



A SYNTHESIS OF ACTIVE LEARNING DESIGN MODEL WITH CONSTRUCTIONISM ON VIDEO STREAMING ENVIRONMENT

Suthin Rojprasert

Department of Educational Administration,
Faculty of Liberal Arts, Southeast Bangkok University, Thailand.

Corresponding author: suthin@sbu.southeast.ac.th

Received: August 10, 2023 / Revised: November 6, 2023 / Accepted: November 14, 2023

Abstract

This study introduces an active learning design model rooted in constructionism, tailored for the video streaming environment. The primary objective of this model is to enhance the creative thinking skills of students in Thai higher education. The model's foundation is built upon insights gathered through interviews, brainstorming sessions, expert opinions, and online focus groups. It comprises the following components: defining learning objectives, learner analysis, lesson content design, selection of learning activities, establishment of a supportive learning environment system, and methods for learning assessment. Each input was meticulously scrutinized to ascertain their suitability for active learning design. This model is specifically crafted for implementation in the context of video streaming within Thai higher education. The findings from this study will empower educators to craft curricula integrating social media technology into instruction, thereby fostering improved deep learning among students.

Keywords: Active learning, Constructionism, Video Streaming.

1. Introduction

Education in Thailand has a rich history of promoting autonomous learning within its educational practices. Thai educational institutions and agencies have consistently tailored their offerings to align with the interests and abilities of learners while acknowledging their unique differences. The primary aim of the teaching and learning process is to empower students to progress at their own pace, fully realizing their potential. To achieve this objective, educators must consider the diverse learning styles of their students, particularly in the context of higher education.

In the twenty-first century, learning necessitates the development of critical thinking skills (Komala, Lestari, & Ichsan, 2020). Active learning, which mirrors the principles of autonomous learning, is a fundamental goal of the nation's educational system. Teachers and professors are encouraged to craft instructional strategies and models that resonate with their students' preferences, thereby fostering creative and critical thinking in higher education. Active learning is generally characterized as student-driven activities aimed at constructing knowledge and understanding. While not always explicitly emphasized, metacognition—students' reflection on their own learning—is a crucial element that bridges the gap between activity and learning (Brame, C., 2016).

The emergence of the information society and the acceleration of life's pace have driven individuals to create and implement networked learning environments. Users now demand a more intelligent, efficient, and personalized internet experience to enhance learning management, user engagement, and resource sharing. This demand is particularly pressing in the current era, where many students engage with technology not only for educational purposes but also for entertainment. The readiness of human resources, especially educators, to keep up with the rapidly evolving technological landscape is critical to addressing the challenges of learning media in the 4.0 era (Adiyono, 2022). Educators are also expected to harness their creativity in delivering effective learning methods to their students (Adiyono, 2020).

The study of innovative learning methodologies and technologies has gained significant attention from scholars and educators, especially those operating within higher education. The introduction of new media has revolutionized the educational landscape, opening up exciting opportunities for enhancing the learning experience.

Significant Transformations in Education: The Evolution of Thai Higher Education. In recent years, the landscape of education in Thailand has witnessed remarkable developments, particularly in the realm of higher education. Notably, Thai higher education institutions have embraced the digital era, providing students with robust online learning platforms complemented by high-quality network infrastructures. This shift towards digitization has not only revolutionized the learning experience but has also paved the way for Web 3.0 technologies to usher in a new era of education.

Web 3.0, the next evolution of the internet, promises to bring about substantial improvements in education. By enhancing data management, supporting mobile internet accessibility, nurturing creativity and innovation, boosting learner satisfaction, and facilitating collaborative endeavors within the social web,



it offers a plethora of advantages. Through the utilization of Web 3.0 tools such as NFTs (Non-Fungible Tokens) and the metaverse, educators can tailor their teaching methods to ensure comprehension for all students within the classroom.

This educational transformation is underpinned by two main platforms: semantic technologies and the social computing environment. Semantic technologies, characterized by open standards, are applied atop the web to define structured data and enable more effective discovery. The social computing environment, on the other hand, fosters collaboration between humans and machines, facilitating the organization of numerous social web communities (Norasak, Suphakornthanakit, 2008).

