CHAPTER ONE

HUMAN LEARNING

1 APPROACHES TO LEARNING

Definitions of learning have changed over the years. For a long time, learning was defined as a change in behaviour that was the result of experience. This definition functioned as long as research on learning was limited to conditioning. In the 1960s, psychologists began to study other phenomena under the heading of learning. As a result the definition was revised and learning now refers to changes in behaviour, or to changes in the state of an individual's knowledge that are due to experience (Liebert *et al.* 1986: 205, Anderson 1998: 21).

Different learning theories offer different explanations of **learning processes**. Hamilton and Vernon (1976: 412):

> (...) accept the argument that the cognitive and behavioural branches of psychology are derived from different paradigms or world views, specifically the organismic and mechanistic models, respectively, which are fundamentally incompatible and irreconcilable. (...) The cognitive and behavioural approaches to learning are consequently mutually exclusive alternatives, and the adequacy of each must be evaluated within its own ground rules.

Another important consideration for Hamilton and Vernon (*ibid*) is the fact that different world views cannot be merged because such eclecticism is confusing. Nevertheless, research evidence suggests that neither view by itself is adequate to explain the developmental changes found in learning processes. Some of these are more consistent with behavioural analysis and some with cognitive analysis.

Włodarski (1996a: 317), suggests finding a common point of reference for both approaches. In his opinion one should not erase the differences but be aware of them. The basic difference in the approaches refers to the learning material. Behaviourists

concentrate their analysis on the learning of elementary behaviours and basic motor responses, and apply the results to explain even very complex processes, such as speech and thinking. Although this associationist interpretation of simple stimulus--response reactions is absolutely justified, it gives no grounds to interpret the complex processes of a human mind. It can be assumed that with the growing complexity of performance, the role of underlying, unobservable variables increases and the importance of the immediate influence of the environment decreases. Thus, Włodarski (1996a: 319) proposes that from the research perspective the approaches are not mutually exclusive, on the contrary they are mutually complementary.

A developmental perspective on learning

In all the models of development Hamilton and Vernon (1976: 415–416) outline it is assumed that as a child matures, his behavioural repertoire changes and "the constellation of observable behaviour shifts from a predominance of stimulus--determined reflexive activities and unlearned homeostatic mechanisms to behaviours that are more organised and are cognitively mediated".

A developmental trend in learning processes during infancy is such that cognitive processes begin to replace reflexive processes (Hamilton and Vernon 1976: 440). The trend continues in early childhood, and there is considerable evidence that by the age of about 7 learning is primarily a cognitive process. Also the change from involuntary to voluntary attentional processes continues in childhood with the development of more complex voluntary processes. Hamilton and Vernon (*ibid*) state that trends in the development of learning processes are therefore seen to be largely attributable to the development of cognitive processes.

From the developmental point of view all learning processes change over an individual's lifespan. For example, an increase in the rate of learning has been observed in the learning of nonsense syllables, words and digits. McGeoch (1953 quoted after Włodarski 1996a: 185) found out that the number of necessary repetitions decreased with the age of the subjects.

Transfer, the process where the experience of one task has an effect on performance of a different task subsequently undertaken, has been researched among children. The research seems to confirm the thesis that children use transfer increasingly as their age progresses, and that transfer is realised in a growing number of situations, and becomes more and more explicit (Ledzińska 1981: 231).

It has also been discovered that involuntary learning, the only form of learning in infants and very young children, develops with age, but only up till the period of early school years. Later it remains stable. Voluntary learning, on the other hand, starts developing in pre-school and increases in importance throughout the lifespan (Włodarski 1996a: 191).

Voluntary learning entails the use of strategies, which enhance the rate of learning. Two types of learning strategies have been of interest to researchers: those referring to acquiring material – the strategies of remembering, and the strategies of recall which are, concerned with retrieval from memory. Both are referred to as

memory strategies. According to Flavell's research (1970 after Włodarski 1996a: 193) the spontaneous use of appropriate strategies is a positive function of age. Pre-school children usually do not use any strategies, 7- and 8-year-olds use them regularly, and only 10-year-olds utilise strategies spontaneously (Jagodzińska 1985 after *ibid*).

Undoubtedly, strategies play an important role in learning. Together with the subject's development their repertoire and frequency increase, and the strategies improve. For example, in verbal strategies, the first strategy to appear is the naming of a stimulus during perception (pre-school age), next the postponed repetition of the name (about 7 years), and only later seeking associations between the elements of material to be learnt, as well associating it with the subject's existing knowledge (Jagodzińska 1985a, 1985b after *ibid*: 194). Memory strategies and study strategies will be described in more detail in Chapter 1 (see Chapter 1: 3.2–3.3).

2 THE ROLE OF INTELLIGENCE IN LEARNING PROCESSES

2.1 DEFINING INTELLIGENCE

Intelligence has been one of the most thoroughly researched areas in psychology during the twentieth century, "but we still can neither define it precisely nor measure it accurately. To put it simply, intelligence is that marvelous skill that humans (...) use to allow them to *adapt to their environment*, and *adapt their environment to them*" (Davenport 1994: 197).

