

AOT-Using Open Educational Resources with Connectivism Enhance Creative Thinking in THAI Students

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Abstract

This research is proposed to improve the development of the open educational resources in the connectivist environment, by focusing on the creative thinking skills in Thai secondary students. The aims of this research are in twofold, firstly, to develop the open educational resources (OER) which promote creative thinking skills in Thai secondary students, and secondly, to evaluate the use of the open educational resource (OER) on the development of the creative thinking skills in Thai secondary students. The study was conducted with 100 secondary students from Chanhunbamphen school, Thailand. The students were required to study English by using an open educational resource (OER) system in the connectivist environment. The learning achievement test, and the creative thinking test were used to measure the level of learning outcome and creative thinking skills. The data were analyzed by using the arithmetic mean, standard deviation, and t-Test Dependent. The results indicated that the high-order thinking skills score of Thai secondary students significantly increased when comparing between the pre-test and post-test score ($p = 0.01$). This study suggested that the Open Educational Resources development should consider the connectivist environment and 5R of openness concept to promote high-order thinking. The research further suggested five phases of OER development, namely, 1) Stimulate 2) Scope 3) Improve 4) Integrate 5) Allotment.

Keywords: Instructional Design, Teacher Education, Open Educational Resources, Creative Thinking skills

1. Introduction

Thinking skills are important. The process of thinking is complex, diverse and mixes of many skills. Teaching is the key to develop the higher-order thinking skills by relating to the learner's effort and the interest in learning. Teaching practices must be appropriate and parallel with the socio-cultural environment which is constantly changing (Gonzalez, 2012). Especially, the advanced technology these days can support classroom activities including gaining and receiving the contents, information and data through the Open Educational Resources (OER). The OER has been recognised as one of the learning tools that could facilitate the acquisition of knowledge. Retrieving information from the internet is convenient and also without costs. The sources are various such as open courseware and content, open software tools, open materials, Repositories of Learning Object, websites, personal blog or even the comments in social media in the form of graphic and narrator which is easy to understand and stimulate the learning and creative thinking skills. Using these technologies for classroom activities is the important factor for teaching. Moreover, using the tools in the appropriated time can help the learners to achieve the learning goals as well. The OER provides virtue opportunity of students to obtain the knowledge in an effective and efficient way. Despite the potential benefits offered by using OER, there is considerable little research on how to effectively use the OER to support the learning in Thailand. In addition, fostering students' thinking skills to adopt the OER is yet to be investigated in Thai education.

2. Research Objectives

The following research objectives were framed to guide the development of this research:

1. To develop the open educational resource (OER) which promote creative thinking in Thai secondary students.
2. To investigate the use of the open educational resource (OER) in promoting the creative thinking skills in Thai secondary students.

3. Statement of Problem

In this research, the problem addressed by the researcher focused on the lack of using open educational resources to promote students' high order thinking skills in Thai educations. After conducting the empirical investigation on prior research, the researcher found that the aspects related to the creating skills of thinking with the current learning materials administrated were mainly conducted in a traditional way. As such, classroom activities which related to the use of the open educational resources for Thai students are still lacking. In addition, fostering students' thinking skills to learn in open educational resource context is yet to be investigated in Thai education.

4. Connectivism Theory

The theory of Connectivism was developed by George Siemen (2005). He mentioned that Connectivism is one of the educational theories that could support the rapid change of knowledge and discovery of new knowledge. In current digital age, the knowledge life is shorter than it used to be in twenty years earlier (Gonzalez, 2012). This is due to the fast development, progressively evolving of the technology which consequences shorten the time spent on new knowledge discovery from the immense available of information. As a result, learning solely through classroom based is not sufficient anymore. People need to develop themselves to handle the changing of technology and culture as well as the new knowledge that might impact their lives.

