Ogata, H. et al. (Eds.) (2015). Proceedings of the 23rd International Conference on Computers in Education. China: Asia-Pacific Society for Computers in Education

Thai Urban School Students' Scientific Argumentation in Physics Learning Weblog

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Abstract: This study aimed to enhance Thai urban school students' scientific argumentation through physics learning weblog. The participants included 47 Grade 10 students studying in an urban large-size school, Kaennakon Wittayalai School. This study was done during the first semester of 2014 academic year. The physics learning weblog provided argumentation situations in six sub-units: (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. A qualitative was adopted in this study. Students' expression, discourse, and tasks in physics weblog were collected to examine students' argumentation in physics learning. The Toulmin's diagram of Arguments Pattern (TAP) was used as framework to interpret students' argumentation on weblog. The findings indicated that the physics learning weblog enhanced scientific argumentation. Students could comment or express their ideas. The paper will discuss details of students' argumentation regarding on TAP's coding schema - data, claim, warrants, qualifiers, rebuttals and backing. Implications for effective situation argumentation of weblog in Thai physics context are also discussed.

Keywords: Weblog, argumentation, physics learning, TAP

1. Introduction

The Weblog (blog) is a web-based technology which contains users' comments which could be written from opinions, experiences or observations. A weblog is usually administered by a small group of people and usually displays comments or discussion in a conversational style or other informal formats. They provide individual users with an easy way to publish online and others to comment on these views. Furthermore, there is a suite of secondary applications that allow weblogs to be linked, searched, and navigated. Although originally intended for individual use, in practice weblogs increasingly appear to facilitate distributed discussions. Students learn how to share their thoughts and communicate, opinions which reflecting on real-world issue through comment on the blog (Duplichan, 2009). The weblog could provide students to generate dynamics of the conversation structures and develop their argumentation model (de Moor and Aakhus, 2003). In addition, blogs can also give the "silent student" a voice, the one that 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 is "fun" and "helpful" also 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 Thai Ministry of Education, have organized workshop for training Thai teachers to create blog content through "wordpress" (URL: http://www.wordpress.com); there is increasing science learning blog. This allow students could be able to study a lesson at anytime, anywhere when they are 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)

When students learn how to create a scientific argument and develop rationale behind the arguments. They will be able to integrate their knowledge with the actual problem better. In real life situation, when these students face to the issues, they will be able to apply the skill and apply their knowledge in specific science to solve the issue. Part of argumentation is students be able to develop sensible reason to support their argument. Quality argumentation would be greatly help in solving

issues or conflicts between parties (Lin & Mintzes, 2010). Another important factor is how learning environment is setup. In order to achieve effective result of argumentation, teacher must divide students into small groups. This provides students a higher chance to participate in discussions and develop arguments effectively. There is a correlation between the quality of the student's argument and the ratio of teacher to students in the group discussion (Osborne et al., 2004). In order to provide opportunities of argumentation, students would have more social interaction among themselves, and they are tends to generate ideas until also conclusion is drawn or the problem is solved (Suksringam, 2007).

Argumentation frameworks for multi agent systems can be used for different purposes like joint deliberation, persuasion, negotiation, and conflict resolution. On this research, we are focus on argumentation-based joint deliberation among students learning in classroom. Argument-based onjoint deliberation involves discussion over the outcome of a particular situation or the appropriate course of action for a particular situation in the classroom. Students are capable of learning from experience, in the sense of past examples (situations and their outcomes) are used to predict the situation outcome. However, since individual student experience may be limited, the individual knowledge and prediction accuracy is also limited. Thus, learning students are capable of arguing their individual predictions with other agents may reach better prediction accuracy after such an argumentation process (Ontañón, & Plaza, 2007).

