

# Implications

Here are some practical implications of theories analyzed here together with links to their source and context.

## Behaviorism

1. Potential to learn leads to frustration if not satisfied. [Connectionism](#)
2. Negative reinforcement (punishment) does not really lead to any kind of learning. [Connectionism](#)
3. Repetition enhances learning. [Connectionism](#)
4. Reward and punishment do not initiate learning, but rather can motivate to present already learned behavior. [Sign Learning](#), [Operant conditioning](#)
5. Students need to be able to learn at their own pace. [The Keller plan](#), [Programmed instruction](#)
6. Students must have learning objectives defined. [The Keller plan](#), [Conditions of learning](#)
7. In order to advance to the next unit, a student needs to demonstrate mastery of the preceding unit. [The Keller plan](#), [Programmed instruction](#)

## Long-term memory and knowledge organization

1. Human knowledge is organized in the long-term memory which has practically unlimited capacity and duration. [A Brief History of Human Memory Systems Research](#)
2. Representations in the long-term memory can be stored as logogens (verbal stimuli) or imagens (non-verbal stimuli). [Dual coding theory](#)
3. In order to acquire knowledge into long-term memory, it has to complete the time-consuming process of *consolidation*. During that time, new knowledge is vulnerable to trace decay and retroactive/proactive interference. [A Brief History of Human Memory Systems Research](#)
4. A schema is a hierarchical mental framework humans use to represent and organize remembered information. [Schema theory](#)
5. A script is a mental framework for representation of complex event sequences. [Script theory](#)

## Working memory and cognitive architecture

1. Human working memory has a limited capacity of  $7 \pm 2$  or  $4 \pm 1$  chunks of information. A chunk is an unit operated as a whole and it has a different meaning for an expert and for a novice. [Human Working Memory](#)
2. Human working memory has four components: phonological loop, visuospatial sketchpad, episodic buffer and central executive. Visuospatial sketchpad and phonological loop allow parallel processing of visual and auditive information. [Human Working Memory](#), [Cognitive load theory](#)
3. Since working memory has a limited capacity learning won't occur if that capacity is exceeded. [Cognitive load theory](#)

## Prior knowledge

1. Meaningful learning won't occur unless the learner possesses necessary prior knowledge. [Assimilation theory](#)
2. Comprehension and retention depend mostly on the schemata the reader already possesses. [Schema Theory](#)
3. The meaning is not conveyed by the teacher and is not in (educational) information. Rather meaning is derived by the student from his existing knowledge (schemata) and its interaction with presented information. [Schema Theory](#)

## Meaningful learning

1. Learning is not a passive, but a conscious, active process. [Constructivism](#), [Cognitivism](#)
2. Learning is the process of knowledge construction/acquisition. [Constructivism/Cognitivism](#)
3. Learning occurs through interaction of learner's prior knowledge (knowledge schemes), ideas and experience. [Constructivism](#)
4. Learning is a socially enhanced process. [Constructivism](#), [Social Cognitive Theory](#), [Social Development Theory](#)
5. Meaningful learning won't occur unless the new ideas are presented in a clear way that enables their relating to other ideas. [Assimilation theory](#)
6. The teacher should advise students how and in which context to apply and transfer the just gained knowledge in the world outside the classroom. [Conditions of learning](#)
7. The teacher should provide guidance to students in discussion, answer their questions and offer them additional materials on topic. [Conditions of learning](#)
8. Starting point for any learning is experience, yet different people learn better using different learning styles. One of the classification of these styles is to abstract or concrete experience or conceptualization. [Experiential learning](#)

## Instructional design principles

1. Modality principle - learning will be enhanced if presenting textual information in an auditory format, rather than in visual format, when it is accompanied with other visual information like a graph, diagram or animation. [Cognitive theory of multimedia learning](#)
2. Redundancy principle - capacity of both human information channels can unnecessarily be overloaded by redundant information presented through both channels. [Cognitive theory of multimedia learning](#)
3. Spatial contiguity principle - information processing is easier when two related visual information sources are closer to one other. [Cognitive theory of multimedia learning](#)
4. Temporal contiguity principle - simultaneous presentation of related information should be most similar to the way human mind operates and has provided good experimental results, same as presenting related multi-modal information with very short time differences. [Cognitive theory of multimedia learning](#)
5. Coherence principle - extraneous material that may be interesting or motivating but is irrelevant and generally wastes learning resources. [Cognitive theory of multimedia learning](#)
6. Individual differences principle - emphasizes influence of prior knowledge and cognitive capacity to results of learning. [Cognitive theory of multimedia learning](#)
7. Signaling effect - presents the increase in the learning outcomes due to promotion of attention

- to relevant information. [Cognitive theory of multimedia learning](#)
8. Segmenting effect - means that learning should be more efficient if a continued animation or narration could be split into more smaller parts. [Cognitive theory of multimedia learning](#)
  9. Worked examples effect - presenting worked examples before asking students to try to solve one [Cognitive theory of multimedia learning](#)
  10. Synthesizers - (diagrams, images or other) enable easier meaningful integration and assimilation of new knowledge into existing knowledge. [Elaboration theory](#)
  11. Concept maps - visual representation of the relationships between concepts. [Concept mapping](#)
  12. Present topic with gradually increasing complexity. [Elaboration theory](#), [Cognitive theory of multimedia learning](#)
  13. Advance organizers - introductory material presented before the learning material at a higher level of abstraction, generality, and inclusiveness. [Assimilation theory](#)
  14. See also: [Case-Based Learning](#), [Simulation-Based Learning](#), [Goal Based Scenarios](#), [Problem-Based Learning](#), [Inquiry-Based Learning](#), [Incidental Learning](#)

## Humanist dimension of learning

1. Learning is a natural desire, a mean of self-actualization and development of personal potentials. The importance of learning lies in the process, not outcome. [Humanism](#)
2. We cannot teach another person directly; we can only facilitate his learning. This should be the goal of the educational process and teachers through realness, prizing and empathy. [Facilitation theory](#)
3. Students should be invited by their teachers to develop their potentials. People, places, policies, programs and processes related to the educational process should be maximally inviting. [Invitational learning](#)

## Connectivist dimension of learning

1. Since knowledge is nowadays rapidly growing and changing, the process of learning should not be focused on acquiring more knowledge into or from each of available information sources, but on connecting to them and maintaining those connections. [Connectivism](#)

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