Scoping Review of Learning Theories in the 21st Century

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Abstract— Academic practitioners need to enlighten their teaching practice by integrating learning theories into their instructional courses. However, traditional educational philosophies such as behaviourism, constructivism, and cognitivism are considered as the foundation of teaching and learning, they do not argue intrinsically as instructional design in the 21st century. Continues evaluation of learning for each generation holds pedagogy in high standard. Learning theories has undergone many changes, and therefore guidance in modern educational theory is important for continues learning. Lifelong learning, rapid development of science and technology principle stimulates educational growth, and requires new learning methodologies. Learning in the 21st century has undergone profound changes, due to an influence in mobile tools and new technologies.

The study reviews traditional learning theories, including connectivism with viewpoint for the 21st century using scoping review to probe strengths and weaknesses and produce deductions into knowledge transfer. The study recommends connectivism as a suitable learning theory that allows teaching and learning with technology to be viewed in an optimistic perspective that relate to the ability of positive outcome.

***Index Terms*— Learning Theory, Digital Age, Connectivism, Pedagogy**

I. Introduction

A learning theory can be advanced or may take a new direction based on new information, as mainly it is used to synthesise large body of information, and application depends on whether it is currently useful or not useful for explaining or predicting behaviour [1]. A number of learning approaches are discussed in the literature, however, the paper focus only on connectivism, behaviourism, cognitive, constructive, socio-cultural and experiential learning theory. The study uses ocean technique, and competence assessment criteria to propose theories that can be mapped to the 21st century.

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Learning process, diverse and difficult as it is constitutes relevant component of human growth throughout centuries, related to the discipline of psychology and education, which includes behavior, cognitive, human, constructive and social learning; multiple learning theories are hypothesized to play a major role in teaching and learning as employed by instructional designers [2].

The question for many academics is whether the traditional learning philosophies such as behaviorism, cognitivism, and constructivism support new blended approach to teaching and learning with technology. New blended approach defined as use of e-learning, conceptualized with mobile technology, and face-to-face learning in formal or informal context [2]. The learning theories named behaviorism, cognitivism, and constructivism were produced when learning was not impacted by technology, and were normally used in the creating of instructional environments [3]. Academic activities such as aggregation, relation, creation and sharing are not supported by all learning philosophies, in a new blended approach; it is assumed that a new learning theory must be considered to practically implement all learning activities.

A need arise to scrutinize learning theories based on the rapid development of information and communication technology; as pedagogy theories are born as an influence of science and technology education [4]. The young generation today, is referred to as the “Net Generation”, as they spend hours practically using smart phones and computers, media has a dramatic influence on learners and their thinking has been restructured; it is also difficult to educate this generation using the traditional face to face, therefore, it is important that academics must be equipped with new competencies and pedagogical professional skills [4]. Academics that use technology to support learning seek learning philosophies to structure understanding and innovations [5].

The Net Generation is highly influenced by information and communication technology, fundamentally they have an exceptional learning style and preferences; they are distinguished to previous generations through the following characteristics [4]:
Text book literacy is poor, prefers Internet and can find important information online, as they are visually literate, as compared to using libraries for research

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- They learn by doing, and inquire with their peers rather than teacher dominated techniques
- They learn and work in teams to help each other

Knowledge is expanding exponentially, and the time span is now measured in months from when knowledge is gained to when it becomes obsolete, in order to contest shrinking half-life of knowledge, academics are forced to develop new techniques of deploying instruction in an educational institution [3].

II. Prevailing Learning Theories

The section describes the tenets of learning theories, and assesses them for the 21st century digital age. The study explore existing theories for learning through the literature, where a specific attention is paid to learning theories that promote growth of learners, and academic institutions can be guided through the choice and implementation of the learning theories.

A. Connectivism Learning Theory

The researchers [1] argues that a learning theory named connectivism was developed mainly to denounce boundaries or limitations of behaviourism, cognitivism, and constructivism theories as denoted in figure 1 below. This theory was introduced based on the ground that knowledge exists in the world reasonably than in the head of an individual; Learning as a process occurs within nebulous environment of ever-changing essential elements, not under the control of the individual; Furthermore, connectivism uses network of nodes and connections for learning, with an understanding to know where to find knowledge when is required [6].

