

### Piagetian Theory:

The major theory in the area of cognitive development and learning was proposed by Piaget (1966, 1972) and is largely based around the development of the mental structures called 'schemas' described earlier in this chapter. For a young child, a schema could involve the actions involved in 'reaching out and grasping an object', or for an older person it might involve the mature and complex sequence of expectations and actions involved in 'going to a restaurant'.

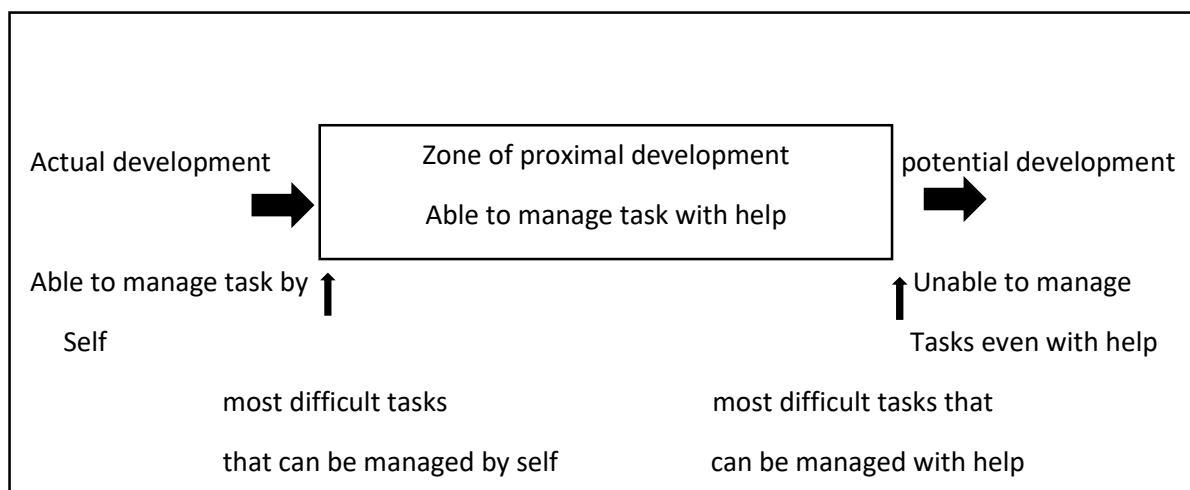
From an adult perspective, children's schemas appear relatively uncomplicated, and early on these involve ways of representing direct interactions with the physical world. As children mature, Piaget believed that schemas become progressively more complex and can ultimately be capable of representing abstract features, enabling older students to carry out high-level thought processes. Piaget was interested in how this development happens, in terms of children's experiences and the influence of new information on their knowledge structures.

### Modifications of Piaget's ideas

Piaget's ideas have generally been subject to a great deal of criticism and modification. First, there is considerable evidence that children are often able to carry out tasks at an earlier age than his theory says they should be capable of (Siegler and Alibali, 2005). Whether they can do so seems to depend on whether the tasks have meaning or relevance to the children, as illustrated by the following classic study.

children are certainly capable of carrying out many tasks earlier than Piaget would have predicted. Despite this, there are still some limits to their attainments, and one would not, for example, expect very young children to be capable of certain types of abstract thought, no matter what experiences they had had, or how particular tasks were presented to them.

### Social constructivism:



**Figure 01:** zone of proximal development

Piaget was mainly concerned with the cognitive and logical nature of children's development. Although he believed that children's abilities develop through their interactions with their environment, he tended to focus on the mental adaptations involved, rather than the role of the environment. However, other theorists, such as Vygotsky, a contemporary of Piaget, have emphasised the way in which children's experiences underlie their cognitive development. Those

experiences are determined by the particular individuals (usually parents) who interact closely with children from an early age.

Vygotsky saw the progression of children's cognitive abilities as developing in a generally similar qualitative way to that proposed by Piaget, with initial abilities dependent on direct experiences and actions, leading eventually to more complex and abstract thought. He also believed that children build up or construct their own meaning and understanding of their environment. Unlike Piaget, however, he believed that they do so mainly through their ability to internalise experiences. The experiences themselves he saw as being largely provided by parents interacting with their own children. For example, Vygotsky (1978) described young children learning to point when they see their parents doing so in response to something that they want.