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 also solving problems. The teacher must be aware of the importance in 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 introduction before study in higher education (Rosnow & Rosenthal, 1989; Aikenhead & Ryan, 1992). Most students do not like it, they are thinking 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. When students are learning how to create a scientific argument there are reasonable to integration in thinking skills with specific knowledge related to social issues. They can develop confidence in making decisions in their lives and 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 urban school are scared to claim with friends and scared of express their own opinions in physics classroom. Particularly the students in urban school, they show few comment and they do not attempt to describe the situation, discussion or arguments by their own (Pimvichai et.al., 2015). The question proposed in this weblog is "Do we need scientific argumentation as a concept in learning physics weblog?" From above advantage of weblog to support the learning, researcher interesting in create this technology as a scientific argumentation for enhances argumentative teaching and learning in urban physics classroom under Thai context.

2. Aims of the research

The study aimed to enhance Thai urban school students' scientific argumentation through physics learning weblog.

3. Methodology

This study is concerning with qualitative approach. The authors interpreted students' argumentation about physics learning in the weblog. The Toulmin's diagram of Arguments Pattern (TAP) (Toulmin, 1958) were used to interpret the students' Physics from six argumentation situations which shown in the comment wall on the blog.

3.1 Participants

The participants included 47 Grade 10 students who were studying in an urban big size school (Kaennakon Wittayalai School) in the first semester of 2014 academic year. The school is the urban big size school of Khon Kaen province, northeast of Thailand.

3.2 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 unit menu are 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 six contents of the force, work and energy unit which student must learn in class 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 are included six argumentation situations which relevant with six contents in the previous menu. The fourth participant menu are provide the participant information in this study and the sixth mind map menu will to show students' task after they finish learning the unit.

3.3 Data collection and data analysis

Students' argumentation will be corrected from students' reflection on argumentative situation of the six learning unit and students' discussion. Students' scientific argumentation will be interpreted based on Toulmin's diagram of Arguments Pattern (TAP) (Toulmin, 1958). The TAP consist of six categories that include: Data, Claim, Warrants, Qualifiers, Rebuttals and Backing that shown in Table 1.

According to Table 1, TAP reflects the students' explanations of the methodology argumentation of force, work and energy. Though the elements of a scientific argument (*scientific idea, expectations generated by the idea, and relevant observations*) are always related in the same logical way, in terms of the science process, those elements may be assembled in different orders.

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).

4. Finding and Discussion

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

4.1 Data (D) Component

Students in the urban schools, in terms of reasoning, it was found that students used the data that they already had to make a conclusion. Some groups are answer by using the data on the website to support their conclusion, and also they had fewer counter-arguments with friends than in classroom. In addition, the data from textbooks and website were used to answer the questions, and student tried to encourage friends' discussion by using facts or evidence to prove the argument. In terms of facts and evidence, the researchers found that students rarely used scientific idea, expectations generated by the idea to facts and evidence to support their answers on the weblog. Students in the urban schools illustrated their scientific argumentative in the discussion on the weblog. They raised opinions in the discussion more than they did in the classroom. In addition, they can use facts or evidence to prove argument. It can be seen in the following dialogue: dialogue situation one of the force and work content in table two.

4.2 Claim (C) Component

In the claim component, students in the urban schools are showed high interest in answering questions via the weblog since it encouraged them to express opinions among their friends. Most of them would search for the information from the internet to help their friend come up with the answer. However, some of the students followed and agreed on the conclusion made by the wise students. To come up with a conclusion, students used information from scientific concepts, lessons, reasons, and logic to support their conclusion, as well as making references to the data source or their own experience combined with information from the internet. These shows scientific argumentative in the students since they have knowledge, they are aware of their understanding and able to apply it with the given situations on the weblog. This can be seen in the dialogue about force and work in Table three.

