



LEARNING AND COGNITION

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1 THEORIES OF LEARNING

Learners experience the curriculum in very different ways depending on their background and abilities. Their general level of development and academic attainment is usually very different, even among learners who are peers. In many cases the differences will emanate from different abilities, for example: delayed speech, poor social skills and even lack of attention in class. This makes us wonder how the information presented in class is turned into knowledge for the learners.

Therefore, this subtopic seeks to introduce you to cognition as a process through which knowledge is acquired through experiences, sensations and thoughts. It will also introduce you to learning, which is a process of acquiring knowledge through experience. Last, this subtopic will also explore how both cognition and learning are interrelated, as cognition is particularly important for teaching because it is the process that leads to learning.

1.1 What is learning

Learning is a complex process, but what is learning exactly? Consider the following definitions and the implications each has for teaching:

- Learning is the process of acquiring knowledge or skill through study, experience, or teaching.
- Learning is experience that brings about a relatively permanent change in behavior.
- Learning is a change in neural function as a consequence of experience.
- Learning is the cognitive process of acquiring skill or knowledge.
- Learning is an increase in the amount of response rules and concepts in the memory of an intelligent system.

Regardless of which theory of learning is being applied, it is essential that teachers enable an open and flexible approach to their practice. Each learner has individual needs and slightly different ways of learning. This individuality suggests that for there to be an effective use of theories of learning, they should be used simultaneously, drawing on the benefits and overcoming the limitations of each.



Reflection point

Think about your own learning:

- When do you find learning easy?
 - When do you find learning difficult?
 - What strategies do you use when you learn?
-

In order to support learners in learning and developing knowledge, a teacher needs to plan strategies and respond to learners effectively through taking into account the diversity in the classroom and the learning needs of individuals. To do this effectively, it is helpful to understand some of the main theories about learning and how these might manifest themselves in the classroom. It is in this regard, we will take critical analysis of the following four key theories of learning:

- Behaviourism
- Constructivism
- Social-constructivism
- Cognitivism

1.2 Types and processes of learning

1.2.1 Behaviourism

Behaviourism defines learning as a change in the behaviour of the learner. The learning theory suggests that in order to have learning, the learners must be actively engaged and being rewarded immediately to reinforce their activity. Behaviourism concentrates on the aspects of learning that are overtly observable and measurable. The desired behaviour is advanced by external stimuli. Therefore, it is mainly based on the stimuli-response associations: given the right stimulus, you will get the right response.

If a learner shows desirable behaviour in class, the concepts of Behaviourism tells us to reinforce this behaviour as a teacher (stimuli), as it will be likely that the desired behaviour will become more probable in the future (response). Likewise, undesirable behaviour that goes unrewarded will be extinguished. All behaviour is acquired by the shaping of behaviour using and anticipating on stimuli-response associations. The Behaviouristic learning theory emphasizes that the response is observable and measurable, as knowledge and skill can be demonstrated through the learners' observable behaviour.

The behaviourist shuts his eyes and asks only to be allowed to make observations upon what his subjects are doing under given stimulating conditions. ”

Watson, 1920

History

Psychologists *Pavlov*, *Watson* and *Skinner* were responsible for the development of the behaviouristic learning theory in the early part of the twentieth century. Watch the below as an extra reference and get more background information on the research each of the psychologists conducted and how their ideas influenced the behaviouristic learning theory. The video will also give you extra insights on the stimuli-response model where the behaviouristic approach is based on.

Link to the video: <https://bit.ly/36KrQKh>

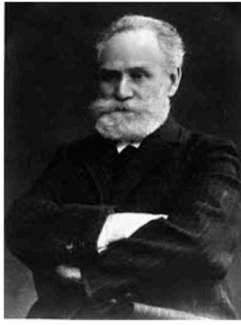


Figure 1: Pavlov



Figure 2: Watson

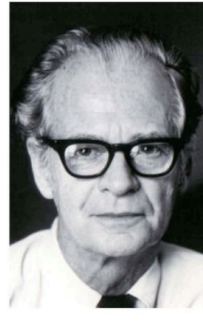


Figure 3: Skinner

Key principles and classroom implications

The main principles underpinning the behaviouristic learning theory are:

