



Application of Learning Theories on Medical Imaging Education

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ABSTRACT

The main objective of the education process is that student must learn well rather than the educators to teach well. If radiologists get involved in the process of medical education, it is important for them to do it through sound knowledge of how students learn. Researches have proved that most of the teachers in the field of medical education including diagnostic imaging are actually doctors or technicians, who didn't have an opportunity to study the basics of learning. Mostly they have gained their knowledge through watching other educators, and they mostly rely on their personal skills and experience in doing their job. This will hinder them from conveying knowledge in an effective and scientific way, and they will find themselves lagging away behind the latest advances in the field of medical education and educational research, which will lead to negative cognitive outcomes among learners. This article presents an overview of three of the most influential basic theories of learning, upon which many teachers rely in their practical applications, which must be considered by radiologist who act as medical educators.

Keywords: Radiologists, Medical education, Learning theories, Medical imaging

INTRODUCTION

In order to reach the maximum level of performance, it is important for radiology educators to operate through a good knowledge and background of how students learn. Most medical educators, including radiologists, have little or no formal background in education [1,2]. There are three basic theories of human learning that are applied in education, the cognitive, behavioral, and constructive theories. Behavioral theory concentrates on the observable behavioral response of the learner. Cognitive theory concentrates on what goes on inside the learner's mind, while constructive theory considers learning as a social process mainly depends on the interaction among learners and between learners and educators. Each theory deal with the learner and the learning process from different perspectives, no one can judge that one of these theories is correct and the other one is wrong, each theory has its own value through the educational context that it discusses. Being aware of these theories will help radiology educators to be more effective, create good learning environment for learners and gain satisfactory results.

Theories of Learning

The cognitive theory is the first one to be discussed, it focuses on the way that different idea and concepts fit together inside the learners' minds. It also concentrates on the variety of information patterns and how different factors can change these patterns and may improve or decline the abilities of learners in using their knowledge in solving problems. Cognitive theory is basically interested in what is happening inside the learners' minds. The first cognitivists were Dewey, et al., they believed in the possibility of having insight into learner's mind and understand what is happening inside it [3]. Cognitivists are interested in how acquired knowledge is transferred to new situations. A key concept in cognitive learning theory is that knowledge is processed on multiple levels [4].

The second theory is the behavioral theory which is based on observing the change of the learners' response as they get different types of stimulations during learning. It concentrates on observable behavior of the learner. Although the roots of this theory may extend back to the 17th century, it is traditionally associated with the behaviorist Skinner in the 20th century [5]. Unlike cognitivists the behaviorists are not interested on what happens inside the learners' mind, they observe learners' response to stimuli as one of two types: right or wrong. If learners responds correctly that

means the educator was successful in his job, if learners did not respond correctly the educator will be considered as unsuccessful and further instructions will be administered until the correct answer becomes the pattern of learner's response.

Constructive theory is the third theory which concentrates on what happens between learners during education process. Constructivists tend to view learning in connection with a community of practice and knowledge as an integral part of the context in which learning develops [6]. Constructive theory considers knowledge to be negotiable and understanding comes through interaction between learners and educator and between the learners themselves. The constructivist theory of learning, as put forward by such theorists as Vygotsky, focuses that learning is a largely social process [7].

Each learning theory deal with education components from different points of view, and that is why it is important to talk briefly about components of education.

Components of Education

Education is generally considered to be composed of three main components; curriculum, instruction, and assessment. Curriculum is the academic content in a specific program that intended for students to learn. There are two types of curriculum, formal and informal. The formal curriculum is composed of course syllabus, written learning objectives, lectures, reading assignments, etc. The informal curriculum is composed of lessons that are learned outside the known formal channels, such as coping with reporting mistakes and learners' expectations like their plans after completing their course. This knowledge is not official in the sense of being prescribed or even monitored, yet it permeates the experience of all students in any program, whether they are aware of it or not [8]. Radiology educators must know that informal curriculum sometimes can be more important than formal.

The second component of education is instruction or the way of teaching. There are different ways of teaching, like teaching through lectures, teaching through computer-based instruction and watching a recorded lecture linked to slides. Instruction can be divided into two planned and unplanned. Example of planned instruction is to plan giving a lecture on a specific topic at a specific time and place. On the other hand, unplanned instruction could be as spontaneous delivery of information during clinical practice.

The third component of education is assessment which is used to identify the level of knowledge that the learner has gained. It can be formal assessment or informal, formal assessment could be like written exams that can become part of the learners' record. Informal assessment could be like feedback that is delivered orally in day-to-day activities sometimes informal assessment could be more informative than formal.

The concept of curriculum, instruction, and assessment and the way they fit together in the educational process as a whole, depends on the learning theory through which the educator perform his job.

Curriculum, Instruction, and Assessment According to Learning Theories

From cognitive point of view, curriculum is expected to put a lot of focus on the basic concepts of discipline rather than facts. It is also expected to focus on the link between the education and what is already known by learners. Learners are expected to use their own concepts in solving the new problems. Important concepts must have been reconsidered and developed during the time spent in the curriculum. From behavioral approach curriculum is considered as a set of principles, concepts, facts and procedures that learners need to know in order to control the domain. From behavioral approach curriculum is supposed to consist of a set of educational objectives that should be under the focus of every learner.

From a constructivist point of view, the curriculum is supposed to be consisting of different types of problems that face learners after they leave the instructional context. Educators and learners are supposed to work together on the exploration of these problems, and both of them are encouraged to construct new knowledge as they work together. There is no specific type of knowledge that every learner supposed to acquire.

Concerning instruction, from a behavioral point of view is supposed to consist of presentation and practice. The educators tell the learners what they are supposed to know, and the learners accordingly do their responses, and when they are tested, they are supposed to be provided with feedback on their performance. Then they are supposed to take the benefit of this feedback to modify their responses. From a cognitive point of view, the learners are supposed to

look at problems from different points of view, to encourage them to depend on their own understanding of the basic concepts and the application of these concepts in solving problems. From constructivist point of view, there will be emphasis on the importance that learners must be involved as explorers of the domain. The instructor supposed to encourage the learners in exploration of the problem rather than telling them what to look for.

Concerning assessment, there is a big difference in approach to assessment techniques between the three learning theories. From behavioral point of view, assessment will be independent and stress objective. From cognitive point of view, assessment techniques are supposed to emphasize on depth rather than breadth. Educators supposed to aim to know how learners think rather than knowing what they already know. From constructivist point of view, assessment and instruction are supposed to be closely related and should take place simultaneously. Constructivists confront learners with complicated and extended tasks are supposed to be completed and solved in a long period of time.

CONCLUSION

There is a rapid evolution of learning strategies and theories on the last few decades. Radiology educators are supposed to explore in order to benefit from them in their teaching tasks. There is a big difference between merely memorizing facts and routines and actually being able to function effectively as a clinical radiologist [1]. The art of learning theory has changed from teacher-directed approach to learner-centered approach. A new concept in effective education that learner initiative is considered as essential ingredient, and new learning strategies aim to foster this concept. Likewise, a new trend has emerged, focusing on how learners approach complex situation rather than what each learner should know, this trend emphasizes component problems and playing down component skills.

Educators who have good knowledge about learning theories can create good learning environment for learners. The main reason of discussing these theories is to clarify the perspective of each theory about educational components. Every theory has its own point of view about education, which depends on the context of the educational process that is discussed. Changing this context leads to the change of the actual contribution of each theory in the field of education, as it is clear that there are areas of overlap between each of the three theories.

DECLARATIONS

Conflict of Interest

The authors have disclosed no conflict of interest, financial or otherwise.

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