The connectivism theory was introduced as a learning theory according to the principle that knowledge exist in the world rather than the head of an individual, and propose similar approach to activity theory of Vygotsky which regards knowledge to exists within applications; it contains also resemblances to social learning theory which proposed that people learn through interaction [6]. Connectivism is defined as consolidation of constructivism, cognitivism, and behaviourism as indicated on figure 1 diagram [2].

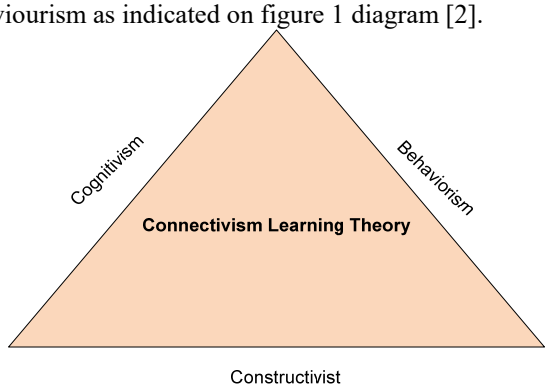

Fig 1: Triangular Framework for Connectivism Learning Theory

B. Behaviourist Learning Theory

Learning is based on foundation of impulse-reaction relation, where student receive feedback for the answer, which helps to avoid wrong answers; learning is assessed quantitatively with a simple examination, where a student need to recall answers in the exam. However, the consequences result in delusion of learning, where the learner's alignment of knowledge do not change permanently, because exams request only repetition without building new alignment of knowledge [7]. The researchers [8] describe the theory to have started in the earlier 20th century, and that is a model that assumes learner to be passive and responds to environmental incentive; they further argues that the theory is criticized since it applies where learning environment is at lower level of skill or knowledge, and that revolution of cognitivism learning theory replaced behaviourism theory in the 1960s.

C. Cognitivism Learning Theory

The theory focus on inner mental actions, as it is important to consider how people really learn; mental actions such as thinking, knowing, memorizing, and problem-solving are focused in the theory to create knowledge; its weakness is when a learner is able to accomplish a task, but not through the best suited way to the learners, since learners are trained to do a task in a similar way to allow consistency [8].

D. Constructivists Learning Theory

The theory is based on leaner-centred view of teaching, this is rooted in cognitive psychology, and states that knowledge do not move into the learner, but, the learner has to "construct" knowledge; learning requires the learner to involve in active, goal-oriented, and feedback seeking process, where the learner designs, assess, and develops their own learning strategies; hence the learner is assumed as a dynamic recipient and handler of knowledge. However, knowledge rebuilding depends on prior experience and knowledge, again on the learning environment and social interaction [7]. The researchers [9] argues that learning is a dynamic progression of constructing knowledge moderately than attaining knowledge; further states that knowledge is shaped based on learner's practises and connections; also argues that the theory has been the main provider to fruitful learning process in the 1990s.

E. Socio-Cultural Learning Theory

The researchers [10] argues that socio-cultural theory acknowledges that scaffolding plays an important role to assist collaborative learning, where students are cognitively prepared, yet they need help from teachers or mentor to understand task at hand to be performed.

Self-directed learning and experiential learning are two other activities that support the constructivism learning theory [11]. The theory highlight on understanding information rather than memorizing and reproducing it

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again [12]. There exists many schools of constructivism, such as Trivial, Radical, Social, Cultural and Critical constructivism [6].

F. Experiential Learning Theory

The theory focus on doing an activity at an approved workstation and processing that activity from both content and learner perspective; this takes a learner through a reflexive process allowing global connections to learning; the theory is also accepted as a non-formal model for teaching and learning; the learning theory allows learners to witness their surroundings, gather information, attain knowledge, apply and reflect on experiences learned [13].

A mentor is provided by industry or approved workstation to provide guidance and assistance to the learner on a specialized outcome, leading through a hands-on learning process. Buehlmann and Espinoza (2014) defines the experiential learning theory as "*An Instructional approach in which students learn through direct experience and reflection*" or defined as "*A philosophy that informs many methodologies in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, clarify values, and develop people's capacity to contribute to their communities"*.

The learning is based entirely on the process instead of the outcome; learners see themselves through the learning experience.

III. RESEARCH METHODOLOGY

A. Scoping Review

Scoping Review is chosen in these research to synthesize evidence from published papers, and explore literature relevant to learning theories in academic journals, books and conference proceedings [15][16]. The scoping review outlines Behaviorism, Cognitivism, Constructivism and Connectivism, in the setting of a wider development of philosophies of education, providing a theoretical charter for the exploration. The prime data for the research is obtained through research articles, published in journals, book chapters, proceedings, and thesis.

