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In the preceding chapter we emphasized the actualization of learning results. We were therefore concerned with the actual recollection of what has been learned. During transfer the learning results are applied and used in other situations—either modifications of old situations or totally new ones. The dividing line between the actualization of a learning result and the functioning of such a result as an influence in other situations is by no means clear-cut. Both theoretically and in practice there are many ways in which the transfer of informal, incidental or causal learning might take place. The range of this transferred knowledge is wide and its influence important: it manifests itself, for example, in the child's functional linguistic ability and in the effects of cultural influences. This aspect of transfer is certainly important and merits attention; but in this chapter we shall concentrate on the effects of transferring learning results which have been intentionally consolidated. Knowledge derived from a study of transfer in this context will throw some light on the phenomenon in general.

17.2 TRANSFER AND THE COGNITIVE STRUCTURE

According to the assimilation theory, meanings are consolidated in the cognitive structure. The various aspects of assimilation are interpreted in different ways by different people, but it is generally agreed that what is consolidated is meaning.
Transfer

17.1 INTRODUCTION

Transfer is the name given to the phenomenon that occurs when knowledge acquired in one field influences the way in which work is done and the level of achievement reached in some other field. Usually this influence is positive, but it may be negative.

In the preceding chapter we emphasised the actualisation of learning results. We were therefore concerned with the actual recollection of what has been learnt. During transfer the learning results are applied and used in other situations – either modifications of old situations or totally new ones. The dividing line between the actualisation of a learning result and the functioning of such a result as an influence in other situations is by no means clear-cut. Both theoretically and in practice there are many ways in which the transfer of informal, incidental or casual learning might take place. The range of this transferred knowledge is wide and its influence important: it manifests itself, for example, in the child's functional linguistic ability and in the effects of cultural influences. This aspect of transfer is certainly important and merits attention, but in this chapter we shall concentrate on the effects of transferring learning results which have been intentionally consolidated. Knowledge derived from a study of transfer in this context will throw some light on the phenomenon in general.

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In Piaget’s opinion assimilation is the way in which experiences are arranged in schemas in the course of internalisation. Accommodation is the change that occurs in the person—in this case his schemas—so that new operations (actions propounded in thought) can be internalised. An operation, then, is a meaningful representation of an action and an ordering of new thought-schemas which are based on previous schemas. Thus, schemas of operations are arranged in the cognitive structure for future use. Piaget’s experiments are mainly concerned with the transfer of meanings.

The ideas put forward by Bruner of Harvard correspond very closely with those of Piaget, except that Bruner places the emphasis upon generalisation. At first the child’s learning consists in searching for “an image of the path”, but Bruner (1964, pp. 1-15) goes on to say: “Our main concern is not with the growth of iconic representation, but with the transition from it to symbolic representation.” He thus emphasises language as the source of symbols by means of which generic concepts can be contained or represented in the cognitive structure.

Ausubel’s whole “cognitive theory of meaningful verbal learning” is based upon the attribution of psychological significance to logical or potentially meaningful study material. During assimilation meanings are subsumed and this brings about significant changes in them.

To sum up, we may say that the protagonists of the theory of assimilation into the cognitive system all agree that what is assimilated or internalised is meaning.

It is evident that assimilated learning results are meaningful and that the ability to transfer them to new situations depends upon their possessing this quality of meaningfulness. A primary condition for transfer, therefore, is a clear, stable and unambiguous cognitive structure which will allow such meanings to become apparent.

17.3 DIRECTIONS OF TRANSFER

17.3.1 Lateral or sideward transfer

The individual who bases the work that he is doing upon knowledge acquired in other fields or in relation to other subjects, is actualising lateral transfer. This occurs in all formal learning situations as well as in everyday life. In order to balance one’s bank statement one must add and subtract correctly, as one learned to do at school. And to work out the total number of electrical resistances joined in parallel, as one is required to do in physics, the student must use his arithmetical knowledge
of the addition of fractions to arrive at the formula
\[
\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}
\]

Mathematics has an enormous number of transfer functions, particularly with regard to the physical sciences.

The quantity of knowledge that can be transferred laterally ultimately depends upon the breadth to which the learner can effectively generalise what he has learnt, with a view to new situations.

