

## Short overview and summary of learning theories

S. Guttormsen, January 2010

### Behaviorism

The behaviourist approach assumes that it is not possible to describe precisely what occurs within humans when they learn. Internal processes remain hidden inside a *black box* and therefore cannot be explored objectively. That is why in behaviourism one must orient using *observable behaviour*, which can be externally influenced by means of conditioning.

Learning can be directed by means of *rewards and punishments*. Accordingly, *instrumental learning* is an expression of the behaviourist approach. *Positive and negative reinforcement (reward)*, punishment and cessation are distinguished as entities here. This form of behaviourist learning is based on the theory of operant conditioning postulated by Thorndike (1898) and Skinner (1938, 1953, 1969).

In behaviourism, *the teacher assumes an authoritative role* (Baumgartner & Payr, 1994). For example, the teacher decides what should be learned and determines the time structure of the instruction. In this process, the *learner's task is largely limited to the passive reception of the materials presented* (Blumenstengel, 1998; Reinmann-Rothmeier, 2003).

Down to the present day, the behaviourist learning approach serves as the theoretical basis for certain e-learning methods such as *drill and practice* programmes. These methods are used for ongoing testing of acquired knowledge; correct answers are reflected in the scoring and sometimes a reward is given; the programme is repeated if the number of mistakes is too high; the course is sequentially structured, etc.

### Cognitivism

In contrast to behaviourism, cognitivist approaches attempt to infer the *internal processes* that take place in learning. They attempt to penetrate the black box that remains closed to behaviourism. Accordingly, in cognitivism the learning process itself - rather than just the results - is observed. This process is characterised by an *active processing of incoming information by the learner*. Learning is a result of *comprehension* (Kuhlmann & Sauter, 2008).

In teaching and learning situations, one therefore looks for general rules that make it possible for learners to solve problems. In practice, the teachers observe the learners and give assistance at the required points of the learning process; *teachers can be said to have the role of a tutor* (Baumgartner and Payr, 1994).

A specification of cognitivist approaches is given in Wittrock's model of generative learning (1974a). It relates to the cognitive linking of new learning content with pre-existing knowledge, which affects the perception and interpretation of the new knowledge. The model is based on the core assumption that learners actively shape the learning process by striving to generate meaningful knowledge from the information received from their environment: „[...] *although a student may not understand sentences spoken to him by a teacher, it is highly likely that a student understands sentences that he generates himself*“ (Wittrock, 1974b, p. 182). *Teaching therefore becomes a process leading the learner to construct meaning and plans of action* (Wittrock, 1991).

Self-directed learning can be understood as a counterpart to directed learning: generally speaking, the term means that learners determine for themselves the goals and contents, forms and means, results and times as well as places of their learning. When learners take predefined contents and goals and manage their own learning process, making their own decisions about the ways and means of their learning organisation, this can also be referred to as self-organised learning according to Bannach (2002). In such cases, cognitive strategies are now needed to make it easier for the learner to understand, store and retrieve the knowledge. It is namely through elaboration that people attempt to network new information with existing knowledge or skills and thereby store it in a lasting manner.

*Organisation strategies* help the learner to organise the intake and storage of information. This is how information is selected or consolidated and structured into larger units of meaning. Finally, rehearsal strategies support the storage of information in *working memory*, further application of knowledge supports *consolidation in the long-term memory*. Learning methods based on this paradigm support learners' problem solving strategies and insight learning based on a construction of knowledge from existing knowledge structures.

### Constructivism

We understand constructivism as a *sub-field of cognitivism*. After all, the two fields share a very similar point of departure: both approaches are concerned with the processing of information, which in behaviourism remains hidden inside the black box. When looking at this process, however, constructivism particularly emphasises individual perception, individual interpretation and individual construction. According to Heinz von Foerster (1984), the *“reality”* as being perceived from an individual, is a personal construct. *There exists no objective reality*.