IV. RESEARCH RESULTS

The research use scoping review approach proposed by Arksey and O'Malley framework and revised by other researchers[17] [18][19] composed of five important steps, which are: Define research question, Ascertain important studies, Choose articles, Graph the data, and Organize, Encapsulate and report the research outcomes.

A. Define Research Question

The research question has been defined as:

- How is the learning philosophies impacted when knowledge is no longer acquired in linear method?

B. Ascertain Important Studies

We searched electronic databases such as ACM Digital Library (http://portal.acm.org), IEEE Explore (http://ieeexplore.ieee.org) and Google Scholar (http://scholar.google.co.in) using search terms as identified by research team, and information specialists as inputs.

C. Choose Articles

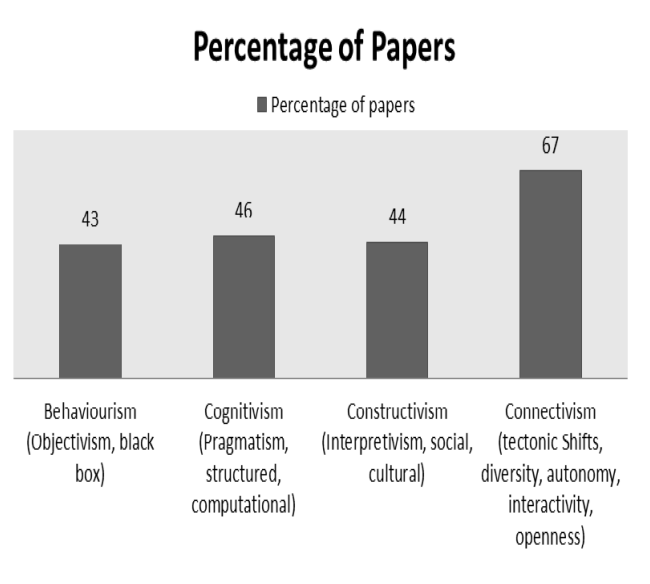

Fig 2: Observation of trends in research papers

200 articles were retrieved in 2016, as shown in figure 2 below and screened for importance based on their titles and abstract. Studies not published in English were excluded, including studies which avail abstracts only, and those which do not include studies on learning theories and learning styles.

The included articles are scrutinized to extract relevant information on pedagogical strategies, paradigms and outcomes from different perspectives. Articles that met inclusion criteria were retained for scoping review.

D. Graph the Data

Table 1 below shows research papers according to each factor on learning theories, based on publications and pedagogical benefits used.

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Table 1: Learning Theories Table

Author	Learning theory	Limitations	Benefits
[13]	Experiential	Limited workstations	Student growth and building lifelong relationships with industry
[8]	Behaviorism	criticized since it applies where learning environment is at lower level of skill	Replaced by cognitivism
[8]	Cognitivism	Its weakness is when a learner is able to accomplish a task, but not through the best suited way to the learners	Learners are encouraged to explore instructional materials and to become active creators of their own knowledge
[7]	Constructivism	Theory has been the main provider to fruitful learning process in the 1990s.	Learners solve problems and develop solutions, with minimal intervention from the teacher
[10]	Socio-Cultural	Learners need help from teachers or mentor to understand task at hand to be performed	
[1]	Connectivism	Developed mainly to denounce boundaries or limitations of behaviourism, cognitivism, and constructivism theories	

Table 2 below shows frequency of pedagogical factors according to the number of research papers studied and the percentage. The concept of connectivism has a large impact as a theory in the Net generation, and a number of researchers have a viewpoint that it serves as a critical structure in the 21st century as depicted in figure 3 below.

Table 2: Research Topic Areas

Pedagogical Learning Philosophies (Epistemological Traditions)	% of papers
Behaviourism (Objectivism, black box)	38
Cognitivism (Pragmatism, structured, computational)	40
Constructivism (Interpretivism, social, cultural)	44
Connectivism (tectonic Shifts, diversity, autonomy, interactivity, openness)	67

The collaborative method named group grid was exercised by the research team, and resulted in research results in figure 4 and figure 5 for blue ocean technique and competence levels on learning theories. The techniques, reflect connectivism learning philosophy as a suitable pedagogical approach influenced from information communication technology on education, thus an instruction for the Net generation in reverence for their active learning style [4].

