

Cognitive Psychology & Its Applications



Issues in Thinking: Key terms

Representation

For this section, you need to know about the ways in which we represent knowledge:

- **Concepts**
A concept is abstract knowledge about something that is not linked to individual instances - for example, knowing about “desk” or “joy” does not necessarily mean remembering a particular desk or a particular instance of joy. To get more of a feel for what a concept is try thinking of “desk” - it means something to work on, somewhere to store things, a piece of furniture, it tends to have four legs etc. It is not a simple idea and defining a desk is much more difficult than pointing to one or finding one to work on.
- **Schemas**
A schema is a knowledge structure ; it is a packet of information that encompasses all the knowledge and experience that a person has about some specific thing in the world and it can be abstract (for example, knowledge and experience about abstract concepts such as justice) as well as concrete knowledge (for example, knowledge about the appearance of a face). We use schemas to make sense of the world, in particular to make sense of ambiguous and unfamiliar information, in terms of our existing knowledge and understanding.
- **Cognitive maps**
A cognitive map is an inferred process that contains the knowledge that we have about the space in which we live. It is a representation of the world, in particular it includes an understanding of the spatial relationships that constitute routes through the world (e.g. you will have a mental map of the streets and paths that lead you from your home to college).
- **Enactive**
Representation of the world through actions that may be very difficult to put into words. For example, riding a bicycle involves an enactive mode of thinking that is represented in virtually automatic patterns of motor activity and it is difficult to describe in words exactly how we do it - to describe how this knowledge is represented. It is knowledge based on concrete experiences. It is the first mode of thinking developed (suggested by Bruner, 1966) and it lets the child represent the world through actions; any knowledge that babies have is based upon what they have experienced through their own behaviour.
- **Iconic**
An icon is an image, so this form of representation involves building up a mental image of things we have experienced. Such images are normally made up of a number of past encounters with similar objects or situations. This is, according to Bruner, the second mode of thinking developed by children, where the child is at the mercy of what it *perceives*.
- **Symbolic**
This mode of representation frees the individual from their immediate context and allows a person to go beyond the information given and represent the world symbolically. The ability to symbolise depends, to a large extent, on language and is at the heart of a person’s capacity to think abstractly and to make knowledge about

the world their own. This is, according to Bruner, the final mode of thinking developed by the child and it is the point at which language has its greatest influence on thought. It indicates the start of the child's ability to use verbal rules to guide them and it allows the child to restructure problems mentally.

Thinking about thinking

Thinking is often considered one of the highest expressions of our mental development. It has a number of characteristics, mainly:

1. It tends to be conscious- though few would deny that unconscious processing occurs continuously
2. it varies in the extent to which it is directed - sometimes we can let our thoughts run free and other times we are very focused
3. the amount and nature of the knowledge used in different thinking tasks can vary enormously- e.g. adding 2+2 involves little effort, but writing a novel - or even this handout - uses much more knowledge and effort.

One of the most interesting aspects of thinking is the fact that we can introspect on our thinking - we can think about thinking! However, psychological experiments on thinking about thinking have found that retrospective recollections of conscious thoughts are often unreliable. In fact, even introspective (see next page for definition of introspection) evidence taken as thoughts are being produced is only reliable under some conditions. So, maybe thinking about our thinking is rather an unreliable exercise.

Investigating Thinking

For this section, you need to know some of the different methods used to investigate thinking:

- ***introspection***
This depends on subjects reporting their personal and private conscious experiences, which would be almost impossible to obtain in any other way. Investigations using this method would ask subjects to report on their conscious experience, usually whilst they are carrying out a task. Retrospective reports are unreliable because they rely on memory, which will almost certainly be imperfect. These methods were used in particular by early psychologists such as Wundt.
- ***thinking aloud protocols***
Protocols are the steps taken in solving a problem and if we can identify the protocols that humans use when carrying out specific tasks or solving problems then it could give useful information not only about the way that humans think but also for the development of computer simulations of thinking. To try to find out more about the ways that humans think, thinking aloud protocols are used. This is where the participant verbalises his or her thoughts whilst they are carrying out a particular task or solving a problem. Usually a tape recording will be made, to be analysed later in order to work out the thought processes that the participant used.
- ***behavioural observation***
Another way to find out more about how people think when carrying out various tasks is to watch what they do and note what they say. Behavioural observation involves systematic analysis of different behavioural categories. It could involve video-taping an individual for later analysis or simple watching and listening to them and taking notes. If more than one observer is used then inter-rater reliability must be checked; if just one observer is used then intra-rater reliability must be checked. Also, issues of validity can be problematic because this method will involve a great deal of interpretation and inference from the researcher if it is thinking that is being analysed because you cannot directly observe thinking!

- **reaction time**
Measurement of how quickly a person responds to a particular stimulus or set of stimuli can be used to indicate factors that influence speed of processing and hence that influence thinking. The basic argument is that if more processing is required then reaction time will be longer. For example, if the task is to press a single button every time you hear a particular stimulus then if reaction time slows when asked to choose which button to press from a choice of three then this suggests that making the decision about *which* button to press takes time. This can give some basic and crude indications about factors influencing thinking.
- **analysis of errors**
This method can take a number of forms. One is to comparing speed and accuracy to work out whether there is any trade-off between speed and errors - it would be important to work out if someone is processing something quickly simply because they are making many mistakes. Another method is to analyse the mistakes that people make when they are speaking in order to work out what it going on in their language (and, perhaps, thought) processes. It can also involve analysing errors made when solving problems to see if any insight can be gained into the steps that are taken during problem solving activities. In addition, memory errors can be particularly useful in analysing memory processing and reasons for forgetting.

physiological measures

There are a number of ways that physiological measures can be used:

1. single neuron recording to find out what a particular neuron's range of response is
2. Another possibility would be CAT, PET or MRI scans whilst people are carrying out various cognitive functions to see which parts of the brain are active.
3. An EEG could be carried out to see what pattern of activity is taking place in the brain. Evoked potentials are often used in this context, to see where characteristic peaks and troughs in brain activity occur during particular cognitive activities.
4. Another physiological measure that can be used is skin conductance response (SCR), which used to be known as galvanic skin response (GSR) - it is known that the conductivity of the skin alters with alterations in the autonomic nervous system in response to stress and arousal, so this alteration can be measured to indicate some thought processes.