The aspect of human adaptation to the environment in defining intelligence has already been pointed to by Piaget in his definition:

> Intelligence is an adaptation. In order to grasp its relation to life in general it is therefore necessary to state precisely the relations that exist between the organism and the environment. Life is a continuous creation of increasingly complex forms and a progressive balancing of these forms with the environment.
>
> (Piaget 1952 in Sutherland 1992: 25)

A different view of intelligence is presented by psychologists representing the information processing school (IP). One of its adherents, Robert Sternberg, (1977 quoted after Sutherland 1992: 87) has synthesized his ideas into a theory of intelligence in which various factors involved in IP make up intelligence. "By definition, therefore, to be intelligent is to be able to process information efficiently". Sternberg's six factors are as follows:

1. **spatial ability** – the ability to visualize a problem spatially in all its details;
2. **perceptual speed** – the ability to grasp a new visual field (or view) quickly;
3. **inductive reasoning** – the ability to generalize from evidence presented;
4. **verbal comprehension ability** – the ability to understand new words quickly;
5. **memory** – the ability to store visual material in the brain;
6. **number ability** – the ability to manipulate numbers according to certain rules.

Haywood *et al*. (1992) suggest a more extended view based on a group of assumptions about intelligence, the nature of cognition, the role of motivation and other affective variables in learning and problem-solving. These assumptions are summarized by Ashman and Conway (1997: 95–96):

1. Intelligence refers to many aspects of behaviour with individual differences in strengths and weaknesses.
2. Intelligence is determined by many factors generally considered to result from two causative roots, genetic and environmental.
3. The pattern of cognitive development has a biological basis although 'native ability' is not sufficient to explain individual differences.
4. To function successfully in the world, each individual must acquire a wide range of thinking perceiving, learning, and problem-solving skills.
5. The development of the skills required to function successfully within the world depends upon a person's motivation and attitude to learning and problem solving.
6. Every individual has scope for further intellectual development.
7. Intelligence is modifiable to a limited extent although cognitive processes are readily developed and lead to substantial changes in performance.

2.2 INTELLIGENCE TESTING

The area of psychology which deals with the testing of human abilities is called psychometrics. Some psychologists rejected the very idea of intelligence testing, for example Piaget, claiming that it cannot be measured or tested. Others find it useful in diagnosing children's developmental level and interpreting learning difficulties or deficiencies.

The first intelligence test was designed by Alfred Binet and his colleagues in the early 1900s. "He believed that intelligence was not a single concept and could not be captured by a single number" (Ashman and Conway 1997: 85). He distinguished between the **chronological age** (CA), which is the actual age in years and months, and the **mental age** (MA), which is worked out from the number of correct answers given to the subtests (*ibid*).

The concept of the intelligence quotient (IQ) came from a German psychologist called William Stern. He found out that someone's IQ can be described by dividing their mental age by their chronological age and multiplying it by 100. It is expressed by the formula IQ + MA/CA x 100 (Davenport 1994: 204). Davenport also claims that (*ibid*) if the curve of normal distribution was applied to intelligence, then 68 per cent of people would score in the IQ range of 85 to 115; 95 per cent of people would score between 70 and 130; 99,7 per cent would be between 55 and 145, whereas only 0,3 per cent would have scores at the two extremes.

Developmental psychologists use **developmental scales** to assess a child's physical, social and intellectual skills. For example (Davenport 1994: 199–200):

- **The Gesell Developmental Scales**, which are simple descriptions or established age norms;
- **The Bayley Scales of Infant Development**, for infants up to 30 months, consists of a mental scale, a motor scale and an infant behaviour record;
- **McCarthy Scales of Children's Abilities**, for 2.5- to 8.5-year-olds;
- **Wechsler Scales**, a series of intelligence tests for children of different ages.

Developmental scales are useful for diagnosing particular areas of difficulty a child is having at the time, rather than used for predicting future intelligence (*ibid*).

2.3 Wechsler Intelligence Scale for Children

According to Ashman and Conway (1997: 88), "Wechsler scales are arguably the most commonly used English language tests of intelligence".

David Wechsler developed his original intelligence test in 1939, and a children's version of the scale was developed in 1949. The Wechsler Intelligence Scale for Children (WISC) has been changed and re-normed several times since then. The necessity of setting revised norms appeared since scientists have observed a steady worldwide gain in performance on intelligence tests (Kaufman 1994: 1). The first revised version was released in 1974 (WISC-R) and the following one appeared in 1991 (WISC-III). Although WISC-III (1991) is the most up-to-date version of the Wechsler's scales, many psychologists worldwide still use the WISC-R version. The practical reason for its popularity with psychologists is their belief that it is "a reliable instrument that is valid for aiding in a wide variety of educational and psychological classification and placement decisions. (...) The primary reason for revising the WISC-R is that the norms are nearly 20 years old" (Shaw, Swerdlik and Laurent 1993: 151). The reason why Polish psychologists still use the WISC-R, apart from the issue mentioned above, is the fact that the WISC-III has not yet been standardized for the Polish sample (Duszyńska-Łysak 2000: in interview). In the latest version (WISC-III), most of the WISC-R test remains unchanged and there is only one new subtest introduced i.e. the Symbol Search.

