Joyner Document Format v2.2: CS6460

Ajit Kumar Yadav
ayadav85@gatech.edu

Abstract— "What frameworks and models does the literature provide for evaluating the effectiveness of online learning tools and strategies in developing critical thinking and problem solving skills?".

Given the above qualifier question, I have to come up with the best possible explanation of educational theory that has influenced the development of pedagogy and educational technology for online learning.

INTRODUCTION

In the past two three decades there has been much research as to what strategies make learning impactful. Different philosophers, psychologists and educational practitioners put their views on it. These strategies are termed as theories and it is basically composed of 3 key elements; *Explore (what exists?)Explain (Why does it happen?), and Design (How do i achieve this outcome?)* (Gibbons and Bunderson (2005)). Historically the learning theories can be categorized in five main categories: a) Behaviorism b) Cognitivism c) Constructivism d) Humanism and e) Connectivism. Additional theories may include a) transformative b) social and c) experiential. We will briefly see how it applies to learning itself:

Behaviorism

According to behaviorism, learning is based on a system of routines that drill information into a student memory bank (Bransford et al., 1999) along with positive feedback from teachers, if students do well, they receive positive reinforcement and signaled out for recognition (Brian 2021). Ivan Pavlov, the father of behaviorism argued that mind and consciousness are unimportant in this process. Learning can be measured in terms of stimulus and response in a

repeated practice. In later research behaviorism led to the development of taxonomies of learning, in that the Bloom's taxonomy evolved as a dominant phenomenon that is focused upon higher order thinking. Later it was taken forward by Robert Gagne, who developed *Nine Events of Instruction.*

Cognitivism

In contrast to behaviorism, learning relies on both external factors and the internal thought process. It brought back the mind's role in learning. Under this philosophy the learner is seen as an information processing system, who absorbs information, undertakes cognitive processes on it and stocks it in memory. According to cognitivism, the cognitive process of mind such as motivation and imagination are critical elements of learning (Brian 2021) that come in between stimulus and response.

Constructivism

In parallel to behaviorism and cognitivism, some educational theorists like Dewey and Piaget brought the idea of constructivism. Under this philosophy, the learner builds upon his/her previous experiences and constructs new knowledge. It puts more focus on active engagement of learners (Applefield et al., 2021). It also defines the teaching and learning process as a social construct, meaning it is heavily influenced by interaction between students and teachers.

Humanism

Having this assumption that people are inherently good (Brian 2021), humanism focuses on creating an environment conducive to self actualisation. In doing so, the learner's needs are met and then they are free to determine their own goals while teachers assist them in doing so.

Connectivism

Strongly influenced by technology (Barabasi 2002; Siemens 2004), connectivism focuses on the learner's ability to source and update new accurate information (John, 2016). So knowing where and how to find the best information is as important as information itself.

With the advancement in educational research over the years, new theories are continuously evolving. Transformative, social and experiential theories are such examples of ongoing research. These theories (for example, the experiential

theory etc) put more focus on those strategies that involve real world problem solving , learning by doing, critical thinking and creativity.

The above mentioned theories gave birth to many frameworks devoted to online learning. Two such examples are a) ***The Conversational Framework By Laurillard.*** b) ***Anderson's Multimodal Model of Online Learning also termed in later research as Integrated Model of Online Learning***

CONVERSATIONAL FRAMEWORK BY LAURILLARD

This model elaborates on Pask and Scott conversation theory (Pask 1976), Laurillard argues that the nature of much academic learning is largely defined by the acquisition of complex concepts and the creation of conceptual distinction, it is not possible with one way presentation of the content; there must be two way dialogue between student and teacher situated in concept (***as shown in appendix A***) and it is central to academic learning. Process of learning is supported by the creation of interactive 'micro-worlds' (learning activities) in which students can actively engage in practice that enhances and reinforces the ideas that have been formulated through discussion.

