Learning Theories in Microlearning

Mandy Lambert Lambert

LDT Program, Purdue University

EDCI 53100

Dr. Angela van Barneveld

March 1, 2020

Final Project: Learning Theories in Microlearning

Introduction

Behaviorism, Cognitivism, Constructivism: Comparing Critical Features from an Instructional Design Perspective by Peggy A. Ertmer and Timothy J. Newby was written in 1993 with the purpose to explain the three fundamental learning theories: behaviorism, cognitivism, and constructivism applied to instructional design. Ertmer and Newby state, "it is expected that after reading this article, instructional designers and educational practitioners should be better informed 'consumers' of the strategies suggested by each viewpoint" (p. 45). The article answers five questions for each of the learning theories to depict comparison. Two of these questions that were included specifically for the instructional designer were "what basic assumptions/principles of this theory are relevant for instructional design?" and "how should instruction be structured to facilitate learning?" (p. 46).

There is a 2013 addendum to the article, *Article Update: Behaviorism, Cognitivism, and Constructivism: Connecting "Yesterday's" Theories to Today's Contexts* by Peggy A. Ertmer and Timothy J. Newby. This addendum focuses on the impact of technology on instructional design. The original theories discussed are still relevant, yet the type of learning experiences have changed, and students will expect designers to take advantage of this (Ertmer & Newby, 2013). Thus, the purpose of this paper is to extend Ertmer and Newby's article, focusing specifically on the modern, often technology-based instructional design tool of microlearning following the principles of behaviorism, cognitivism, and constructivism.

Microlearning is a relatively new term that focuses on small, individual units of learning. It is commonly used with technology especially through mobile learning but is technically determined by the size and independence of information rather than the method of delivery. Per Sánchez-Alonso et al. (2006) the four principles of microlearning are that an activity contains

limited information, is individually referable and addressable, is self-contained, and is reusable and remixable. In congruence with the Ertmer and Newby article, this article drives to answer the question: “in what real-world ways can each learning theory be implemented through microlearning?”

Literature Review

Though there are many examples of microlearning and its benefits, limited research has been done on applying learning theories to microlearning. Researchers, Hug and Friesen (2007) directly state that microlearning can be used for any theory but do not elaborate what that would look like. Austrian researchers, Bernhard Göschlberger (2016) and Peter Baumgartner (2013), examine the differences in microlearning between the three theories, though with limited real-world examples. There are also several articles by other researchers that demonstrate using a sole concept of a learning theory in microlearning, yet in these studies there are no expansion upon the multiple ways microlearning can be used with a learning theory nor is there a comparison to the other theories. Therefore, this article will equip readers with a starting point for considering different options to implement educational theories through microlearning. It will do this by further examining available literature, by considering fundamental properties of the three learning theories, and by using examples of real-life application.

Application

Behaviorism in Microlearning

Baumgartner (2013) believes the manifestation of behaviorism in microlearning is determined by the limitation that the learner solely interacts with the object (as opposed to interacting with the teacher or with co-learners). This refers to the passive role the learner takes and focus on environmental stimuli in behaviorism. There is no consideration of the learner’s

context and beliefs about a subject, his or her individual rate of learning, or the mental processes involved such as organizing ideas or thinking critically. Behaviorist tactics focus on conditioning a response in a learner and creating an automatic reaction in learner's long-term memory (Driscoll, 2005).

Since microlearning involves individual components that can be given in any order (Hug & Friesen, 2007), it is ideal for creating immediate responses to stimulus to create reinforcement. An example that will be used throughout this paper is a manager of customer service representatives at a retail company is looking to improve accuracy and efficiency on how his employees are handling calls. Customers call in with different questions and the customer service representatives must assist the customer or transfer the call to another department. The manager hires an instructional designer to come up with the best method of teaching employees a variety of information and skills. The instructional designer's first task is to help condition employees to quickly and automatically transfer calls they cannot assist with to the correct department. Using microlearning, the designer could build a variety of short scenarios where a mock customer recording is played and the employee must direct the call to the right department. When the employee responds to the prompts, his or her behavior is reinforced immediately with feedback saying if the choice was right or wrong. The manager could also link results to extrinsic rewards such as bonus money, additional time off, or gift cards. Following microlearning principles, each call scenario is several minutes long and can be done one at a time in any order. The prompt becomes a cue to trigger the response of the learner (Ertmer & Newby, 2013). Over time the learner should be conditioned to be quicker and more accurate with his or her transfer choices (Driscoll, 2005).

