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Enhancing Metacognition through Weblog in Physics Classroom Thai Context

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Abstract: This study examines the effects of using weblog technologies to create argumentative activities and enhance students express the metacognition on the situations' discussion. The Toulmin's diagram of Arguments Pattern (TAP) was adopted to interpret the students' metacognition in Thai rural physics classroom context. The participants were 33 Grade 10 students in the first semester of 2014 academic year, from a rural school in the Khon Kaen province of Northeast Thailand. The finding shows that rural students are very satisfactory to learn through the blog and the blog support them to post the comment for discussion. Their writing express metacognitive awareness, knowledge and control depend on each TAP's coding schema. Consequently, this study provides effective weblog argumentative strategies for enhancing student's metacognition in physics classroom Thai context.

Keywords: metacognition, argumentation, physics weblog

1. Introduction

A weblog (blog) is a web-based technology that is one of the popular web 2.0 teaching tools in this century (Namwar & Rastgoo, 2008). Blog can help to break down the classroom walls and increase students' motivation to learn about science (Barlow, 2008). It is provide both teachers and learners with the ability to extend discussions away from the traditional face-to-face classroom. Blogs provide teachers as a user-friendly online format that can be used to emphasize strategies, introduce new topics, ask questions, review concepts, evaluate for tests, have argumentation and provide enhancement opportunities (Barlow, 2008). Students learn how to share their thoughts and communicate opinions which reflecting on real-world issue through comment on the blog (Duplichan, 2009). In addition, blogs can also give the "silent student" a voice, they are not very comfortable show their ideas in classroom. The blog can offer a "safe place" for their voices to be heard in a lower pressure environment (Luehmann and Frink, 2009). Students felt blog was "fun" and "helpful" and made them interested in using these technologies (Barlow, 2008; Columbo, 2007; & Erickson, 2009). It allows students the chance to take charge of their own learning (Luehmann and Frink, 2009).

Since 2010, The Technology for Teaching and Learning Center, under the Thai Ministry of Education every years training Thai teachers to create blog content through "wordpress" free blog service (URL: http://www.wordpress.com). Anantasook (2014) research study show that the students achievement after learning by using a weblog that applying social media entitle "basic C program language" was higher than before learning at a significance level of .05 and the satisfied of students who learning academic achievement with lesson on the blog in the high level as 4.29 of 5 score and standard based as 0.86. Another study suggests that teaching with lessons on the blog could decrease the differences between individuals. Students can study base on their own or preparing to study before attends in class. They can learn a lesson at anytime, anywhere when they comfortable and they can share ideas with friends via the comments box lessons. These can decrease the problem of students who not dare ask the teacher, answer the question or discussion in the classroom (Sudprakone, 2012).

According to the section 24 of the National Education Act of B.E. 2542 (1999) (Office of the National Education Commission; ONEC, 1999), provide the important idea of learning process, educational institutions shall provide training in thinking process, management, how to face various situations and application of knowledge for obviating and solving problems. The teacher must be aware of the importance of effective strategies for teaching and learning science (physics).

Physics is a scientific subject that is important to study in order to understand phenomena that occur and an introduction before study in higher education (Rosnow & Rosenthal, 1989; Aikenhead & Ryan, 1992). Most students do not like it, they think physics is a difficult subject, difficult to grasp and understand especially on the calculation content. Therefore, it must be improvements in the instructional model for teaching and learning factors that affecting the increase academic achievement. Yuenyong, Jones and Sung-ong (2011) suggested that metacognition is essential tool that supports students' learning physics using higher-order thinking processes and situated cognition ideas are the arguments that show the influence of culture on students' cognitive processes. When students learn how to create a scientific argument that there is a reason able to integration of the thinking skills with specific knowledge related to social issues. Students are able to use better reasoning in the support of the issue manually in order to promote the issues in argument are conflicting (Lin and Mintzes, 2010). They can develop confidence in making decisions in their lives and to participate as a responsible citizen in the social responsibility and democratic (Driver, et al., 2000).

However, from the previous researcher study revealed that Thai students from both urban and rural school are often shy, afraid to argue with friends and are afraid of express their own opinions in classroom. Particularly the students in rural school, they show a few comment and they do not attempt to describe the situation, discussion or arguments by their own. It seems like they lack metacognitive awareness, knowledge and control. From above advantage of weblog to support learning, the researcher interesting to create this technology as a metacognition strategy for enhance argumentative teaching and learning in rural physics classroom under Thai context.

