scholl, 2005; Mathes et al., 2005).

(c) **Tutoring**

Tutoring is a basic cognitive apprenticeship between an expert and novice. Tutoring can take place between an adult and a child or between a more-skilled child and less-skilled child. Tutoring is an effectively ways to helps student, especially those who are not doing well in their subject.

(d) **Cooperative Learning**

Cooperative learning is learning based on experience or group discussion. Among prominent psychologists who discuss this subject are Johnson and Johnson (1991), Slavin (1984) and Kagan (1988). Activities in cooperative learning integrate principles from multiple intelligence theory, mastery learning, thinking skills and communication skills. Teachers who try to embed this technique in their classroom teaching have to be highly committed, focus and possessing high *espirit de core*. Students also learn through example meaning by look up to teacher as an idol.

In cooperative learning, students are motivated to work cooperatively with other members in the same group. Group achievement also means individual achievement. The bright students will help the less-bright students to achieve, so that their group will get high marks. That is because individual's mark will be sum up to form group mark. So every individual is accountable for group achievement. At the same time, they get to know how other students think and solve problems. They also learn how to collaborate with other people. To make learning more meaningful and interesting, teacher can organize many activities in cooperative learning such as **Student Teams Achievement Divisions (STAD) technique** or **jigsaw technique**.

The descriptions of both techniques are explained as follows:

Student Teams Achievement Divisions (STAD) technique

- STAD involves team recognition and group responsibility for learning in mixed-ability group (Slavin, 1995).
- Reward are given to teams whose member improve the most over their past performance.
- Teacher present the lesson, then students study the worksheet based on subject presented by teacher.

- Usually, students are assigned to team of 4 or five members.
- Teams are assigned practice working on problem together and study together, but the members take quizzes individually.
- The result individually is contributed to team's overall score.

Jigsaw technique

- In jigsaw, one member of each group is pulled out to form an expert group.
- In the expert group, they will be taught new skills until they become expert in it.
- After that, this expert group will disperse and each member will go back to their original group.
- This expert member will teach his/her group members the new skill they have learned.
- After that each group will be tested and marks will be given to each group based on their performance.

In cooperative learning, teacher can form groups based on heterogeneity that is based on achievement such as good students and low-grade students, different ethnicity, gender, and personality. The prominent goal is to make them work together cooperatively because their performances are based on each individual mark that is sum up together at the end of each activity. So they have to help one another to achieve and become less selfish.

SELF-CHECK

Discuss 2 techniques used by social constructivism teacher in the classroom?

6.4 CONCEPT OF METACOGNITION

Metacognition is a thinking activity that is closely related to constructivism because in building understanding on information, one has to think and monitor his own thinking.

6.4.1 Definition of Metacognition

Metacognition is an important concept in cognitive theory. It is about self-reflection, self-responsibility and initiative, as well as goal setting and time management.

According to Winn and Snyder;

"Metacognition consists of two basic processes occurring simultaneously which are **monitoring your progress** as you learn, and **making changes and adapting** your strategies if you perceive you are not doing so well."

(Winn, W. & Snyder, D., 1998)

The definition of metacognitive varies depending on the psychologist's perspective.

According to Tan;

"Metacognition is thoughtfulness."

(Tan, 2003,p412)

Metacognition refers to thinking about one's own thinking which is examining one's own information processing. It is thinking about your own thinking and about how you process information effectively. As Hyde and Bizar (1989, p51) stated;

"Metacognition refers to our ability to understand and manipulate our own cognitive processes. It involves thinking about our thinking and purposely making changes in how we think."

(Tan, 2003)

Example of metacognition process is during examination when we answer question.

• First, we involve in thinking or process of recall information from the long-term memory.
• After finish answering, we repeat thinking about what we have answered or monitoring our previous thinking.
• So, the process of thinking that we are engaging at that particular time is called metacognition.

Many students fail to think about their thinking. They do not think about how they think, which means they cannot control their information processing. They fail to engage in the "self- planning, self-monitoring, self-regulating, self-questioning, self-reflecting, self-reviewing" that is necessary to critical thinking and learning (Hyde and Bizar, 1989). It is also a learning skill. If you have good learning skill means you know how to monitor,

regulate, and control your own thinking.

