

Learning Theory: Narrative Review

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Abstract

In review of medical education literature there are seven main categories of learning theories. This review has aimed to summarize them. Different learning theories include adult learning theories (Andragogy), behaviors orientation, cognitivist orientation, humanist orientation, social learning orientation, constructivist model and transformation learning. In conclusion, in medical education and its theories bases should effectively include all of these aspects in order to train competent graduates.

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Introduction

A conventional assumption has been believed that if someone knows something, he/she could teach it. Developments of medical education departments in the world indicate the new beliefs regarding medical education science besides medical sciences. In other words faculty members should consider education skills to achieve better learning outcomes (1).

This article is to analyze and summarize learning theories relevant to medical education. Seven categories of learning theories specific to medical education are reviewed.

First category: Adult Learning Theory (Andragogy)

The main focus in medical education is adult learning. For the first time in 1833, "Kapp" used "Andragogy" and then "Plato" described it including natural involvement of adult in learning process. In the 20th century, "Dewey", "Lindeman" and "Anderson" completed the Andragogy theories. In 1980, "Knowles" changed and completed the theories.

The main characteristics of Andragogy are reviewed below:

1. Autonomous and independency: Adults need freedom and their own leadership of learning. Teachers are just facilitators in adult learning. They are interested in specific learning fields, attractive for them.
2. Background knowledge and skills: Adults need to find relevancy between their previous experience and new learning matters.
3. Goal oriented: Adults follow their aims. They are interested in organized and carefully described learning programs.

4. Daily task relevance: Adults need a reason to learn. Learning should be related to their job and responsibility.
5. Practical considerations: Adults focus on useful and practiced aspects of learning relevant to their work. They are interested in rapid responses of every learning activity.
6. Respect: Adults should be respected and feel free to negotiate.
7. Motivation is necessary for adults: The best way to motivate them, is explanation of learning causes and its direct relation into personal development. Teachers should know the aims of the learners and use motivational strategies. Adults' motivations are mainly internal.
8. Retention: In adults retention and application of learned issues should be considered.
9. Transference of learned subjects and practice to apply in situation is mandatory (2-6).

Second category: Behaviors Orientation

This is a teacher based model. Environment is prepared in such a manner to guide a specific response. The main goal in this model is to change behavior. The place of learning in this model is the environment of stimulus. There are 3 presumptions regarding behaviorists' approach as follow:

1. Observable behavior is the focusing point of learning.
 2. Environment shapes behavior.
 3. Reinforcement is the main part of learning processes.
- Pre request learning is mandatory before advanced steps. In competency-based curricula planning in medical education, behavioral models are useful. Specific determined aims facilitate learning processes, and



assessment indices. These specific aims enable teachers to specify expected competency levels for each part of the curriculum. Typical planning for behavioral aims includes three Sections:

1. Behavior as performance, which should be exposed by learner.
2. Condition, necessary for performance presentation.
3. Criteria indicator of learning.

For example in a physical exam of a patient presented with abdominal pain, a senior resident should be able to make decisions about surgical interventions (performance) with 80% accuracy (criteria).

In medical education, behaviorism is usually used to induce and assess clinical skills. Regarding skills, teachers expose specific and optimal behaviors, learners observe behavior. Check lists, rating forms and direct observations or other methods are used to evaluate competency and to reinforce it.

The behaviorism learning model is basically passive, responding to stimuli, shaping behavior in learner through positive and negative reinforcement. Positive reinforcement increases the probability of doing behavior and punishment decreases it. It is said that learning is described as a change in behavior.

Behaviorists found brain functions difficult, and simply deleted it from their primary findings. Actually, only observable and measurable behaviors should be studied. All three elements including classic conditioning, operant conditioning and role modelings are used here (7, 8).

Third Category:-Cognitivist Orientation

Learning takes place in the internal environments of the learner, in cognitive structures. Learners use cognitive instruments such as insight, data processing, understanding and memory to change meanings into events. Learning in cognitivist models take place through science structure understanding. Against behaviorism, learning happens in internal environments instead of external environments. Learners actively take part in their learning and their function is the result of their thinking. Change of behavior is observable just as the product of mind function. The Cognitivist model considers the mind as a computer with data entry, processing and specific results. Thinking, memory, self-reflection and motivation effects better learning. Learning steps happen through data processing in sensory-motor process, coding, short and long term memory, all followed by data entries.

There are a variety of outcomes in different learners resulting from a common stimulus, not simply explainable by abovementioned simple pathways. Many differences are due to different learning styles especially in adults or higher level learners. In higher level learning, problem solving should be mentioned.

“Jean Piaget” discusses data accommodation and assimilating and schemes to explain how assimilation improves accommodation in response to new data and experience which are not predicted in previous schemes. Behavior is a result of mind process and an equilibration of schemes and environments. “Vigotsky” confirmed socio-cultural influences in learning based on “Piaget” theories. “Geshtalt” learning point of view is merged in cognitivist

theories.

