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Effectiveness of Blended Collaborative Knowledge Construction to Prepare Senior High-School Students for Science Project Development: Learn-Read-Share Academic Journal Publications in Seminar Course

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Abstract: Science project endures as a key project for high school students by developing and constructing knowledge through the research questions that they formulated. To reach this aim, students need to gain more knowledge by searching and reading scholarly journals for better understanding, current applications, interesting studies, and findings. Based on this perspective, the study proposes a blended collaborative knowledge construction approach with learn-read-share journal articles. While working in this process, students can construct and develop their understanding and ideas with the support of technology in order to brainstorm with peers, teachers, and specialists. Online social media was used as a medium throughout the learning activities for discussion, brainstorm, and presentation, while face-to-face activities were used when meeting the teachers for consultation. In the meantime, students gained experiences of collaboration and self-learning, which are essential for developing science projects in the future; besides their reading literacy would be promoted. After the proposed approach was implemented, it was found that most students gained higher scores of learning achievements; also, the reading literacy, presentation and answering skill. The findings of this study could serve as a model in adopting blended learning with collaborative learning activities for science and other subjects.

Keywords: Blended learning, Collaborative Knowledge Construction, Reading literacy, Science project, Information technology

1. Introduction

Science project has been considered as a significant portfolio of science's education. The primary objective of the science project aims to training the students to create their science projects which are necessary for studying at the higher level. Furthermore, doing a science project could be a significant process for students to create and develop innovative science, technology learning progressively. Besides, it was found that reading academic journal publication is another crucial pathway to develop a foundation for science projects (Hermida, 2009).

Reading academic journal publication's not only enables students to learn new vocabulary, but they also could increase their reading speed, concentration, and critical thinking (Journal, Vol, & Issue, 2013). Hence the significance of academic journal publication reading absolutely increases the reader's performance, particularly in critical thinking's skill. Like as the skill need for reading academic journal publication, According to Micheal Owusu-Acheaw, they offered the necessary four skills for reading academic journal. For instance, skimming and scanning the text, highlighting the key points, reading for comprehension and connectivity (Owusu-Acheaw & Larson, 2014).

In addition to the skill needed in academic journal reading, there are some limitations obstructing students learning. Firstly, the main obstacle is language skill, particularly people who wasn't English Native speaker. The necessary skill for improve this weakness is to skim and scan the text. Secondly, comprehending keyword's point. Thirdly, the reading comprehension. Student profoundly comprehends the journal publication, and the last is to connect each part of journal publication collaboratively, which's called "Connectivity" (Hermida, 2009).

From the reading literacy's limitation, applying both lecture-based learning and ubiquitous learning to connect knowledge from the lecture and self-learning skill through online database is considered as the effective method to reinforce this study. Owing to its convenience, the student can gain and construct knowledge from the online database in the same time they also can gain the necessary skill from the lecture class too (Fadde & Vu, 2014). Therefore, blending technology with conservative method of learning recognized as a significant issue (Jeffrey, Milne, Suddaby, & Higgins, 2014).

According to the overall journal reading's limitation, the purpose of this paper aims to study the reading literacy's result from reading academic journal publication, comparing between self-learning, and under advisor's guideline through the activity which combines with blended and collaborative learning through a significant process: Learn-Read-Share Academic journal publication by using various processes in order to construct knowledge collaboratively, e.g. peer-discussion, adviser's consultant.

2. Related Studies

2.1 Information and Reading Literacy

Reading Literacy in the context of learning' s assessment defined as understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential to participate in society. (Framework, 2016) Generally, reading literacy associated with information' s searching without a doubt because it was significant to use data in order that the reader can thoroughly comprehend the journal publication. (Cambria & Guthrie, 2010) Nevertheless, definitions of reading and reading literacy have changed over time in parallel with changes in society, economy, and culture. It is no longer considered an ability only acquired in childhood during the early years of schooling. Instead, it is viewed as an expanding set of knowledge, skills, and strategies which individuals built on throughout life in various situations, and through interaction with their peers and with the larger communities in which they participate. Hence many skills increased along with reading literacy' s outcome inevitably. According to the significance of reading literacy, learning' outcome expressed to 21st-century skill. For instance, critical thinking, communication, and collaboration.