A key to grasping the concept of metacognition is the word purposeful. Metacognition is controlled. It is purposeful thoughtfulness. But how we engage our cognitive processes is not always clear and unambiguous.

Table 6.2 lists some awareness and actions that are important to enhance our critical thinking.

Table 6.2: A Strategy for Helping Learners Acquire Critical Thinking Skills

A Metacognition Approach in Teaching Critical Thinking Skill	
Explanation by the teacher	• Introduce the skill. • Show examples and non-examples. • Use exercises to practice the skill.

Modelling by the teacher	• "Think aloud" the modelling process by the teacher/expert.
	  - Identification of problem
	  - Initiation of strategies
	• Learner interpretation of the modelling process.
	• Teacher provides cues and prompts if there is a lack of understanding.

Modelling by the learner	• "Think aloud" the modelling process by learners in different situations. • Comparison of their modelling processes. • Silent modelling whereby learners are on their own.

Source: "Teaching Critical Thinking : A Metacognitive Approach," by William W.Wilen and John Arul Philips, March 1995, 59(3), 135-138. © National Council for the Social Studies. Reprinted by Permission (Tan, 2003).

6.5   THE DIFFERENCE BETWEEN NOVICE LEARNER AND AN EXPERT LEARNER

Knowing how to learn and knowing which strategies work best are the valuable skills that differentiate between expert learners and novice learners. Below are some characteristics that differentiate expert learners from novice learners.

Novice Learners

• They always stop to evaluate their comprehension of the material.
• They generally don't examine the quality of their work or stop to make revisions as they go along.
• They are satisfied with just scratching the surface and don't attempt to examine a problem in depth.
• They don't make connections or see the relevance of the material in their lives.
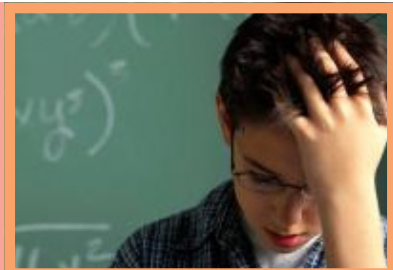
Expert learners

- **Expert learners** are more aware than novices learner.
- They try to check for errors, why they fail to comprehend, and how they need to redirect their efforts.

We've all experienced the phenomenon of reading a page in a textbook and then realizing we haven't comprehended a single thing.

- A novice learner would go on to the next page, thinking that merely reading the words on a page is enough. An expert learner would re-read the page until the main concept is understood, or flag a difficult passage to ask for clarification from an instructor or peers later.

SELF-CHECK

Compare the differences between novice learners and expert learners.

6.6 STRATEGIES FOR ENCOURAGING METACOGNITON IN THE CLASSROOM

6.6.1 Strategies to Improve Student's Thinking Techniques

It is obvious that expert learners benefit more than novice learners in the classroom. As teachers, we cannot sit back and watch. We have to use thinking techniques such **as self-regulated learning** to guide our instructional choices.

Figure 6.5 illustrates some strategies that can be used by teachers to improve student's thinking techniques that are self-questioning, KWL, PQ4R, and IDEAL
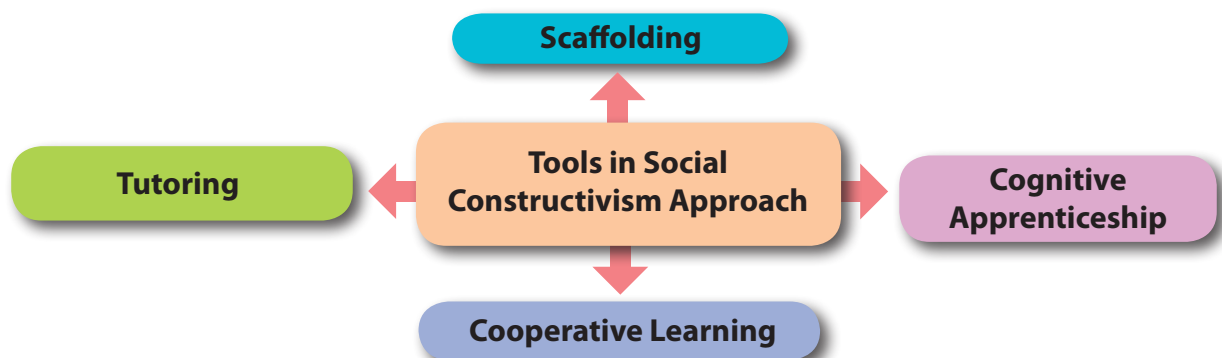
Scaffolding