There are two key pre-assumptions in cognitivist theories:

1. Memory is an active processor of data
2. Previous knowledge plays an important role in learning.

A practical example of the “Geshtalt” theory is a medical student using problem solving approach in diagnosis. In a holistic view to a patient the “Geshtalt” theory is considered.

“Briggs” explained the “Geshtalt Theory” principles which are used in medical education written examinations as the “best answer”.

Learners, analyze the question to choose the best answer. The cognitivist function of the brain and problem solving approaches are used. Physicians should process all data results of history and physical examination in his/her brain to organize and screen them and come to probable diagnosis. “Kohler” describes brain processing function in problem solving. The problem-based learning method is designed based on cognition. Prioritization of problems and clinical symptoms in order to diagnose in medical education is not very different with “Kohler’s” experience on monkeys. Teacher is facilitator of the cognition process to help learners how to learn. The aim of this approach is to improve self-directed learning. Knowledge and skills are learned to practice in other situations, contexts and topics. “Ausubel” believes that people think and learn by concepts. Concepts are described as aims, events and situations with common criteria.

“Ausubel” explains meaningful learning as a relation of new and previous knowledge.

This approach encourages learning strategies to communicate concepts with each other to understand knowledge structures. Critical thinking via reflection is among the most important parts of cognitivism. “Walker” and “Bound” believes reflective processes in three phases:

1. Review of the experience
2. Notification of the sense of experience
3. Re-evaluation of the experience

This process could occur before during experiences called reflection on action or reflection in action. The two characteristics of cognitivism theory, directly functional in medical education are:

1. Concept maps
2. Reflective thinking

Concept Map

“Novak” & “Gowin” cognitivist learning strategies are graphic instruments to show interrelation of different concepts. Learner should diagnose key concepts, interrelate concepts and understand relations to be able to develop a concept map. The aim of this practice is to relate new and previous concepts. Function of concept map in medical education is to facilitate. Concept recall, understanding complicated concept relations, extraction of main concepts of a book or article, designing articles, presentations as simply brain storming as communication with other learners.

Reflective Thinking

For reflective thinking, teachers ask students to describe their clinical experiences. Recall and explaining the event

is followed by a reflection including discussion of learned points and alternative probable experiences which might happen. Reflective thinking as a cognitive learning strategy might be used in several learning situations including hospital departments, conference halls, small groups, simulated environments by standard as true patients (7-10).

Fourth category: Humanist Orientation

In humanist model, learning is individual function to achieve his/her maximal potential. The aim is becoming self-directed. "Rugers" describe it as facilitative learning theory. Teacher facilitate learning in such a manner, there is no external threat. In this theory, learning is a natural characteristic of human being. This is clearly observed in child learning and development besides parents. There are defence against change. It is not easy to put aside things taught to be correct until now.

Facilitative teachers in comparison to other teachers are less strict in their own beliefs and are more listening to learners and their feelings and consider this relationship as important as course content. They accept and use feedbacks in positive and negative aspects to build their manner and behavior. In this approach, learners are encouraged to be responsible in their own learning and consider self-evaluation as the best evaluation.

Learning should be focused on parameters resulting in solving significant problems and prominent results.

This theory is useful in medical education and learning "scientific practice". Practiced examples of facilitative learning are consultation with patients with unusual diagnosis, communication with parents of children with difficult disease and mange of cancerous patients. Learning focus in humanist are facilitative theory is on individual needs to achieve maximal development potential. Learner's motivation in learning is accentuated with their willing to develop to a level which is able to do characteristics of learning based on this approach are follow:

1. Active learning
2. Internal start of learning
3. Self-evaluation

The most important and well known aspect of humanist learning is self-directed learning. In self-directed learning, learners are responsible for designing, practicing and evaluating their learning.

Nowadays, in the technology and computer based world, self-learning is developing as an appropriate learning approach. Technology based learning experience, of well designed, encourage learners to be responsible for their own education, develop as well and use necessary instruments to manage and evaluate their learning. Computerized simulations, problem solving scenarios, immediate feedback, role playing experiments confirming self-direction and self-evaluation are examples of self-directed learning (11-13).

Fifth category: Social Learning Orientation

Social learning has focused on learning in social backgrounds. Social learning is specific in human beings. Observation and modeling are key characteristics of social learning approaches. Learner takes new information and

plays new roles.

In the social learning theory, learning takes place in observation and communication in a social background. In order to learn new knowledge and skills, learners should rehearse observed behavior.

On the opposite side of the behaviorism approach, social learning is involved in cognition. The learner observes experiment or simulated model and is expected to expose related behavior in the situation. Learning processes happen in relation to and in observation of other in social background. The focus of learning is on interrelationship, learning environment and optimal behavior.

Teachers are responsible for new role modeling, behavior guide and facilitates learners to exercise new behaviors and roles.