2. Aims of the research

This research study examines the effect of weblog upon enhancing argumentation and metacognition in Thai rural physics classroom context.

3. Methodology

This study concern with qualitative approach, the findings stem from interpretive the students responded; how the effect of weblog upon enhancing argumentation and metacognition in Thai rural physics classroom context. The Toulmin's diagram of Arguments Pattern (TAP) (Toulmin, 1958) were used to interpret the students' metacognition that from six argumentation situations which shown in the comment wall on the blog.

Participants

The sample for the case study consisted of 33 Grade 10 students in the first semester of 2014 academic year that from Dongmon Wittayakom school, a rural small size school in the Khon Kaen province of Northeast Thailand.

Weblog as the instrument

The weblog [http://jirutthitikan.wordpress.com/] which concern in this study was created by the researcher. The objective's blog setting was provided for teaching and learning of argumentation in physics classroom at the force, work and energy Unit. This blog consist of five main menus; (1) Introduction of the Unit, (2) Lesson on the Unit, (3) Argumentation situation, (4) Participants, and (5) Mind Map.

The first introduction the unit menu includes the introduction on the physics area in Thai science curriculum and the objective of learning in the force, work and energy unit. The second lesson on the unit menu that include pre-post test and 6 contents of the force, work and energy unit which student must learn in class that are: : (1) Force and Work (2) Energy, Kinetic Energy, Potential Energy (3) Law of Energy Conservation, (4) Apply Law of energy Conservation, (5) Power, and (6) Mechanical. The third argumentation situation menu, that include six argumentation situations which relevant with six

contents in the previous menu. The fourth participant menu that provide the participant information in this study and the final mind map menu will show students' task after they finish learning the unit.

4. Data collection and data analysis

Five students' groups completed argumentation in the six argumentative questions with their friends. They also express evidence of their conceptual understanding "thinking of thinking" (metacognition) by post or comment discussion. The metacognition on student discussion could found through Toulmin's diagram of Arguments Pattern (TAP) (Toulmin, 1958). It consists of 6 categories that include: Data, Claim, Warrants, Qualifiers, Rebuttals and Backing that shown in Table 1. The interpretive of students' argumentation typically looks at three dimensions of metacognition (metacognitive awareness, knowledge and control).

Table 1: Coding scheme from Toulmin's diagram of Arguments Pattern (TAP)

Discourse Move	Definition
Data	Students can use facts or evidence to prove their argument.
Claim	The statement being argued. Students' principle comment or an assertion made by students' brainstorm in groups. Arguments which are a simple claim versus a counterclaim or a claim versus a claim. Argument which may have several claims and counterclaims.
Warrants	A student has arguments consisting of a claim versus a claim with data, warrants or backings but do not contain any rebuttals. The general, hypothetical (and often implicit) logical, statements that serve as bridges between the claim and the data.
Qualifiers	Statements that limit the strength of the argument or statements that propose the conditions under which the argument is true.
Rebuttals	Counter arguments or statements indicating circumstances when the general argument does not hold true. Sometime students are subject to argumentation displays and extended argument with more than one rebuttal or argumentation has arguments with a series of claims or counterclaims with data, warrants or backings with the occasional weak rebuttal. Although argumentation shows arguments with a claim, with a clearly identify able rebuttal.
Backing	Statements that serve to support the warrants (i.e., arguments that don't necessarily prove the main point being argued, but which do prove the warrants are true).

According to Table 1, TAP reflects the students' thinking that are considered in the metacognition includes: 1) Metacognitive awareness: *students know, use, and can interpret scientific explanations of the methodology of force, work and energy*; 2) Metacognitive knowledge: *students understand the nature and development of scientific knowledge of force, work and energy;* and 3) Metacognitive control: *students can generate and evaluate scientific explanations and arguments of force, work and energy.*

5. Finding and Discussion

The dialogue of students' discussion in six argumentative situations was shown in the blog. The information was then searched to identify episodes of metacognition from dialogical argument. Dialog of the rural students who attend in the discussion or debate comments on various issues of argument on the blog was frequent and there also diverse missed opportunities for giving the quality of the feedback to students. The evidence on all aspects of teaching through blog investigated that the arguments are relied on the use of metacognition for discussion that shown in each component of Toulmin's diagram of Arguments Pattern (TAP) as the following:

5.1 Data (D) Component

The students' comment during weblog learning activities provided the data corpus on the students' argument engagement. Even though, some answer is correct, the claim or explanation of situation is not enough that could be found in the dialogue of the Law of Energy Conservation content in table 2.