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

NO	Student	Student discussion on weblog (Rural School)
S1 G3	loveyoubaby	Trolling a cart on an inclined plane has more work than on a flat plane because inclined planes require more force.
S2 G3	Ta13052538	Trolling a cart on an inclined plane requires more force which means more work.
S3 G3	T Tod Saramat	Trolling an object on an inclined plane has more work than on a flat plane because it requires more force.
S4 G3	Lee Yon Hwa	Trolling on an inclined plane has more work than on a flat plane because inclined planes require more force.
S4 G3	Lee Yon Hwa	Trolling a cart on an inclined plane has more work than on a flat plane because it requires more force.
S5 G3	Sirimon Didjaroen	I think moving along an inclined plane has more work because we have more force than moving along a flat plane… But I don't know. I think I agree with Lee Yon Hwa.
S5 G3	Sirimon Didjaroen	……. I have no idea. Let's take my friends' answers.
S6 G3	Nakarin	Why not?
S6 G3	Nakarin	I am already in the weblog but my picture didn't display. Well, now let's figure out the answer from our class. What would the answer be? Let's do it!
S4 G3	Lee Yon Hwa	Whatever you guys say, I'm Ok with it.

Table 3: The dialogue from the blog's comment wall about the fore and work content

NO	Student	*Student discussion on weblog (Rural School)*
S1 G3	loveyoubaby	Trolling a cart on an inclined plane has more work than on a flat plane because inclined planes require more force.
S2 G3	Ta13052538	Trolling a cart on an inclined plane requires more force, so it generates more work than flat planes.
S3 G3	T Tod Saramat	Trolling on an inclined plane has more work than on a flat plane because of more force.
S4 G3	Lee Yon Hwa	Trolling on an inclined plane has more work than on a flat plane because inclined planes require more force.
S4 G3	Lee Yon Hwa	Trolling a cart on an inclined plane has more work than on a flat plane because it requires more force.
S5 G3	Sirimon Didjaroen	I think moving along an inclined plane has more work because we have more force than moving along a flat plane… But I don't know. I think I agree with Lee Yon Hwa.
S6 G3	Nakarin	I agree with everyone ;)
S6 G3	Nakarin	You all are very good.
S5 G3	Sirimon Didjaroen	No comment. I'll take you guys' answer.
S6 G3	Nakarin	Why not?
S6 G3	Nakarin	I am already in the weblog, but my picture doesn't display. Let's find the answer. Let's think about it.
S4 G3	Lee Yon Hwa	Whatever you say, I'm ok with it.

4.3 Warrants (W) Component

In the warrants component, when students are into claim and discussion, students often have evidence for the claim and used the reliable data to support their comment questions, which are about the topic. In terms of providing reasons in Physics weblog, it was found that the students in the urban school showed high interest in answering questions via the weblog since it encouraged them to express opinions among their friends. Most of them would search for the information from the internet to help their friend come up with the answer. However, some of the students followed and agreed on the conclusion made by the wise students. To come up with a conclusion, students used information from scientific concepts, lessons, reasons, and logic to support their conclusion, as well as making references to the data source or their own experience combined with information from the internet. This shows scientific argumentative in the students since they have knowledge, they are aware of their understanding and able to apply it with the given situations on the weblog. This can be seen in the following dialogue about fore and work (table four).

Table 4: The dialogue from the blog's comment wall about the fore and work content

NO	Student	*Student discussion on weblog (Rural School)*
S1 G3	loveyoubaby	Trolling a cart on an inclined plane has more work than on a flat plane because inclined planes require more force.
S2 G3	Ta13052538	Trolling a cart on an inclined plane requires more force, so it generates more work than flat planes.
S3 G3	T Tod Saramat	Trolling on an inclined plane has more work than on a flat plane because of more force.
S4 G3	Lee Yon Hwa	Trolling on an inclined plane has more work than on a flat plane because inclined planes require more force.
S4 G3	Lee Yon Hwa	Trolling a cart on an inclined plane has more work than on a flat plane because it requires more force.
S5 G3	Sirimon Didjaroen	I think moving along an inclined plane has more work because we have more force than moving along a flat plane… But I don't know.

		I think I agree with Lee Yon Hwa.
S6 G3	Nakarin	I am already in the weblog, but my picture doesn't display. Let's find the answer. Let's think about it.
S4 G3	Lee Yon Hwa	Whatever you say, I'm ok with it.