- Learning at its best takes place through the teacher taking control over the learning process, who is actively reinforcing learners in order to get the desirable learning outcomes
- Learning outcomes are measurable/observable
- Repetition and practice is key to achieve learning, as it strengthens the relation between stimulus of the teachers and the desired response by the learner
- Feedback is vital to achieve learning, as the teachers stimulates the learner to give the desired response to measure learning outcomes
- Positively reinforced behaviour (for example, by rewards, praise or recognition) is likely to be repeated
- Negatively reinforced behaviour (for example, by ignorance) is less likely to be repeated

1.2.2 **Constructivism**

Learning, according to the constructivist theory, occurs when knowledge is constructed by the individual as a result of their experiences in the world. The core concept of constructivism is that knowledge is constructed as learners build new knowledge on the basis of what they have already learned. As learners enter learning situations with knowledge acquired from previous experiences, their prior knowledge influences what new or modified knowledge they will build from the new learning experiences.

To build from the new experiences, learning must be active, the learner is not a passive receiver of transmitted information. If the new experience is inconsistent with learners' present knowledge, this knowledge must be adjusted to accommodate the new experience. Teachers would do this through the creation of scaffolds. This is where the teacher provides a means for learners to apply already existing skills to acquire new knowledge. The constructivist teacher is curious about learners' current understanding, provides experiences in which learners are actively involved, allows responses to guide subsequent lessons, promotes relevant experiential learning, and fosters self-reflection.

When you teach a child something, you take away forever his chance of discovering it for himself. Teaching means creating situations where structures can be discovered. ”

Piaget, 1920

History

Dissatisfaction with the limitations of Behaviourism led researchers to look for ways to explain the unobservable changes that took place when learning occurred. These developments were rooted in the work of Jean Piaget, in the 1920s. Piaget's view was that learning occurs when knowledge is constructed by the individual as a result of their experiences in the world. This progresses through distinct stages (Stages of Cognitive Development), he termed:

- **Sensorimotor** (birth - 2 years): experiencing the world through senses and actions
- **Pre-operational** (2 years - 7 years): representing things with words and images but lacking logical reasoning
- **Concrete operational** (7 years - 11years): thinking logical about concrete event
- **Formal operational** (11 years - onwards): abstract, hypothetical thinking, systematic deductive reasoning, interest in issues



Figure 4: Piaget

Furthermore, Piaget formalised that people construct new knowledge from their prior experiences through the processes of **accommodation** and **assimilation**. People assimilate when they integrate a new experience into their already established mental framework and accommodate when they reframe their mental representation of the world to incorporate their new experience.

Key principles and classroom implications

The main principles underpinning the constructivist learning theory are:

- Learners come to the classroom with prior understandings and experiences. To promote learning, teachers must address and build upon this prior knowledge.
- Teachers must think about what a child already knows, so that new knowledge can be related to existing schemata (assimilated or accommodated).
- Teachers must look for misconceptions in the learners' existing knowledge and provide learning activities that enable the learners to understand the limitations of their current conceptions.
- Teachers must prepare learning tasks in which the learners can actively participate as learners' own discovery as a crucial element in learning.

1.2.3 Social-Constructivism

The social-constructivist learning theory claims that learning is dependent on socio-cultural influences. Therefore, it is through interaction and exercise of communication that people learn. It is the teacher's role to create a situation where the learner can compile their own interpretations by using interpretations of others around them. Teachers would do this through the creation of scaffolds. This is where the teacher provides a means for learners to apply already existing skills to acquire new knowledge. In this view, the social-constructivist learning theory is a supporter of Piaget's work (Constructivism), but they disagree on one key point: Social-constructivism criticizes Constructivism for focusing on the individual learner rather than on the social context in which learning takes place and advocate that interaction between learners, through language, influences the level of conceptual understanding.

By giving students practice in talking with others, we give them frames for thinking on their own. ”

Vygotsky, 1922

History

The development of Social-Constructivism roots in the work of Russian Psychologist Lev Vygotsky. Vygotsky's view was that learners learn optimally from interaction with their peers, whether their peers are of the same age or of a higher age and whether they had the same development stage or not.