According to the applied paper's review, reading literacy popularized to use in order to assess English language' s skill, particularly two main skills, such as reading, and writing. In addition to assessing language' s skill, it could be express to the reading comprehension skill too. Students could develop their reading literacy competence through the project course (Bozsik, 2015). Students read the academic paper in ordered to comprehend the knowledge's content from paper. Hence reading literacy is not only necessary for the student to comprehend the paper but also can continue to do a project at the higher level. Lastly, reading literacy remains to be a significant process for the learner to comprehend the academic journal publication. According to the related studies, using reading literacy could increase reading comprehension skill. Therefore, reading comprehension' s considered as the fundamental skill need to construct knowledge collaboratively.

In this study, the author use Bozsik's idea to apply to this research exactly because the seminar course is necessary for Grade 10 student to continue doing Science project in Grade 11.

2.2 Collaborative Knowledge Construction

Collaborative Knowledge Construction (CKC) has been considered as an approach to learning, especially for understanding and supporting practices where people are creating or developing useful and reusable things in collaboration (Moen, Morch, & Paavola, 2012). In addition to Moen,

Collaborative Knowledge Construction has a vital role in supporting learning: theoretically, pedagogically. Nowadays knowledge constructed by a various process in ordered to support the learning outcome's hypothesis (Stahl, 2000). Therefore, the definition of collaborative knowledge construction is the learning method that constructed by the collaborative aspect and environment's learning. For instance, peer-discussion, adviser's consultant, etc.

According to the definition of collaborative knowledge construction, peer-discussions considered as a significant process to construct the collaborative knowledge because the student can get any comment and suggestion in class (Davoust, 2009). In addition to class discussion, sharing on social media has been considered as the other convenient method of sharing an idea. (Nvironments, Luo, & Clifton, 2017) Constructing knowledge through Peer-to-Peer (P2P) concept encouraged the student to develop the participation skill. Firstly, data searching and reading was essential for the ubiquitous collaborative learning. Secondly, was reading comprehension' s process. Thirdly, students discussed the data with peers in ordered to exchange knowledge' s outcome. This is the most important process of P2P discussion (Kersey, Di Eugenio, Jordan, & Katz, 2008). Many researchers used CKC to construct knowledge in the term of interdisciplinary knowledge integrating through Computer-assisted (Data, Approaches, Weerd, Tan, & Stoyanov, 2017). Similar to Ertl, Kopp, and Mandl (2005), CKC could positively influence individual learning outcomes. Montero-Fleta, Begoña used the concept of CKC in ordered to evaluate how students construct knowledge by using Wikipedia as the method to assess the English skill in Spanish student. Learning through Wikipedia's considered as a favorite channel for searching any data in the context of collaborative learning (Montero-Fleta & Pérez-Sabater, 2011). Nevertheless, there had some limitation because student rarely constructed knowledge from searching in Wikipedia. Hence in addition to search in Website, the discussion was another process that students could construct knowledge from peer-discussion (To & Carless, 2016).

In this study, it is very convenient for the students to searching for any data and knowledge on the internet. Furthermore, they also can search and learn through Internet anywhere, including others online channel. Nevertheless, search and read without criticizing, and debate is not counted as the knowledge construction (Constructivist). Therefore, discussion is considered as a significant process for constructing knowledge, especially peer discussion.

2.3 Blended Learning

Blended learning is considered as an educational program that combines online digital media with traditional classroom methods. It requires that physical presence of teacher and student, with some part of the student, can control-mediated activities while learning from lecture' s class. Furthermore, blend learning can be called as "technology-mediated instruction", "web-enhanced instruction" ,and "mixed-mode instruction." For the similar definition, a term is increasingly used to describe the way e-learning is being combined with traditional classroom methods and independent study to create a new hybrid teaching methodology. Educators developed six models of blend learning as follow: the Face-To-Face Driver Model, the rotation model, the flex model, online lab school model, self-blend model, and the online driver model (Boyle, Bradley, Chalk, Jones, & Pickard, 2003).

According to the definition of Blend learning mentioned, it recognized as a significant part of learning's method in this present because blend learning doesn't only decrease the classroom pressure, in particularly young student, but also create the new learning' s environment by blending between the traditional classroom (lecture-based learning) and online learning.