Siemens (2005) defined eight principles of Connectivism, which are:

- Learning occurs through a diversity of perspectives and opinions regarding the subjects.
- Learning is constructed through the network of nodes from a particularly important source of information
- Learning is not merely a result of learners but also technology discovery
- Capacity to continuously acquire knowledge is more important than what knowledge had existed.
- Supporting and maintaining the connection is vital in supporting continuous learning.
- The ability to recognize the connectivity between the existing information, opinions, and concepts is one of the central skills in learning
- To have an up to date and accurate knowledge is the main aim of Connectivism theory
- *"Decision-making is one of the learning process"*; which learners need to pay particular attention by taking into account the reality. This is due to the knowledge as of today might be obsolete or otherwise proving to be wrong in the future.

Siemens (2005) also proposed six main components required in learning based on Connectivism theory, which are:

- A platform where both instructors/teacher and students/learners could be connected
- A platform for an individual to express their ideas (blog, journal)
- A platform where everyone can discuss, share and exchange the ideas (discussion forum, open meetings)
- A platform to search and explore the existing knowledge (portal, website)
- A platform where students/learners can learn in a structured course (courses, tutorials)
- A platform to be updated regarding the new information or knowledge (news, research)

Connectivism drawing the concept of knowledge acquisition in the digital age where information and knowledge distribute and spread all over the network. Learning can occur at any places and in the informal learning environment. Learning is no longer an individual cognitive process but rather in a network of a community. In a network, learning arose from the sharing of knowledge, exchanging of ideas and opinion, communication between each node of knowledge by taking into account the rapid change, up to date and accuracy of information. The connection between each node of knowledge required different kind of supporting activities, learners and suitable time in order to create the most effective learning environment.

5. Open Educational Resource (OER)

Knowledge sharing can distribute through various approaches such as writing a blog, sharing on social media, uploading on YouTube. Open Educational Resource (OER) is one of the effective approaches which allow everyone to have free access to the educational related materials. The development of the OER system requires information technology management and other supporting tools. OER is accessible through public domain which defined by the copyrighted license indicated the permission to use the material for educational purposed. The information available in OER covers from learning material, course material, modules, text book, video lecture, course exercise and assignments as well as examination papers. To access this information, related applications and tools are required. Current use OER systems and applications available in public domain are included Open Courseware, Open Education

Resources free software, Open Source software, Open Source Initiative, Open Content, Open Publication License and Creative Commons. OER can be categorized into 3 main forms which are content, tools and capacity (Downes , 2009).

- Content: in general, most Open Courseware applications can be considered as a content form which focused more on offering a different kind of learning materials.
- Tools: tools can be used to develop learning material and medium. Currently, both free and commercialized versions are available worldwide.
- Capacity: referring to the EOR systems that contain a large amount of information and providing with the effective searching capacity. This type of OER systems is sometimes referred to as a digital library.

Wiley (2014) identified 5 “R’s” characteristics of OER as:

- Retain: the right to make, own, and control copies of the content.
- Reuse: the right to use the content in a wide range of ways.
- Revise: the right to adapt, adjust, modify, or alter the content itself.
- Remix: the right to combine the original or revised content with other open content to create something new.
- Redistribute: the right to share copies of the original content, your revisions, or your remixes with others.

However, accessing, reusing, redistributing, revising and remixing the available materials in OER is restricted by the copyright license and different type of license offering a different degree of actions one can perform with the materials. Creative Commons (CC) (Creativecommons.org, 2002) license is one of the most frequently used licenses which can be divided into 6 different licenses, include:

- CC-BY requires the user to give the proper credit to the original works with the permit to be used for commercialization.
- CC-BY-SA requires the user to give the proper credit to the original works and indicate if the changes had been made with the permit to be used for commercialization. Redistribution of the new version of material under the same license.
- CC-BY-ND requires the user to give the proper credit to the original works and indicate if the changes had been made. The materials are allowed to be used for commercialization. However, users are not allowed to redistribute the modified version of the works.
- CC-BY-NC requires the user to give the proper credit to the original works and indicate if the changes had been made. However, users are not allowed to redistribute the modified version of the works.
- CC-BY-NC requires the user to give the proper credit to the original works and indicate if the changes had been made. However, this material or modified version is not allowed to be used for commercial purposes.
- CC-BY-NC-SA requires the user to give the proper credit to the original works and indicate if the changes had been made with the restriction not to be used for commercialization. Redistribution of the new version of material under the same license.
- CC-BY-NC-ND requires the user to give the proper credit to the original works and indicate if the changes had been made. However, commercialization and redistribution of the modified version are not permitted.

