Using Weblog to Promote Critical Thinking – An Exploratory Study

Huay Lit Woo, and Qiyun Wang

Abstract—Weblog is an Internet tool that is believed to possess great potential to facilitate learning in education. This study wants to know if weblog can be used to promote students' critical thinking. It used a group of secondary two students from a Singapore school to write weblogs as a means of substitution for their traditional handwritten assignments. The topics for the weblogging are taken from History syllabus but modified to suit the purpose of this study. Weblogs from the students were collected and analysed using a known coding system for measuring critical thinking. Results show that the topic for blogging is crucial in determining the types of critical thinking employed by the students. Students are seen to display critical thinking traits in the areas of information sourcing, linking information to arguments and viewpoints justification. Students' criticalness is more profound when the information for writing a topic is readily available. Otherwise, they tend to be less critical and subjective. The study also found that students lack the ability to source for external information suggesting that students may need to be taught information literacy in order to widen their use of critical thinking skills.

Keywords—Affordance, blog, critical thinking, perception, weblog.

I. INTRODUCTION

HISTORY in secondary schools in Singapore used to be seen as a subject that has a great body of factual information to remember and its assessment is mostly based on how much factual content that one can recall [19]. Because of this, History has long been regarded as boring and meaningless. In 2003, the Singapore Ministry of Education (MOE) took a great step to review the syllabus and revitalize both the subject content as well as the pedagogic process leading to the new form of assessment.

The new History syllabus for lower secondary level (equivalent to secondary one and two) was officially implemented in the schools in 2006. The new syllabus is a result of MOE's initiatives to integrate the use of Information and Communication Technology (ICT) with the application of thinking skills in an attempt to make learning similar to that of a historian [13, 19]. By emulating the scientific process

H. L. Woo is with the National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616 (phone: 65-67903262; fax: 65-68968038; e-mail: huaylit.woo@nie.edu.sg).
Q. Y. Wang is with the National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616 (phone: 65-67903267; fax: 65-68968038; e-mail: qiyun.wang@nie.edu.sg).

undertaken by a historian, students are taught to source for relevant materials by using ICT tools such as Internet to support historical events rather than being "spoon-fed" for information. They are also required to think critically like a historian to discern facts from opinions with evidence and arguments. In response to this new approach of learning, the assessment procedure is also modified to focus more on development of critical thinking skills in addition to the acquisition of historical knowledge.

The new syllabus calls for teachers to adopt a more student-centred approach and to allow students more space to reflect and take stock of their own learning. The change imposes great challenges to both the teachers and the students because it does not only involve a change in the mindset in terms of teaching and learning, it also concerns how ICT can be incorporated in the pedagogy. Many researchers agree that ICT has a great role to play in facilitating learning that adopts a student-centred approach [2, 6, 9]. Many ICT tools are capable of providing means to promote reflection and collaborative learning which are important ingredients for fostering a critical thinking mind. Weblog is one of such tools that is believed to process the required *affordances* to facilitate the application of critical thinking skills [18, 21, 25]. Affordance is also known to be related to perception of use [15] and the context in which the technological tool such as blog is being applied [26]. Details of affordances will be discussed in the following sections. This paper posits that Weblog or blog should be able to promote students' critical thinking given its provision for reflective writing and social connection but its extent of impact needs to be ascertained through research. This paper is therefore written to answer the question: how can writing weblogs impact students' critical thinking and what is the extent of the impact? This paper will discuss the design, implementation and results of a study conducted in conjunction with the research question.