At the heart of Web 3.0 lies the concept of structuring data and connecting it for more efficient knowledge acquisition. The application of artificial intelligence, affective computing, and pedagogical approaches has given birth to cutting-edge learning environments with modern interfaces, catering to a wide array of knowledge fields. This burgeoning domain has been coined “E-Learning 3.0” in various scholarly works (Rubens et al., 2012, Dominic et al., 2014, Hussain, 2012).

Furthermore, the evolution of education has empowered students to become creators of collective intelligence on the web. Social networks have emerged as vital tools, enabling students to actively contribute as authors of knowledge within diverse learning environments. In addition to the traditional roles of reading and writing, students now collaborate to co-create knowledge (Wheeler, 2011).

This transformative educational landscape holds vast potential for a multitude of applications, including gaming, social networking, and beyond. It is a result of the convergence of various cutting-edge technologies, marking a significant shift in the educational paradigm. Thai higher education, by embracing these changes, is poised to provide a dynamic and inclusive learning experience, preparing students for the challenges of the future.

2. Active Learning and Constructivism in Education

Active learning is an educational approach that places the focus squarely on students’ needs and their active participation in the learning process. It leverages information technology and various pedagogical techniques to captivate students’ attention, ultimately empowering them to assume responsibility for their own learning journey. This innovative approach to education encourages students to apply their newfound knowledge to diverse problems and contexts, granting them greater autonomy in their learning. Active learning involves engaging students with course materials through dynamic methods such as discussions, problem-solving, case studies, role plays, and individual accountability, fostering not only subject mastery but also the development of vital skills like self-directed learning. This teaching approach is rooted in constructivism, a learning theory that highlights how individuals construct knowledge by connecting novel ideas and experiences with existing ones to form a deeper understanding (Bransford et al., 2000).

In a seminal 1991 study titled “Active Learning: Creating Excitement in the Classroom,” Bonwell and Eison (1991) emphasized the importance of active learning, defining it as anything that compels learners to

actively participate and reflect on their actions and thoughts. Many similar definitions echo this sentiment. Active learning, according to these definitions, is a process that engages students in various activities such as reading, writing, discussions, and problem-solving, rather than passively listening to an expert. It fosters critical thinking by encouraging analysis, synthesis, and evaluation of course content, both individually and through group activities and class-wide discussions (Prince, 2004; Freeman et al., 2014; Michael, 2006; Barkley, Cross, and Major, 2014). Research in education demonstrates that incorporating active learning strategies into university courses significantly enhances the quality of the student learning experience (Freeman et al., 2014; Theobald et al., 2020). In essence, active learning refers to activities that engage students in the learning process, allowing them to construct knowledge by linking new information to their existing knowledge and fostering independent thinking, problem-solving, and decision-making.

Constructivism, which underpins active learning, is a key component of the cognitive revolution in educational theory. It diverges from traditional behaviorist theories by positing that learning is an active process where individuals actively process information to construct solutions to problems. According to cognitive theory, learners take an active role in building their understanding, in contrast to the passive role ascribed to them by behaviorist theories. Professor Emeritus Seymour Papert advanced the cognitive constructivist theory as a response to conventional behaviorism. While behaviorist theorists view learning as a passive process, cognitive theorists argue that learners must engage actively in the learning experience to retain information and construct knowledge (Papert, 1993).

Papert (1993) emphasized that, in the past, people learned skills they could use throughout their lives, but today, with the rapid evolution of the job market, the most crucial skill is the ability to learn new skills and adapt to changing circumstances. He asserted that individuals must become adept at learning, adapting, and dealing with the unexpected, and this trend will continue into the future. In this context, the competitive edge lies in the capacity to learn and adapt (Papert, 1993, p. vii). Active learning, rooted in constructivist principles, prepares students to thrive in this dynamic and ever-changing landscape by equipping them with the skills to learn, think critically, and adapt to new challenges.