In the constructivist paradigm, learning is *building knowledge* based on individual, experience based building blocks. Continued learning is an *ongoing re-construction process*. For this reason Wittrock's model of

generative learning can also be classified as a constructivist learning paradigm according to Bonn and Grabowski (2001) – although Wittrock did not explicitly mention the constructivist approach in any of his work. Self-directed learning is also an expression of this approach. The expression "explorative learning" (also: discovery learning) was coined by Bruner (1961) and represents a further expression of constructivist learning. Explorative learning happens when learners are stimulated by the learning environment, are actively engaged in solving problems, independently acquire their own experience, carry out experiments as the opportunity arises and thereby gain new insights into complex issues and principles. According to Bruner (1961), the transformation and (re-)organisation of the learning material allow it to be adapted to the learner's individual cognitive structures and make it possible to discover new insights beyond what is given.

In constructivism, the *teacher is seen as a coach or a trainer* (Baumgartner & Payr, 1994) – the learning process can be stimulated and supported externally, but not be totally controlled (Reinmann-Rothmeier, 2003). *The teacher and the learner work together to set learning goals and communicate on the same level.* The teacher assists in identifying and solving problems, cooperates with the learner and accompanies the learning process (Kuhlmann & Sauter, 2008). In this manner, constructivist learning receives a social, collaborative component (Mandl et al., 2004; Seufert et al., 2001). When more people take part in such a process, it can be called distributed cognition according to this paradigm (Hutchins, 2000). Accordingly, knowledge is not strictly individual but is distributed among several people or a team. According to Kuhlmann and Sauter (2008), the innovative communications instruments of Web 2.0 are very well suited to cooperative or collaborative learning. This is because they promote the active participation of the learner in the communication process.

### Information processing

Information processing theories represents *another sub-field of cognitivism*. These theories aim at describing the *flow and processing of information* in the human cognitive system from the presentation to the sense organs, the modalities of sensing, the representation in the cognitive system, storing the information (forms, levels and processing of memory), as well as retrieval, when stored information is needed in order to learn or solving a task. Within the field of cognitive psychology, information processing is an important aspect of *understanding human thinking and learning*.

Three alternative ideas are prominent: sequentially, parallel-distributed and connectionistic processing. The *sequentially idea* holds that information is processed in a serial, discontinuous manner as it moves from one stage to the next. The *parallel-distributed processing* model states that information is processed simultaneously by several different parts of the memory system, rather than sequentially. This model emphasizes the fact that information is stored in multiple locations throughout the brain in the form of networks of connections. The *connectionistic model* is consistent with the sequentially processing approach in that the more connections to a single idea or concept, the more likely it is to be remembered. It is one of the dominant forms of current research in cognitive psychology and is consistent with the most recent brain research.

### Situated Learning

Situated learning is concerned with *how learning occurs everyday*. This theory offers a very different view on learning compared to the theories presented above. It is not a recommendation that teaching should be "situated" or "relevant." It is a theory reflecting an important aspect of the nature of human knowledge, claiming that *knowledge is dynamically constructed* as we conceive of what is happening to us, talk and move. Situated learning was first proposed by Jean Lave and Etienne Wenger as a model of learning in a Community of practice. *At its simplest, Situated Learning is learning that takes place in the same context in which it is applied.* Lave and Wenger (1991) argue that learning should not be viewed as simply the transmission of abstract and decontextualised knowledge from one individual to another, but a *social process whereby knowledge is co-constructed*; they suggest that such learning is situated in a specific context and embedded within a particular social and physical environment. Lave and Wenger assert that situated learning "is not an educational form, much less a pedagogical strategy" (p.40).

Proponents of this theory claim that knowledge is not a thing or set of descriptions or collection of facts and rules. We model knowledge by such descriptions. But the map is not the territory: human knowledge is not like procedures and semantic networks in a computer program. Human knowledge should be viewed as a capacity to coordinate and sequence behaviour, to adapt dynamically to changing circumstances. Understanding how *learning is a process of conceiving an activity*, and activities are inherently social, puts emphasis on improving learning addressing *issues of membership*, participation in a community, and identity. Saying that activities are social has nothing to do per se with whether the activity is done alone or with other people present. Action is situated because it is constrained by a person's understanding of his or her "place" in a social process.