Tutoring

Tools in Social Constructivism Approach

Cognitive Apprenticeship

Cooperative Learning

Figure 6.5: Some strategies that can be applied in teaching to improve the thinking technique

Figure 6.4: 4

The descriptions for these stategies can be explained as follows.

(a) Self-Questioning

To facilitate metacognition, teachers can teach students specific strategies and allow them time to practise the strategies. One of the strategies is teacher presenting to them divergent questions or teacher can encourage the students to generate their own questions. Ganz and Ganz(1990) suggest that:

> "**Self-questioning** encourages the students' monitoring of their own cognition, along with the assessment of their feelings about the efficacy of their thinking. It also assists students in the employment of **self-correction** and the development of newer understanding."
>
> **(Tan, 2003)**

In teaching the process of self-questioning, teacher may use **cognitive behaviour modification**. It is a metacognitive strategy in which the teacher demonstrates a task and guides students through the use of instruction and practice.

Wilen and Philips (1995) enumerate 3 steps for helping learners as illustrated in figure 6.6.

Teacher requires identifying the skills to be taught.

Teacher requires to outline the steps necessary to complete the skill.

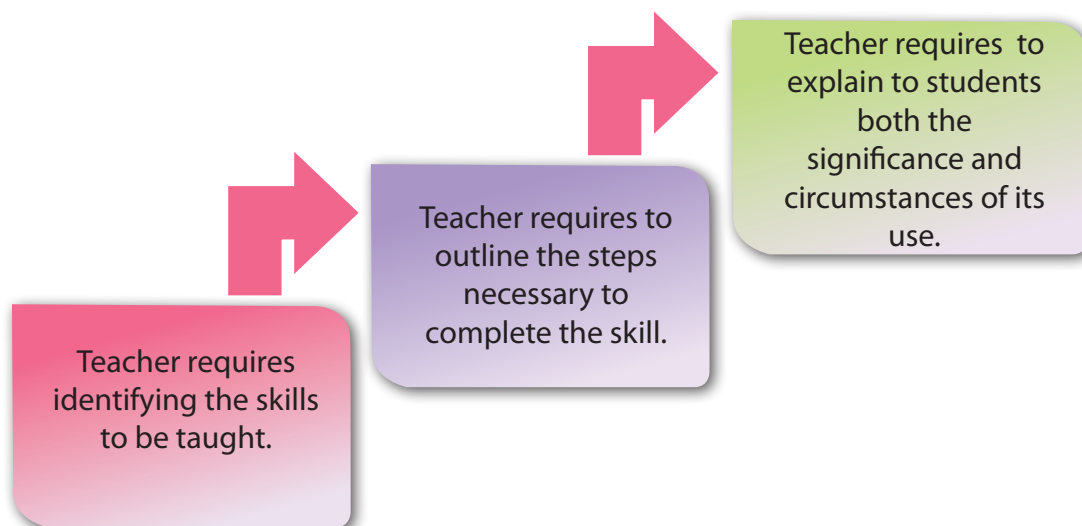Teacher requires to explain to students both the significance and circumstances of its use.

Figure 6.6: 3 steps for helping learners

An example to describe emphasizing metacognitive of awareness in the classroom are illustrated in Figure 6.7.

Firstly, the teacher divided the students into small groups and each group were given specific task.

Students meet in small groups at the beginning of Science class to review the task given to their group.

They discuss what to do and divide specific task to each member to find answer or to solve problem.

After 20 minutes, they meet again and discuss their finding.

This means the student aware of their thinking as well as the thinking of others. The teacher guides the student in doing their thinking.

Figure 6.7: Example of the process of emphasizing metacognitive awarenessin the classroom.

(b) **KWL strategy**

According to Dixon-Krauss;

"KWL is a strategy enabling students to know what they **know**, what they **want to learn**, and what they **did learn**."