As will be discussed in Chapter 9, Vygotsky considered language to be a key feature of children's development. At first they use it mainly to interact with others, but from the age of two years onwards, they use it increasingly as a basis for 'thinking out loud'. Eventually a form of simplified language becomes internalised at about seven years of age and acts to regulate and organise thought when necessary. Vygotsky saw language as the result of early socialisation, but believed that, by its use in social contexts, it is also the main vehicle for developing later knowledge and understanding.

Anticipating modern perspectives, Vygotsky also believed that children's development can be best understood in terms of the acquisition of their culture. This is embodied in language, art, and ways of seeing and understanding the world, including elements such as metaphors and other models, songs and play. This emphasis implies that there will be significant differences in the thinking of children from different cultural backgrounds, and is supported by findings that basic features such as values and attributional styles can vary widely. Kivilu and Rogers (1998), for instance, found that children from Kenya considered that their academic success depended largely on how they were taught. By contrast, children from Western and Asian countries generally consider ability and effort to be much more important.

Vygotsky particularly believed that children's early understanding came from the support that they were given by interacting with knowledgeable adults. Such support enables children to function in an area named the zone of proximal development (see Figure 01), which is beyond children's normal independent abilities. When children are given such support, they are then able to internalise the work and to make further progress.

This approach implies that teaching should focus on activities within this zone, since it is here that most progress is occurring. In Piagetian terms, this is the area of greatest disequilibrium and accommodation, and these processes underlie children's interest, curiosity and intrinsic motivation. A further important aspect is that children with the same level of ostensible development may actually have different proximal development zones. As an example of this, two children could have the same basic word-reading vocabulary but one of them may be more likely to make progress if he or she has better abilities with speech and letter sounds.

## **Scaffolding**

The process by which children can be taught within the proximal development zone has been described by Wood et al. (1976) as similar to the process of scaffolding in building. This apt metaphor implies that the adult supplies initial support to enable children to construct their understanding, and that this support is then withdrawn when they have independent abilities. Wood et al. studied parents teaching three-to-five-year-old children simple physical construction tasks. In this situation, effective teaching appeared to be based on two main 'rules':

\*when a child was struggling, the tutor immediately offered more help;

\*conversely, when the child was successful, the tutor gradually reduced the support he or she provided and gave less help until the child was managing the task alone.

This is known as contingent tutoring (i.e. the tutor's behaviour is contingent upon the behaviour of the learner).

Another key element of scaffolding appeared to entail involving a child 'luring' him or her into the activity. This was often done by demonstrating interesting parts of the task that the child could do straight away, such as fitting easy parts together. Also the task was often made easier, so as to fit with the child's actual abilities at that time. This could involve taking away parts, or helping the child to see things in a different way.

Unsuccessful strategies that were used by some parents involved demonstrating the whole task, which just overloaded the children. Either the children attempted to leave the situation, or the parents forced them to become more actively involved.

Other parents relied almost exclusively on verbal instructions, such as ‘Put the little blocks on top of the big ones’, which the children were not able to understand without first being shown.

When scaffolding does work well, then, as Vygotsky suggested, children seem to internalise the actions they have observed. A key role for the adult is to demonstrate or ‘model’ correct behaviours, as well as maintain children within their ‘zone of proximal development’. Adults can also function to remind children of their overall goal or objective, since otherwise children might lose their motivation when they have completed part of the task.

Learning from adults does not always involve the tight structure and interactivity of scaffolding, and children can often learn by simply observing or being told what to do. Tharp and Gallimore (1998) refer to the processes of support (including scaffolding) as ‘assisting’. These are more applicable to that teaching and involve the techniques of instructing, questioning and cognitive structuring. These are recognisably what most teachers do, but Tharp and Gallimore emphasise that they should enable students to develop their own understanding, rather than merely assimilate information. For example, teachers can use questioning that leads children to think about topics, rather than just having right or wrong answers. Teachers are also an important source of information that can enable pupils to organise their own knowledge and understanding, by the use of explanations or strategies and rules.