Figure 5: Vygotsky

Vygotsky made reference to the **Zone of Proximal Development (ZPD)** and suggested that there is a difference between what a person is able to do on his own and what they can achieve with the help of somebody who has greater knowledge than them. Vygotsky claimed that if a teacher can provide scaffolds with a focus on interaction during this time then the child's knowledge could be brought to a higher level as they learn from each other. The zone of proximal development is best understood as the difference between what a learner can do without help and what he or she can do with help. Vygotsky stated that a child follows an adult's or peers' example and gradually develops the ability to do certain tasks without help or assistance. It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers. In this view, the best type of learning takes place when the learners are expected to develop skills that are slightly beyond their grasp, but they can develop with the help from peers.

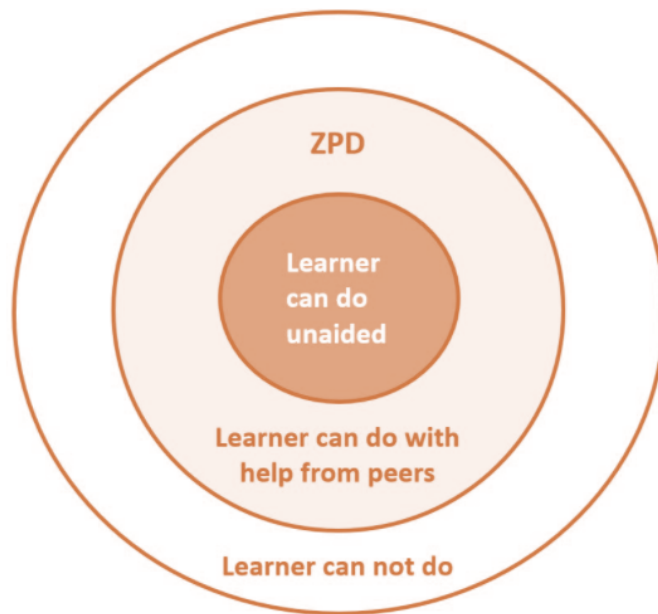


Figure 6: Model for Zone of Proximal Development

Key principles and classroom implications

The main principles underpinning the social-constructivist learning theory are:

- Learning is collaborative in nature and the social context is a major factor.
- All cognitive functions originate as products of social interactions.
- Learners can transmit knowledge to each other through language, as they are received by other learners, knowledge is co-constructed.
- It is the teacher's task to encourage team work and collaboration, organize discussions and debates, provide opportunities for group work and group study.
- Classrooms need to be places where teachers create environments in which learners feel encouraged and secured enough to be able to express and explore their thoughts, feelings and emotions.

1.2.4 **Cognitivism**

Cognitivism is a learning theory that focusses on how information is received, organized, stored and retrieved by the mind. It uses the mind as an information processor, like a computer. Therefore, cognitivism looks beyond observable behaviour, viewing learning as internal mental processes. In this view, learners are actively involved in the way they process information. Knowledge, memory, thinking, and problem solving are areas for development.

Knowledge is an internal process, rather than a product. ””

Bruner

History

Cognitivist theory developed as a reaction to Behaviorism and gained credence in the 1950s. Cognitivists objected to behaviorists because they felt that behaviorists thought learning was simply a reaction to a stimulus and ignored the idea that thinking plays an important role. Although many researchers contributed to the development of the learning theory (e.g. Bruner, Vygotsky, Bloom, Ausubel), Piaget's views had a tremendous impact. Spurred by the work of Piaget (Constructivism), knowledge is viewed as symbolic mental constructs, or schemata. When a learners' schemata are changed, learning takes place. As neuroscientists continue to discover more about how the brain works, cognitive psychologists and educators are concerned with how to use that knowledge in the classroom.



Key principles and classroom implications

The main principles underpinning the cognitive learning theory are:

- Learning is a process of organizing information into conceptualized models.
- Instructions should be organized, sequenced and presented in a manner that is understandable and meaningful to the learner.
- Retention and recall is important to build schema's in the brain.
- Memory is supported by organizing learning material.
- Teachers must provide tools that help learner's brain process information.