BOSCH'S MODEL OF ONLINE LEARNING

Derived from the work of Anderson's online education model (***as shown in appendix B)***, Bosch proposed a blended pedagogical purpose model (***as shown in appendix C***) (for online and face-to-face) using twenty one different design components (as shown in appendix). The framework revolves around multimedia content situated in local social context, self reflection and critical evaluation as we discussed in learning theories (basis of active learning and knowledge creation). Each components can be briefly summarized as follows:

Content

Content is the primary driver of instruction. Mayer (2009) has done extensive reviews of research and concluded that learning is greatly enhanced using visualization and other forms of multimedia. LMS, CMS, or Moodle are great platforms to support multimedia forms of content. This dimension fits well with behaviorism by offering a variety of learning resources as stimuli and cognitivism by demanding cognitive processes to process information and stick it into short term memory.

Social and Emotional Aspect

Research suggests that social and emotional aspects of a learner hugely impact the learning process and hence in blended learning there is opportunity to work on this dimension having face to face talk along with online discussion forums.

Dialectic and questioning

The Socratic method has been one of the major techniques used in the instruction, where teachers stimulate the discussion by asking the right questions to help students think critically about a topic.

Reflection

Reflection is assumed to be a powerful pedagogical strategy under the right circumstances. There is extensive research on reflective teachers and reflective learners dating from the 20th century (dewey(1916), schon(1983)). It is about writing one's experience and reflecting on one's journey on the learning process itself.

Collaborative learning

Many professional programs such as business administration, education, health science rely heavily on collaborative learning as a technique for group problem solving (Marjan et al., 2012). It fits well with the theory of connectivism and constructivism. Such practice leads to the development of problem solving, communication skills and creativity in groups or individuals.

Evaluation

It is one of the most important components in learning. We can have a multitude of assessment resources (aka electronic portfolio) that help in this endeavor . based on an online portfolio teachers can offer immediate feedback that is critical to learning.

CONCLUSION

All the learning theories (Behaviorism, Cognitivism, Constructivism, Humanism, Connectivism, Experiential etc) advocate for active learnings, where students takes the input from various sources as stimuli, process it based on the prior knowledge and experiences, and then construct the new knowledge that is suitable to their professional and personal objectives. In this process, educational

technologies play a key role by facilitating synchronous and asynchronous dialogue between teachers and students (Sandy et al.,2004), by facilitating creative tools to imagine and create specific projects, by facilitating online repositories to create and share learned contents and seek immediate feedback from experts and peers etc.

IMPLICATIONS TO THE DEVELOPMENT OF E-LEARNING PLATFORMS

From traditional learning theories and also the current model of online learning, the Conversational model and Bosch's framework, it is evident that an activity based learning, self reflection, discussion & dialogue between teachers and students is central to academic learning. We must strive to facilitate these practices/activities while developing the e-learning platforms. Based on all these theories on learning, following questions should be answered while developing the e-learning tools:

1. What tools does the system provide for teachers to present and express their ideas to students and support the two way interaction between them?
2. Is the system able to facilitate the learning process for the whole group, small group and individual.
3. What types of learning activities are supported by the system? And which pedagogical strategies are encouraged?
4. Is the overall system student centered (motivates students to be an active learner based on their unique capacity)?

REFERENCES

1. Picciano, A. G. (2021). Theories and frameworks for online education: Seeking an integrated model. In A guide to administering distance learning (pp. 79-103). Brill.

   https://brill.com/display/book/9789004471382/BP000005.xml

2. Barabási, A. L. (2002). The new science of networks. Cambridge MA. Perseus.
   https://web.archive.org/web/20140723114412id_/http://www.allianceforpeacebuilding.org/site/wp-content/uploads/2014/06/Linked-precis-Jan-2009.pdf

3. Bransford, J., Brown, A., & Cocking, R. (1999). How people learn: Brain, mind experience and school. Washington, D.C.: National Academy Press/National Research Council. Retrieved from: http://www.colorado.edu/MCDB/LearningBiology/readings/Howpeople-learn.pd

4. Gibbons, A. S., & Bunderson, C. V. (2005). Explore, explain, design. In K. K. Leondard (Ed.), Encyclopedia of Social Measurement (pp. 927–938). New York, NY: Elsevier.