Seymour Papert's Constructionism champions a learning philosophy that revolves around the creation and sharing of tangible artifacts. These ideas challenge conventional, objectivist notions of education, asserting that knowledge isn't merely transferred as a finished product from one person to another. Instead, individuals acquire knowledge through personally meaningful experiences and reflective processes. Both Constructionism and constructivism emphasize the importance of learning through active engagement, hands-on, intrinsically motivating, real-world tasks.

Constructionism is rooted in two key aspects of construction: firstly, it asserts that people learn by actively constructing new knowledge. Secondly, it underscores the idea that the most effective way to learn is by creating tangible products that extend beyond one's personal thoughts and experiences (Papert, 1990). Building on this, Papert (1999) highlights the significance of a social context for knowledge construction, where participants collaborate to create shareable artifacts. This perspective aligns with the ideas of theorists like Vygotsky, Lave, Wenger, and others.



Constructionism is particularly relevant in the context of digital technology, where the use of technology enables the creation of engaging projects that facilitate learning. Its fundamental objective is to emphasize creativity and foster learning through active participation. Learning is viewed as more effective when approached as an active process, as opposed to passive absorption (Kafai and Resnick, 1996). These ideas usher in a shift away from the traditional notion of education as solely residing in the teacher's mind, transforming it into a partnership between educators and students.

As a result, active learning takes center stage, with students actively working to solve problems and cultivate their creative thinking skills across all levels of education. Active learning within a constructivist framework places a strong emphasis on the learner's active involvement, personal experiences, and social interactions in the knowledge-building process.

3. Strategies for Active Learning Through Web Video Streaming

The role of computer technology in education has evolved significantly in recent years, leading to a dynamic relationship with the models of learning and teaching. Regardless of how meticulously a teacher plans a lesson, the educational landscape is continuously shaped by current events and the students' awareness, often sparking interest in a particular subject matter. This prompts a need for flexibility in teaching, and streaming technology provides the ideal tool for adapting to these changes. Streaming video-on-demand media has revolutionized educational activities, offering educators the flexibility required for effective teaching.

The term "video streaming" has become intertwined with digital media and social communication. It extends beyond mere entertainment, as web-based modules now combine animation, voiceovers, video clips, captions, and text to create well-organized, pedagogically sound educational materials. Streaming media provides teachers with the flexibility to deliver lessons in a manner that aligns with effective teaching approaches. It is versatile enough to accommodate various didactic tactics, seamlessly blending with other techniques and approaches. The development of the internet and compression technologies has ushered in video and audio transmission, making video-conferencing a standard practice and enabling distance-learning classrooms to offer enhanced interaction between instructors and students at broadband speeds. This increased communication speed, combined with the ubiquity of the web, has effectively created an integrated educational medium, leading to a rapid uptake of web-based video streaming technologies.

The educational application of streaming media falls within the realm of integrating computers into teaching and learning. Students actively explore the web and databases to discover relevant videos that pique their interest and enhance their understanding of specific topics. Video streaming techniques have evolved to the extent that they are integrated into specialized educational software, but this integration must be seamless for optimal effectiveness. The future of education envisions streaming video using computer and network technologies as a means to enhance the quality of teaching and learning, learning from the successes and failures of e-learning. This approach promotes a blended learning concept that combines face-to-face activities with e-learning, suitable for synchronous e-learning delivery through the web.

While there are multiple interpretations of “Web 3.0,” it can be defined as the third-generation World Wide Web that emphasizes active participation, connectivity, collaboration, and knowledge sharing among users. Web 3.0 represents a networked digital technology designed to foster cooperation between humans and applications, thereby supporting active learning. In addition to the vast information sources available on the internet for learning, Web 3.0 applications aim to reproduce and enrich content. In a Web 3.0 world, users have the ability to link, integrate, and analyze data from various datasets, with the primary objective of making the web understandable not only to humans but also to machines. This concept is often referred to as the semantic web, where information on the World Wide Web is presented in a format that computers can comprehend and process.