Blended learning' s considered as the current technique supporting among teaching and learning which's been popularized to apply in the educational sector. Since 2011 it rapidly used to replace the traditional learning. In the 21st Century, there are widespread of knowledge's content, especially in the online database. Nevertheless, some of those data were quietly unbelievable therefore learner should compare their background and reference in order to ensure the data that they gain. According to Mugenyi, Chang Zhu and Edmond Kagambe, they found that blended learning could increase the analytical skill in the Undergraduate student (Kintu, Zhu, & Kagambe, 2017). Owing to analyzing the widespread of knowledge' s content on the internet, Anna Wing Bo Tso concluded that blended learning organized the presentation skill effectively (Bo Tso, 2015), in particular through performed in a social media application. According to the related studies involved

with blended learning, Akbayin opined that using blended learning slightly increased percent in assessment score (Akbayin & Yapici, 2012).

In this study, blended learning' s considered as a significant component to construct knowledge in the term of collaboration; particularly, comprehend the reading literacy in the seminar course. Hence, using Anna' s conclusion is appropriately used for this study, in particularly the context of presentation skill. In addition to the presentation skill, the analytical skill' s the other main factor in collaborative knowledge construction; therefore, Kintu's investigation merged blended learning with collaborative knowledge construction perfectly.

3. Design and Development of Blended Collaborative Knowledge Construction with Journal Paper Study

The Seminar Course at the Engineering Science Classroom, King Mongkut's University of Technology of Thonburi is the required subject that Grade 10th students must study and pass this subject in order to continue doing the Science Project when they are Grade 11th students. According to the course's regulation, this subject is considered as a necessary subject because this learning achievement recognized as a significant fundamental skill to continue and prepare the student to create the Science project later. Students anticipated gaining various skill, attitude. For instance, reading literacy, discussion, presentation, and answering skill. For the attitude comprises of teamwork, self-learning, and appropriate technology usage.

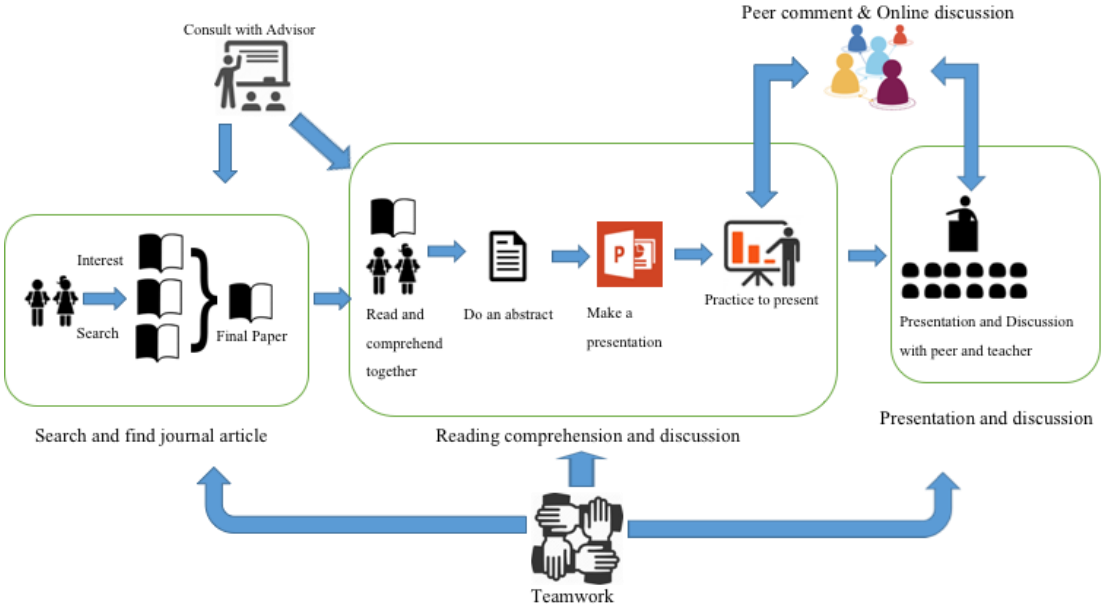

Figure 1. Overall Framework.

