A Literature Review on Theory-Practice Philosophy between Emerging Learning Theories and Pedagogical Strategies in Medical and Allied Health Education

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ABSTRACT

Learning theories aid educators to apply informed decisions in the structure, development and mode of learning delivery. In the field of medical and allied health education, which is considered as hard science, indeed, adherence to the principles of learning theories is observable and mandatory. Medical education is in the midst of constant transformation that will require medical educators to reassess standard teaching practices and develop innovative strategies to optimize student and resident learning. One of the leading questions today is how efficiently the identified learning theory by the educator/class and the learning strategies/ techniques implemented are complemented in the new classroom setting. This synthesis review aims to describe if the teaching and learning strategies under the new online learning environment is applicable with the emerging theories in the new online learning environment in medical education. Moreover, this review intent to describe if the teaching/learning strategies implemented in medicine and other allied health courses are considered as sufficient or needs further improvement based on the knowledge and attitude of the educator in the conduct of activities and the performance and attitude of learners towards the use of contemporary strategies. A total of ten annotated research articles were collated for this synthesis review, which is composed of four studies under experimental study design and six studies characterized as non-experimental. Learning theory and practice are dynamic, interconnected, and inseparable to each other. These two aspects shall complement and simultaneously adjust with one another to deliver effective learning.

Keywords: *learning theory, medical education, theory-practice, pedagogical strategies*

INTRODUCTION

Learning theories provide reference on how an individual learn, and a tool to elucidate, analyse and predict learning. Moreover, it aids educators to apply informed decisions in the structure, development and mode of learning delivery. In the field of medical and allied health education, which is considered as hard science, indeed, adherence to the principles of learning theories is observable and mandatory. One of the most evident driving force in the emergence of new learning theories in this field is technology. Various communication tools were developed that allowed educators to facilitate learning without physical contact with the students. Interest in learning via virtual laboratories was noted among students as it promotes exploration and self- phase learning among them. Apparently, the interplay of physical and digital components of learning became the most observed learning strategy among students. Educational technology consequently flourished on half way through the second semester of the academic

year 2019-2020 when COVID-19 pandemic has become a global health issue. It is noted that, the online learning environment now follows a new set of characteristics and properties not conventional to the existing learning theories in the pre-pandemic period and thus requires up to date forms of learning strategies or techniques to deliver knowledge efficiently.

Educators, specifically in the medical field depend and abide on learning theories in planning teaching methodologies and assessment processes. Thus, it cannot be contested that the shift in the latest learning theories would result to counter changes in the learning approach and evaluation scheme in online education. One of the leading question today is how efficiently the identified learning theory by the educator/class and the learning strategies/ techniques implemented are complemented in the new classroom setting. This synthesis review aims to describe if the teaching and learning strategies under the new online learning environment is applicable with the emerging theories in the new online learning environment in medical education. Moreover, this review intent to describe if the teaching/learning strategies implemented in medicine and other allied health courses are considered as sufficient or needs further improvement based on the knowledge and attitude of the educator in the conduct of activities and the performance and attitude of learners towards the use of contemporary strategies. Summary of recommendations and suggestions from the journal articles will also be included in this review.

An integrative review of the literature was conducted in order to allow for the inclusion of studies with diverse methodologies, such as those with both experimental and non-experimental designs. Studies associated with the evaluation of teaching and learning strategies in accordance with an emerging learning theory were included in this review. Three electronic databases (Google Scholar, PubMed, ScienceDirect) were used. Researches included were dated from 2011 – 2021. The key terms used were as follows: online learning, learning theory, pedagogies, evaluation. Studies that evaluated e-learning / online learning amongst populations other than medical educators were excluded. Studies that did not report empirical research or were not written in the English language were excluded. Ten selected researches were screened and annotated. The following information were extracted and tabulated from each study: author, title, date of publication, methodology, results and conclusion. Descriptive information about included studies was aggregated. Discursive data were subjected to content analysis.