Open educational research is the tool to support learners in learning and gaining creative thinking skill. The data based in the library is also the open educational resources which include the information, tools and media. The data based has the specific access and publish by creative common that makes learning complete.

6. High Order Thinking Skills (HOTs)

Creativity skill is one of the demanded skills. The creativity is defined as "the cognitive skill of proposing a solution to a problem or making something useful or novel from ordinary" (Hwang, Chen, Dung, & Yang, 2007, p. 193). It involves a wide range of higher order thinking. Anderson and Krathwohl (2001) revised Bloom’s taxonomy of learning theory by considering the level of thinking based on its complexity. The taxonomy includes:

1. Remembering is to recognize and able to recall the relevant knowledge from long-term memory.
2. Understanding is understanding the meaning through interpretation, comparison and explanation.
3. Applying is the implementation or use of the knowledge learnt.
4. Analysing is to determine related to overall structure or manage different
5. Evaluating is a decision that has been reviewed and criticized.
6. Creating is to put the elements together to form coherent or the collaboration of all components.

The higher order thinking involves the analysing, evaluating and synthesizing the knowledge obtained in the earlier stage (Anderson and Krathwohl, 2001). To be able to obtain the creativity skills, a student needs to be able to

understand the content clearly, able to apply, analyse evaluate and putting the relevant knowledge together to generating the new ideas.

According to Guilford proposed the concept of "divergent thinking" in the 1950s, when he noticed that creative people tend to exhibit this type of thinking more than others. He, thus, associated divergent thinking with creativity, appointing it several characteristics, as follow: (Guilford 1971 cited Aree Rangsinan 1989)

- Fluency refers to the ability to produce a great number of ideas or problem solutions in a short period of time
- Flexibility refers to the ability to simultaneously propose a variety of approaches to a specific problem
- Originality refers to the ability to produce new, original ideas
- Elaboration refers to the ability to systematize and organize the details of an idea in a head and carry it out

According to Osborn's method of Brainstorming, Osborn claimed that there are two principles which contribute to "*Ideative efficacy*". They are the defer judgment and reach for quantity. Following these principles, he established seven steps of brainstorming with the intention to reduce social inhibitions among group members, stimulate idea generation and increase the overall creativity of the group. These seven steps are 1.) orientation 2.) preparation 3.) analysis 4.) ideating 5.) incubation 6.) synthesis and 7.) evaluation.

Creative thinking is the highest thinking skills which learners should be developed by continuously integrating the skill into the lessons and classroom activities. According to Dhevakulcreative (2009), thinking skills could help the learner to improve their capabilities, patience, intuitiveness and interests in their tasks, also making use of their time to improve their life.

7. Creative Open Educational Resource (CreativeOER)

Designing for learning is important specially to develop a higher order of thinking. Therefore, activities involved, learning instruction and the tools usage should be carefully designed when developing the higher order of thinking. Wiley (2014) suggests 5 Rs component of openness as having a significant impact on learning. Incorporating the 5Rs with the creativity characteristics, the Creative Open Educational Resource (CrOER) is proposed as presented in Figure 1.