In this study, comprising of three main processes for the student to accomplish the seminar course as following. The first process called "Search and find a journal article," the initial process that each group searches for the final journal publication both by themselves and under advisor suggestion. Blended learning involved with the process of advisor's consultant which they also develop to CKC throughout searching, reading, and discussing the activity. The second process is considered as the process of blending developing and constructing knowledge; each group spends a long time to accomplish this process. Firstly, they read and comprehend paper together in order to do their own abstract. Then, they make a presentation that they read and practice to present together as the last activity in this process. In this process, students used both blended learning, and CKC throughout the activity. The last process is the most important process to evaluate skills need, such as presentation, answering skill.

For the online discussion, participants used Facebook as the primary intermediate application for discussion because of its various feature and advantage that all participant can use in

order to discuss. For instance, Closed group (For discussion among advisors and students), Facebook LIVE (For student's online discussion during the presentation).

Table 1

Blended Collaborative Knowledge Construction Activity

Phase	Learning Process	Social Media
Search for Final Paper	1. First of all, each group searched for the journal publications that they interested and read from the online database by themselves, and under the adviser's guideline. In this process, students gain blended learning from self-reading (Online media) and adviser's guideline (Traditional method). 2. Then, decided to choose one journal publication together in ordered to comprehend the journal that they chose. For the advisor's role is to guide student about the method to find the journal publication. However, there are some limited criteria choosing paper as following, the less than ten years of publication, English article only, and the credible source publication.	Advisor created Facebook' s closed group in ordered that student share paper online because it is convenient for the advisor to comment, suggest, and guideline student about journal appropriation, paper comprehension toward the paper they uploaded. In this process, students could construct knowledge collaboratively through any comment and suggestion in Facebook's closed group.
Reading & Discussion	1. Each group read, comprehended, and discussed the journal article by sharing idea and brainstorming together (Blended and CKC). 2. Each group consulted about journal reading comprehension on the topic of correct, reading comprehension with the advisor in ordered to progress their assignment (CKC). 3. After discussing with the advisor, each group created their abstract in ordered to assess overall comprehension about the journal paper they read which express to the reading literacy skill. (Genlott, 2013). The abstract was assessed as the reading literacy's outcome (Blended and CKC). 4. Then, each group created the paper's presentation and practice to present the journal publication by themselves and under the adviser's guideline. (CKC)	Students discussed paper comprehension with the advisor through online' s application such as Skype, and Facebook closed group (Blended and CKC). Moreover, students shared the progress in Facebook closed group in ordered that an advisor could read and comment on it (CKC). Using social media in learning's activity encourage student participating in learning. Besides, it is convenient for an advisor to comment and give a suggestion.
Presentation and discussion	Each group presented a whole journal publication that they read and discuss with peers and the teacher in ordered that students could construct knowledge from discussing with peers, teacher, and audience' s advice (CKC). While presenting, peers recorded the VDO clip through Facebook LIVE in ordered that others audience could participate through FB LIVE as Two-way communication (Blended and CKC). It is considered as an appropriate channel for discussing both through face-2-face in the presentation room, and online in Facebook LIVE's group.	While students were presenting, some of the students recorded the VDO clip through Facebook LIVE in order that others student can see presentation's environment because the author divided students into two presentation rooms.

4. Methods

4.1 Research Design

This study was designed in ordered to assess the effectiveness of Blend Collaborative Knowledge Construction activity toward the seminar course, a required course that grade 10th students have to pass. The seminar's learning activities motivated the student to learn through the journal reading, including discussion, and presentation lastly, which each activity encouraged student to construct knowledge from every process. Therefore, research design based on the activity's expected result shown in Table 1.

4.2 Participants

There were 70 students in grade ten participating in this research study (male = 32, female = 38). All students were anticipated to study and pass the seminar's subject because it is a required subject in order to do the Science Project.

4.3 Research Tools

There were four main instruments used in this study. First, the initial reading comprehension was used to assess the journal's comprehension by comparing before & after the advisor's guideline. The data used in this study was collected from the self-evaluation from Google form comparing with a score from advisor (total score = 5). This instrument was adapted from Abdallah (2010) with self-assessment on reading comprehension. Second, the reading comprehension process was used to assess the reading literacy skill. The data used in this study was evaluated by the first and second draft abstract's score (total score = 4). This instrument was adapted from Alain (2009) in comparative reading assessment method. Third, the summative assessment was used to evaluate both the presentation and answering skill. The data were collected from the presentation's committee. The total score for each skill is 10. Lastly, to assess the attitude consorting with blended collaborative knowledge construction activity both from before and after consultation with the advisor, the questionnaire was adapted from Gallegos and Peeters (2011) with eight Likert-scale items supplemented with open-ended questions. This instrument was designed to assess the following attitude and skills: Teamwork, Self-learning, and Social Media's usage. Moreover, all of the instruments have been validated before conducting the experiment.