LITERATURE REVIEW

Conventional Learning Theories and Pedagogical Strategies in Medical and Allied Health Education

The five most common learning theories followed by medical educators include behaviorist, cognitivist, humanist, social learning, and constructivist orientations to learning (Torre et al., 2011).

In the medical field, the behaviorist orientation is efficient for the development of competencies and demonstration of psychomotor skills. Behaviorism attends closely with the mastery of prerequisite activity before moving to the next step. In this manner, there is an augmentation on what the teacher wants the learner to perform. In this learning theory, both the teacher and the student are aware of what exact behavior needs to be learned (e,g clinical skills), the conditions under which it will be performed (e.g simulated case scenarios) and how it will be evaluated (Torre et al., 2011).

The focus of cognitivism as a learning theory is the student's internal environment and cognitive structures. Information processing, perceptions, cognitive tools and memory are utilized by the learners to help in establishing meanings to events (Clark et al., 2012). It is noted that in cognitivist approach, the teacher only facilitates cognitive process by helping the students

learn how to learn and supports self-directed learning. Developing critical thinking through reflection is one of the most important components of the cognitivist learning orientation.

The third learning theory is humanism. In this framework, it highlights the needs of the individual to achieve self-actualization and fulfilment. The humanist orientation involves personal acknowledgement of the learner's own tasks, learning is self-initiated and results to self-evaluation. The learner becomes autonomous and the role of the teacher is to facilitates the overall development of the student (Long et al, 2011). Self-directed learning is becoming a particularly important and appropriate learning orientation in medical education because of emerging technology. These virtual tools involves problem- based learning scenarios and role playing exercises that denotes immediate feedback to the student (Meili et al, 2011).

Social learning orientation is also observed in medical education. In this framework, learning is rooted from the interactions and observations of others in a social context. Learning is acquired when the student imitate the observed behaviour by rehearsing it (Passi et al., 2013). One of the key feature of social orientation is the combination of role modelling behaviour and cognitive approach to allow the full context understanding of the learner. The usual application of this learning theory in medical education is role modelling/ mentoring. Among in-training physicians they learn specific skills by emulating their teachers who are doing their rounds or precepting outpatient department.

Lastly, constructivist orientation the learning process involves construction of meaning from experiences through critical reflection on the learners' assumptions. Educators assist their students on whether their assumptions are still valid. They also foster critical reflection and negotiate meaning with learners (Ertmer & Newby, 2013). A lot of medical education techniques can be attributed to constructivist theory that includes reflective journaling and developing course portfolios. In addition, focus group discussions are conducted to assess the understanding and reflection of the students. Indeed, learning theories provide medical educators with various approaches to develop instructional and curriculum design. The educational philosophy of the teacher determines which strategy and approach is the most appropriate for various set of learners.

Emerging Learning Theories and Pedagogical Strategies in Medical and Allied Health Education

Medical education is in the midst of constant transformation that will require medical educators to reassess standard teaching practices and develop innovative strategies to optimize student and resident learning. Over the last decades, there has been a shift in medical education practice from the traditional forms of teaching to other platform which make use of distance or electronic learning (Costello et al., 2014). In congruence to this, medical education is governed by emerging learning theories in this new online environment. According to Bosch et al. (2016), the three apparent emerging learning theories in medical education today includes Online Collaborative Learning (OCL), Connectivism and ,Community Inquiry (COI).

The framework of Online Collaborative Learning (OCL), promotes diversification of understanding among students and educators by providing positive atmosphere that promotes building of learning communities. The implementation of OCL make use of authentic activities and interactive tasks that aids students be engaged in more meaningful and knowledge construction. In medical education, the five-stage model of Gilly Salmon (2003) was one of the

most used model in the application of this learning theory. First, the learner were encouraged and given access to online platforms, next, they were engaged to socialization through different media, followed by information exchange. Through this social media collaboration and experience among educators and other students, an individual is now able to construct knowledge and then develop it. This can be seen in the delivery of lectures via modular approach and distance learning.

