

Psychology of Exceptional Learning

How do we change what we know : thinking ?

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Many students have difficulty learning because

- they don't know how to go about learning in the most appropriate ways
- they have difficulty managing and directing their learning, seeing themselves making progress as learners.

We look at the background to these issues in this unit. Topics covered are :

- Actions for thinking and learning
- Two types of thinking strategies; cognitive and metacognitive
- Teaching implications
- Helping students improve their use of learning strategies

Actions for thinking and learning

It is generally acknowledged that a major aim of contemporary education is to help students to improve how they go about learning and thinking. Being able to manage and direct themselves as learners, enhancing how they go about handling information, lifelong learning and effective thinking are seen as being critical aspects of contemporary education. While, of course, it is students who need to change what they know teachers can put in place the conditions conducive to bringing about these changes.

The process of manipulating ideas is thinking. We have learnt when these actions lead us to change our knowledge. There are many ways in which people act on what they know, to learn. These are the learning actions or 'learning strategies'.

Learning is like 'tossing ideas around' in our minds and acting on them in various ways. The learning strategies are the actions that we apply to the ideas¹. They allow us to

- memorise or retain ideas,
- organize and categorize ideas, link them in various ways,
- synthesise and analyse ideas,
- look at ideas in different ways, look for different relationships and patterns,
- predict and anticipate, infer and
- transfer what we know.

These actions change what we know in different ways. Memorising knowledge may not change it a great deal. other than automatising it. Synthesising new ideas from existing ones, looking at new ideas in different ways, inferring, leads to more significant changes. Most students use combinations of these actions to learn new ideas. Particular thinking strategies that allow us to change what we know include the following:

¹ In learning situations it needs to be noted that learners don't necessarily or unconditionally use the learning strategies that they know. Instead, the strategies that they use are the ones that they believe others in the situation will allow them to use (that is, will lead to social valuing) or that they allow themselves to use, to learn.

- **Visualizing** involves using mental imagery to represent ideas. The images can be either of everyday items and events or personal images; we imagine the ideas in real-life contexts. This is what Einstein did when he thought about the question of what happens when objects move faster than light and when Kekule was trying to work out the structure of benzene. Imagery helps us deal with a lot of information. The image gives us a context or scaffold for linking ideas. It also helps us retain ideas in short term memory.

Once we have thought about an idea in one or two contexts, we can generalize it to be more abstract. Visualised ideas can be moved around in our minds and changed, perhaps a bit at a time. We can think about earlier images and modify these. We can also talk about aspects of our visualisations. When asked "How to get to the Freeway from ...(an unfamiliar situation) ?", we can draw on our imagery knowledge, rearrange it and then test it in terms of its reasonableness.

- **Verbalizing** involves linking ideas using a verbal code; we paraphrase or summarize them, put them into a story or narrative or ask questions about them. These strategies help us link the ideas in more abstract ways based their meaning. When we paraphrase ideas, we are more able to
 - recognize more specific and more general ideas, organize ideas around a theme,
 - put ideas into a story or narrative form,
 - reason about them by analogy, for example, to explain why a camel and a balloon are similar or how 'a child plays' and 'an adult works' are alike because both refer to age-related general activities in which people engage. A meaningful link is transferred from one situation to another.
 - retain ideas in sequence in short term memory
 - analyse ideas into their meaningful components, assumptions, etc.
 - sequence ideas in time and space
- **Acting out an idea**, modelling it, can also help us to think about it. Representing an idea as a set of actions can help us to sequence ideas and see how they are logically connected.
- **What does it remind you of?** This strategy cues us to link new ideas with what we already know. We look for similarities and try to categorise the new ideas using what we know. Our existing knowledge acts as a scaffold for organising the ideas we learn. Noting differences between the new ideas and what we know helps us modify what we know. Students can learn to brainstorm, map, collect relevant ideas, ask *What do I already know?*
- **What can I do when it is difficult to learn an idea.?** This strategy cues us to think in different ways about ideas that are difficult to learn, for example,
 - visualize the outcome of a problem or task; *What might it be like? What will I be able to do?*
 - put in place what we know about the idea, select the difficult bits and work on them.
 - think in reverse; begin at the final part of the idea and work backwards.
 - think about what the idea isn't; this allows you to bring in the boundaries of your domain for thinking and to sharpen the ideas about which you are thinking.
 - draw a parallel or analogy with something that you know well.