In addition, there has been considerable thought already given regarding the Internet’s impact on active learning. Viktor Wang and Leslie Hitch (2017) mention active learning via internet technologies; that active learning can take place online but also reinforce that active learning may lead to the creation of new knowledge and the skills needed by learners in this current century and research reveals that technology, used effectively, enhances active learning benefitting the instructor as well as the learner. That is to generate ideas for using active learning in the online environment. According to Prince, active learning is defined as “any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing” (Prince, 2004). In addition, Draves (2002) lists various reasons why the Internet enhances learning, including such advantages as being able to learn at a peak time of day, learning at your speed, accessibility to much information, an ability to track personal progress, and the capability to test personal learning efforts. He also believes cognitive learning via the Internet is better than in-person learning. Several studies have found that online learning is proven to provide creative teaching that is appropriate to the abilities and learning styles of each individual, as well as involving students in active learning with a variety of interactive source materials (Cho and Cho, 2014; Sydnor et al, 2014). Therefore, integrating video and audio streaming into online courses can be used to develop learning strategies that can enhance student motivation, improve participation, facilitate learning and social skills, stimulate higher-order cognitive skills, and increase self-directed learning. Video streaming can help augment text-based materials in online courses that would stimulate the subject matter being discussed, and some active learning forms are well suited to the internet. When integrating video and audio streaming into online courses is important to keep up with change to lead to greater amounts of active learning.

4. Video Streaming in Higher Education

Furthermore, there has been extensive consideration given to the influence of the Internet on active learning. In a study by Viktor Wang and Leslie Hitch (2017), they explore the concept of active learning through internet technologies. They emphasize that active learning can occur in an online environment and can foster the creation of new knowledge and skills essential for learners in the 21st



century. Research indicates that technology, when used effectively, enhances active learning, benefiting both instructors and learners. This discussion aims to generate innovative ideas for implementing active learning in the online realm.

In line with this, Prince (2004) defines active learning as any instructional approach that engages students in the learning process. In essence, active learning necessitates meaningful learning activities that prompt students to contemplate their actions. Additionally, Draves (2002) outlines several reasons why the Internet enhances learning. These advantages encompass the ability to learn at one's optimal time, at one's own pace, easy access to a wealth of information, personal progress tracking, and the capacity to evaluate one's own learning efforts. Draves even argues that cognitive learning through the Internet surpasses traditional in-person learning.

Numerous studies, such as those conducted by Cho and Cho (2014) and Sydnor et al. (2014), affirm that online learning offers creative teaching tailored to individual abilities and learning styles. It involves students in active learning through various interactive resources. Therefore, the integration of video and audio streaming into online courses can be a powerful strategy to enhance student motivation, increase participation, facilitate learning, improve social skills, stimulate higher-order cognitive abilities, and promote self-directed learning. Video streaming, in particular, can complement text-based materials in online courses, enhancing the comprehension of the subject matter.

Moving forward, the role of video streaming in higher education has garnered significant attention from scholars and educators, particularly in higher education institutions (Hill, Wiley, Nelson, & Han, 2003; Hofmann, 2002). Streaming video and audio present exciting opportunities for online teaching and learning. This technology enlivens online courses by engaging learners' visual and auditory senses, making it an invaluable tool for delivering course materials to online students. Instructors must, however, carefully weigh the advantages and disadvantages associated with streaming media before making decisions.

Online instructors can use video streaming to offer alternative course materials to students who are not physically present on campus. As the popularity of video streaming platforms continues to grow, colleges and universities have started to incorporate these tools into their teaching methods to reach a broader audience, making them a suitable resource for students.

Furthermore, educators in various institutions are exploring new media that hold substantial educational potential and effectively support students' learning. Students' use of social networking and multimedia is characterized by personal freedom and informality. The adoption of video streaming in educational settings comes with its set of challenges, and addressing implementation issues and sharing knowledge gained from experience is essential for its successful integration.