Question

Considering the key principles and classroom implications above, think about the following question:

Which tools can teachers present to learners to help them organize and process information?

After noting down your answers, watch the video below and get feedback on the question above.

Link to the video: <https://bit.ly/3qy8tfd>

1.3 Conclusion on learning theories

Based on the four theories of learning previously discussed, you must have drawn conclusion that learning is a complex process that brings together cognitive, emotional, and external (environmental and social) influences and experiences that involves learners acquiring, enhancing, or adjusting her/his knowledge, values, skills, or views of the world. Though different learning theories involve contrasting ideas, in many cases the theories are not mutually exclusive but demonstrate overlapping or connecting ideas. Therefore, as a teacher, you will find yourself moving seamlessly through all learning theories.



Reflection point

Think about your own learning:

Which learning theory best reflects how you learn?

2 LEARNING STYLES

Learning styles have been described as learners' tendency to adopt a particular strategy in learning based on their personal characteristics. Some people believe that this has implications for the classroom, as a learner's preferred learning style may affect the way in which they respond to your teaching. Therefore, this subtopic seeks to introduce you to different learning styles learners can adopt and how you can anticipate on different learning styles in the classroom as a teacher.

2.1 Introduction to learning styles

A learner's individual learning style refers to the preferential way in which they absorb process and retain information. Learning styles depend on cognitive, emotional and environmental factors, as well as prior experiences. In other words, everyone is different and different modes of learning suite different learners. Learning styles are also termed 'learning preferences' or 'learning strategies'.

How do you prefer to learn or process information? Taking the questionnaire below, you can discover your own learning styles and find out how they influence the way you understand and process information.

Watch the below video and get an introduction to learning styles:

Link to the video: <https://bit.ly/3orQ9mk>



Why is it important for teachers to identify learners' learning styles?

2.1.1 Interpersonal learners

Interpersonal learners love to interact and prefer learning through communication and interaction. Interpersonal learners are true people persons. They enjoy heading up committees, participating in group learning projects, and communicating with other learners and adults. They enjoy school activities such as speech, drama, and debate teams. The strengths of people with a high degree of interpersonal intelligence are in communicating with and understanding other people. They may be good at leading and organizing other people and groups, understanding other people and resolving conflicts. The classroom implications discussed in the subtopic on Social

constructivism are corresponding for interpersonal learners' preference to absorb information.



Suitable teaching and learning activities

- Groupwork
- Class discussions and debates
- Peer tutoring
- Micro-teaching
- School clubs and social gatherings

2.1.2 Intrapersonal learners

An intrapersonal learner is someone who prefers working alone, which is the exact opposite of an 'interpersonal learner'. These are self-motivated learners that like to set individual goals, and prefer to study by themselves with their own thoughts and ideas rather than with others that intrude on those thoughts. They are very self-aware of their own strength and weaknesses and may have very high self-management skills. This learning style is also termed 'solitary learning style'.



Suitable teaching and learning activities

- Learning contracts
- Independent study (provide resources as books, websites, videos)
- Allow learners to set goals and tasks for themselves
- Allow learners to study quietly and free from distractions

2.1.3 Kinesthetic learners

Kinesthetic learners absorb information best by doing, experiencing, touching, moving, or being active in some way. In other words, they best absorb information using their body, hands and sense of touch. Often, students with a kinesthetic learning style have a hard time learning through traditional lectures. In those circumstances, they fidget or

can't sit still for long, they want to get up and move around. They would prefer to pull an engine apart and put it back together, rather than reading or looking at diagrams about how it works. This learning style is also termed 'tactile or physical learning style'.