Table 2: The dialogue from the comment blog wall about the Law of Energy Conservation content.

Teacher	We are studying the law of energy conservation. This is the question: Throw up an object at the position X vertically until it reaches the highest position Y. Then, the objects drop down to position Z (Figure). Compare the kinetic energy of the object at the position X, Y, and Z? 
Group 1: Student 3	I think Y has Kinetic Energy (Ek)=0 because the velocity (Vy)=0
Group 2: Student 1	I think when the object dropped, its velocity increases until it has constant velocity (V) at the position Z.
Group 3: Student 2	I think the velocity at X is higher than at Z (Vx>Vz) and velocity Y is Zero (Vy=0)?
Group 4: Student 3	I think the highest kinetic energy stay at Z and zero energy at Y.
Group 5: Student 1	I think the lowest kinetic energy stay at Y and Z more than X position

The students' scientific conception, scientific attitude, logic and reasoning come from their daily context and previous experience in the study of self-knowledge. Students usually use the data from textbook and the content on the blog in an argument with friends in the classroom. The teachers motivate students to participate in learning activities using the score as encourages them to raise the learners' concentration in classroom. Therefore, it makes students eager to find out the comment to get the most points.

Data (D) Component and the metacognition

The question and answers are carefully chosen to reflect the relationship between the teacher and students in the physics blogging classroom using "Data" component found that; students have used the fact to prove the comment of argument. The student's uses data which articulate and expand the idea in each comment. They post their ideas from other sources than the main blog to refer to their claim. In this situation, the role of students is very highly use metacognitive awareness, knowledge, control because they had many source of data in order to answer the question.

5.2 Claim (C) Component

In the claim component, students have few claims on all questions because some groups of students tend to agree with the claims of friends. Sometimes they would not dare to claim on their own; students do not want to comment the questions themselves because they fear of giving wrong comments. Some comment like as agree with their friend that rarely show the scientific explanation. Therefore, students will agree with the conclusion that the majority believes in and assert it as the true claim. Sometimes students may have several claims and counter claims. Students can claim by explaining the reasons with data and claims attributed to comment questions. Teachers compared the claims or comments of each group at the end of the argument to conclude which of them is correct. This could be seen in the following dialogue: Apply the Law of energy conservation (table 3).

Table 3: The dialogue from the comment blog wall about Apply the Law of energy conservation content.

Teacher	What kind of energy is the bungee jumper involve in? Describe it at each of the following stages: A. Before Jumping  B. While the bungee cord isn't stretched  C. While the bungee cord is stretched the most 
Group 3	(*Discussion in group*) - I think (A) has only gravitational potential energy of jumper. - I think same too! and then what do you think about B? - Hmm !!! Figure (B) if viewed in the figure B "I think in the first period, gravitational potential energy of jumper is decreased, kinetic energy is increased." Anyone agrees with my idea or not? - I agree it should be possible and figure (C)? Who can explain and how do you know? - Figure (C) "I think this period has the elastic potential energy of bungee cord and gravitational potential energy of jumper. - And then how will you explain about gravitational potential energy. - (C) this period has the elastic potential energy of bungee cord and gravitational potential energy of jumper. Everyone agrees! Ok? Group 3 conclusion (claim) - We're thinking (A) has only gravitational potential energy of jumper, (B) in the first period, gravitational potential energy of jumper is decreased, kinetic energy is increased and (C), this period has the elastic potential energy of bungee cord and gravitational potential energy of jumper.