Two types of thinking strategies; cognitive and metacognitive

Investigators identify two types of learning strategies; cognitive or reasoning strategies and the metacognitive or self-instruction strategies:

- **cognitive strategies** : refer to how learners act on their ideas, that is, how they think about them. These include inferring the theme to which an idea belongs, linking relevant existing knowledge, visualising, organizing what you know about an idea, self-questioning and monitoring as you learn and back-tracking if necessary. Examples of cognitive strategies include

- (1) making sense of “Convert $3 \frac{1}{2}$ to an improper fraction” by imagining $3 \frac{1}{2}$ as 3 pizzas and half a pizza, imagining each pizza cut in halves and counting the number of halves.
 - (2) thinking about an explanation in a scientific text by imagining each proposition as an action.
- **metacognitive strategies** : refer to how learners direct and manage the cognitive strategies. Whenever you learn a new idea, for example, when you convert $3 \frac{1}{2}$ to an improper fraction, you need to use several metacognitive actions. You may
 - plan in various ways, for example, decide to imagine $3 \frac{1}{2}$ as pizzas because this worked in the past for them.
 - monitor how effectively the learning is progressing and fine-tune if necessary,
 - take further strategic action if necessary to change direction and
 - evaluate the success of your learning, reflect on what you learnt and what worked

Metacognition in learning includes three components;

- knowing that a particular action is a useful learning strategy,
- knowing how to use it and
- knowing when and why to use it.

Learning an idea requires the use of both cognitive and metacognitive strategies. While the distinction between them frequently becomes “blurred”, it is useful. Some learners don't use cognitive strategies effectively because their metacognition is inadequate. Even though they may know particular strategies, they may not understand how or when to use them.

When are we likely to use our learning strategies ? We use them when we want to reduce a temporary state of uncertainty in their minds. We may need to

- solve a problem, deal with a 'nagging doubt', be unable to 'fit' an idea in with other ideas when we believe it should fit, explore an idea in an open-ended way to know more about it.
- maintain our level of social approval or acceptance and the learning will help us to do or say things that will be acceptable to the group.

There are affective conditions that we need to have in place to use the strategies. We need to

- believe that we may be successful in achieving our purpose of resolving the nagging doubt.
- see ourselves making progress with the learning; if we don't, we are more likely to give up.
- satisfy social demands; we are less likely to use strategies that do not meet group approval.

Our motives for learning initiate our use of learning strategies through our metacognitive knowledge. Our motives are linked to the metacognitive and cognitive strategies we use. They influence how we plan to learn a set of ideas, the strategies we select, how we monitor progress and how we evaluate the learning.

More competent students use a wider range of learning strategies and do so selectively. Learning disabled students are 'non strategic'; they do not use spontaneously the range of strategies used by their more academically able peers. Reading disabled children use a limited range of reading-comprehending strategies. They may use corresponding strategies in oral language.

Developmental trends in learning strategies Children and adults differ in the learning strategies they use;

- children of different ages use different strategies.
- culture also impacts on the particular strategies used.

The two areas of knowledge develop in parallel through childhood and adolescence.

How metacognitive knowledge develops This knowledge develops gradually, in parallel with an increasingly varied range of learning experiences. Children aged 5 to 7 years have little explicit metacognitive knowledge. By the end of primary school they have substantial knowledge. Developmental aspects include:

- planning develops slowly and improves rapidly between 10 and 14 years of age.
- monitoring learning develops slowly but teaching improves it.
- awareness that knowledge can be managed begins 5-7 and develops into adolescence.