We know from experience that all students cannot transfer learning results to new situations with equal ease and efficiency. Whether these individual differences should be ascribed to study methods, teaching methods, intelligence or other inherited characteristics, or to a combination of these and possibly other factors, is still an open question. Teaching and study methods are variables which certainly warrant intensive study in this context, and are indeed receiving close attention. Gagné (1970, p 336) for example, says: "Accordingly, the usefulness of any learned capability will be increased if it is practised in as wide a variety of situations as possible." Such a variety of situations increases the possibility of relevance. Similarly, Bruner (1970, p 124) says: "To instruct someone ... is to teach him to participate in the process that makes possible the establishment of knowledge ... . Knowing is a process, not a product."

17.3.2 Vertical transfer

Learning results make it possible for the individual to understand and execute other learning tasks that are more advanced and more complex. The primary internal condition for vertical transfer is the mastering of the ancillary abilities. Although previous learning results are emphasised, vertical transfer depends ultimately upon functional learning products. Reproduction is required, but it must be meaningful reproduction that is functional within the particular context. The broader and the more flexible the person's established knowledge, the more potential there is for vertical transfer. Examples of vertical transfer are encountered in formal learning in all curricula in which relatively simple learning results are followed by more difficult and more complex study material.

17.3.3 The quality of the cognitive structure

Transfer is principally a function of the relevance, meaningfulness, clar-
ity, permanence, integration and explanatory breadth of the ideas that were originally subsumed under more comprehensive ideas. Generalisations may be transferred if they are thoroughly understood and if there has been sufficient over-learning. Ample concrete, empirical examples (deductive) will be required, particularly in the primary school.

17.3.4 Transfer is not an automatic process

The anchoring idea in the cognitive consciousness to which new ideas are to be attached must be singled out in the course of advance organisation. In presenting the study material the teacher should differentiate the information in a progressive manner, i.e. the most general and comprehensive ideas should be presented first, after which there should be progressive differentiation in terms of specific detail.

In order to make provision for transfer whilst the cognitive structure is being formed, each subject must be integrated, and all subjects must be integrated with one another, in such a way that common ideas may be singled out and reconciled. This recognition and actualisation of ideas that are common to two or more subjects makes lateral transfer possible.

Vertical transfer is made possible by the arranging of the study material in a sequence of steps. This ensures that there are no "gaps" in the cognitive structure: that the material required for the next step, or for transfer, is actually there. For linear programming and for the "guided learning" advocated by Gagné, the study material is organised in such a way as to supply the antecedent information which must be applied in more complex learning tasks.

Thus Ausubel (1968, p. 162) having emphasised the importance of a clear, distinct and unambiguous cognitive structure, defines the specific condition for transfer as follows: "Thus transfer can be facilitated by providing opportunity for learning principles in as wide a variety of situations as possible, by explicitly emphasizing the similarity between training and the criterial tasks and by presenting the latter tasks continuously or in close succession."

17.4 OTHER THEORIES OF TRANSFER

17.4.1 Generalisation and transposition

The cognitive-structure theory of transfer is related in some respects to
C.H. Judd's theory of classic generalisation. Judd emphasised the specific generalisation for discrete problems. In Ausubel's view, the formation of a functional cognitive structure by means of receptive learning is more important than specific generalisation. The idea of meaningful variables does include Judd's generalisations, but only as part of a more comprehensive functional unity.

There is a remarkable similarity between Ausubel's view of the cognitive structure and the transposition theory put forward by the Gestaltists and the Field theorists, to the effect that transfer takes place through the person's perception of the relationship between known principles and the particular case represented by the new situation. The cognitive theory emphasises these relationships as well as the process of generalisation.

17.4.2 Formal moulding

The "ability psychology" of former days was based upon the hypothesis that the human mind consisted of a variety of capacities such as memory, reason, concentration, and so on. Each of these could be exercised separately. If the capacity for memory were being exercised, for example by memorising a large number of poems, the capacity improved and the person would find it easier to memorise other kinds of study material. This implied that the child should be induced to study certain specific subjects: mathematics and Latin, for instance, would improve his capacity for logical thought. Any improvement in the capacity concerned would be transferred to all the other fields of study.

At the beginning of the present century this theory was subjected to close and careful experimental testing by people like James, Thorndike, Woodworth and Briggs. They found no evidence in support of formal moulding. Later, J.B. Carroll (1940), A. Rapp (1945), A.G. Wesman (1945) and Strom (1960) (Ausubel, 1968, p. 163) produced experimental findings indicating that the studying of one school subject has no appreciable influence on learning achievements in other subjects.