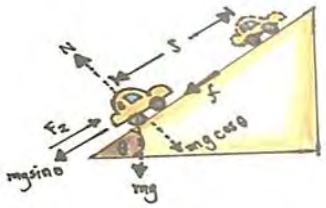
Claim (C) Component and the metacogmition

The questions and answers chosen to reflect on the relationship between teachers and students in the physics blogging classroom using "Claim" component found that; the students' arguments in blogging classroom are interesting. Students comment on each issue with many claims in the force, work and energy content while some groups, students tend to agree with the claims of their friends instead of making claim themselves. As a result, the class mocked or blamed the situation so that the student is the audience more than the claimer. In the dialogs of claim component, students' metacognitive awareness, knowledge and control are very slightly use by owns self. They are flowing groups and teachers more than trust owns self.

5.3 Warrants (W) Component

In the warrants component, when students are into claim and discussion, Students often have evidence for the claim and are used for reliable data to support their comment questions that are about the topic. The students when it is claimed by warrants it consists of reasoning, assumptions and source of comment. Some students are drawing their own on the book and show in class (it is difficult to post the picture in the blog at that time) to warrants their claims or may be more of the comment to other groups. This can be seen from the following dialogue about force and work content (table 4).

Table 4 : The dialogue from the comment blog wall about force and work content.

Teacher	Pushing a toy car on a flat surface (case A) and push it up the slope (case B) with equal speed, distance, and acting force. Which one use more work? And why ?
Group 4	We're think case B cost more work than case A; FB > FA"
	
Group 4 Student 2	A student affirms the claims by drawing (that shown in the figure).

Warrant (W) Component and the metacognition

The questions and answers chosen to reflect on the relationship between teachers and students in the physics blogging classroom using "Warrant" component found that; when students prepare to make claim and discussion, they often have evidence for the claim and use reliable data to support their comments. The students claimed that warrants consist of reasoning, assumptions and source of comment. Some students draw pictures by themselves to warrant their claims. The comment on this physics arguments, most students would agree with or justify, combine ideas organize the discussion. Students' metacognitive knowledge in the warrant component was shown more than metacognitive awareness and control. Student usually used knowledge from their old experience and the teacher teach through a blog to support their reason.

5.4 Qualifiers (Q) Component

The results from six argumentative activities indicated that students use qualifiers that propose the conditions under which the argument is true in physics blogging classrooms rather than propose the limitation of their friend's arguments. In this dialog of qualifiers component, students' metacognitive awareness, knowledge and control couldn't shown metacognition since they are not aware of qualifiers for decide to answer the argumentative question. The students' debate based on their experience and teachers though then they never think of the condition or limitation while discussion in blogging classroom. However, when students need to use picture explanation, they wrote on the book and they could not post on the blog. It could be mention that shown the limitation of arguments via the blog.

5.5 Rebuttals (R) Component

In the rebuttals component, students agree rather than rebut with the hero who can explain or answer questions. Most students who are not proficient enough or have not experience usually consider their friends as heroes without rebuttals. They are maybe afraid to comment because they have that notion that the comment which receives rebuttals is wrong. The student replied that if the comment is wrong, everyone can saw that is a shameful thing for them. This can be seen from the following dialogue about power content (table 5).

Table 5: The dialogue from the comment blog wall about power content.

Teacher	Could you try to solve this problem? The different way to the waterfall at the top of mountain; first is tortuous way and less slope, another is a straight line but more slope. Which way are easy and spent little time?
Group 2 Student 1	I think the first way is easier because it has less inclined slope and uses lesser power.
Group 2 Student 2	I agree with you. Anyone have any answer other than that? *(No comment from other)*
Group 2	Claim that "I think the first way is easier because it has less inclined slope and uses lesser power."

Table 5: The dialogue from the comment blog wall about power content (continue).

Group 3 Student 1	I think the first way is easier and save energy because the driver can slow drive. While the second way need high accelerate for release the high friction force.
Group 3 student 2	I agree with you. Anyone have any answer other than that? *(No comment from other)*
Group 3	Claim that "the first way is easier and save energy because the driver can slow drive. While the second way need high accelerate for release the high friction force."

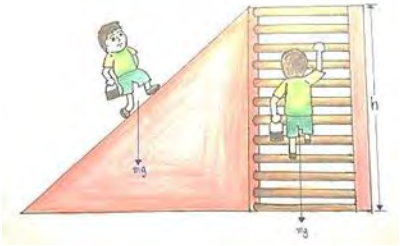
Rebuttals (R) Component and the metacognition

Students rarely make rebuttals to the argument, because most students who are not proficient often wait for ideas from their "hero" friends. They are sometime afraid to comment because they consider an argument that has rebuttals is wrong. The student replied that if the comment is wrong, everyone can seen that is a shameful thing for them and may be they thought that their friends make appropriate explanation. Therefore, students show a little of metacognitive control because they do not like arguments to express their idea, they usually wait scientific explanations from their "hero" friends. However, students who can debate that mean they expressed more metacognitive awareness and metacognitive knowledge which both kind of metacognition appropriate for rebuttals.