There are clear indications that students encounter both advantages and challenges when utilizing Web 3.0 tools and programs in university settings. These technologies serve as supplementary resources to support educational objectives, providing students with a diverse array of educational and learning platforms (OHEI, BRINK, 2019). In their work, Aslam and Sonkar (2019) have identified key qualitative

features of Web 3.0 technologies applicable to distance higher education. These features encompass intelligence, personalization, compatibility, and virtualization, all of which contribute to transformative developments in the way users access information. Of particular note is the emergence of self-learning artificial intelligence programs capable of autonomous growth and adaptation.

The adoption of Web 3.0 in distance higher education has ushered in a paradigm shift, empowering students and revolutionizing the educational landscape to enhance learning outcomes (Amit Chauhan, 2015). As observed by Noskova, Pavlova, and Iakovleva (2015), the evolving trends associated with Web 3.0 demand that educational practices embrace new modes of communication and cultivate an understanding of innovative educational strategies among students. Notably, video streaming presents a promising avenue for higher education to reimagine the design of a more enriching educational experience. Traditional residential programs, for example, can refocus their efforts on educational activities, while incorporating video streaming materials to bolster the educational contributions made to society. This shift promises to enhance learning efficiency and broaden the impact of higher education institutions. The potential for both the quantity and quality of learning to increase is substantial.

Furthermore, instructors can readily adapt a wide range of active learning strategies to online courses. Online active learning introduces fresh opportunities for students to engage, participate, and collaborate, thereby fostering a dynamic learning environment.

5. Summary

This model aims to enhance the development of creative thinking among students in Thai higher education. Its foundation is built upon data gathered through interviews, brainstorming, expert opinions, and focus group discussions. The need for a more comprehensive active learning model that incorporates contextual factors into the educational process becomes evident.

6. A Conceptual Model for Active Learning with Constructionism via Video Streaming

Prior to students' interest and readiness for active learning, a conceptual model for active learning with constructionism via video streaming is introduced. In this model, undergraduate learners take charge of self-planned and self-conducted learning projects, exerting influence over learning objectives, activities, resources, and priorities. Active learning is described as a means to enhance knowledge and skills. It fosters an acceptance of assessment, enabling students to learn more effectively, solve problems, and cultivate creativity through constructionism.

Moreover, students gain knowledge through hands-on experiences, learning by creating and thinking about what they are doing or learning while actively engaging with video streaming. Within this dynamic classroom environment, students have opportunities to exchange ideas, share skills, and foster creative and critical learning.

The integration of new media, particularly interactive and social communication media, in the context of Web 3.0, opens up new possibilities for online learning and social networks. Efficient tools such as NFTs and the metaverse allow teachers to tailor their teaching methods to ensure comprehensive understanding among all students in the classroom. This approach encompasses two main platforms: semantic technologies and the social computing environment.

Conceptual models serve as visual representations of the relationships between critical concepts, which are vital for designing effective approaches to foster students' creative thinking. The following section introduces a conceptual model for active learning with student engagement in a video streaming environment, which can be implemented during any teaching session (see Figure 1).