4.4 Experiment and Implementation

The 70 participants were divided into 35 groups. Each member also has a responsibility to ever process of learning. The Blended CKC' s activity experiment initially started during the first process, seeking for the final paper. From this process, the author can assess attitudes as following: Teamwork, Self-learning. The second, reading comprehension, reading literacy' s assessment in the context of blended CKC' s activity. For instance, online discussion, face to face (f2f) discussion and do their own abstract. From the process mentioned, it could assess the attitude toward social media usage, reading comprehension, and reading literacy skill too. The last process was to assess the presentation and answering skill from teacher's scoring.

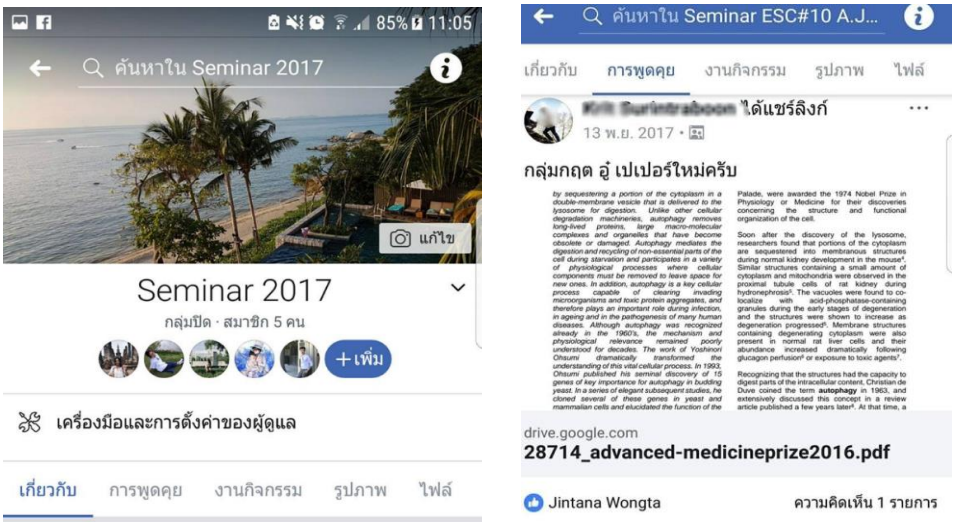

Figure 2. Facebook Closed Group for Student's Online Discussing with Advisor.

Figure 3. The Process of Presentation and Discussion with Peers and Advisor.

According to Figure 2, Facebook closed group picture which created for sharing and discussing among students and advisor in each advisor. This process is a part of the search and finds journal article and Reading comprehension process. Generally, it considered as blended learning through the online and offline channel in ordered that students can construct knowledge from the discussion. Hence Figure 2 express to the Blended Collaborative Construction through the journal reading. For the last process, it was inevitably expressed in Figure 3, the process of presentation and discussion. It considered the last significant process of this study. Students presented their own journal publication's summary in the same time peers and teachers could ask and discuss together. From this process, authors evaluated student's performance from answering score. This figure showed the presentation (13-15 minutes/group) and 30 minutes for discussion and answers to the questions.

5. Experimental Results

5.1 Journal Reading Literacy

Based on the evaluation result of Journal reading literacy in the method of CKC activities, it found that most students perform at the higher score of learning achievement after consulting with the advisor, as shown in Table 2. This implies that student can comprehend the journal publication better after they consulted with the advisor.

To further investigate the reading literacy's result, which was assessed from the abstract' s score, by analyzing the correct structure and paper comprehension. For Table 3, it found that the second draft abstract's average score is higher than the first draft score. Hence the result from reading literacy can express that most participant could get more comprehensive for reading the

journal publication after they consulted with the advisor. Like as the reading literacy result, unsuspecting that student could get more score from the final draft's abstract than the first draft.