(Dixon-Krauss, 1996)

This metacognitive strategy starts with students' discussion of what they know, and a listing of the information. Then students are encouraged to make prediction about what they want to learn.

Table 6.3 depicts the KWL chart by Primary six students studying the life of **Pahlawan Hang Tuah of Malacca.**

Table 6.3: KWL Chart on Life of Pahlawan Hang Tuah

| K What you KNOW	W What you WANT to know	L What you LEARNED
He was Malacca's warrior and Laksamana.	How did he become a Laksamana?	He became Laksamana after defeating Majapahit and Pahang.
He served during the Sultan Mansur Shah's reign.	Did he serve other Sultans?	No, because he was too old to serve the next Sultan.
Bendahara at that time was Datuk Seri Maharaja	Was his relationship with Bendahara good?	Very good. Bendahara hid him and saved him from termination.
He led the army to defeat Pahang and Majapahit.	What tactics did he use to defeat Pahang and Majapahit?	He studied their war tactics and took advantage of their weaknesses.

(c) **PQ4R strategy**
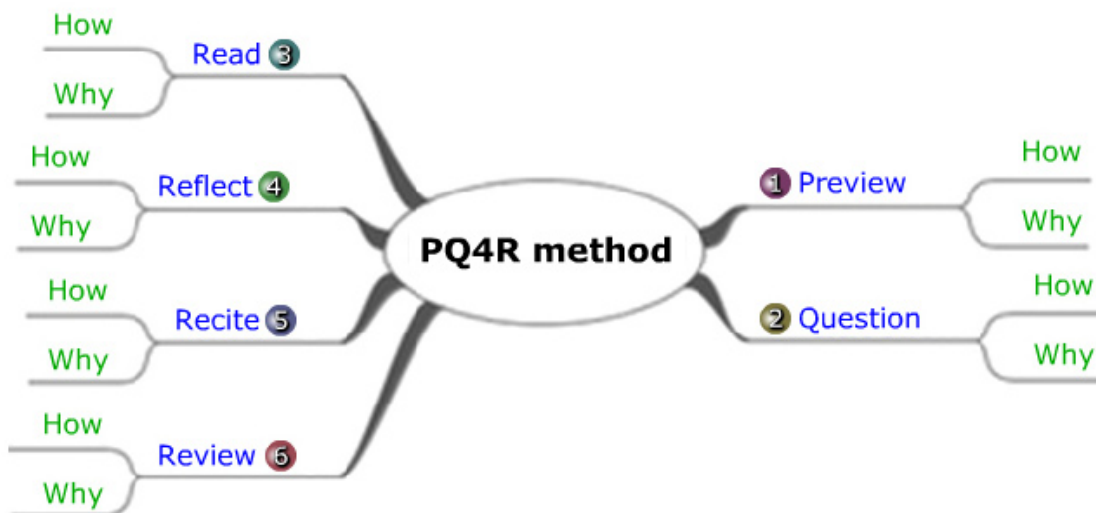
Figure 6.8: Acronym for "PQ4R"

PQ4R is an acronym for Preview, Question, Read, and Reflect, Recite and Review as illustrated in Figure 6.8. This PQ4R strategy assists students to process a lot of information in a relatively short amount of time. It helps the students to orient cognitively to the task at hand prior to actual reading. The steps for PQ4R method are described in Table 6.4.

Table 6.4: PQ4R Method Descriptions

PQ4R	
Preview	Survey the material to get an idea of the general organization, major topics and subtopics. Look at headings and pictures to try to identify what you will be reading about.
Question	Ask questions about the material as you read it. Use headings to ask questions (who, what, why, where)
Read	Read the material. Try to answer your own questions while reading.
Reflect	Think about the material that you just read and try to make it meaningful by: 1) Relating it to things that you already know about, 2) Relating the subtopics to primary topics, 3) Trying to resolve contradictions, 4) Trying to use the material to solve simulated problems.
Recite	Practice remembering the information by stating points aloud and asking and answering questions. Use headings, highlighted words and notes on major ideas.
Review	Actively review the material, focusing on asking yourself questions and rereading the material only when you are not sure of the answers.