The instructional designer could also cover a variety of topics to ensure the employee does not lose practice over a certain type of question. For example, there could be a mix of calls that must be directed to the clothing department, home goods department, and children's department so the employee is adept at recognizing and responding to each of them. Additionally, the designer could easily track the learner's progress as well as create a sequence of prompts that become more difficult over time. Per Ertmer and Newby (2013), two ways to apply behaviorism are producing measurable outcomes and "emphasis on mastering early steps before progressing to more complex levels of performance," (p. 49). An initial level could involve the customer recordings specifically mentioning the name of the department they need to be transferred to. A more challenging level will involve the employee having to use various cues to ascertain which department is needed. For example, if toys are mentioned the employee should connect the subject to the children's department.

Additional examples of behaviorism in microlearning are seen in two studies focusing on the use of drill-style, digital flashcards. In the background of *A Platform for Social Learning*, Göschlberger (2016) states "microlearning implementations oftentimes use learning activities similar to flashcards… Flashcards are generally associated with behaviorist learning style and lower-level cognitive functions," (p. 2). This is due to the *rote learning* and automated memorization associated with a learner repeatedly practicing flashcards and increasing in response speed and accuracy (Driscoll, 2005). Göschlberger (2016) explains that to raise flashcards to a higher level of learning, they must be enhanced with explanation or feedback. He describes a prototype how one might do this which will be examined later in this article. Similarly, in *MemReflex: Adaptive Flashcards for Mobile Microlearning*, Edge et al. (2012), created an adaptive flashcard system done on a mobile phone for students to memorize words in

another language. This study suggests that behaviorism the best fit for microlearning stating, "neither flashcards nor microlearning are tools to be used in isolation, further work is required to connect this fundamentally behaviorist approach to more situated, constructivist, and collaborative pedagogical methods" (p. 9). Edge et al. (2012) offer no additional insight onto the "work" required to relate microlearning to other theories. Consequently, the subsequent sections of this article will explore and address how one might do this.

Cognitivism in Microlearning

For cognitivism in microlearning, Baumgartner (2013) suggests transitioning from learner interaction with an object to learner interaction with the teacher. Baumgartner states "learning is an active process which has to be planned, revised and reflected by the learner" (p. 6). This is completed with more active input from the teacher to give explanations on incorrect assumptions and develop internal mental models. Cognitivism focuses not only on environmental cues but on how the learners "code, transform, rehearse, store, and retrieve information" (Ertmer & Newby, 2013). Cognitivists include feedback, foster accurate mental connections, and focus on organizing information. Furthermore, they determine and use the learner's prior information to connect to new material (Ertmer & Newby, 2013).

Instructional designers can implement these strategies while keeping lessons short and independent. A pre-assessment of quick questions could be done to determine the learner's prior knowledge and adjust which questions are given based on where knowledge gaps are. Rather than solely increasing in difficulty, the questions could follow a dynamic path where questions in categories that have been answered incorrectly show up rather than questions with subjects that have been mastered. Using the customer service example, if an employee receives 100% on calls

related to delivery time scenarios, the employee will no longer receive prompts in this category and can focus on subjects he or she has not yet mastered.

Additionally, beyond simple flashcards and memory recall, quick activities involving matching and organizing could be implemented. The customer service representative could drag and drop several customer questions into the appropriate departments. This provides examples and non-examples, a key tactic of cognitivism (Driscoll, 2005). Another option is to send the employees an organizer to fill in to categorize questions into different types of required responses such as shipping, account information, or returns. These activities create comparison between the different categories and shows their connection, thus developing the mental models to categorize this information. After multiple applications, this schema will become automated and learners will keep this model of organization in long-term memory (Driscoll, 2005).