E. Organize, Encapsulate and Report Research Outcome

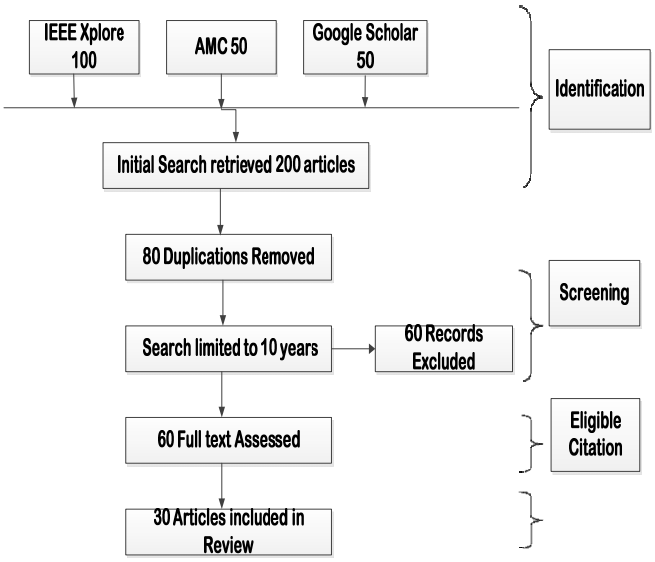

Fig 3: Flowchart of search results

F. Blue Ocean Technique

Eliminate	Raise
	-Constructivism
Re	**Create**
- Social-Cultural - Behaviourism - Cognitivism	-Connectivism -Experiential training

Fig 4: Blue Ocean Technique

G. Competence on Learning Theories

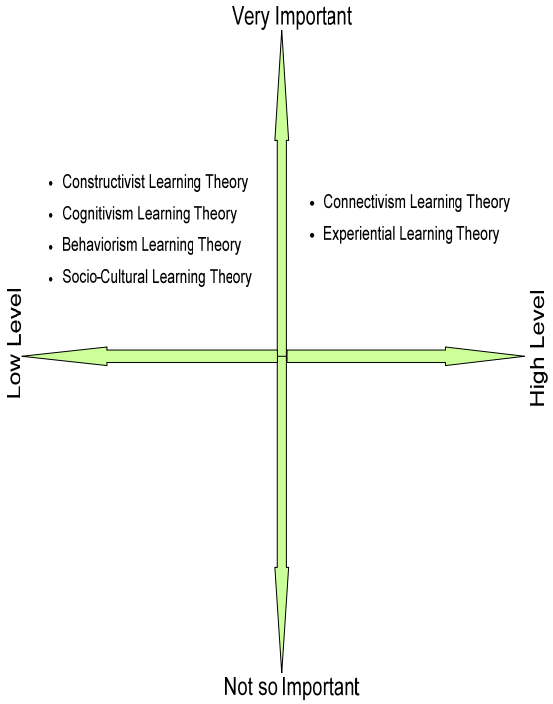

Fig 5: Competence on Learning Theories

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V. Conclusion

The researchers [10] argues that the objectives for learning theories such as behaviorism and cognitivism are assumed to highpoint how Bloom's taxonomy can be incorporated into bigger educational aims. Tshwane University of Technology (TUT), as an institution embraces Blooms taxonomy, as teachers use it to encourage higher-order thinking in their learners from lower cognitive levels. The taxonomy was designed to give a collective language for teachers to discuss and exchange learning and assessment [10].

Although experiential learning theory has found footing at TUT, it does not yet get the attention it deserves in the academia, as not all programs offer work integrated learning. Engineering faculty offers work integrated learning for a year, while ICT faculty offers work integrated learning at an approved industry workstation for only six months. The experiential learning theory allows learners to have interactions with industry to find better opportunities.

The article recommends learning theory such as connectivism and experiential learning theory as described by competence assessment and blue ocean strategy in figure 4, and figure 5 above. These theories describe how learners can learn new things, and they also provide a strategy to increase quality of learning.

The assessment in figure 2, and figure 3 shows modern educational paradigm, which was designed as a response to outmoded paradigms, where connectivism is considered newly considered for the 21st century [2]. Authors [1] write a conclusion that every theory or new idea presented deserve merits and close examination for the benefit of learners, and that technology is an influencing factor to learning theories; and that prevailing learning theories are obligatory in order to obtain knowledge for a specific field.

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