Suitable teaching and learning activities

- Learning by doing: hands on learning methods, using manipulatives, imitations and practice
- Discovery learning and experiments
- Constructions games
- Demonstrations
- Field trips and excursions
- Role-playing and simulations
- Allow frequent breaks

2.1.4 Verbal learners

Learners with a verbal learning style prefer to learn verbally by reading or listening. Thus, this learning styles involves both written and spoken words. It is possible to hear such a statement from a verbal learner "I prefer to read instructions on how to do something rather than have someone show me." It is necessary to present to them plenty of reading materials, as they love reading and writing. Verbal learners are naturally born speakers and find it easy to express themselves, both in writing and verbally. This learning style is also termed 'linguistic learning style'.



Suitable teaching and learning activities

- Activities to verbally express themselves: presentations, speeches
- Round table discussions and classroom debates
- Role-playing
- Simulations
- Word-based tasks: scripting, assertions

- Interviewing
- Repeating and rephrasing
- Group study

2.1.5 Visual learners

Visual learners learn best by engaging their visual senses. The whiteboard, texts for reading, or information on computers all help them succeed in the classroom. It's important to distinguish that some visual learners prefer the written form of the language, such as a book that explains grammar or vocabulary. This preference is similar to an analytical approach. Other visual learners prefer diagrams or charts that illustrate grammar or vocabulary.

Although most people believe notes aid memory, visual learners see notes as a prerequisite to memory. In other words, if they don't write down the information and/or draw charts and diagrams, then they won't remember the information. Note that listening skills are a primary component of oral communication. Extra opportunities should be given to build listening ability, with many opportunities for visual learners to hear and process the information. This learning style is also termed 'spatial learning style'.



Suitable teaching and learning activities

- Visual aids: charts, diagrams, images, mind mapping, use of whiteboard
- Flashcards with images and/or words
- Use color, layout, and spatial organization
- Allow and give time to write notes in the class

2.1.6 Logical learners

Logical learners enjoy learning that is systemic or follows given procedures. Logical learners like using their brain for logical and mathematical reasoning. They typically work through problems and issues in a systematic way, and they like to create procedures for future use. They can recognize patterns easily, as well as connections between seemingly meaningless content. This also leads them to classify and group information to help them learn or understand it. Logical learners are often very well with numbers and can perform complex calculations. This learning style is also termed 'mathematical learning style'.



Suitable teaching and learning activities

- Problem-based learning
- Open-ended questions
- Diagrams
- Puzzles

2.1.7 Auditory learners

Auditory learners prefer to collect and confirm information via listening. Some of these learners learn best when the teacher explains orally. They can quickly process and act upon the information. Information written down has less meaning until auditory learners also hear it. Such learners enjoy a setting where they are able to clearly hear the sound in a learning situation and can easily sit at the back of the class, as they can benefit from lectures more than the other learners do.

Some auditory learners learn best when participating in speaking activities in pairs/groups. These learners more effectively absorb and retain the information with dynamic use of the language. This learning style is also termed 'musical or rhythmic learning style'.



Suitable teaching and learning activities

- Storytelling
- Read information out loud (e.g. instructions)
- Provide auditory resources: CD's, podcasts
- Speaking activities in pairs/groups

2.2 One size does not fit all

Every person uses more than one learning style in the course of learning. Therefore, one single approach to teaching does not work for every learner or even for most of the learner. The educators' awareness of the various learning styles of the learners and

their efforts towards matching the teaching and learning styles may help in creating an effective learning environment for all the learners.

A teacher can adopt a variety of strategies in catering for different learners in his class, for example:

- Having a variety of learning aids on display in the class as diagrams and images.
- Varying teaching methods to cater for a variety of learning styles, such as group work, individual assignment, problem solving, dramatization, field trips and quizzes.
- Being conscious about the seating arrangement in your class. Learners can be allowed some freedom to choose where to sit and seats should be arranged in a variety of ways to cater for the differences.

3 LEVELS OF COGNITION

Learning, from a cognitive point of view, involves mental operations or thinking skills. It is important for teachers to clearly understand these mental operations in terms of levels of complexity in order to design meaningful lesson competencies expected of the 21st century learner. Therefore, a multi-layered model, named Bloom's Taxonomy, will be introduced in this subtopic to help you understand different levels of cognition.