Following the importance of learner/teacher interaction, the manager could ensure availability to answer questions and give explanations. The instructional designer could set up a chat system or email protocol for the employees to ask the manager quick questions during or after a call. Pairing the decisions with explanations gives the employee context. This will also give the manager a better idea of how the employee is interpreting information. Per Ertmer and Newby (2013), in cognitivism, "learners' thoughts, beliefs, attitudes, and values are also considered to be influential in the learning process" (p. 52). Two-way communication will present this information to the manager so he or she can offer additional coaching through exercises or explanations.

Finally, the shortened nature of microlearning is synonymous with the cognitivist concept of cognitive load. "Cognitive load refers to the strain that is put on working memory by the processing requirements of a learning task," (Driscoll, 2005, p. 136). This is associated with

cognitivist theories as it refers to the learner correctly inputting content into appropriate schema in their long-term memories. This is exemplified in the article, *Application of Cognitive Load Theory in Mobile Micro-learning* by Meng et al. (2016), who explain that in order to address this concept in microlearning it is crucial to use personalized learning content and effective student-teacher interactions. They state that teachers must play a more active role in mobile microlearning, and "should first learn about the learners' learning progress and give necessary online tutoring, according to the learners' different abilities to promote the process of cognitive resources" (p. 3). The timely guidance through interaction with teachers, best ensures that learners are challenged but not overwhelmed with new information. Prompts involving organizing or matching, dynamic lessons, teacher explanations, activating prior knowledge, and monitoring cognitive load are all cognitivist principles that an instructional designer can implement through microlearning.

Constructivism in Microlearning

Finally, Baumgartner (2013) describes the application of microlearning to constructivism as involving constructing knowledge where instructors present learners with complex and ill-formed problems where learners must apply knowledge to critical thinking and solving. The learner no longer acts with only the object or the instructor, but now interacts with a co-learner. Baumgartner explains if students are to "invent new things and to produce and generate new knowledge we have to provide a special challenging learning environment, which is authentic… complex, uncertain, instable and unique" (p. 6). Likewise, Driscoll (2005) teaches that learning outcomes of constructivism are not simply memorizing content, but for the learner to develop skills of critical thinking, self-regulation, mindful reflection, and reasoning.

Whereas microlearning activities such as flashcards, multiple choice questions, matching, or organizing fit well with the other theories, an instructional designer should make use of short, yet open-ended questions for a constructivist approach. For example, designers could use a five-minute self-reflection for learners to consider how well they understand a concept or completed a task. Continuing with the customer service representative example, directly after a customer call, employees could be asked to reflect on how they handled it. This information compared with the customer feedback could give valuable insights to managers. If an employee believes they handled a call correctly, but the customer is not satisfied, managers might investigate if the employee holds an inaccurate understanding of protocol.

The use of multiple perspectives is another powerful aspect of constructivism that lends itself well to the short interactions of microlearning. Ertmer and Newby (2013) state "the role of instruction in the constructivist view is to show students how to construct knowledge to promote collaboration with others to show the multiple perspectives" (p. 59). The instructional designer in the customer service example could set up a social platform for employees to post tips, experiences, and questions that they have around handling customer calls. This allows employees to consider situations that they might not have experienced yet. They can see how protocol can apply to different situations, thus transferring the knowledge to other contexts, an important aspect of constructivism (Ertmer & Newby, 2013).

Finally, on this platform, employees might construct their own concepts creating new ideas to improve processes. This concept is used in *A Platform for Social Microlearning,* where Göschlberger (2016) transforms the example of microlearning with drill-style flashcards to an idea for microlearning on a social platform. Göschlberger states "microlearning activities are especially well suited" (p. 1) to social platforms. Twitter with its 140-character limit is

specifically referenced as an example of "micro-blogging" (Göschlberger, 2016). Göschlberger also creates a prototype for a constructivist, microlearning social platform while learners can complete several tasks: "1) Create and share, 2) Evaluate, rate, comment and improve 3) Tag and collect 4) Interact with and solve learning problems," (p. 2). Göschlberger (2016) explains that these tasks correspond with the highest levels of Bloom's taxonomy including analysis, synthesis, and evaluation (Driscoll, 2005). Creating unique posts and comments fit with the constructivist focus on learner control and active manipulation of information (Ertmer & Newby, 2013). Evaluating, rating, and improving others' submissions introduces social negotiation and examining multiple perspectives (Driscoll, 2005). As seen in this section, self-reflection, multiple perspectives, learner control, and social negotiation are all effective applications of constructivism in microlearning.