But despite experimental refutation, the theory of formal moulding is even now by no means dead. A discussion of teaching aims in a book published in 1960 contains references to the capacity for problem-solving, the capacity for critical thought, and so on. The ideas of the past cannot be altogether cancelled out with a simple stroke of the pen.

However the idea of capacities, as it was originally formulated, really is a thing of the past. The concept of capacities has been replaced by that of functions, which is somewhat narrower in scope. On this basis Woodrow (1927) found that methods of memorising are affected by transfer,
and Weggitt (1934) showed that transfer also influences people's study-habits. Selz and the Mannheim school demonstrated, moreover, that methods of problem-solving can be acquired and that these have considerable positive value with regard to transfer. This is not a reaffirmation of the old idea that there are substantive mental capacities which can be improved. The student is indeed in a better position to solve problems, but a great many diverse cognitive functions are also active when such tasks are being performed and the person is involved as a totality.

17.4.3 Identical elements

Thorndike developed his "transfer of training" theory in 1913. In his opinion transfer is possible if the new learning task includes elements that are identical with elements contained in the old learning result. The degree of transfer depends upon the quantity of identical elements. This view is based upon the mechanistic principles in terms of which he explains his theory of "connectionism". Though it is true that transfer does occur where two sets of material contain identical elements, many other factors play a significant part in the process. Among these we may mention principles, generalisations, methods, techniques, the intention to learn, attitudes, self-confidence, the self-concept, personal involvement and other personality factors. Since learning involves the total person, transfer will bear a relationship to the learner's total involvement.

17.5 CONCLUSION

Jerome Bruner (Clarizio et al., 1970, p. 286) says that "... One of the principal objectives of learning is to save us from subsequent learning". He sees effective learning in terms of generalisation that can be transferred to new situations.

Transfer occurs when learning has been successful, and it must be regarded as both an aim and a result of such learning. What a plight man would be in if he were able to make use of each little bit of discrete knowledge only if it were a specific learning result. Transfer does occur, both laterally and vertically, but it is not an automatic process.

Experimental findings (Clarizio, 1970, p. 282) indicate that there is a positive correlation between intelligence and transfer. It has also been shown by various investigators that the greater the degree of correspondence between tasks the more effectively transfer is likely to take place. Transfer is also closely connected with teaching methods and methods
of study. As in the case of learning, and indeed all human activities, physical and mental health is an *a priori* precondition, i.e. the necessity for it is self-evident.

Glancing back at what we have said about the nature of transfer and the experimental data concerning it, it would appear that transfer depends upon:

(a) *Personal involvement in the act of learning.* This includes a conscious intention to learn, a suitable cognitive style, interest in and readiness for the learning task.

(b) *Reactivation of the relevant concepts, principles or identical elements.* The learners perception of related or corresponding concepts should not be clouded by a mass of incidental, irrelevant, or even specific characteristics or details.

(c) *Actualisation of learning results.* In addition to recognising the situation, the learner must be able to recall the relevant learning results from his memory (i.e. remember them). If he cannot do so we say that those results have been forgotten. The learning results required for transfer must have been consolidated in the learner's cognitive system, and the consolidation must have been accompanied by a feeling of success. It must not be unpleasant or painful for the learner to remember the learning result, otherwise there will be a tendency towards repression or other defence mechanisms where that particular learning result is concerned.

When we study transfer, the emphasis shifts to the manner of learning and the method of teaching that will ensure eventual transfer. This interest culminates in teaching for transfer in the didactic situation. This teaching implies, inter alia, that the teacher should *assist* the pupil to become personally *involved* in the act of learning and to *experience* his relationships with the subject matter meaningfully. The *meanings* thus assigned and grasped and consolidated by the pupil may then be fully available for *transfer* in novel situations.
Storage of knowledge

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CHAPTER 18

Storage of knowledge

18.1 INTRODUCTION

Teachers and empirical educationists are always concerned with the problem of knowledge, its acquisition, availability and functionality. Learning explicitly concerns knowledge. Our primary consideration throughout has been the child in his totality. The child is always in a relationship with his world. Learning presupposes understanding on the part of the learner, for which involvement is a prerequisite. Understanding or discovering meaning is not simply a coldly objective rational matter. The one who understands is always a human being, someone who experiences the insight, success in a learning task, grasping of relationships, recognition of a new discovery, etc. as agreeable, exciting, enjoyable, encouraging, or the reverse. The attribution and discovery of meaning, of which the learner must give an account either immediately or at some later stage, occurs in the course of his total personal involvement with the attribution of meaning.