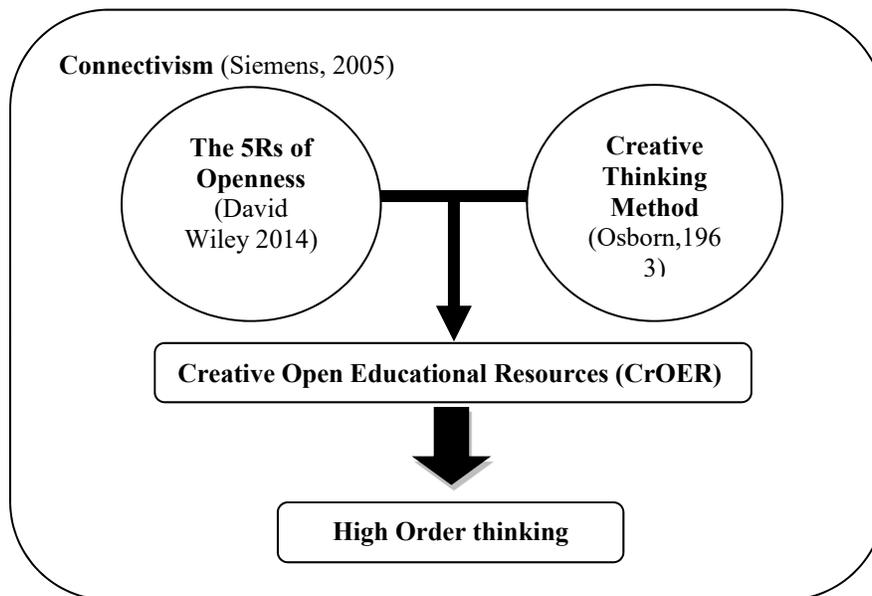


FIGURE 1 Creative OER framework

8. Methodology

8.1 Research Design

This is a quantitative study that covers five steps in the research procedure. Firstly, this research began by analyzing and synthesizing the principles and learning theories on the related field which were Connectivism theory, the open educational resources and high order thinking skills. In the second step, OER was designed by using Creative OER framework. After that, OER was developed according to the design in step 2, so that the students could participate in activities provided for this study. In the fourth step, the Creative Open Educational Resources (CrOER) was implemented to promote high order thinking skills in the classroom. Finally, this research study was carried out to evaluate the CrOER, by using the pre-test and post-test. Data were analyzed by using purposive sampling and arithmetic mean, standard deviation, and t-Test Dependent.

8.2 Research Procedure

In this study, the total number of 100 secondary students from Chanhunbamphen school participated in this study. Figure 2 presents the research procedure used in this study. The study began by asking students to complete the quiz to measure the creativity skills at the beginning of the study, i.e. before students were exposed to the learning activities by using Google Form. The creative thinking skills assessment was developed based on Guilford theory by addressing four components of creativity namely, fluency, flexibility, originality and elaboration. After completing the pre-test, students are then introduced to the learning activity. The learning activities were designed and divided into six steps as follow:

1. Search Problem: students were asked to watch a video clip introducing to the learning problem. Then, they were asked to analyze the problem from the media and post it on OER learning platform to brainstorm with their classmates. Social media such as YouTube and Facebook are used as a mean of communication.
2. Set Up Idea: in this step, students were asked to do some research to generate the ideas to solve the identified problem. The teacher provided some guidance and instruction on how and where to look of reference and relevant knowledge. The tools used in this step are OER webtools and YouTube.
3. Select Idea: After generating the ideas, students were guided to select and provide the supporting reason on how the problem could be solved by using the identified ideas. The students were then asked to present the potential guideline on how to solve the problem by considering the reliable references and share the information with other classmates. Teacher and other classmates would be asked to provide comments and raise any questions and issues that might have an impact on the given problem and the presented solution. Several tools could be used as this steps such as OER Websites, Youtube ect.
4. Summary Idea: In this step, students were asked to summarize the guideline to solve the problem as well as a suggested solution by synthesizing the information and comments given by their peers and teacher to generate the new knowledge. The OER tools used in this step were Facebook to communicate the idea and the OER websites.
5. Share Idea: After summarizing the idea, students were required to present the new knowledge gained in step 4. The OER tools and elements that could be used in the presentation are Video Clip, e-book, Web site, Page Facebook or Blog.
6. Score Idea: both teacher and students were asked to evaluate the idea presented in step 5. The teacher evaluated the assignment according to the criteria and providing the comment. Students were asked to provide feedback on the presented ideas of their peers. The OER tools used in this step were Facebook, Youtube.