Common applications of the social learning theory in medical education are role-modeling, communicative learning and teaching based on case studies. Role-modeling process is in harmony with social learning in many aspects. For example, learners observe key characteristics of a teacher for instance in listening to heart looking for murmur. He/she memorizes what and how the teacher did it and builds a memory for future recalls. Learners should request behavior and listen to the heart by the same technique and receive feedback in her/his own work, needing observation and reinforcement of the correct behavior.

Role-modeling is the back-bone of clinical medical education in many wards. Students learn to do their tasks as the same as their teachers. Physicians always learn in social backgrounds by observing each other's' behaviors. The special aspect of the social learning theory is the role-modeling of behavior by cognitive learning for deepening the understanding how, why and following which aim, role-model use specific method (14-16).

Sixth category: Constructivist Orientation

This theory is among the newest and most special learning approaches throughout the world. Knowledge is constructed by learner and learning experiments and are merged in previous beliefs and knowledge. This is believed that learning happens by the concept of creating through experiments, learning place is in concept development, understanding and paying attention to experiments.

Constructivism based on cognitivism is another aspect of active learning. Learning is an active process. Older learners and adults, accept constructivism processes besides self-directed learning, background attention and active learning through experimental learning. Experimental learning practice in skills is coming besides learning. Learners are expected to create knowledge and learn skills actively. This process is called situated learning which takes place in true experiments of learners in the society.

In the 18th century, "Vico" suggested learning by constructing knowledge based on what the learner can explain. "Piaget" considered a balance in his concepts in assimilation and accommodation. He believed that learning is based on individual understandings of the experiment. "Von glaser field" confirmed the "Truth" to be constructed by a balance of the individual with the

others and with the environment.

In "Vygotsky's" point of view socio-cultural factors are very important.

Constructed knowledge are influenced by beliefs, mental structure and experiments resulting in special learning of each person. This matter is true in different learning styles, worthy for teachers to know. This philosophy clarifies the importance of not just curriculum content, impossible passive teaching of knowledge, but also the individual specific learning of each person.

For more effective learning, teachers should pay attention to the learners' differences. The aim is more effective learning to achieve educational outcomes. "Vygotsky" described effects of language and culture on learning. If there are communication barriers, learning is impossible. In multicultural societies, this is more prominent. Exposure of new tasks, needs education and step by step help and learning support by scaffolding. Sometimes experts are able to do work which learners are not yet able to do.

The Zone of proximal development (ZPD) is the existing distance between the learner's ability to help and to work independently. "Vygotsky" believes that learning takes place in this zone. Teachers can apply this concept by exposing procedures or experiments. Whenever learner's practice to satisfy their teachers, scaffolding could withhold and learners are permitted to work independently. The Learner's ability can be tested by extending ZPD after basic abilities are achieved. This method enables learners to move to the upper levels of ZPD and to develop. The curriculum and program design should consider this concept in order to correct transfer of content and make sure of effective transfer. If programs are higher than ZPD, rejection and decreased motivation of learners is possible. Task based learning clarifies the importance of constructivist theories. Dynamic group and problem solving approaches in true life are included. Students sense tasks exposed in true life.

Students actively learn to do these tasks and are responsible for their own learning. Learning is a product of understanding concepts and a background mechanisms for tasks. Learning place in constructivism approach is internal including new scheme creation for deepening understandings and change in attitudes. The teachers' role is critical reflection and concept discussion to learners.

The learning strategies in medical education used in this approach include critical appraisal, work narratives and portfolio preparation. For example in work narrative writing, learners understand their activity in new task. Learners are encouraged to write 3 narrative columns including:

1. Description of a patient
2. Writing their own understanding and feeling
3. Learning from this experiment

After narrative writing, small groups of learners were gathered to discuss similarities and differences of their patients and their understandings (17-20).

Seventh category-transformation learning

Andragogy does not well address concepts of reflection and motivation, so transformation learning is more

appropriate.

The main aspects of this theory are structures and mechanisms by which adults assimilate and understand their experiments.

Reflection to experiments is dependent on genetic and cultural backgrounds of people. The teachers' role is to motivate asking questions and reflection to existing pre-assumptions of the learner and other people. Useful methods in this regard are critical incident analysis, small group working to formulate ideas in specific subjects and reflective activity.

Transformative learning (T.L.) is still in development process, needing more researches. This approach is similar to and complementary of "Inner apprentice" idea. In other words, learning is internal self-education to recall correct information in a correct time and place. In such a suitable learning environment, learners achieve knowledge through movements from cognitive dissonance into cognitive resonance in Kairo stages. Kairo in Greece means "right time of work" and learner's maximum learning happens in these times. In medicine, it means competency improvement by learners. Competency improvement should be a main motivation of every medical university. Medical competency is described as an appropriate application of communication, knowledge, skills, clinical reasoning, ranking and reflection in practical daily work directed in individual and society benefits.

In conclusion, medical education and its theoretic bases should effectively include all of these aspects in order to train competent graduates (21-24).

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Conflict of interest

The authors have no conflicts of interest.

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