The human consciousness, contrary to what Locke had supposed, is not a blank sheet on which letters, symbols, ideas, etc. are imprinted as on clay or wax tablets. Knowledge is never received passively. Insight is not achieved unless the learner focuses intentionally on the learning task (which could be a sensory impression) with the intention of knowing it. But does the intentionality revert to its original state of pure potential when the cognition has been completed (Royce 1969)? The answer to this question is shown by experience. If one has to master the same piece of knowledge again on a later occasion, one does not have to struggle one's way through the entire process the second time. Every one has had the experience of being able to recall knowledge of which he had not been conscious for many years. It has even been shown that knowledge which an individual once possessed and can no longer recall
through recognition, can be evoked by means of hypnosis. At any given moment one knows a deal more than one is aware of. And having once known something, one retains certain residues of greater or lesser functionality.

Of course, one has no access to an individual's knowledge other than his attempts to recall it. One learns to make the learning task your own, for it represents knowledge or skill that will enable you to do what was once beyond your reach. Learning is a phenomenon peculiar to man, for he learns throughout life to act and live more efficiently.

18.2 THE NATURE OF KNOWLEDGE

At this moment my consciousness is focused on the objects on my desk, on the noises I hear and the theme I am considering. As the stream of consciousness continues, these experiences rapidly slip into the past. Some of them I shall recall easily, others will be totally forgotten. I am oriented in respect of the objects and people in my life-world because I attribute meaning to them. Because of these meaningful relationships I am able to live in a particular way.

Certain motor skills acquired with great pains function as automatisms. Examples include walking, writing, cycling and swimming. These actions are performed automatically, as it were. They require no recall or reflection. In fact, thought can even interfere with the smooth progress of an automatism, e.g. returning a ball in a game of tennis. Life is made possible by such automatisms.

Once a child has mastered language effectively a whole host of words, phrases, concepts, names, etc. function as automatisms. This knowledge enables him to think and communicate.

It is therefore important that when learning a language the child should know the customary, ordinary meaning well enough to be able to use it without effort or reflection. Note that in acquiring knowledge that has to become automatic, the goal is always functionality. This knowledge must always be readily available for purposes of communication and thought.

18.2.1 Mechanically memorised knowledge

Knowledge that has been mechanically memorised can re-enter the conscious mind through reproduction. In this case the learning intention is directed at reproduction rather than understanding of the subject matter. Often names, words, dates, poems, arithmetical tables, etc. are
mechanically memorised, probably because exact reproduction is required. It has the implication that if only perfect reproduction receives recognition, pupils will tend to memorise mechanically even when comprehension is necessary.

18.2.2 Images and meanings

Theoretical and empirical research seems to indicate that two types of knowledge are reinforced, viz images and meanings. A small baby recognises his mother’s face. Before the preschool child has learnt to read, he recognises his parents’ car and those of many other people. He also recognises the picture on the breakfast cereal packet or the ice cream container. It would seem that young children manipulate this knowledge in the form of images. Speaking of this phenomenon, Prilbram (1969, p. 200) writes: ‘My plea is, therefore, that we not lose sight of the picturesque, for the brain is built to work with pictures.’ With reference to learning methods he says that ‘learning through image-making is equally potent’.

Insights and concepts require attribution of meaning. One can distinguish between conceptualisation and the assimilation of concepts, with problem-solving as an additional facet. In this regard we are thinking of a wide range of ‘meanings’ which the learner must store for immediate or future use. How are these meanings stored? Sonnekus (Nel et al. 1965, p. 302) speaks of personal integration while Van Parreren (1962, p. 15) refers to the organisation of meaningful subject matter into meaningful contexts. Several other authors speak of structuring meaning so as to form cognitive structures (cf. Ausubel 1968; Mouly 1973; Klausmeier 1975). Generalisation is essential, since this is the only way in which broader concepts with a wider range can be obtained. This peculiarly human capacity for obtaining and retaining a vast hoard of ideas and information in every sphere of knowledge through meaningful verbal learning is based on cognitive abilities such as symbolic representation, abstraction, categorisation and generalisation (Ausubel 1968 p. 59). All this points to conscious manipulation of concepts so as to find relationships and to structure these concepts. Man cannot operate effectively by means of arbitrary associations and discrete cognitive entities. Experience has shown that he can internalise such knowledge only through relearning it and that even then it is soon forgotten.