5. Harasim, L. (2012). Learning theory and online technologies. New York: Routledge/Taylor & Francis.

6. Siemens, G. (2004). Connectivism: A learning theory for the digital age. Paper retrieved from: http://www.elearnspace.org/Articles/connectivism.htm

7. Britain, S., & Liber, O. (2004). A framework for the pedagogical evaluation of elearning environments.

8. Applefield, James. M., Huber, R., & Moallem, M. (2000). Constructivism in Theory and Practice: Toward a Better Understanding. *The High School Journal*, *84*(2), 35–53. http://www.jstor.org/stable/40364404.

9. Goldie, J. G. S. (2016). Connectivism: A knowledge learning theory for the digital age?. *Medical teacher*, *38*(10), 1064-1069.

10. Pask, G. (1976). Conversation theory. *Applications in Education and Epistemology*.

11. Laal, M., & Ghodsi, S. M. (2012). Benefits of collaborative learning. *Procedia-social and behavioral sciences*, *31*, 486-490.

APPENDIX

A.

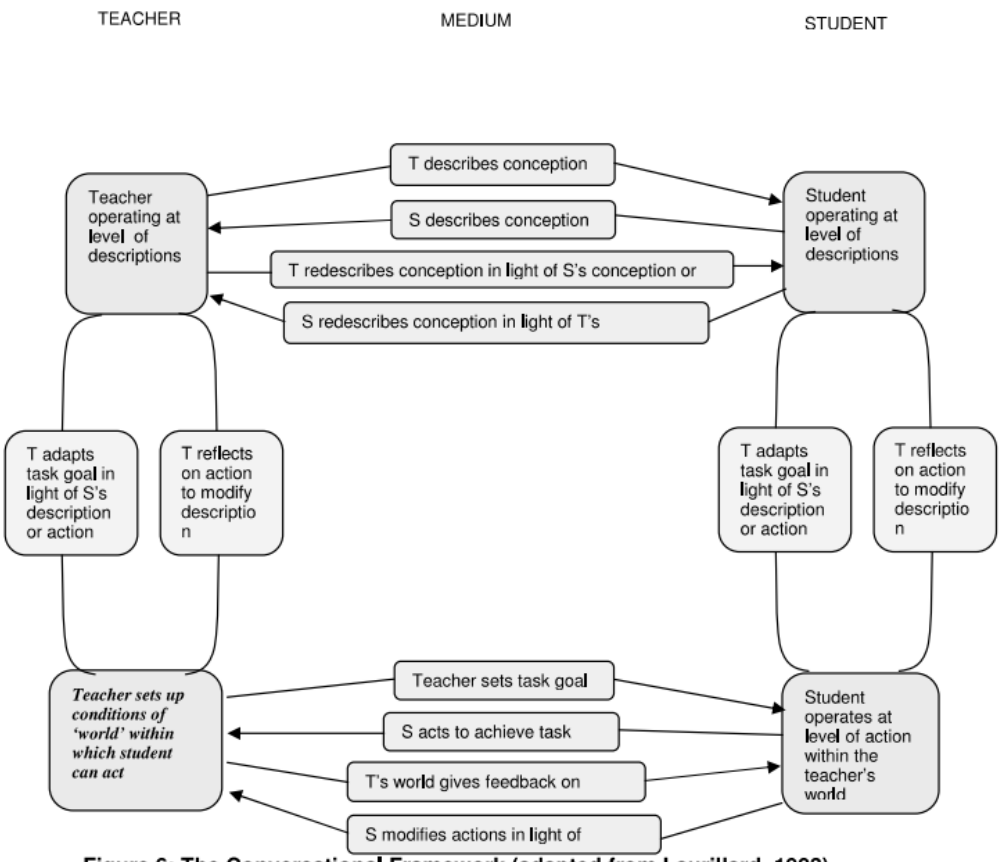


Figure 6: The Conversational Framework (adapted from Laurillard, 1993)

B.