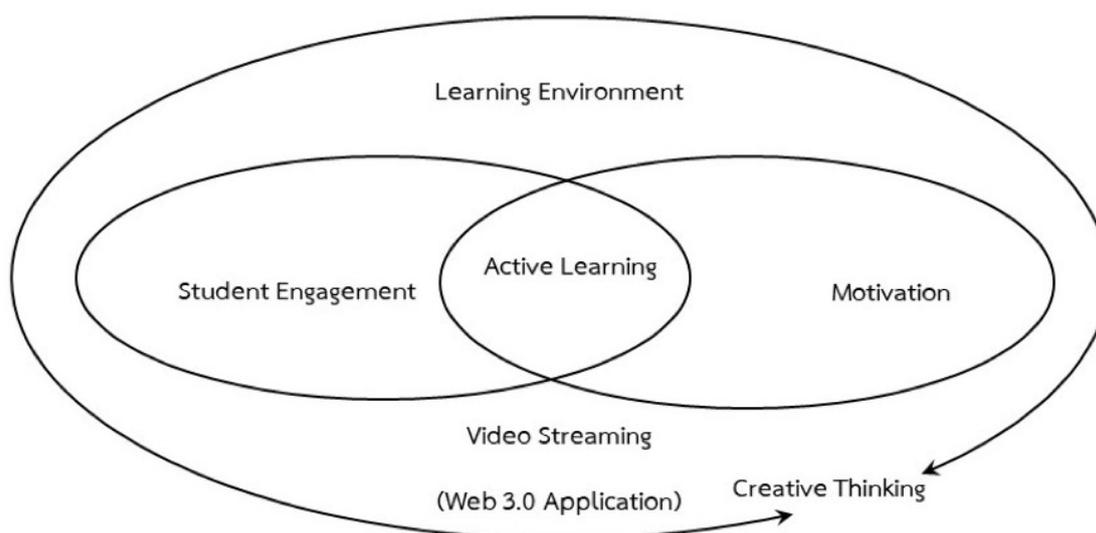


Figure: 1. A conceptual model for active learning with constructionism in the environment of video streaming.

7. Conclusions

It seems like you've provided a brief excerpt from a document or paper discussing instructional system design for active learning with constructionism in the context of video streaming. The conclusion you've mentioned likely summarizes the major principles and elements discussed in the document. These principles may include elements from scholars such as Metzger and Langley (2020), Talbert and Mor-Avi (2019), Park & Choi (2014), Wongpibool, P. (2017), and Arnold, R. S. (2012).

The document appears to emphasize the integration of active learning concepts within the model, design, and implementation of active learning in conjunction with constructionism within the video streaming environment. The inclusion of Figure 2 suggests that there might be a visual representation or diagram that illustrates how these concepts are interconnected. If you have specific questions or need further information about the content of this document or the principles mentioned in the conclusion, please feel free to ask, and I'll do my best to provide additional details or clarification.

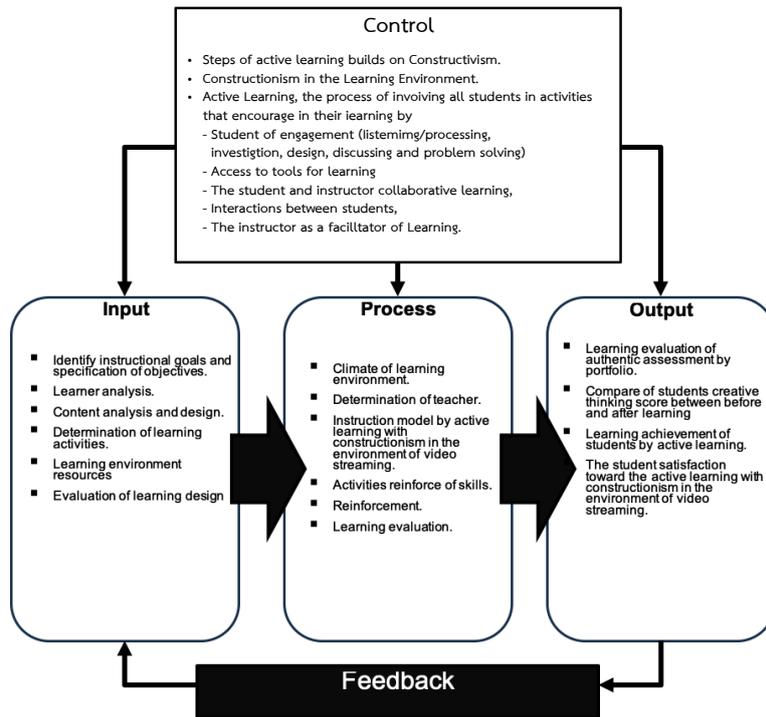


Figure: 2. Illustrates an active learning model infused with constructionism, within the context of video streaming.

This framework promotes the idea of lifelong learning, emphasizing the significance of knowledge acquisition. It empowers learners to take charge of their own educational journey, fostering self-discipline and responsibility. In this model, all students are actively engaged in activities designed to enhance their learning experiences. Success within the video streaming learning environment is contingent upon its suitability for effective learning. This concept can be readily applied in higher education settings.