### **Socio-cultural theory**

Research into the processes of learning and cognitive development has been transformed in the last 20 years through the significant influence of sociocultural theory. Also described as ‘socio-historical’ and ‘cultural-historical’ theory, its origins are to be found predominantly in the work of the Russian psychologist Lev Vygotsky. As Mercer and Littleton (2007) explain, sociocultural research is not a unified field, but those working within it treat communication, thinking and learning as processes shaped by culture, whereby knowledge is shared and understandings are jointly negotiated and constructed. As communicative events are shaped by cultural and historical factors, thinking, learning and development cannot be understood without taking account of the intrinsically social and communicative nature of human life.

From a sociocultural perspective, humans are seen as having a unique and distinctive capacity for communication their lives are normally led within groups, communities and societies based on shared ways of using language, ways of thinking, social practices and tools for getting things done. Education is thus seen as a dialogic process, with students and teachers working within settings that reflect the values and social practices of schools as cultural institutions. A sociocultural perspective raises the possibility that educational success and failure may be explained by the quality of educational dialogue, rather than simply by considering the capability of individual students or the skill of their teachers. It encourages the investigation of the relationship between language and thinking and also of the relationship between what Vygotsky called the ‘intermental’ and the ‘intramental’ the social and the psychological in the processes of learning, development and intellectual endeavour (Mercer and Littleton, 2007). Partly through the influence of these ideas, social interaction has increasingly come to be seen as significant in shaping children’s cognitive development.

### **Connectionism**

One of the problems for most of the above theories of learning is that they tend to involve the development of rather abstract features such as concepts and schemas without any links to what this could all be actually based on. Connectionism is a way of looking at thought and learning that is based upon highly complex parallel logical systems that have similarities to the structure and possible working of the human brain. The new approach can account for a range of complex functions, including concept formation and identification. It represents a radical departure from classical cognitive descriptions, which are usually couched in terms of a clear sequence of logical processes.

The human brain is made up from a huge number of cells, probably more than a trillion of the main ones, known as neurons. Each of these links with thousands of others, and together they form a dense and highly complex web of interconnections. Basic brain processes such as perceptions happen relatively quickly typically in less time than it takes for information to pass between ten neurons. This, combined with findings from neurophysiological research, makes it seem likely that much of the brain’s processing takes place in parallel, with many neurons becoming activated at the same time, and hence many processing operations occurring simultaneously. This perspective sees learning as the process by which different connections between the neurons become strengthened or weakened, producing specific patterns of pathways which are the basis for new concepts and ways of thinking.

The key elements of this process can be represented in a system called a 'neural network', which can be either a computer program or an integrated circuit. The system is made up from layers of artificial 'cells' or units, which are connected with each other. One layer acts as the 'input', rather like the initial sensory processes of the brain. Another layer usually acts as a 'hidden' or interconnecting level, where the main biasing and routing of information happens. A final layer acts as the 'output' and is the result of the combinations of the various biases in the connections. Like neurons, each unit in the network will become activated and pass on information only if the information it receives goes above a certain critical threshold.

Neural networks have to be 'trained' using feedback to give the desired output for specific inputs. This is done by repeatedly giving the network a range of possible input experiences, then using the accuracy of the output to modify the biases of the connections between the units. When a particular output is incorrect, the biases are given a slight nudge in their values towards what would give a correct answer, in a technique known as 'back propagation'.

Connectionism has been applied in a broadly similar way to this by Sejnowski and Rosenberg (1987) to train a neural network called NETtalk to 'read' text. This was set up to accept text input and to output phonetic codes that could be turned into sounds. The training input involved a large amount of normal English text, coupled with its corresponding phonetic output. At first, the network emitted only random sounds, then went through a stage of 'babbling', which then became closer in normal speech, eventually developing a fairly accurate spoken representation of what was written. The trained network was able to 'read' new text that it had never encountered before. 'Neural networks have also been used to develop language capabilities that were once thought to involve sophisticated high-level cognitive processes. Rumelhart and McClelland (1986), for instance, developed a system that learned to identify the past tense of regular and irregular verbs, and Elman (1991) was able to train a network to make grammatical predictions for missing words.

The reason for carrying out such investigations is that they could be telling us something about how the brain may be working. One key feature is that the above networks did not need any special predisposition to learn certain types of structures. This appears to throw some doubt on the idea that humans must possess some specific inherited abilities in order to learn apparently complex behaviour. Nor do networks need any form of 'rule processing', even though the final set of connections does reflect whatever regularities and patterns there were in the original information. In NETtalk, for instance, the hidden layer units showed distinct separate patterns of activation for vowels and consonants. Combined with the fact that it is difficult to argue that such networks are 'conscious' in any meaningful way, this throws some doubt on the need for classical, 'rule-seeking' cognitive processes in basic learning.