After complete the learning activities, students were asked to answer to the creativity test questions.

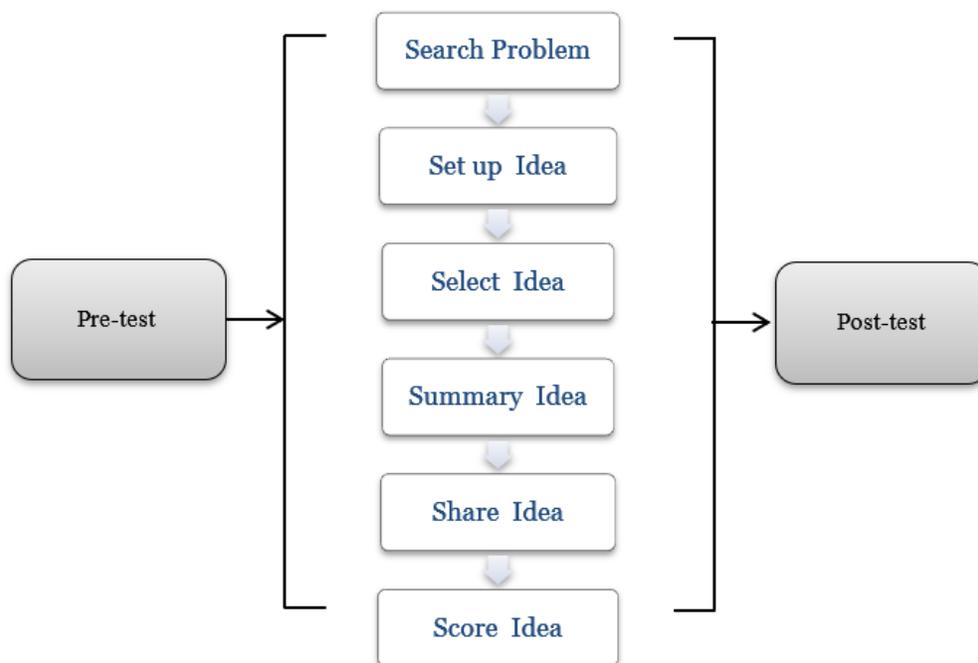


FIGURE 2. 6S of Creative OER Procedure

9. Analysis and Discussion

The question items of pre-test and post-test to evaluate the creativity of students were evaluated according to the corresponding creativity components and the level of creativity as presented in Table 1.

Table 1: The criteria of creativity measurement

Components of Creativity	Level of creativity		
	Good	Fairly	Need for Improvement
Fluency	The student was able to correctly answers more than 70% of the question items	The student was able to correctly answers at least 50% but not more than 70% of the question items	The student was able to correctly answers less than 50% of the question items
Flexibility	The student was able to organise, categorise most of the items in variety approaches	The student was able to organise, categorise the items in three to five number of approaches	The student was able to organise, categorise some of the items in one or two approaches
Originality	The student was able to adjust, alter, modify, and apply most of the items accordingly	The student was able to adjust, alter, modify, and apply some of the items accordingly	The student was able to adjust, alter, modify, and apply a few of the items accordingly
Elaboration	The student was able to elaborate, systematize and organize the details of most of the items accordingly	The student was able to elaborate, systematize and organize the details of some items accordingly	The student was able to elaborate, systematize and organize the details of a few items accordingly

Table 2 presents the frequency and percentage of students' creativity score obtained from the questionnaires. The score highlights the pre and post test score according to four dimensions, namely, fluency, flexibility, originality and elaboration.