II. CRITICAL THINKING

The new History syllabus does not give an official definition to critical thinking but provides some indicators such as "making comparisons, analysing and drawing conclusions through an examination of different types of source materials" [13]. This is insufficient as the process of applying critical thinking is certainly more complex and varied. It is vital to provide a suitable definition by operationalizing critical thinking in the context of this study. However, to give a definition to critical thinking has always

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been a perennial problem because critical thinking by itself is a contextual construct [5, 23]. The meaning of critical thinking often depends on values and culture; for example, in some cultures, being critical may be interpreted as "argumentative" or "being critical of others" [10]. While some regard critical thinking as a form of philosophy but others see it as a skill. To give a few examples to illustrate this complexity; Tsui, on page 743 of [22], defines critical thinking from a pedagogic perspective and calls it an ability to "identify issues and assumptions, recognize important relationships, make correct inferences, evaluate evidence or authority and deduce conclusions". Staib from [17], however, cited Paul's definition [16] and refers it to "the art of thinking about your thinking while you are thinking in order to make your thinking better" (p. 643). In addition, Torff [20] sees it as comprising "cognitive skills and strategies that increase the likelihood of a desired outcome…" (p. 37). It can be seen that critical thinking can be associated with ability, art and skill or all of them depending on which contextual perspective that it is derived from.

For the context of this study, it is decided that critical thinking should be identifiable and quantifiable so that it could provide suitable information to answer the second part of the research question (see Introduction) which requires a measure of the extent of impact weblog has on critical thinking. In other words, critical thinking should be defined in such a way that it is measurable. Working from this premise, Newman, Webb and Cochrane's [14] model for analysing online discussion is adopted to provide a framework for defining critical thinking.

The model is chosen because it has a comprehensive list of indicators that can be used to identify the existence of critical thinking characteristics from any piece of writing. It also has a set of coding rules to allow both positive and negative criticalness to be taken together into consideration. The detailed description of the indicators is given in Appendix 1 but for discussion purpose, the categories of critical thinking characteristics are extracted and presented below:

Ten Categories of Critical Thinking Characteristics (adapted from Newman, Webb & Cochrane, 1996):

1. *Relevance (R)*
2. *Importance (I)*
3. *Novelty (N)*
4. *Outside knowledge/experience (O)*
5. *Ambiguities (A)*
6. *Linking ideas (L)*
7. *Justification (J)*
8. *Critical assessment (C)*
9. *Practical utility (P)*
10. *Width of understanding (W)*

The list above shows that characteristics of critical thinking are grouped into ten categories. Each category has both positive and negative indicators for coding the prose given in a student's blog post. For example, under *Relevance* (R), when "relevant statements" are detected to support an argument, it will be coded as R^+ which indicates a positive criticalness. On the other hand, when "irrelevant or diverse

statements" are found, then it will be coded as R^- which means a negative criticalness. With this coding system, a person's net criticalness for a particular critical thinking characteristic can be determined by working out the algebraic sum score of the number of R^+ and R^-. But when this net criticalness is compared to the total number of critical statements made for a particular characteristic, then another measure called the *Critical Thinking Ratio* (CT) will be more appropriate. This value is calculated by taking the ratio of the difference of positive and negative criticalness to the sum of positive and negative criticalness (see Marra, Moore, & Klimczak, 2004). That is, if x^+ represents the number of positive critical statements and x^- represents the number of negative statements, then

$$CT = \frac{(x^+ - x^-)}{(x^+ + x^-)}$$

CT can range from -1 to +1. The greater the positive ratio, the more critical the thinking is. Following the concept used in Newman's et al. model, critical thinking for this study is operationally defined as "a habit of mind that is manifestable by the indicators in Newman's et al. model and the extent of it is measured by net criticalness or the Critical Thinking Ratio (CT)".

III. WEBLOG

A weblog is a public domain web-based journal published in reverse chronological order. Most weblogs contain not only the web journal called the post but also allow hyperlinks, pictures or videos to be embedded in the posts and has a feature for readers to send their comments directly to the author or reply via email [8]. In other words, blogs work like a webpage to update readers on information [11] but also possess the ability to reach out to the readers for feedback. Weblogs offer a two-way communication platform that connects the author to the public and vice versa. This helps to facilitate the process of writing and rewriting through collaborative learning which is a way known to be helpful in fostering critical thinking [22].

Another advantage for writing weblogs is that blog posts are searchable using search engines; therefore bloggers who want their blogs to gain readership must first gain popularity so that their blogs can be highly ranked in the search results. For this, there is a likelihood that serious bloggers would put in effort to deliver credible blog contents [1]; this means bloggers are encouraged to be more critical in their views and be more reflective in their writing.