For example, a child developing language may make what appears to be an overgeneralisation of a rule, as when saying 'mouses' instead of 'mice'. This can be taken to indicate that he or she is consciously generating and testing hypotheses about the underlying structure of adult language. However, at one stage of training, Rumelhart and McClelland's (1986) network made the very same type of error, indicating that such learning could in fact be largely automatic and unconscious, with the 'prop' crazies of implicit learning described earlier in this chapter.

There are large numbers of units in any practical neural network, and their connections represent a highly complex system. For this reason, it is not possible to know exactly how the various weightings in a trained system are operating. In a similar way, it may be that we cannot actually know the exact nature of human learning and can only describe possible associations between input experiences and output responses representing a rather unexpected return to some of the original ideas of behaviourism.

It is fair to say, however, that the relevance of connectionism is still hotly debated, and there are still many uncertainties about how the brain really works. There are also difficulties in getting neural networks to reproduce general relationships between symbolic representations; they tend to be relatively specific to what they have been trained up on. Despite this, neural networks have many strengths that come from their distributed nature. This means, for instance, that they are able to represent complex, probabilistic concepts such as the use of prototypes or schemas. It seems likely, therefore, that connectionist approaches will continue to be a useful way of describing general learning processes, and may have a basis in the underlying biological functioning of the brain.

### **Noticing hypothesis**

Attention is another characteristic that some believe to have a role in determining the success or failure of language processing. Richard Schmidt states that although explicit metalinguistic knowledge of a language is not always essential for acquisition, the learner must be aware of L2 input in order to gain from it. In his "noticing hypothesis," Schmidt posits that learners must notice the ways in which their interlanguage structures differ from target norms. This noticing of the gap

allows the learner's internal language processing to restructure the learner's internal representation of the rules of the L2 in order to bring the learner's production closer to the target. In this respect, Schmidt's understanding is consistent with the ongoing process of rule formation found in emergentism and connectionism.

### **Automaticity**

Thinkers have produced several theories concerning how learners use their internal L2 knowledge structures to comprehend L2 input and produce L2 output. One idea is that learners acquire proficiency in an L2 in the same way that people acquire other complex cognitive skills. Automaticity is the performance of a skill without conscious control. It results from the gradated process of proceduralization. In the field of cognitive psychology, Anderson expounds a model of skill acquisition, according to which persons use procedures to apply their declarative knowledge about a subject in order to solve problems. On repeated practice, these procedures develop into production rules that the individual can use to solve the problem, without accessing long-term declarative memory. Performance speed and accuracy improve as the learner implements these production rules. DeKeyser tested the application of this model to L2 language automaticity. He found that subjects developed increasing proficiency in performing tasks related to the morphosyntax of an artificial language, Autopractan, and performed on a learning curve typical of the acquisition of non-language cognitive skills. This evidence conforms to Anderson's general model of cognitive skill acquisition, supports the idea that declarative knowledge can be transformed into procedural knowledge, and tends to undermine the idea of Krashen . that knowledge gained through language “learning” cannot be used to initiate speech production.

### **Semantic theory**

For the second-language learner, the acquisition of meaning is arguably the most important task. Meaning is at the heart of a language, not the exotic sounds or elegant sentence structure. There are several types of meanings: lexical, grammatical, semantic, and pragmatic. All the different meanings contribute to the acquisition of meaning resulting in the integrated second language possession.

Lexical meaning – meaning that is stored in our mental lexicon;

Grammatical meaning – comes into consideration when calculating the meaning of a sentence; usually encoded in inflectional morphology (ex. - ed for past simple, -‘s for third person possessive)

Semantic meaning – word meaning;

Pragmatic meaning – meaning that depends on context, requires knowledge of the world to decipher; for example, when someone asks on the phone, “Is Mike there?” he doesn’t want to know if Mike is physically there; he wants to know if he can talk to Mike.