Connectivism learning theory relies heavily on the use of technology. An educator that follows this framework shall introduce opportunities for digital learning such as online courses, social networks and webinars. In medical education, there are various programs and platforms being used to deliver lectures and conduct laboratory activities. One of which is the utilization of virtual laboratories. The use of virtual labs is an innovative way to convey medical knowledge by using case stories in highly realistic clinical scenarios (Honey et al, 2011). These simulations enable learners to see and interact with representations of natural phenomena that would otherwise be impossible to observe. In the study of Issenberg et al (2009) demonstrated the benefits of simulation technology over traditional lectures in improving specific surgical technical skills, cardiovascular examination skills, and acquisition and retention of knowledge.

The third emerging learning theory in online education now is Community of Inquiry. It highlights the presence of three aspects: social, teaching and cognitive to facilitate efficient educational experience in online distance learning environment. Thomson et al. (2017) consider a Learning Management System (LMS), the typical venue where courses are taught. In using LMS, social presence is represented by the feature of the LMS to display biographies and basic information of the users. While, teaching presence can be can be supported by the ability of the LMS to create modules and run assessments uploaded by the instructors. Lastly, cognitive presence is developed through the participation of both educators and students in online discussion forums. COI in medical education is commonly used in case study exercises wherein, students are required to collaborate and interact with each other through various media platforms with the supervision of their instructors (Garrison et al, 2018).

Research Articles on Emerging Learning Theories and Pedagogical Strategies in Medical Education

A total of ten annotated research articles were collated for this synthesis review, which is composed of four studies under experimental study design and six studies characterized as non-experimental (Table 1). The three emerging learning theories which include COI (n=4), connectivism (n=4) and community inquiry (n=2).

Table 1: Summary of annotated research articles on emerging learning theories and pedagogical strategies in medical education

Title/ Author/ Location/ Year of Publication	Highlighted Learning Theory	Pedagogical Strategies	Methodology	Results/Conclusion	Status: Sufficient or Needs Development
Online Collaborative Learning in Health Care Education Anglia Ruskin University, United Kingdom Catherine Westbrook (2012)	Collaborative Online Inquiry (COI)	1. Online Socialization 2. Information Exchange 3. Knowledge Construction	19 students from Post graduate Magnetic Resonance online course were given specific tasks based on Salmon's Five Stage Model	1. Enhanced student socialization and has enabled students to work together 2. University Modular assessment questionnaire showed that students valued the three activities and improved their experience of distance learning 3. Some of the tasks were time consuming	Needs Improvement
Optimizing collaborative learning in online courses Care and Public Health Research Institute, Department of Health Promotion, Maastricht University, Maastricht, the Netherlands de Nooijer et al. (2020)	Collaborative Online Inquiry (COI)	1. Focus group discussions 2. Group assignments on problem based learning principles	26 students from a regular master's degree programme in Health Education and Promotion participated in the study. Groups of four or five students work online on a group assignment, where they have to design a health promotion intervention based on the intervention mapping (IM) protocol.	1. Students can critically discuss their own and other's opinions, ideas and work 2. Students effectively cooperate in small groups with persons of different backgrounds and initial levels 3. The initial online socialization phase among students took time	Needs Improvement
How the Study of Online Collaborative Learning can Guide Teachers and Predict Students' Performance in a Medical Course	Collaborative Online Inquiry (COI)	1. Focus group discussions 2. Group assignments on problem based learning principles	Interaction data were extracted from the learning management system (LMS) forum module of the Surgery course in Qassim University, College of Medicine. The data were analyzed using social	1. When augmented with calculated network parameters, SNA offered an accurate view of the course network, each user's position, and level of connectedness 2. The degree of	Needs Improvement