New ideas learnt in a meaningful way are integrated in the cognitive structure and are much less susceptible to interference, fading and premature forgetting. Meaningful learning of new ideas does not exclude repetition. Some learners moreover require more time, manipulation
and practice – which are cognitive activities – before consolidation is complete. Such meaningful repetition aimed at clearer understanding is totally different from mechanical memorisation aimed solely at correct reproduction.

Recall of meanings from the cognitive structure through memory or recognition is production rather than mere reproduction (Van Parren 1962, p. 15). It is not so much a matter of recalling learnt ideas in their totality, but of restructuring them.

Penfield (Pribram 1969, p. 165) writes: ‘Most of what man calls to mind voluntarily is made up of generalisation.’ He remembers a song and can hum the tune without recalling when and where he learned it.

Gestalt theory maintains that each psychological element, whether perceptual or active, is modified as soon as it is embodied in a new Gestalt. Knowledge that is recalled and is functional in thinking does not constitute reproduction but is based on ‘... reorganisation, restructuring and production’ (Humphrey 1963, p. 184).

Meanings as generalisations are concepts linked as such with a linguistic symbol. They are stored, recalled and used in this way. Ausubel (1968) emphasises his assimilation theory, according to which meaningful verbal learning entails the assimilation of ‘clear, stable and unambiguous meanings’ (p. 56) for storage in the cognitive structure.

If the generalisations to be stored as meanings are attenuated, one wonders what will eventually be recalled. In this regard Norman (1976) agrees with Bartlett when he writes (p. 223): ‘Remembering is viewed more as process of reconstruction than as recollection.’ Hence what is actually recalled appears to be the generalisation as meaning. Without being aware of it, the individual reconstructs the situation in detail from his experience. It is commonly known that the evidence of different eyewitnesses to the same accident will differ. Each is convinced of the accuracy of his own account even though it differs from that of other witnesses in certain respects. To a large extent the details are reconstructed from personal experience.

New ideas are comprehended and assimilated by means of meaningful verbal learning. Such understanding of new subject matter is facilitated if it is presented in structured entities. These structures promote internalisation since the conscious mind grasps images, particularly visual ones, more readily.

The concepts embedded in the cognitive structure cannot always be recalled at will. Sometimes this is possible, but other ideas can only be recollected through recognition, while yet others can be recalled solely by means of hypnosis. Whether they can be recalled or not, these concepts are not in a passive or dormant state. This phenomenon is illustrated by the perceptual process.
The perceiver is perfectly conscious of the traces of past experience and the fact that something is added to 'objective' reality. Madison (1969, p. 237) uses the term reintegration to describe the process whereby incoming sensory stimuli locate corresponding traces of past experience and interact with them, thereby integrating the conscious perception as a joint product of current stimulus and the rudiments of past experience.

In discussing perception, Lorenz cites the phenomenon that in his interpretation of an object which is, say, seen, the individual makes use of knowledge of which he is unaware. He writes (Pribram ed. 1969, p. 41): 'Quite obviously, the highly complicated perceptual processes here under discussion imply something like an unconscious memory in other words a storage of information that is inaccessible to our selfobservation.' Hence a distinction should be made between knowledge stored in such a way and knowledge that can be recalled at will. Other cognitive components appear to reside in the unconscious since they are impervious to voluntary recall. It would seem that there is a dynamic interaction between ideas in the cognitive structure at a low level of consciousness. This may account for divergent thinking and creativity.

18.3 WHERE IS KNOWLEDGE STORED?

In the previous section we were concerned with the state in which knowledge is stored, the assumption being that meaningful ideas are integrated with relevant anchoring ideas in the cognitive structure to produce an integral structure. Different spheres of knowledge will probably have separate, interconnected structures.

Mechanically memorised knowledge certainly does not form part of the cognitive structure. Ausubel (1968) gives a possible explanation for this. He suggests that such knowledge floats like 'loose clusters' among the components of the cognitive structure.

Bear in mind that the cognitive structure is used as a construct to account for the phenomenon of the retention, assimilation and memorisation of knowledge.

Psychopedagogics has no simple explanation of where knowledge is stored, but a neighbouring discipline like neurophysiology casts some light on this matter. Owing to its complexity and the large number of unknown factors, we merely refer to this aspect in passing.