### **Complex Dynamic Systems Theory**

Second language acquisition has been usually investigated by applying traditional cross-sectional studies. In these designs usually a pre-test post-test method is used. However, in the 2000s a novel angle emerged in the field of second language research. These studies mainly adopt Dynamic systems theory perspective to analyse longitudinal time-series data. Scientists such as Larsen-Freeman, Verspoor, de Bot, Lowie, van Geert claim that second language acquisition can be best captured by applying longitudinal case study research design rather than cross-sectional designs. In these studies variability is seen a key indicator of development, self-organization from a Dynamic systems parlance. The interconnectedness of the systems is usually analysed by moving correlations.

## **Krashen's 6 hypotheses**

### **What are Krashen's Hypotheses?**

Krashen's theory of second language acquisition consists of six main hypotheses:

The Acquisition-Learning hypothesis

The Monitor hypothesis

The Natural Order hypothesis

The Input hypothesis

The Affective Filter hypothesis

The Reading Hypothesis

How do Krashen's Hypotheses apply to the SL/FL classroom?

### **The Acquisition-Learning hypothesis**

According to Krashen, there are two ways of developing language ability. Acquisition involves the subconscious acceptance of knowledge where information is stored in the brain through the use of communication; this is the process used for developing native languages. Learning, on the other hand, is the conscious acceptance of knowledge 'about' a language (i.e. the grammar or form). Krashen states that this is often the product of formal language instruction.

#### **Application for teaching:**

According to this theory, the optimal way a language is learned is through natural communication. As a second language teacher, the ideal is to create a situation wherein language is used in order to fulfill authentic purposes. This in turn, will help students to 'acquire' the language instead of just 'learning' it.

### **The Monitor hypothesis**

This hypothesis further explains how acquisition and learning are used; the acquisition system, initiates an utterance and the learning system 'monitors' the utterance to inspect and correct errors. Krashen states that monitoring can make some contribution to the accuracy of an utterance but its use should be limited. He suggests that the 'monitor' can sometimes act as a barrier as it forces the learner to slow down and focus more on accuracy as opposed to fluency.

#### **Application for teaching:**

As an SL teacher it will always be a challenge to strike a balance between encouraging accuracy and fluency in your students. This balance will depend on numerous variables including the language level of the students, the context of language use and the personal goals of each student. This balance is also known as Communicative competency.

### **The Natural Order hypothesis**

According to Krashen, learners acquire parts of language in a predictable order. For any given language, certain grammatical structures are acquired early while others are acquired later in the process. This hypothesis suggests that this natural order of acquisition occurs independently of deliberate teaching and therefore teachers cannot change the order of a grammatical teaching sequence.

#### **Application for teaching:**

According to this hypothesis, teachers should be aware that certain structures of a language are easier to acquire than others and therefore language structures should be taught in an order that is conducive to learning. Teachers should start by introducing language concepts that are relatively easy for learners to acquire and then use scaffolding to introduce more difficult concepts.

### **The Input hypothesis**

This hypothesis suggests that language acquisition occurs when learners receive messages that they can understand, a concept also known as comprehensible input. However, Krashen also suggests that this comprehensible input should be

one step beyond the learner's current language ability, represented as  $i + 1$ , in order to allow learners to continue to progress with their language development.

**Application for teaching:**

This hypothesis highlights the importance of using the Target Language in the classroom. The goal of any language program is for learners to be able to communicate effectively. By providing as much comprehensible input as possible, especially in situations when learners are not exposed to the TL outside of the classroom, the teacher is able to create a more effective opportunity for language acquisition.

**The Affective Filter hypothesis**

According to Krashen one obstacle that manifests itself during language acquisition is the affective filter; that is a 'screen' that is influenced by emotional variables that can prevent learning. This hypothetical filter does not impact acquisition directly but rather prevents input from reaching the language acquisition part of the brain. According to Krashen the affective filter can be prompted by many different variables including anxiety, self-confidence, motivation and stress.

**Application for teaching:**

In any aspect of education, it is always important to create a safe, welcoming environment in which students can learn. In language education this may be especially important since in order to take in and produce language, learners need to feel that they are able to make mistakes and take risks. This relates to directly to Krashen's hypothesis of the affective filter. To learn more about creating a positive classroom environment

**The Reading Hypothesis**

This hypothesis basically states that the more we read in a SL the greater our vocabulary will be.

**Application for teaching:**

It is important to involve reading in the language classroom to increase knowledge of the language and the way it is used in real-life contexts.