Source: Educational Psychology Theory and Practice by Slavin, 1994

(d) **IDEAL strategy**

IDEAL is an acronym for Identify, Define, Explore, Act and Look as illustrated in Figure 6.9, which is important for effective and efficient thinking and problem solving. A teacher who is concerned with facilitating effective thinking and problem solving can teach each of these metacognitive skills to students.

I	D	E	A	L
Identify	Define	Explore	Act	Look

Figure 6.9: Acronym for " IDEAL"

Effective problem solving should begin with **identification** of potential difficulties. It is also necessary to attempt to ascertain just what makes this problem so difficult, to ask, "What's wrong here?" Thus, after identification, **problem definition is** a significant step. The third strategy in problem solving is **exploration**. The students act on their solution options. Usually expert learners think purposefully, reflective and open-minded in finding solution. The last strategy, after trying a solution, is for the student to **look and note** which actions lead to successful resolution.

6.6.2   Metacognitive Strategies for Successful Learning

There are several tips of metacognitive strategies for successful learning as listed in Figure 6.10.

Planning:
- Estimate the time required to complete the task.
- Plan study time into your schedule and set priorities.
- Make a checklist of what needs to happen when.
- Organize materials.
- Take the necessary steps to learn by using strategies like outlining, mnemonics, diagramming, etc.

Monitoring and Reflection:
- Reflect on the learning process, keeping track of what works and what doesn't work for you.
- Monitor your own learning by questioning and self-testing.
- Provide your own feedback.
- Keep concentration and motivation high.

Awareness:
- Consciously identify what you already know.
- Define the learning goal.
- Consider your personal resources (e.g. textbooks, access to the library, access to a computer work station or a quiet study area).
- Consider the task requirements (essay test, multiple choice, etc.).
- Determine how your performance will be evaluated.
- Consider your motivation level.
- Determine your level of anxiety.

Figure 9.10: Tips of metacognitive strategies for successful learning

Imagine you are about to take a final exam. Figure 6.11 illustrates an example of the possible metacognitive strategies to take when you are about to sit for a final exam.

Figure 6.11: Using metacognitive strategies to study for an essay exam

As students become more skilled at using metacognitive strategies, they gain confidence and become more independent as learners. Independence leads to ownership as students realize they can pursue their own intellectual needs and discover a world of information at their fingertips. The task of educators is to acknowledge, cultivate, exploit and enhance the metacognitive capabilities of all learners.

SELF-CHECK

Describe few metacognitive strategies used by teacher in the classroom.

SUMMARY

- Constructivism is "an approach to learning in which learners are provided the opportunity to construct their own sense of what is being learned by building internal connection or relationship among the ideas and facts being taught."

- Constructivism begins as an impact of "cognitive revolution" in the 1950's.

- Constructivism can be divided into cognitive constructivism and social constructivism.

- Some of constructivist teaching techniques are scaffolding, peer tutoring, cognitive apprenticeship, cooperative learning and discovery learning.

- Metacognitive is "thinking about one's thinking".

- Expert learners think purposefully, reflective and open-minded whereas novice learners are rigid and narrow-minded.

- Some of the metacognitive strategies are self-questioning, PQ4R, KWL, IDEAL, reflective thinking and critical thinking.

KEY TERMS AND CONCEPTS

Terms	Definitions
Cognitive apprenticeship	A mentorship in which a teacher and a student work together in to accomplish a challenging task or solve a difficult problem; in the process, the teacher provides guidance about how to think about the task or problem.
Cognitive constructivist	Piaget's work is most often described as the impetus for the current cognitive constructivist movement. Piaget (1954) proposed the formation of schema or cognitive structures which constitutes the meaning and understanding of an individual's world.
Cognitive revolution	The 'cognitive revolution' is the name for an intellectual movement in the 1950s that began with what are known collectively as the cognitive sciences. The cognitive revolution in psychology was a response to behaviorism .