The ideas of the situated learning movement have received much attention and even enthusiasm in recent years. However, for the implementation of effective learning environments based on a rationale of situatedness, some *problems* have to be solved. Three of them are: (1) Neglect of specifying the type of instructional support that is necessary for effective situated learning, (2) over-confidence in the engagement-inducing potential of complex problems, and (3) undifferentiated use of the notion "activity". (Renkl et al, 1996)

## Social Learning

Bandura's 'Social Learning Theory, mediates between the behavioural, cognitive, and Lave's social view of learning and is an important part of the "learning-model landscape". According to Bandura people *learn through observing others' behaviour*, attitudes, and outcomes of those behaviours. "Most human behaviour is learned observationally through modelling: "From observing others, one forms an idea of how new behaviours are performed, and on later occasions this coded information serves as a guide for action." Social learning theory explains human behaviour in terms of continuous reciprocal *interaction between cognitive, behavioural, and environmental influences*. Necessary conditions for effective modelling are:

*Attention* various factors increase or decrease the amount of attention paid.

*Retention* remembering what you paid attention to. Includes symbolic coding, mental images, cognitive organization, symbolic rehearsal, motor rehearsal

*Reproduction* reproducing the image. Including physical capabilities, and self-observation of reproduction.

*Motivation* having a good reason to imitate.

Bandura considered personality as an interaction between three components: the environment, behaviour, and one's psychological processes (one's ability to entertain images in minds and language).

## References

- Bannach, M. (2002). *Selbstbestimmtes Lernen*. Baltmannsweiler: Schneider.
- Baumgartner, P., & Payr, S. (1994). *Lernen mit Software*. Innsbruck: Österreichischer Studien-Verlag.
- Blumenstengel, A. (1998). *Entwicklung hypermedialer Lernsysteme*. Berlin: Wissenschaftlicher Verlag.
- Bonn, K. L., & Grabowski, N. L. (2001). *Generative Learning theory: A practical cousin to constructivism*. Paper presented at the Joint Meeting of Mathematics, New Orleans, LA.
- Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*, 31(1), 21–32.
- Foerster, H. von. (1984). On Constructing a Reality. In P. Watzlawick (Ed.), *The Invented Reality* (41–62). New York: W. W. Norton.
- Hutchins, E. (2000). *Distributed Cognition*. *IESBS*, 1–10.
- Kuhlmann, A. M., & Sauter, W. (2008). *Innovative Lernsysteme. Kompetenzentwicklung mit Blended Learning und Social Software*. Hamburg: Springer.
- Lave, J, Wenger, E. (1991) *Situated Learning. Legitimate peripheral participation*, Cambridge: University of Cambridge Press
- Mandl, H., Kopp, B., & Dvorak, S. (2004). *Aktuelle theoretische Ansätze und empirische Befunde im Bereich der Lehr-Lern-Forschung*. München.
- Renkl, A., Gruber, H., Mandl, H. (November 1996): *Situated learning in instructional settings: From euphoria to feasibility*. (Forschungsbericht Nr. 74). München: Ludwig-Maximilians-Universität, Lehrstuhl für Empirische Pädagogik und Pädagogische Psychologie, Internet, ISSN 1614-6336
- Reinmann-Rothmeier, G. (2003). *Didaktische Innovation durch Blended Learning: Leitlinien anhand eines Beispiels aus der Hochschule*. Bern: Huber.
- Seufert, S., Back, A., & Häusler, M. (2001). *E-Learning – Weiterbildung im Internet: Das „Plato-Cookbook“ für internetbasiertes Lernen*. Kilchberg.
- Shumway, J. M., & Harden, R. M. (2003). AMEE Guide No. 25: The assessment of learning outcomes for the competent and reflective physician. *Medical Teacher*, 25(6), 569–584.
- Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Skinner, B. F. (1969). *Contingencies of reinforcement*. New Jersey: Prentice-Hall.
- Thorndike, E. L. (1898). Animal intelligence: An experimental study of the associative processes in animals. *Psychological Review Monograph Supplement* 2 (4, Whole No. 8).
- Witrock, M. C. (1974a). Learning as a generative process. *Educational Psychologist*, 19(2), 87–95.
- Witrock, M. C. (1974b). A generative model of mathematics education. *Journal for Research in Mathematics Education*, 5(4), 181–196.
- Witrock, M. C. (1991). Generative teaching of comprehension. *Elementary School Journal*, 92, 167–182.
- Witrock, M. C. (1989). Generative processes of comprehension. *Educational Psychologist*, 24, 345–376.