Table 2

Results of Journal Comprehension

Experiment	*n*	M	SD	*t*	*p*
Before	70	3.69	0.69	4.97	0.00*
After	70	4.16	0.50		

** $p<0.05$*

Table 3

Results of Reading Literacy

Round	*n*	M	SD
First	70	3.15	0.40
Second	70	3.51	0.38

The last process to construct knowledge collaboratively is the other important process, which expressed to the overall learning achievement. According to the data as shown in Table 4, an average score of presentation skill, and answering skill is 8.03, 7.78. From Table 4, learning achievement can be divided into two categories: Low Performance (LP), and High Performance (HP).

The overall journal reading literacy result implies that students tend to get more comprehensive in reading skill. Moreover, in the case of presentation and answering skill, the number of high-performing students is slightly much more than low-performing students. For the other 25 students could get average performance in presentation skill. Like as answering skill, the number of high-performing students is also slightly higher than low-performing students. Nevertheless, their average score is high.

Table 4

Results of Presentation and Answering Skill

Gender	*n*	Average Presentation Score (M± SD(	Answering Skill (M ± SD)
Male	32	7.87 ± 1.07	7.91 ± 1.07
Female	38	8.09 ± 1.01	7.67 ± 1.08
All	70	8.03 ± 1.03	7.78 ± 1.08

Table 5

Results of Presentation and Answering Skill by Achievement

Group	*n*	Presentation Score (M ± SD(	*n*	Answering Score (M±SD)
LP	20	7.34 ± 0.58	27	6.97 ± 0.52
HP	25	9.08 ± 0.59	33	8.69 ± 0.77

5.2 Skills & Attitude

Based on the questionnaire result about the attitude toward teamwork, and self-learning, we found that the attitude toward teamwork slightly decreased after meeting the adviser, as shown in Table 6, the average teamwork' s score before meeting advisor is approximately 3.69 which' s contrast to the average score after meeting advisor slightly decreased to 3.28. Like as the *p*-value, it implied that the comparative result was significantly different in the

score. Similar to Table 7, the questionnaire results implied that there is no significant difference in Self-learning score between before and after meeting adviser. Nevertheless, according to the attitude's score, it slightly tended to decrease, especially the teamwork. From the comparative self-learning, include the attitude toward technology usage, the author implied that technology and social media is a significant indicator to encourage the student to learn by themselves. Hence, in this case, the advisor has a vital role in encouraging the student to learn through the technology (Blended learning).

Table 6

Results of Teamwork Skill

Experiment	*n*	M	SD	*p*
Before	70	3.69	0.68	0.00*
After	70	3.28	0.64	

** p<0.05*

Table 7

Results of Self-Learning Skill

Experiment	*n*	M	SD	*p*
Before	70	4.24	0.52	0.53
After	70	4.18	0.60	

6. Conclusion and Discussion

This study investigated the effectiveness of Blended Collaborative Knowledge Construction to Preparing Senior High-School Students for Science Project Development through learning, reading, and sharing the understanding from academic journal publication. Taking the seminar course to assess the necessary skills, and attitude toward the seminar course' s learning. In this study, we reported several findings. First, the advisor has an important role to guide and suggest student for learning the seminar course, especially learning the journal's structure, improvising student to self-learning. Second, all student could construct knowledge from each process of learning. For instance, discussing with the advisor, peer-discussion, presentation, and answering. Third, the attitude toward working as teamwork's slightly decreased.

According to the finding, we conclude that self-learning is a vital learning method for the student, in particular, the senior high school student (Hardré et al., 2006). Nevertheless, the teacher also has an essential role in guiding and suggesting students learn by themselves in the context of suggestion, consultant. Moreover, presentation, discussion among teacher and peers encouraged students more confident, and being open-minded (Weegar & Pacis, 2012). From the findings of this study, Blended CKC's activity through the journal reading activity is the other appropriate learning method, which student can both develop every English skill, and researching skill too.

However, the current study has some limitations that should be resolved and improved. First, the number of participants in this study was relatively small; therefore, many participants across different contexts and background would be challenged to study for further generalization of this proposed approach. Second, there are some limitations on teacher's assessment because each teacher did not have a same standard' s scoring. Finally, each student did not have an equal language skill. From the limitation, the teacher scoring' s considered as a critical limitation to assess student performance. From the limitation, author anticipated that the institute would impel to install VDO Conference for discussion online among peers from other campuses.

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