The role played by language in changing how learners learn The language learners speak can become a key way of thinking. Learners internalize the language of their culture and this becomes their 'inner speech' or 'self-talk'. They use this 'inner speech' to direct and organize their thinking. It allows them to represent features of external events, link ideas in acceptable ways and manage their own behaviours. Without inner speech, individuals' responses follow directly from the external events they experience with little 'thinking in-between'. This internalization is believed to begin around the ages of four to five. Children who do not develop efficient inner speech have greater difficulty thinking.

Thinking strategies begin as physical actions Learning strategies often begin as physical actions and, with age, are gradually internalized.

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| physical actions on objects | physical actions on perceptions | mental actions on objects, events | mental actions on abstract symbols and propositions |
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Thinking strategies can combine into chains of ways of thinking, with two or more strategies integrated into a 'more powerful' single strategy.

Teaching implications

Teachers can help students broaden their knowledge of cognitive and metacognitive strategies by

- fostering an awareness and valuing of how learners learn and think
- teaching cognitive and metacognitive strategies directly.

Help students become more aware of how they go about thinking.

Encourage a sensitivity to thinking processes and how different children think about an idea.

- **Ask students to describe how they go about learning.** Most students find it hard to describe how they learn and the actions they use. Because they haven't done this before, they may not feel that they have the necessary words. They also may feel self-conscious about doing it, that these issues are personal and private.

We can initiate this discussion by talking about how we learn and give students different options. For the first one or two learning activities we might ask questions that require the students to select the alternative that best matched how they learnt, for example,

- (1) "Did you make a picture in your mind or did you talk to yourself about the ideas?"
- (2) "Did you need to guess and to change your mind?"
- (3) "Did you use what you already knew about the idea?"

Students can build up both their ability and confidence in talking about these aspects of learning.

- **Teach the language of thinking.** Not having the language necessary for talking about one's thinking limits how thinking can be improved. Because students have difficulty putting their thoughts into words, they can't explicate how they think. Teachers can

- (1) help pupils learn ways acceptable to them for talking about their thoughts, encourage thinking aloud, ensure that recognition precede recall questions.
- (2) teach the vocabulary of thinking, include words that refer to mental processes and outcomes such as *know, think, believe, guess, predict, hypothesise* and *imply*. Help students see how learning these terms improves their thinking.
- (3) help them improve their metacognitive language, ask them to talk about their action plans for thinking, how, when and why to use various learning strategies, how they evaluate their thinking and how they feel.

- **Help students become aware of the value of self-talk in learning.** They can see how talking about the ideas they are learning helps them to

- reason about them, to see logical connections etc.,
- plan their way through academic tasks and
- modify their existing knowledge base

Verbalising their "mental actions" makes them more "concrete" and this helps students to recall them on later occasions, to analyse them, and to modify them.

- **Encourage 'thinking aloud' when students are working through tasks.** Thinking aloud' while they are learning helps students understand their 'ways of thinking' better. Give them a range of ways of showing and recording how they were thinking, for example, talking about how they think, using cartoons with thinking bubbles, acting out thoughts, using a dialogue journal. A metacognitive journal can use the following prompts:

What did I learn today ?
How did I feel about learning today ? What did I enjoy / find boring ?
How well did I do with my learning ?
How was what I learnt similar to other things I already knew ?
How might I use what I learnt in the future ? What can I do now that I couldn't do before?
If I had to learn this again, how would I do it differently next time ?
What do I think I will learn in the next lesson ?

Encourage them to

- keep a record of what works for them (*My ideas on thinking*)
- monitor their progress as thinkers
- make positive self-attributions as thinkers, that their thinking is getting them results.

Verbalizing thoughts makes them more 'concrete' and 'permanent' so that students can recall them more easily analyse and modify them.

- **Remind and cue students to use learning strategies.** While they are learning to use various strategies, you need to tell or remind students to use them. They often have so many other things to keep track of that they may neglect the thinking strategies. Cue them to try different strategies in various contexts. It is not sufficient to leave it to chance that the students will use them.