Table 2. Frequency and percentage of students' creativity before attending the class

Components of Creativity	Level of Creativity number (%)					
	Good		Fairly		Need improvement	
	before	after	before	after	before	after
Fluency	21.4	57.1	37.1	42.9	41.5	0
Flexibility	25	46.4	39.3	42.9	35.7	10.7
Originality	17.9	42.9	32.1	50.0	50.0	7.1
Elaboration	10.7	32.1	17.9	46.4	71.4	21.4

In this study, the Creative OER Procedure which consisted of six steps, 1.) search problem 2.) set up idea 3.) select idea 4.) summary idea 5.) share idea 6.) score idea (6 S CrOER) to promote creative thinking was implemented. The level of creativity was divided into 3 levels which are good, fairly and need for improvement. The good creativity level shows to have a higher proportion of items based on the post-test score in every creativity component as compared to the pre-test. Similarly, the fair level of creativity also had an increasing percentage of post-test scores in all components. In contrast with the first two levels, the number of items that were categorized as needing further improvement level of creativity showed significantly lower post-test score in all components. This result indicates the improvement in fluency, flexibility, originality and elaboration of the students after experienced with the OER application. The items that were initially categorized as the need for improvement of the fluency has reduced to zero. This indicates the potential usefulness of OER to improve the creativity level of the secondary students. Finally, based on the evaluation, this tool has been evaluated at "The Most Satisfied Level" by both teachers (instructors) and students (attendees).

Table 3. The pre-post test score (T-test)

Test	n	Points	S.D.	t	sig.
Pre - Test	100	12.41	2.34	9.967	.000
Post – Test	100	16.76	1.43		

Based on the initial result, the statistics were used to observed the significant level of the pre and post-test. Thai secondary students' posttest score gained from high order thinking skills part was higher than the pre-post test score at the statistical significance at level .01.

9. Conclusion

This research presents the use of OER as a tool to promote the creativity skills for the Thai secondary students. The study consisted of 100 students. The designed learning activity involved six steps, which are, problem searching, set up the idea, selection of the ideas, summary, share and score the selected idea. The OER was used as a learning platform to carry out the activity. The OER tools used in this study consisted of several tools which could be divided into two categories. The tools used to support learning were E-paper, search engine, YouTube, and the other uploaded online materials/Resource and the tools which used for communication such as a forum, blog, news as well as social media such as Facebook. The research study was carefully addressed the Creative Common licensing agreement. The pre and post-test were used to examine the level of creativity. The result indicated the higher level of creativity after students were experienced with the OER based learning activity. This result suggested that the OER has the potential to promote the higher order of thinking and creativity skills.

References

- Anderson, L., & Krathwohl, D. A. (2001). *Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman
- Downes, Stephen (2005). "An Introduction to Connective Knowledge ~ Stephen Downes". Downes.ca.
- Hwang, W.-Y., Chen, N.-S., Dung, J.-J., & Yang, Y.-L. (2007). Multiple Representation Skills and Creativity Effects on Mathematical Problem Solving using a Multimedia Whiteboard System. *Educational Technology & Society*, 10 (2), 191-212
- Gonzalez, C. (2004). The Role of Blended Learning in the World of Technology. Retrieved December 10, 2004 from <http://www.unt.edu/benchmarks/archives/2004/september04/eis.htm>.
- Kanpai, T. (2011). Proposed guidelines for art criticism instruction to enhance higher-order thinking of undergraduate students in art education.
- Chanayotha, P. (2014). Open Educaional Resource development base on service learning approach to enhance public consciousness creative problem solving for Rajabhat University students.
- Siemens, G. (2005). "Elearnspace. Connectivism: A Learning Theory For The Digital Age". *Elearnspace.org*. N.p., 2004. Web. 6 Dec. 2015.
- Siemens, G. (2006). Global summit 2006: Technology Connected Futures. Retrieved from http://dspace.edna.edu.au/dspace/bitstream/2150/34771/1/gs2006_siemens.pdf
- UNESCO. (2002). "Model Curricula for Journalism Education." Retrieved August 17, 2013 from <http://unesdoc.unesco.org/images/0015/001512/151209E.pdf>.
- Wiley, David (2009). "The Four R'S Of Openness And ALMS Analysis". www.redhat.com.