5.6 Backing (B) Component

In the backing component, students were subjected for argumentation and had arguments with a series of claims with data, warrants and backings obtained from the references of the theory of energy (kinetic energy and potential energy). Even though reference is a reliable reason to support the comment of them, the most students tend to support ideas from a group of other friends rather than their own comments. Sometime they tend to wait for the hero group started comment and followed it although the answer was incorrect. This can be seen from the following dialogue energy content (table 6).

Table 6 : The dialogue from the comment blog about energy (kinetic energy and potential energy) content

Teacher	A and B carry the basket with the same size and weight. A climbing up the vertical ladder, B climbing up the slope ladder. At the same height, who make higher energy on the basket?  *(After students discussion in their group and start to share with other group)*
Group 2	The energy to carry the basket A and B up to the top have to be equal because they are at the same height level.
Teacher	*(Teacher repeated answer Group 2)* "Group 2 comment that the necessary energy to carry the basket A and B up to the top have to be equal because they are at the same height level" Do you have anything different from group 2 idea?
Group 3	Group 3 agree with Group 2 because energy of the basket A and B are potential Energy (Ep). Due to Ep= mgh the question fix the same m, h, and g, then EpA=EpB
Group 1	Group 1 agrees with group 3 and group 2 because energy of the basket A and B were caused by additive height from potential energy (E_p)
Group 4	Group 4 agrees and support the claim from group 1 because of the equal height and equal weight due to E_p=mgh; E_pA=E_pB
Teacher	Concluded that the questions of A and B on the wall, these two cases are the same height. Energy of the two baskets will both increase equally with the equation mgh.

Backing (B) Component and the metacognition

Students are subject for argumentation and had arguments with a series of claims with data, warrants and backings obtained from the references of the theory. Even though reference that is a reliable reason to support their comments. In this "backing" component, it is found that most students tend to support idea from their friends' group rather than their own. Some students tend to wait for another group makes the comments. Sometime they tend to wait for another group, which is a hero group that usually comments, to give ideas and agree with them. From these situation, it seem like students show a little metacognitive awareness, knowledge and control. They do not attempt to give describe the situation or comment by their own.

6. Conclusion and Suggestion

This research study revealed that learned by weblog which provide the scientific content and the argumentative activities could be motivate students to express their own ideas, opinions on situation's discussion. It expressed the students' metacognitive thinking on the situations that demonstrate on the post wall. The rural students claim on various issues commonly learning in the class. The students claim (C) on the Data (D) and warrants (W) component. Other elements comprise of the rebuttals (R) and backing (B) in which students made was based on their experience and content knowledge from the blog and their teacher. For the qualifiers (Q), students usually do not claim in each contents. In metacognition dimension, students express very highly metacognitive awareness, knowledge and control in the use many source of data (D) for debate. While they had very slightly metacognitive awareness, knowledge and control for claim (C) their ideas. Students' metacognitive knowledge in the warrant (W) component show more than other kind of matacognition. In addition, students who can debate that mean they had metacognitive awareness and metacognitive knowledge for rebuttals (R). However, students do not show metacognition in the qualifiers because they never think of the condition or limitation while discussion in blogging classroom.

Interestingly, students prefer to post the comment for discussion, this maybe they never learn with the blog, learning through blog is the new approach for them. Learning on the blog could encourage students to higher thinking from argumentation and it could reduce the problem from students who not dare ask teacher, they could share the understanding on learning with friends via the comments box lessons. However, sometime they are aware that their comment maybe wrong, that make them more serious and lack the confident before share some ideas on the blog. In addition, the study also reveal that students who learned through the lesson on web blog very satisfactory. They were exciting and funning with learning because lessons' blog are interesting, easy to use and quickly access lessons.

These findings suggest that the teacher can create the scientific content blog within the argumentative activities in Physics for enhancing student's metacognition in Thai context.

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