University of Eastern Finland Saqr et al. (2018)			network analysis. The analysis included visual as well as a statistical analysis.	collaboration of the student is directly correlated with its class performance and final grade.	
Fostering Students' Collaborative Learning Competencies and Professional Conduct in the Context of Two Gross Anatomy Courses in Veterinary Medicine Laakkonen & Muukkonen (2018)	Collaborative Online Inquiry (COI)	1. Focus group discussions 2. Group assignments on problem based learning principles 3. Teaching sessions	First year veterinary medicine students taking myology and arthrology course were require to work individually while second year ,students taking topographical anatomy worked on their assignments in group and with teaching sessions	1. Students on the myology and arthrology course gave more positive comments on professional conduct than the students on the topography course	Needs Improvement
Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives Al-Balas et al. (2020)	Connectivism	1. Use of multimedia 2. Synchronous live streaming sessions by the teacher	This cross-sectional study is based on a questionnaire that was designed and delivered to medical students in their clinical years. For this study, the estimated sample size ($n = 588$) is derived from the online Raosoft sample size calculator.	1. Overall satisfaction rate in medical distance learning was 26.8%, and it was significantly higher in students with previous experience in distance learning. 2. Technical and infrastructural resources reported as a major challenge for implementing distance learning	Needs Improvement
Medical students learn over distance using virtual reality simulation Alverson et al., (2010)	Connectivism	1. Distance technology and virtual reality (VR) simulation within a problem-based learning	This pilot project involved students from the Universities of New Mexico and Hawaii and compared (1) control groups consisting of medical students in a tutor-guided PBL session using a text-based case, (2) distance groups using the same text-based case but interacting over distance from multiple	1. Successful PBL tutorial with medical students from two institutions with the integration VR and distributed distance interaction in combination or independently. 2. Addition of these modalities did not interfere	Needs Improvement

			sites, (3) groups using a VR simulation scenario integrated into the case without interaction over distance, and (4) combination groups interacting over distance from multiple sites with integration of a VR simulation scenario.	with learning dynamics when compared with traditional tutorial sessions.	
Problem-based learning in public health instruction: a pilot study of an online simulation as a problem-based learning approach Spinello & Fischbach (2010)	Connectivism	1. Web-based simulation platform	Using a web-based simulation platform, a virtual community was designed in which the effects of a mock infectious disease outbreak could be studied and various interventions could be tested. Upon completion of the semester course, 14 undergraduate public health education students completed a survey and participated in a focus group to determine issues related to the simulation.	1. PBL experience based on a community simulation may be effective in providing a motivating and interesting PBL tool for instruction 2. Majority of students agreed that the experience was more motivating and interesting than a more traditional assignment. 3. Design recommendations include an emphasis on incorporating a rich multimedia background, realistic communication and project management tool	Needs Improvement
Reflection of connectivism in medical education and learning motivation 5 during COVID-19 Ismail et al (2020)	Connectivism	1. Web-based simulation platform	Cross sectional study that uses a quantitative approach, involving undergraduate 100 medical students of Universiti Kebangsaan Malaysia (UKM). Tool was adapted by Students Motivation Towards Science Learning (SMTSL) survey	1. Higher frequency in digital learning usage frequency does not exert a great impact on learning motivation. 2. Medical educators should be creative in enhancing extrinsic motivation by making use of digital learning as a platform	Needs Improvement

Enhancement of student perceptions of learner-centeredness and community of inquiry in flipped classrooms Lee & Kim (2018)	Community Inquiry	1. Flipped classroom (FC) principles	Questionnaires were given to a cohort of Year 2 students in a six-year undergraduate medical education program, who had taken an introduction to medicine course in a FC format. The 34-item tool consisted of three sub-scales – teaching, social, and cognitive pressences.	1. The student perceptions of student-centeredness and sense of COI in FC increased significantly in both high-achieving and low-achieving students ($p < 0.01$). 2. Flipped classroom model is an effective approach to fostering a learner-centered learning environment and developing a community of inquiry among medical students.	Sufficient
A Community of Inquiry approach to learning design in a community-engaged learning program Marjadi et al. (2017)	Community Inquiry	1. Multi-media open educational resources 2. Provision of Online "Weekly Study Guide"	The Medicine in Context (MiC) program is the flagship community-engaged learning and teaching program at the Western Sydney University School of Medicine. MIC webpage were digitalized and the effect of this improved online platform was analysed.	1. Developments have resulted in novel, engaging learning activities. 2. Preliminary evaluation indicates students' greater engagement with the MiC program and deeper levels of learning	Sufficient