Neurosurgeons have found that by touching the cerebral cortex with an electrode at a specific point, using a local anaesthetic, the patient will relive a whole train of past experiences. Penfield (Pribram, 1969, p. 168) writes: '...a stimulating electrode, applied to the surface of the inter-
pretive cortex of a conscious man, sometimes selects a moment in past time and causes the stream of consciousness to flow again. This record apparently includes all that the individual was aware of at the time, things seen and heard in normal detail, things felt and believed. Apparently the neuroactivity accompanying each consecutive state of consciousness is permanently imprinted on the brain. This imprint is a track of neuron connections that can be traced many years later by an electric current, thereby triggering a re-experience.

One immediately wonders whether all sensory impressions and images are registered intact. Penfield offers the following answer (Pribram 1969, p. 166): 'What he turns his mind to will be preserved in the brain's sequential record. The concomitant doing, which were subconscious, are not recorded, at least not in the same way... There is no evidence, as far as I am aware, that any of the things he ignored are stored away— at least not in any available form—in the central nervous system.' He also claims that a child learns when, and only when, he is paying attention. This indicates that cerebral mechanisms are under control of the personal ego.

These details show that knowledge is in fact stored in the brain. However, it is not possible to mechanically recall a particular scrap of information by means of electric stimulation, although by directing the consciousness it can be recalled through memory and recognition. Penfield admits this (p. 158): '... there is no thoroughfare of cause and effect between the brain and the mind of man, and there will be none until a new bridge is built.' In the light of these findings we are justified in assigning primary importance to the involvement of consciousness in the acquisition and storage of knowledge. Since attention in the sense of personal involvement is cardinal in the consolidation and retention of knowledge, we shall refer to it briefly.

18.4 INVOLVEMENT AND THE STORAGE OF KNOWLEDGE

We have said that involvement is a prerequisite for the attribution of meaning. We do not deny the phenomenon of incidental knowledge (cf. Van Praereren, 1962), but this has little value, especially for the type of learning done at school. As the developing child constitutes his expanding life-world he increasingly forms relations with people, objects and ideas with which he is involved. The quality of his experience constantly determines the continuation of this involvement and the quality of meaning.
The phenomenon of involvement can be broken up into more homogeneous components so as to form a clearer grasp of it. These would include an observant mind, attention, perseverance, learning time, cognitive style, insight.

An important component of involvement is attention. Van Niekerk (1971, p. 22) defines it as the measure or degree in which the person is focused on the performance of an activity in which he is engaged, hence the extent to which he is wrapped up in it. The way of paying attention also denotes its concentration on the matter in hand, in this case on the learning assignment. To remember something one must first understand it. This requires involvement and especially concentrated attention.

Since the act of attending with a view to understanding and consolidating knowledge is intentional we are clearly concerned with an action by the person in his totality. When the individual selects an object for this attention, the affective, conative and normative components each fulfil a very special function, in addition to the cognitive component which is of course pre-eminent in matters of knowledge. One decides on the object to which one will devote one's attention so as to know it, remember it and be able to reproduce it. Nothing is automatic or mechanical.

Hence only situations, learning tasks, concepts and images to which the individual pays attention, i.e. wants to know, will eventually be known and stored as knowledge.

18.5 SUMMARY

Man learns in order not to have to learn again. This means that the knowledge he acquires should be functional. To orient himself and create a life-world he must not only have knowledge, but also a framework of knowledge, methods, techniques, skills, etc. so as to proceed with the forming of relationships. Everything has to be learnt – physical skills, language, attitudes, habits, concepts, etc. – and this knowledge must be stored in such a way as to be readily available for use.

Neurophysiology has been able to demonstrate empirically that knowledge is stored intact in the brain. Because of the complexity of the brain's chemical and neurological functioning, this fact is of interest to empirical educationists since it provides mechanical evidence for various conditions for learning. Here the accent is on meaning, in the facts which are meaningfully consolidated are remembered. Apart from this, neurologists believe that only those activities (cognitive or otherwise) which received the learner's attention will be consolidated. Hence attention is regarded as a component of involvement, which underscores
its role as a prerequisite for experience and attribution of meaning. Man’s cognitive totality is structured as meaning, but fully integrated with the motor and affective components of experience. The evidence moreover indicates that as a personal being man uses his brain to record experience so that it can be recalled for use later on. This is done psychologically, but it can also be effected mechanically by electrical stimulation of the cortex. As yet specific knowledge cannot be recalled in this way, but it serves to corroborate the phenomenon of consolidation. Mechanical memorisation and the forming of associations serve a purpose, but the accent is on meaningfulness achieved by involvement in the learning task.
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