One more advantage deriving from blogging is that a weblog is designed for self-expression; it is likely to engender stronger ownership and accountability because blogs reflect the character of the owner. Feedback and public views may be critical for some bloggers who want to uphold their image in the cyberspace. Hence, regular evaluation and reflection on their blogs may become necessary which in turn, can cause a blogger to adopt a more critical attitude when handling the feedback and comments from the readers [25].

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The above advantages suggest that a weblog possesses many useful features that can be used as an educational tool to facilitate learning, in particular, the aspect of critical thinking. But features of a tool like weblog and learning outcome resulting from the tool do not always form a direct causal relationship. In fact, the relationship is less straightforward as pointed out in the Theory of Affordance. Affordance, premised on perceptivity of users, provides a useful framework for designing learning environments that incorporate technical tools. The next section provides a detail elaboration on what affordance is and how it applies to the study of this paper.

IV. AFFORDANCE

Affordance is a term first introduced by Gibson in the seventies. Its main tenet is to provide a relationship between perceptibility of an artifact (tool) and the action resulting from this perceptibility from an ecology perspective [3]. The concept has since been used in many fields including educational technology and extended to include effects of using the tool which is termed *effectivity* [7]. Wallace [24] sees a connection between knowing technology and using technology. She associates the former as the affordance of technology and the latter as the Pedagogical Content Knowledge (PCK). PCK is unique knowledge possessed by an experienced teacher to skillfully and meaningfully integrate the content of a lesson with appropriate pedagogies to achieve effective learning. Affordance, in a similar manner, is a unique provision by technology that when used appropriately, would allow the features of a technological tool to be integrated with the learning process to actualize desirable learning behaviour. In Wallace's view, the affordance of technology (or a technological tool) must be weighted carefully against the tasks designed for the learning. In other words, the key tenet in Wallace's view is the interaction between the technology and the learner. The technology-learner relationship is further extended to include the context of learning in John and Sutherland's [7] paper. Context, in a way, can be influential in determining the technology-learner relationship because context tells not only the conditions for learning but also the background of these learning conditions. Knowing the context therefore helps a teacher (designer) to plan a realistic learning environment and adopt a more practical attitude on the choice of tools and the types of activities. The concept of affordance when used with technical tools can be described with the help of a diagram shown in Fig. 1.

Fig. 1 shows that the affordance of a tool must begin with a context and all activities must take place under this context. The diagram starts with a user being offered a (technical) tool in such a context. In the framework of affordance, the tool only offers opportunities for the user to use and whether the user will use the tool in a way that is designed for (if the tool is an artifact) will depend on the user's perception of the tool within the context which in turn is determined by the user's culture, social setting, experience and intentions of use [4], 1991). If the user sees usefulness in the tool through his/her own interpretation, the user will use the tool (resulting in an

action) in a way that he/she deems right. If such an action results in behaviour that is expected of the design, then effectivity is said to have achieved and the tool is regarded as having successfully facilitated the achievement of the desired outcome. If not, it is likely that a mismatch occurs between the design of the tool and the actual use of the tool. This is probable because in most cases the designer of the tool is not the user and thus could not share the same perception of the user in terms of how the tool is supposed to be used. Therefore, it is important that designers make provisions to ensure the usage of the tool is easily perceptible to the user. This can be done by either exposing the users to some pre-use training or include only familiar features of the tool to encourage usage. This is so because people tend to favour tools that they are accustomed to. The line of thought described in the affordance framework will be used to frame the design of this study.
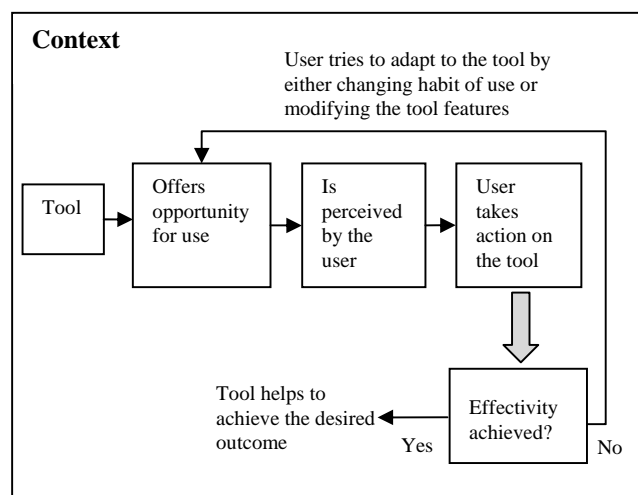