8. Reference

- Arnold, R. S. (2012). *Active Learning for Improving Phranakhon Rajabhat University Pre-Service Science Teachers' Learning Behaviors and Conceptions about Teaching and Learning*. College of Teacher Education, Phranakhon Rajabhat University.
- Aslam, S. & Sonkar, K.S. (2019). *Online Learning with Special Reference to SWAYAM and e-PG Pathshala: An Overview*. Retrieved October 25, 2023, from https://www.researchgate.net/profile/Sana-Aslam-3/publication/332971895_Online_Learning_with_Special_Reference_to_SWAYAM_and_e-PG_Pathshala_An_Overview/links/5f1e66d345851515ef4d562b/Online-Learning-with-Special-Reference-to-SWAYAM-and-e-PG-Pathshala-An-Overview.pdf
- Barkley, E. F., Cross, K. P., & Major, C. H. (2014). *Collaborative learning techniques: A handbook for college faculty*. Hoboken, NJ: John Wiley & Sons.



- Brame, C. (2016). *Active learning*. Vanderbilt University Center for Teaching. Retrieved October 31, 2023, from <https://cft.vanderbilt.edu/active-learning/>
- Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom*. ASHE-ERIC Higher Education Report No.1., Washington, D.C.: George Washington University. (ERIC Document Reproduction service No. ED340272)
- Bransford, J., Brown, A., & Cocking, R. (2000). *How People Learn: Brain, Mind, Experience, and School*. Washington, D.C.: National Academy Press.
- Chauhan, A. (2015). *Web 3.0 and E-Learning: The Empowered Learner*. In *Artificial Intelligence Technologies and the Evolution of Web 3.0*. Retrieved June 12, 2023, from <https://doi.org/10.4018/978-1-4666-8147-7.ch005>
- Cho, M. H., & Cho, Y. (2014). Instructor scaffolding for interaction and students' academic engagement in online learning: Mediating role of perceived online class goal structures. *The Internet of Higher Education*, 21, 25–30. Retrieved June 25, 2023, from <https://doi.org/10.1016/j.iheduc.2013.10.008>
- Dominic, M., Francis, S., & Pilomenraj, A. (2014). E-learning in Web 3.0. *International Journal of Modern Education and Computer Science*, 6(2), 8. Retrieved June 12, 2023, from <https://www.mecs-press.org/ijmecs/ijmecs-v6-n2/IJMECS-V6-N2-2.pdf>.
- Draves, W. (2002). How the Internet is changing how we learn. *Advanced Teaching Online fourth edition*. 13(4) 9-17. Retrieved June 12, 2023, from <https://dl.icdst.org/pdfs/files4/58fca0f3e78a11ba20ba875240d804c0.pdf>
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410-8415. Retrieved June 12, 2023, from <https://doi.org/10.1073/pnas.131903011>
- Hill, J. R., Wiley, D., Nelson, L. M., & Han, S. (2003). *Exploring research on internet-based learning: From infrastructure to interactions*. In D. H. Jonassen (Ed.), *Handbook of research for educational communication and technology (2nd ed., pp. 433 – 460)*. Mahwah, NJ: Lawrence Erlbaum.
- Hofmann, D. W. (2002). Internet-based distance learning in higher education. *Tech Directions*, 62(1), 28–32. Retrieved June 12, 2023, from <https://www.learntechlib.org/p/95322/>
- Hussain, F. (2012). *E-Learning 3.0 = E-Learning 2.0 + Web 3.0? International Association for Development of the Information Society*. Retrieved June 12, 2023, from https://www.researchgate.net/publication/263108816_E-learning_30_e-learning_20_WEB_30
- Kafai, Y., & Resnick, M. (1996). *Constructionism in practice: Designing, thinking, and learning in a digital world*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Komala, R., Lestari, D. P., & Ichsan, I. Z. (2020). Group investigation model in environmental learning: An effect for students' higher order thinking skills. *Universal Journal of Educational Research*, 8(4A), 9–14. doi: 10.13189/ujer.2020.081802.