Encourage them to judge how well particular strategies work for them; this can help them decide when and if they might use them in the future. Have them discuss when and if they might use them in the future. What types of problems might they be useful for ? This teaching leads to independent strategy use by students.

- **Give students opportunities to explore how they learn** Encourage them to try

- planning through a task; how this helps them to achieve outcomes,
 - generating questions about a topic or theme,
 - acting out ideas, role playing and simulations.
- ***Play by the rules for learning*** . Teachers need to show they genuinely value and encourage students using learning actions by giving positive feedback when students use them, for example "You made a guess . That is a good thing to do." or "You took a risk. That really helped you ".
 - ***Have pupils work together to share , trial and evaluate strategies.*** Learning strategies teaching is enhanced in co-operative learning situations because these contexts encourages risk taking and allows work loads to be shared. Co-operative learning
 - (1) facilitates academic learning more than individual and competitive learning contexts.
 - (2) enhances long term and short term memory skills and critical thinking skills,

A useful type of activity is 'paired problem solving' . Students work in pairs. They take turns to talk aloud while working through a problem while the other provides feedback, requests vocalisation and responds to what is said. They can engage in this type of activity when they are learning in larger groups as well. The technique facilitates learning to trust and take risk in the learning situation, for comparing thought processes and for building metacognitive knowledge.

- ***Help students understand the role of questions in learning***. Encourage learners to ask questions of the content , teachers, their peers and themselves. Let them see how asking questions helps them learn new ideas. Suppose a group of children is learning the feeding habits of sharks. At the outset they could work either individually or in small groups to suggest the types of questions the teaching might answer, for example

What do sharks eat ? When do they eat ? How do they catch their food ?

The feeding habits of sharks

How much do they eat at once How often do they eat ?

Help them see how this activity assists them to organise and extend the ideas they learn. After learning the topic they can work in groups to write easy and difficult quiz items for class peers.

After a few years of formal education, some children forget how to ask other than superficial questions. Teachers need to demonstrate ways of asking different types of questions and help students re-learn how to do this. Students may feel threatened by an emphasis on questioning rather than on 'being told'. They need to be work in supportive small-group activities in which they can ask questions of others or imagine doing so.

In particular, students need to learn how to ask questions that extend their learning. These questions focus on 'why' and 'how' rather than on 'correct answers' and direct attention in various ways, for example, they help students to

- (1) clarify their thoughts (" Do you mean ...?)
- (2) see the implications of what they are saying ("But what about ... ? Where does fit in ?)
- (3) identify the assumptions or beliefs on which their ideas are based ("Why do you think that?)
- (4) collate or organise their ideas ("How can we put it all together ?").

Gradually encourage students to ask these types of questions themselves. Let students see that they already have part of the answer to their question.

Foster a positive attitude to questioning, for example, students learn that they

- don't need to answer questions immediately and needn't be anxious 'carrying around questions' .
- can learn to ask a range of open-ended questions and note the questions that lead to thinking.
- need not feel threatened by an emphasis on questions; some feel threatened when they are asked to describe how they think and learn or why they hold particular beliefs. They believe the questions suggest that what they think must be faulty or wrong.
- **see an alternative role for the teacher**, not to teach ideas but to help children explicate what they already know implicitly; to act as a coach or facilitator. Teachers can model how they think by thinking aloud, let their pupils see what they do when they find thinking difficult.
- **teach strategies for organizing their knowledge of thinking and learning**, for example
you can see link you didn't see before you can work out how to do things better
What does thinking mean ? What are we doing when we are thinking ?
you see things that you didn't see before you understand things differently
you organize ideas in new ways
- **show you value different ways of thinking**. When students are next thinking about how they learn, encourage both
 - creative, lateral thinking with open-ended learning tasks in which pupils develop their own questions to explore and
 - analytic and critical thinking.

Encourage them to examine how the two aspects have an important role in the thinking process.