Conclusion and Further Research

After completing this article, readers should see some hands-on ways of applying behaviorism, cognitivism, and constructivism through microlearning. These are just a few examples and by no means cover every strategy of each learning theory, nor every possible microlearning application. It should, however, serve as a starting point for instructional designers to consider how to apply learning theories implemented through microlearning in real life projects. Additional research could further develop and exemplify the situations described in this article, create additional microlearning applications for the learning theories, and consider the cost-benefit analysis of implementing these theories through microlearning.

Further research is also needed to compare the learning results of microlearning with more traditional lessons. A study published in 2018 by Mohammed et al. compared microlearning with traditional teaching methods in teaching an information and technology

course in a primary school in Iraq. The results were an 18% increase in learning by the students taught through microlearning. The authors believe this is due to microlearning matching the limited attention span of today's learners as well as fostering creativity and motivation.

However, much more research is needed to truly understand the best scenarios for microlearning. As with many learning techniques, it is likely the effectiveness of microlearning is dependent on the individual situation. It would be extremely beneficial for additional studies to be done on the following questions: Do certain student ages or knowledge levels work best with microlearning? How do different types of technology compare as mediums for microlearning? Are certain subjects or learning objectives best for microlearning? This information must be considered for a designer to thoroughly evaluate pairing microlearning with a learning theory for a given project.

References

Baumgartner, P. (2013). Educational dimensions of microlearning – Towards a taxonomy for microlearning. In M. Roth, P. A. Bruck, & M. Sedlaczek (Eds.) *Designing microlearning experiences– Building up knowledge in organisations and companies*. (p. 1-10). Innsbruck University Press. https://imb.donau-uni.ac.at/themetest/wp-content/uploads/2013/04/Baumgartner_2013_Educational-Dimensions-for-MicroLearning.pdf

Driscoll, Marcy (2005*). Psychology of learning for instruction* (3rd edition). Ally & Bacon.

Edge, D., Fitchett, S., Whitney, M., & Landay, J. *Memreflex: Adaptive flashcards for mobile microlearning.* (2012). Paper presented at MobileHCI 2012 Conference on Human Computer Interaction with Mobile Devices and Services in San Francisco, United States. http://pire.fiu.edu/publications/memreflex.pdf

Ertmer, P.A., & Newby, T.J. (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 26(2), 43-71.

Göschlberger, B. (2016, September 13-16). *A platform for social microlearning*. [Paper presentation]. 11th European Conference on Technology Enhanced Learning, Lyon, France. http://www.goeschlberger.com/preprints/2016/A_platform_for_social_microlearning.pdf

Hug, T. & Friesen, N. (2007). Outline of a microlearning agenda. In T. Hug (Ed.) *Didactics of microlearning* (p. 15-34). Waxmann Publishing Co. https://books.google.com/books?hl=en&lr=&id=J0-

KAwAAQBAJ&oi=fnd&pg=PA9&dq=microlearning&ots=3tO0BhyHms&sig=0O2EcU4ykUqeKJH_EXIUvdPyRGk#v=onepage&q&f=true

Meng, J., Wang, Z., & Li, Z. (2016, October 15-16). *Application of cognitive load theory in mobile micro-learning*. [Paper presentation]. 2016 International Conference on Management Science and Innovative Education, Sanya, China. https://doi.org/10.2991/msie-16.2016.110.

Mohammed, G. S., Wakil, K., & Nawroly, S. S. (2018). The effectiveness of microlearning to improve students' learning ability. *International Journal of Educational Research Review*. *3*(3), 32-38. https://dergipark.org.tr/en/download/article-file/458672

Sánchez-Alonso, S., Sicilia, M., García-Barriocanal, E., & Armas, T. (2006). *From microcontents to micro-learning objects – which semantics are required? (Semantics for microlearning)* [pdf]. (p. 295-303). http://www.cc.uah.es/ie/projects/luisa/papers/2006/SanchezEtAl_Microlearning06.pdf