Constructivism	**A theoretical perspective that proposes that learners construct a body of knowledge from their experiences – knowledge that may or may not be an accurate representation of external reality.**
Cooperative learning	**An approach to instruction whereby students work with with their classmates to achieve group goals and help one another learn.**
Critical thinking	**A technique in mental processes whereby students are asked to look for one correct answer through compare, contrast, apply, analize, synthesize and evaluate.**
Discovery learning	**An approach to instruction whereby students develop an understanding of a topic in a hands-on fashion through their interaction with the physical or social environment.**
Gestalt psychology	**The school of thought based on the belief that human consciousness cannot be broken down into its elements.**
IDEAL	**IDEAL is an acronym for Identify, Define, Explore, Act, and Look, which are important for effective and efficient thinking and problem solving.**
KWL strategy	**KWL is a strategy enabling students to know what they *know*, what they *want to learn*, and what they *did learn*. This metacognitive strategy starts with student discussion of what they know, and a listing of the information. Then students are encourage to make prediction about what they want to learn.**
Metacognition	**One's knowledge and beliefs regarding one's own cognitive processes, and one's resulting attempts to regulate those cognitive processes to maximize learning and memory.**
Neuroscience Perspective	**The viewpoint in psychology that focuses on the nervous system in explaining behavior and mental processes.**

Peer Tutoring	An approach to instruction whereby students who have mastered a topic teach those who have not.
PQ4R method	PQ4R is an acronym for : Preview, Question, Read, Reflect, Recite and Review. This PQ4R strategy assists students to process a lot of information in a relatively short amount of time.
Reflective thinking	A technique in the mental processes whereby students are asked to monitor and evaluate their past experiences.
Scaffolding	A support mechanism, provided by a more competent individual, that helps a learner successfully perform a task within his or her zone of proximal development.
Self-questioning	The process of asking oneself questions as a way of checking one's understanding of a topic.
Social constructivist	Social constructivism is rooted from Vygotsky's psychosocial theory that knowledge is not transfered from teacher to student but constructed in student's mind. Social constructivism approach emphasizes the social contents of learning and that knowledge is mutually built and constructed.
Structuralism	The nineteenth-century school of psychology that sought to determine the structure of the mind through controlled inspection.
Tutoring	Tutoring is a basically a cognitive apprenticeship between an expert and novice.

ENDNOTES

1. Eggen, P & Kauchak, D. 2007. *Educational psychology windows on classrooms*. 7th ed. New Jersey: Prentice Hall.

2. Lahey, B. B. 2004. *Psychology: an introduction*. 8th ed. Boston: McGraw Hill.

3. Ormrod, J. E. 2006. *Educational psychology developing learners*. 5th ed. New Jersey: Prentice Hall.

4. Santrock, J. W. 2008. *Educational psychology*. 3rd ed. Boston: McGraw-Hill.

5. Tan O. S., Parsons, R. D., Hinson, S. L. & Sardo-Brown, D. 2003. *Educational psychology a practitioner-researcher approach*. Australia: Thomson.

6. Woolfolk, A. 2004. *Educational psychology*. 10th ed. Boston: Pearson.

7. Royer, J.M. 2007 .The Cognitive Revolution in Educational Psychology. Connecticut. Information Age Publishing.

REVIEW AND DISCUSSION QUESTIONS

1. The role of teacher in constructivist learning approach is as a _____.

    A. Facilitator

    B. Active teacher

    C. Passive observer

    D. Classroom administrator

2. 'Constructivism is a view of learning that says learners use their experiences to actively construct understandings that makes sense to them, rather than have understanding delivered to them in already organized form.' This definition was given by _____.

    A. George Miller (2003)

    B. Eggan and Kauchak (1997)

    C. Borich and Tombari (1997)

    D. Richard Mayer, Etkina et al (2005)

3. "Metacognition refers to our ability to understand and manipulate our own cognitive processes. It involves thinking about our thinking and purposely making changes in how we think." This definition is given by _____ .

   A. Sternberg (1998)

   B. Benjafeld (1992)

   C. Hyde and Bizar (1989)

   D. Willen and Philips (1995)

4. The impetus for cognitive constructivism is Jean Piaget (1896-1980) with his theory of _____.

   A. Schema

   B. Assimilation

   C. Accomodation

   D. Cognitive development

5. Vygotsky (1978) was regarded as the impetus for social constructivism. According to him knowledge are transfer through _____.

   A. thinking

   B. Observing

   C. communication

   D. Stimulus and response