- **teach students to reflect on how they learn** . A key aspect of understanding how you learn is being able to review and analyse your experiences as a learner. What you know about your learning history becomes your data base for analysing how you learn. Reflection means thinking evaluatively about past experiences and possible future experiences. It is like 'replaying the mental videotape' of experiences. You can weigh up the actions taken, what did or didn't work and identify options for yourself. Generally you will have a purpose for reflecting, for example, to see what did or don't work, how a current problem might be solved or to see future options.

Reflecting does not seem to come naturally to most people. Things that teachers can do to help students to learn to reflect and see its value include the following:

- we need to clarify our own understanding of reflection and decide how we will
 - model and encourage reflective behaviours, let students see that it is both valuable and valued in learning, praise them for using it
 - value individual differences in reflection and
 - help students broaden their options for reflecting.
- provide students with things to reflect on. Students ultimately need to manage their own reflective processes. It is not enough to tell them to "reflect"; we need to help them explore this in non-threatening group problem-solving activities. They can
 - (1) choose an aspect of a topic they have been learning and present it to a group in any way they choose and then reflect on their reason for choosing the aspect and the format.
 - (2) reflect on how they prefer to learn best at school, the types of homework format that suit them.
 - (3) first work individually learning a topic, then in pairs on it and then in a small group. How and why does their understanding of the topic change at each stage ?

- make time available for reflection. As well as making reflective activity an essential part of all learning, if possible set aside regular time for it. For many students, everyday living is crammed with 'busy work and activity'. Even a school day has little time for pupils to think over the ideas they have been learning.

In the primary classroom, at the end of each morning and afternoon's working time, give them 5 to 10 minutes 'review time' when they go over the things that they have learnt, what worked for them, when they might think like that again in the future, use the time to write about their thoughts or draw pictures of their thoughts. Some students may need to see this modelled. Avoid the temptation to call this 'thinking time'.

At home students can set a time each evening when they actively think back over the day's activities. They might spend a few minutes each morning before school, thinking through the likely activities in which they will engage and what they might do.

- model and share reflective actions. Reflection is learnt like other mental actions. Teachers and parents need to model it, by describing what they do when they reflect, particularly in shared experiences. Students can share how they went about reflecting. Discuss the different ways in which people reflect. Develop learning to reflect as a joint activity with students taking on the role of teacher. Students need to be aware of the differences this and learning content knowledge.
- provide multiple ways for learning how to reflect. Many students are reluctant to reflect publicly; they believe the ideas are private. Allow them to reflect through toy and puppet play and, for older children, role-play and drama. Some find background music can assist.
- encourage pupils to explore how being reflective works for them, helps them improve how well they learn, how it helps them to see ideas from different perspectives, to understand them better and to use them more effectively.
- help students see how they can reflect in different ways, for different purposes, particularly in the future. Do pupils reflect about different ideas in different subjects in different ways ?
- help students understand how they reflect, how they use self-talk and imagery to reflect, when and why they might use reflection in the future..
- explore with pupils ways in which they can record their reflections and keep a diary or journal of them; they can use
 - audio tapes
 - writing,
 - pictorial, diagrammatic formats
 - enactive, dramatic formats.

When students know that there are things that they can do to learn and what these things are, they are more empowered as learners to control of their own learning. They can see learning as doing things. They can be encouraged to evaluate each action and see when it is most useful; that some actions can be used across a range of learning situations, while other actions are more specific.

They can list the actions that they find useful and can gradually add to this as they try new ones. The list can remind them, whenever they encounter a new task, of options they have. They can learn to ask themselves "*How will I approach a similar learning task in the future; what might I do first, second, etc ?*" They can switch strategies, particularly when they find one is not helping them to learn an idea. This helps them to learn how to deal adaptively with difficult learning tasks. When they are finding an idea difficult to learn, they can try using alternative ones.

- ***Encourage the learning of ways of thinking*** that are unique to subjects. Help students learn templates for solving types of problems and for thinking in various ways.