3.1 Introduction to Bloom's Taxonomy

Bloom's taxonomy is a classification of cognitive skills into hierarchical levels of complexity that can help teacher teach and learners learn. While the affective and sensory domains have been given less attention, the cognitive domain has been the primary focus of most traditional education and is frequently used to structure curriculum learning objectives, assessments and activities. The image below visually demonstrates the hierarchy of Bloom's taxonomy, separating lower order thinking skills from higher order thinking skills.

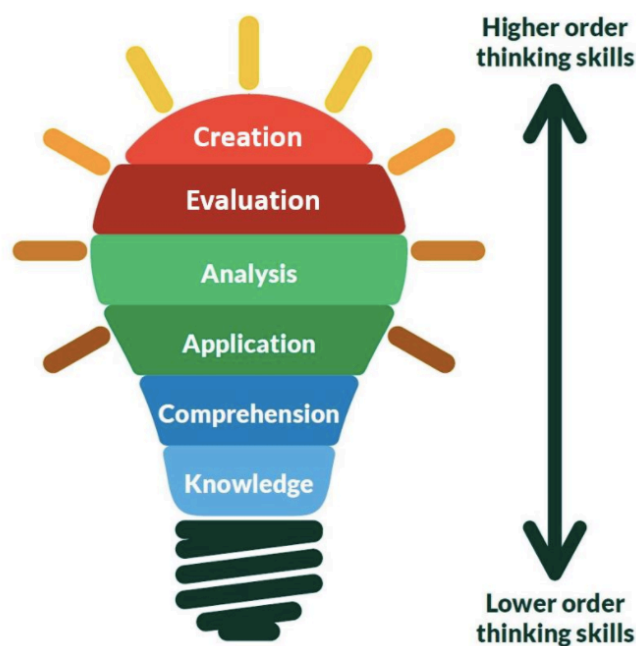


Figure 7: Bloom's Taxonomy - The cognitive domain

Levels of cognition

According to Benjamin Bloom, there are six levels of cognition. Each of these levels of cognition have verbs that can be used in stating lesson objectives in preparing to teach. Some of the verbs that can be used to state lesson objectives are mentioned below together with the categorized level of cognition:

Knowledge: remember or recall previous learned information.

Example: recall country capitals, memorize a poem

Verbs: define, repeat, list, name, ...

Comprehension: demonstrate an understanding of the facts.

Example: summarize the plot of a story, explain a process in one's own words

Verbs: explain, interpret, paraphrase, defend, convert, estimate, ...

Application: apply knowledge to actual situations, use of a concept or method.

Example: use a formula to solve a problem

Verbs: apply, develop, restructure, illustrate, modify, ...

Analysis: break down objects/ideas into simpler parts and find evidence to generalize.

Example: explain how the steps of the scientific process work together

Verbs: analyze, compare, examine, contrast, investigate, experiment, ...

Evaluation: make and defend judgments based on internal evidence or external criteria.

Example: make a judgment regarding an ethical dilemma

Verbs: evaluate, compose, criticize, appraise, defend, justify, support, ...

Creation: Compile component ideas into a new whole or propose alternatives.

Example: design a new solution to a problem that acknowledges the previous failures

Verbs: create, combine, compose, generate, reconstruct, rewrite, combine

3.2 How Bloom's Taxonomy is useful for teachers

Many educators love Bloom's Taxonomy because, among other benefits, it gives them a way to think about their teaching and the subsequent learning of their learners.

The framework can be used to state lesson objectives in preparing to teach. Furthermore, as the framework provides an order for cognitive behaviors, it can be applied to evaluate the complexity of tasks, to create assessment, to simplify or complicate an activity to help personalize learning, and many more.



Figure 8: Benjamin Bloom

Last, as Bloom's Taxonomy helps classifying classroom lesson objectives, it helps teachers to variate among the levels of complexity with a focus on achieving higher levels of the hierarchy. The framework helps teacher to develop critical thinking and higher order cognitive abilities, which are aligned with **21st century skills**, in learners. A framework for 21st century learning focuses on four key skills that are known as '**the 4 Cs**': Critical thinking, Communication, Collaboration and Creativity. Watch the video below to get an introduction to the 4Cs and how it can effect your teaching practice and learners' learning.