In all WISC versions IQ is derived with a mean of 100 and standard deviation of 15. This means that approximately 68 per cent of the population would gain scores between 85 and 115; 100 ± 15. The scales are divided into two dimensions: verbal subtests and performance subtests.

Verbal subtests consist of:

- **information**, which requires answers to factual questions expected to be known by children within the ages of 6.5 and 16.5 years;
- **comprehension**, which requires explanations of customs or cultural values;
- **similarities**, which requires the identification of common features among seemingly unrelated stimuli;
- **arithmetic**, which requires the person to solve mental arithmetic problems;
- **vocabulary**, which requires an explanation of the meaning of words;
- **digit span**, which requires the recall of a series of digits given by the presenter.

Performance subtests consist of:

- **picture completion**, where the person needs to identify missing parts in a picture;
- **picture arrangement**, which requires sequencing of pictures into a story that makes logical sense;
- **block design**, which requires copying two colour patterns using small cubes;
- **object assembly**, where the person needs to construct objects with jigsaw puzzle type stimuli;
- **coding** which requires copying symbols that represent numbers;
- **symbol search**, where searching for a pattern of symbols among a large search group is required;
- **mazes**, which requires tracing a path through a series of mazes.

(Ashman and Conway 1997: 89)

The above is a two-factor solution of verbal and performance subtests, however, since WISC-III subtests measure various abilities the 12 subtests can be divided according to the four factors representing the abilities it tests: verbal comprehension, perceptual organisation, freedom from distractibility, and processing speed (Kaufman 1994: 46) (see Table 1).

TABLE 1: WISC-III subtests attributed to each of the four factors

FACTOR	TEST
Verbal comprehension	information similarities vocabulary comprehension
Perceptual organisation	picture completion picture arrangement block design object assembly
Freedom from distractibility	arithmetic digit span
Processing speed	coding symbol search

(adapted from Kaufman 1994: 46)

In his book *Intelligent Testing with the WISC-III* Alan Kaufman, David Wechsler's colleague and the author of the revised versions of the original test, presents his view on testing children. He claims that although WISC-III is known as 'an IQ-yielding intelligence test' the focus of testing when using this tool should be on the child in the broader context. He states that:

> The focus is the child, with interpretation of the WISC-III and communication of the test results in the context of the child's particular background, behaviors, and approach to the test items as the main goals. Global scores are deemphasized, flexibility and insight on the part of the examiner are demanded, and the test is perceived as a dynamic helping agent rather than as an instrument for placement, labeling, or other types of academic oppression. In short, *intelligent testing* is the key, and the WISC-III is the vehicle.
>
> (Kaufman 1994: 1)

Kaufman (1994: 6) believes that "the ability to individualize test interpretation is complex and subtle and suggests that intelligence tests should be administered by examiners who are sufficiently knowledgeable to interpret them intelligently". The approach to WISC-III interpretation (Kaufman 1994: 6–14) rests on five premises:

1. **The WISC-III subtests measure what the individual has learnt**, which means that it is a kind of achievement test and as a measure of achievement proves to be a good predictor of conventional school achievement.
2. **The WISC-III subtests are samples of behaviour and are not exhaustive**, meaning that one must be cautious of generalizing the results to other behaviours or performance under different circumstances. The other implications are a) the Full Scale IQ should not be interpreted as an estimate of a child's global and total intellectual functioning; and b) the WISC-III should be administered along with other measures, and the IQ interpreted in the context of the other test scores.
3. **The WISC-III assesses mental functioning under fixed experimental conditions**, which means that the standardized procedures of the test help to ensure objectivity in evaluating a child, but they sacrifice the in-depth understanding of a child's cognitive processes that may be obtained from other techniques.
4. **The WISC-III is optimally useful when it is interpreted from an information-processing model**. The basic model has four components: a) Input. How information from the sense organs enters the brain. b) Integration. Interpreting and processing the information. c) Storage. Storing the information for later retrieval. d) Output. Expressing information via language or muscle activity. The model enables examiners to organize the test data in a meaningful way that can help translate significantly high and low scores.
5. **Hypotheses generated from WISC-III profiles should be supported with data from multiple sources**. "Test scores can mislead just as easily as they can lead" (1994: 13).

Sternberg (1993: 162) points out that:

> The WISC-III is a decent measure of memory-analytical abilities. For example Digit Span (especially 'backwards'), visual memory, and Arithmetic provide fairly direct measures of working memory capacity, and other subtests as well (especially the Performance ones) also require substantial working memory capacity. Information and Vocabulary measure the products, although not the processes, of long-term memory.