- Lotrecchiano, R. G., & Norman, M. K. (2021). The Translational Learning Ecosystem. *The International Journal of an Emerging Transdiscipline*, 24, 149-161. Retrieved October 20, 2023, from <https://doi.org/10.28945/4882>
- Metzger, K. J., & Langley, D. (2020). The room itself is not enough: Student engagement in active learning classrooms. *College Teaching*, 68(3), 150–160. Retrieved June 15, 2023, from <https://doi.org/10.1080/087567555.2020.1768357>.
- Michael, J. (2006). Where’s the evidence that active learning works?. *Advances in Physiology Education*, 30(4), 159-167. Retrieved October 15, 2023, from <https://journals.physiology.org/doi/epdf/10.1152/advan.00053.2006>
- Noskova, T., Pavlova, T., & Iakovleva, O. (2015). Web 3.0 Technologies and Transformation of Pedagogical Activities. In *Artificial Intelligence Technologies and the Evolution of Web 3.0*. 16-36. Retrieved June 12, 2023, from <https://www.igi-global.com/gateway/chapter/127282>.
- Norasak, Suphakornthanakit. (2008). “Web 3.0”. Retrieved October 15, 2023, from <https://dokumen.tips/documents/web-30-termpaper-norasak-hfu-furtwangen-heindlebte-08ss-web-20-web-30.html?page=1>
- Ohei, K. N., & Brink, R. (2019). Web 3.0 and Web 2.0 technologies in higher educational institute: methodological concept towards a framework development for adoption. *International Journal for Info omics (IJI)*, 12(1), 1841-1853. Retrieved June 15, 2023, from <https://doi.org/10.20533/iji.1742.4712.2019.0188>.
- Papert, S. (1990). “An Introduction to the 5th Anniversary Collection” In Harel, I. (Ed.). *Constructionist Learning: A 5th Anniversary Collection of Papers*. Cambridge, MA: MIT Media Laboratory.
- Papert, S. (1999). *Diversity in learning: A vision for the new millennium, Part 2*. Retrieved June 20, 2012, <http://www.papert.org/articles/diversity/DiversityinLearningPart2.html>.
- Papert, S. (1993). *The Children’s Machine: Rethinking School in the Age of the Computer*. New York: Basic Books.
- Park, E. L., & Choi, B. K. (2014). Transformation of classroom spaces: Traditional versus active learning classroom in colleges. *Higher Education*, 68, (5) 749–771. Retrieved October 20, 2023, from https://www.researchgate.net/publication/269355454_Transformation_of_classroom_spaces_traditional_versus_active_learning_classroom_in_colleges
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223-231. Retrieved June 20, 2023, from <http://dx.doi.org/10.1002/j.2168-9830.2004.tb00809.x>
- Robert Talbert & Mor-Avi, A. (2019). A space for learning: An analysis of research on active learning spaces. *Heliyon open access journal*. 5(12), 1-19. Retrieved October 25, 2023, from <https://doi.org/10.1016/j.heliyon.2019.e02967>
- Sydnor, S., Sass, M., Adeola, M., & dan Snuggs, T. (2014). Qualitative analysis of multidisciplinary college students in an international alternative break course. *The Online Journal of Quality in Higher Education (TOJQIH)*, 1(1), 27–34. Retrieved October 25, 2023, from <https://www.tojqih.net/journals/tojqih/articles/v01i01/v01i01-04.pdf>



- Wang, V., & Hitch, L. (2017). Is Active Learning via Internet Technologies Possible?. *International Journal of Online Pedagogy and Course Design (IJOPCD)*, 7(2), 48-59. Retrieved October 20, 2023, from doi: 10.4018/IJOPCD.2017040104
- Wongpibool, P. (2017). Students' participation and active learning. *Journal of Yanasangvorn Research Institute Mahamakut Buddhist University*, 8(2), 327-336. Retrieved October 25, 2023, From <https://so04.tci-thaijo.org/index.php/yri/article/view/178540/126898>