Examine cultural differences in thinking, both in subjects and more generally in societies. How are the ways of thinking that are valued in a culture related to how the culture operates ?

As an extension, look at the history of thinking in subjects taught. How did people think in science, law or history in earlier centuries ? How did Galileo think about the solar system or Darwin about the evolution of man ? How was Freud's thinking about mental illness and the development of personality constrained by the time in history in which he lived. How was Marx's thinking about society influenced by his time in history ? What does the history of thinking in a subject area tell us about the growth of thinking in that area ?

- ***Encourage self-monitoring procedures during learning.*** These include
 - when beginning a task, students suggest ways of monitoring their progress towards goals; they decide what will be indicators of their knowledge and ability. They note these down and tick off as they achieve each point.
 - during the learning, show this is valued.
 - model self-monitoring procedures.
 - have students discuss the value of self-monitoring, how it help them learn better.
 - support small-group monitoring of co-operative learning activities.
 - use thinking activities in which intermediate checking and monitoring is important.
 - have students discriminate between tasks that require a higher level of self-monitoring (those that may have a hidden 'trap', or are less routine) and those that require less.
- ***Procedures for monitoring children's use of metacognitive knowledge*** include
 - "think aloud" as they work through a task.
 - asking them to explain how they went about learning in interview contexts
 - checklists that ask learners to comment on how they judge the difficulty of tasks, the goals they set, how well they plan ways of attaining these goals and how they monitor progress towards each goal.
- ***Look at what you are teaching tomorrow and ask yourself***
 - *What are the kinds of thinking I want my pupils to learn ?*
 - *Where, in my teaching, can I include activities to develop ways of thinking ?*
 - When you are linking what students already know with new ideas, remind them of ways of changing what they know.
 - Encourage small group work to suggest questions that a new set of ideas might answer or to review how students went about learning.
 - At the end of a lesson or unit, have students review the learning actions that they used to help them to learn.
 - *How can I organize my lesson to teach this way of thinking ?* You can teach thinking strategies in a number of ways;
 - through social interactions in co-operative learning, pupils engage in group reasoning and problem-solving, sharing strategies, trialing strategies used by peers and thinking aloud interactively.
 - incidentally, observing others using them. In some learning situations this is not appropriate; some learners need more support than this; they need to practise the strategy first on familiar, automatized knowledge and then gradually generalize it.
 - through direct instruction, teaching a strategy explicitly by modelling it, having students apply it in guided practice and then in independent practice.

- through individual reflective activity, leading to learners developing their own personal theories of metacognition.
- by being infused within a content area. Strategies are infused or embedded in a 'content area being learnt. Students reflect on how they learnt the content and transfer the thinking actions to other situations. Infusion lessons blend four teaching procedures
 - (1) having students decide the value of the strategy, how it helps them learn better.
 - (2) having students apply and practise it as they learn new content, using guiding prompts.
 - (3) asking reflective questions that assist students to discriminate between what and how they are learning.
 - (4) having students use the strategy independently.

Each of these teaching procedures is useful in particular situations, depending on what students already know and what the desired outcomes are.

- ***Teach thinking strategies in the developmental trend implied earlier.*** , first as physical actions and allow them to be internalized gradually. As well, have them learn them first in areas of knowledge with which they are familiar and then gradually broaden its application. The developmental trend proposes that we teach thinking strategies in the following sequence: as

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| physical actions on objects | physical actions on perceptions on objects, | mental actions on objects, events | mental actions on abstract symbols and propositions |
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In summary

Strategies are learnt in specific contexts. Students may need help to generalize or transfer them; they may not do so automatically. They can use high level strategies in one context but not in others. Key recommended teaching procedures include the following:

- (1) ask students to monitor the effectiveness of the strategy in terms of their goal or purpose; this helps them retain and transfer them.
- (2) take account of the preferred ways of learning of individual students. Any strategy may be appropriate for some students more than others.
- (3) help students see the new way of learning directly solves current problems that they have.
- (4) teach learning strategies in content areas with which students are familiar and have them gradually transfer the strategy to new content areas rather than teaching the strategy as a decontextualized general strategy. Ask students to discuss how the new context is like the one that they have already used the strategy.
- (5) provide opportunities for pupils to work together, think aloud and sharing strategies.