Synthesis

Pedagogical approaches in medical education has been founded via teacher-centered model. However, there has been a shift in strategies to adopt new and emerging practices and technologies. Medical educators are transforming their instruction styles to a more student-centered and collaborative techniques. The aim of this paper is to demonstrate how the instructional strategies implemented are aligned with the identified theory in the online learning environment.

The adopted theory–practice–philosophy greatly determines what methods we use when educating or studying education (Karpov, 2014). Among the four articles that showcase collaborative online inquiry, it can be noted that the focus of the pedagogical strategies was to promote interaction among the members of the groups. And from this interaction, knowledge is formulated and flows within the learning bracket. The conduct of focus group discussion definitely highlights the principles of COI as it can be observed in three out of four cited studies. Moreover, the provision of properly structured group assignments/ projects can reinforce skills that are both relevant to both individual and group work. It also allocates complex tasks into divisions and steps. Three of the four studies indicated that the conduct of group assignment showed positive feedbacks from the students as it directly enhanced students' performance. However, it was the other way around in the study of Laakkonen & Muukkonen (2018) which pointed out that among veterinary medicine students preferred an individual learning approach. The difference in the year level of students may have affected their perspective in online learning. One of the posing issue in the strategies under COI is the time consuming phase of self-introduction and establishing identity in the online community thus, all studies suggested that these strategies still needs improvement. The development of collaboration scripts that explicitly structured activities and communication platform may resolve this concern.

Connectivism as a learning theory was highlighted through the conduct of simulation activities through online channels. All of the four cited studies utilized web-based simulation platforms to deliver lectures and assessments. It was agreed among three of four research articles that virtual reality experience was more motivating and interesting than the traditional assignment format. This was also coupled by high satisfaction rate in learning in one of the cited study. Although, this is in contrast with the study of Ismail et al (2020) which showed that digital learning mong medical students, does not exert a great impact on learning motivation. This reflected the major concerns in using simulation in the classroom. It was recommended that medical educators should be creative in enhancing extrinsic motivation by emphasizing on incorporating a rich multimedia background and provision of realistic communication and project management tool. Technical and infrastructural resources reported is another challenge for implementing distance learning.

As opposed to the two previously mentioned learning theories and their corresponding pedagogical strategies, community inquiry showed that all strategies such as the adaptation of flipped classroom principles, provision of multimedia open educational resources and establishment of online weekly study guide were sufficient based on the knowledge and attitude of the educator in the conduct of activities and the performance and attitude of learners towards the use of contemporary strategies. This paper do not explicitly say that the theory and practice tandem under COI is the most efficient. Nevertheless, as compared to the two other theories, the principal elements of online learning are compacted in this theory. The observance of theory-

practice-philosophy in curriculum and pedagogical strategies facilitates learning as well as justifying the rationale for educator's instructional design.

CONCLUSION

Learning theory and practice are dynamic, interconnected, and inseparable to each other. These two aspects shall complement and simultaneously adjust with one another to deliver effective learning. In medical education, these emerging theories and corresponding pedagogical strategies provides good educational value that stimulates active learning and promotes student engagement. The importance of instructional design, monitoring, feedbacks, well-structured activities and support for learners and teachers when introducing new technology are observed among the cited studies. Social networking and exploration of commercially developed web tools could lead to pedagogical success in this field. Lastly, and educator must identify theory–practice–philosophy that is disadvantageous for the learners or himself, alongside to enhance the theory–practice–philosophy that leads to improved educational practices through acknowledging learners and learner perspectives.

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