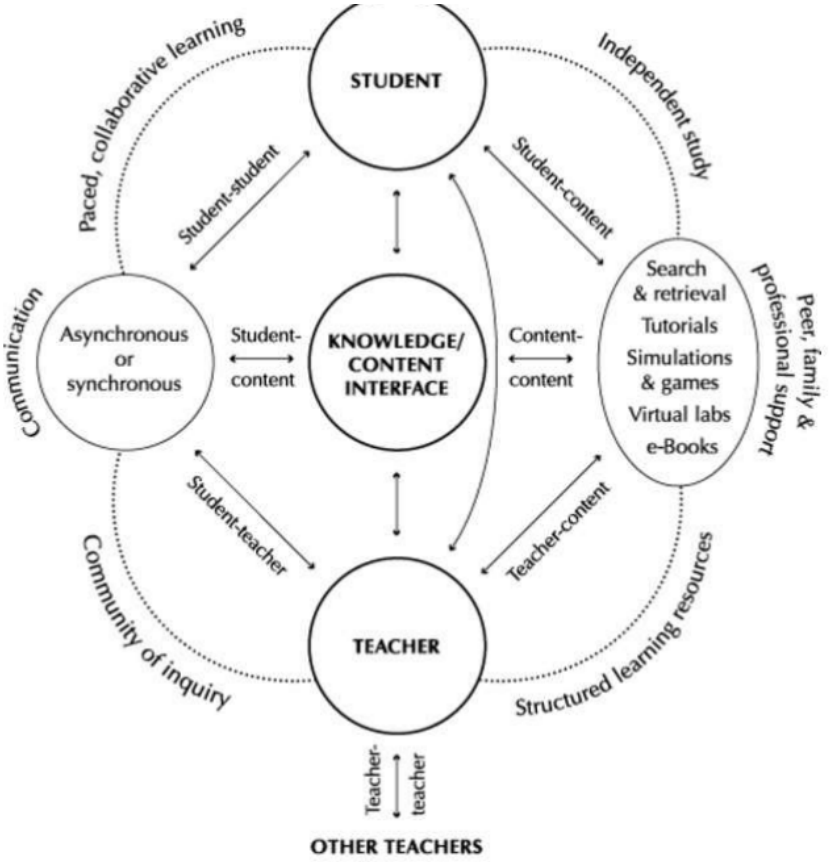
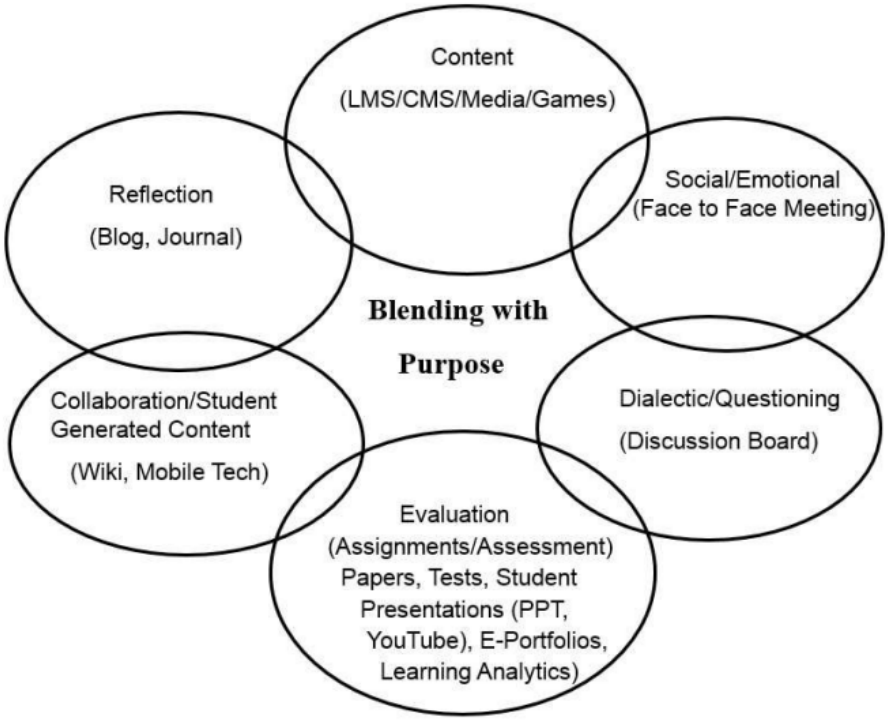


Figure 6. Anderson's Online Learning Model. Reprinted with permission by Anderson, T. (2011). *The theory and practice of online learning*. (2nd Edition). Edmonton, AB: AU Press.

C.



Bosch's framework for Online Learning