Strategies that students can generalize. Types of strategies with wide application include

- ***Using what you already know about the idea being learnt.*** This strategy gives students a framework or skeleton for learning new ideas and linking what they already know to it. It helps them see familiar ideas in the new idea. Key questions for students to learn to ask include

- "What does the topic remind me of ? "
- "How is it like things that I have already learnt ? How is it different ?"
- What do I already know about this ?

Students can look at what they know from different perspectives , for example

When I make pictures of
wood chipping in my mind
what do I see ?

Wood chipping

If I were interviewed about the positive
and negative aspects of wood chipping
what would I say ?

What actions and functions would be associated with wood chipping ?

Students practise applying the key questions either aloud or 'in their heads' to information. The questions help students 'tune themselves in' by using what they know about an idea. They can

- (1) write a summary card showing the main ideas.
- (2) draw a concept map or flow chart, showing how the ideas are related. These charts help students to 'get above' individual ideas, and to see how they fit together.
- (3) brain-storm and engage in key-word type activities.

How to plan your way through typical learning tasks : students tell themselves to answer:

- *"What does the task say?"* They read the data defining the task and recall the meaning of each term or symbol. They integrate the bits of information into a picture of what the task asks. They may separate relevant from irrelevant information. They ask questions such as
 - "What am I being told?"*
 - "What do I want to know, and*
 - "What do I need to find?" "What will the answer be like?"*
- *"What type of task is it?"* They link the task with ideas in memory. They note how they make the classification. They ask themselves
 - "What does the problem remind me of ? "*
 - "How is it like problems that I have already learnt ? How is it different ?"*
- *"What methods will I use with this type of problem?"* They recall the procedures or methods linked with the type of task and the order for using them. They apply the procedures.
- *Is the result or outcome reasonable?"* They decide whether they have answered the question asked and whether the outcome is reasonable / acceptable.

Students need to have time to practise planning how they will complete tasks by applying these types of key questions. They can

- write the key questions on an index card and use them for unfamiliar or difficult tasks,

1. *What does it tell me ? What do I have to end up with ?*
Will reading it aloud help ?
Will drawing a picture help ?
2. *What type of task is it ? What does it remind me of ?*
3. *What procedures will I use ? What will I do first / second / third part say ?*
4. *Does the answer seem right ? Have I answered the question asked ?*

- practise applying the key questions 'in their heads' (or mentally) to tasks; they read a task, 'think' through it and then write down their attempt. This will help them to
 - speed up the time that it takes them to solve problems.
 - see their way through problems,
 - see possible 'danger areas, dead-ends' etc.' coming up. Seeing a dead-end after 30 seconds of thought is preferable to coming to it after 5 minutes of writing.

- suggest the types of tasks one might expect in the topic or subject area,, how the ideas are organised in the area and how to meet assessment demands in the subject area.

Regular successful use may lead to a strategy gradually becoming automatized so that the student automatically initiates it, without the need to invest mental energy.

- ***Putting in place what you know.*** Often in learning students feel themselves drowning. When they identify and link the parts that they already know, they find the remaining parts fall into place. An example is needing to spell a complex word. At first you may believe you can't spell it. When you write down the letters you are sure of in their approximate positions, it is often easy to slot the remaining letters. Some learners find an essay such an onerous task that they can't get started. When they list down all that they know about it and work on making links, the task becomes much more manageable. The obstacles learners encounter can become learning situations in their own right. Students try to discover what worked for them earlier to get around blocks or dead-ends ?

While there are many unresolved issues in relation to learning strategies, they provide a useful way of looking at what we do in order to learn. They draw attention to the need to distinguish between content knowledge and how we learn it, (for example, the distinction between comprehension and the use of comprehending strategies.