4.4 Qualifiers (Q) Component

The results from six argumentative activities indicated that students used qualifiers to propose the conditions under, which the argument was true in physics classrooms. The blogging is rather than proposing the limitation of their friend's arguments. In this dialog of qualifiers component, students' scientific argument in scientific idea, expectations generated with idea, and relevant observations are always related in the same logical way. In the terms of the science process are those elements may be assembled in different orders. Sometimes idea comes first and then scientists looking for the scientific argument, since they are not aware of qualifiers that help them decide the argumentative answer. The students' debate are based on their experience and teachers though they never think of the condition or limitation while discussion in classroom blogging. However, when students need to use picture to explain their claim, they also draw it in the book and cannot post it on the weblog. This is the limitation of argumentation via the weblog.

4.5 Rebuttals (R) Component

In terms of argumentation in the urban schools, it was found that sometimes students made an argument more than one rebuttal because they had different ideas. Their argument contained a series of claims or counterclaims with data, warrants, or backings. Students always made a conclusion with supporting data on physics weblog. Therefore, argumentation shows how they make arguments with a claim and reasons for making rebuttals. This can be seen from the dialogue about power as shown in the Table five.

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

NO	Student	Student discussion on weblog (Rural School)
S1 G4	Yuttapi Chaisomrit	I think Y has Kinetic Energy (Ek)=zero because the speed is zero.
S2 G4	Janita Namsaeng	In the question, we have to compare the kinetic energy and mechanical energy. So, I think Y has the most kinetic energy because Y is on the higher position than X and Z.
S1 G4	Yuttapi Chaisomrit	Could I add more to that? When we throw an object vertically with speed V, the speed of the object will decline and reach 0 on the highest position. What do you guys think? Any ideas?
S1 G4	Yuttapi Chaisomrit	I think Y has less kinetic energy than Z and more kinetic energy than X because it's in the middle of the movement.
S3 G	Lakkana Deesoi	I disagree because I think X, Y, Z has equal kinetic energy because there's no external force involved.
S2 G4	Janita Namsaeng	So, which answer should we take?

4.6 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 energy (kinetic energy and potential energy). Even though references are reliable reason to support the comment of them, most of the students tend to support ideas from a group of other friends, rather than their own comments. Sometime they are tend to wait for the hero in the group started to comment and followed,

although the answer was incorrect. This can be seen from the dialogue about power as shown in the Table six.

Table 6 The dialogue from the comment blog about power content

NO	Student	Student discussion on weblog (Urban School)
S1 G4	Mumin Tk	Normally in our daily life, it's easier to climb zigzag planes, isn't it?
S2 G4	Apisara Tewintarapakti	I think so because it's less steep. No need to change the gear. Hahaha
S3 G4	Kantaphit Boonpromma	I agree with Ying. If it's steep, the engine will work harder. It's like when walk zigzag up the stairs, we get less tired. So, I think going up zigzag planes is easier than steep planes.
S4 G4	Satinee Puangkhum	Zigzag planes would be easier because it is less steep and has less resistance, isn't it?
S3 G4	Kantaphit Boonpromma	So, I think Route 1 would be easier because we get less tired.
S2 G4	Apisara Tewintarapakti	So, the conclusion is that zigzag planes with less steep are easier to climb than steep planes.

5. Conclusions and Suggestions

This research study revealed that learned by weblog which provide the scientific content and argumentative activities could be motivate students to express their own ideas, opinions on situation's discussion. It expressed the students' argumentation and thinking on the situations that demonstrate on the post wall. The 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 on each content. However, students do not show scientific argument in the qualifiers because they never think of the condition or limitation while discussion in blogging physics classroom.

Interestingly, students prefer to post the comment for discussion, and thing that, know, so they can, learn through blog. It 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 get 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, So they make them more serious and get 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 fun with learning because lessons' blog are interesting, easy to use and quickly access lessons.

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

Acknowledgements

This research study was supported by the Higher Education Research Promotion and National Research University Project of Thailand, Office of the Higher Education Commission, through the Cluster of Research to Enhance the Quality of Basic Education.

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