Fig. 1 Diagram to explain the application of affordance on use of tools

V. METHODOLOGY

This study is designed to examine how students could develop their critical thinking skill for the subject History by writing weblogs. It also attempts to determine the extent of the critical thinking that weblogging may produce. Forty-one secondary two students from a neighbourhood school took part in the study. A neighbourhood school in Singapore is a school that serves mainly the students who live near the school. It may be seen as equivalent to a public school in the Western educational systems. The school is a medium-size school which adopts a standard educational system recommended by the Singapore Ministry of Education (MOE). History is a newly revamped secondary two subject which emphasizes that History learning should follow the process used by a historian. Briefly, the process includes sourcing evidence, discriminating facts from hearsay, identifying gaps in arguments, providing justification and offering viewpoints and opinions. The learning process is pivoted on sound critical thinking and good writing. For this, the History textbook makes use of ill-structured questions to assess students' understanding. As a result, students can no

longer use the old method of regurgitation but to apply critical thinking to these questions. This study hopes to perpetuate the habit of critical thinking by providing the students the weblog as an education tool – a tool that hopefully will invoke usage and result in effectivity.

A. Design of the Study

The study is designed based on the concept of affordance given in Fig. 1. According to affordance, a weblog only affords the students the opportunity to write their reflections. To have students carry out the activity desirably, they must first understand the context of learning. The students were told that the weblog writing is an integral part of their regular assignments. This means that weblog writing is not an additional assignment but it merely replaces the traditional hardcopy writing with a digital input. Although minimizing changes could help to reduce negative perception about the use of a new tool, writing weblog for assignments is still a very new experience to many and can generate uneasiness among some students. To minimize this possibility, the students were given a session of weblog training and hands-on practice prior to their blogging assignments. In the training, students were introduced the correct ways of using weblogs to write and post their articles including writing comments to provide feedback to a blog post. But such provision is only confined to the technical aspects of writing; students were not taught anything pedagogical including using thinking skills. For encouragement, the students were also shown how their blogs may be customized to their own favourable looks by using pre-made backgrounds called "skins". The training session hopes to engender a correct perception to the use of weblogs in conjunction with the History assignments. According to Fig. 1, this helps to encourage usage of the tool (action) and in turn effects desirable thinking behaviour (effectivity).

The habit of critical thinking cannot be acquired overnight. And also blogging is essentially a reflective process and a medium to communicate with the readers and vice versa. All these take time. To allow students sufficient time to think and reflect before they blog and for others to provide feedback, the study provided three topics for the students to blog over a six-week period. Each topic and the blogging exercise took a fortnight to complete.

B. Implementation

To have students systematically post their blogs and comment on their classmates' postings, the class is divided into ten groups. This means that there were nine groups of four and one group of five. In the first week, the teacher taught a History topic and assigned a blogging topic. The topics and their characteristics are given in Table IA. The blogging topics did not have straightforward answers and usually required students to provide reasons for a decision. Each student in a group was to research on the topic individually and then wrote their answers in the form of a blog and posted it by the end of the week. The posts were then reviewed and commented by fellow groupmates by the end of the second week. Each student was to make at least one comment from the posts in their group (see Table IB). In the

third week, the teacher again taught a second topic and the process repeated, that is, the students in every group blogged a new topic assigned by the teacher and provided comments to their groupmates by the end of the fourth week. The process went on for another round for a third topic in the fifth week and blogging ended in the sixth week.

TABLE IA
BLOGGING TOPICS AND TOPIC CHARACTERISTICS

Week	Topic for blogging	Characteristics of the topic
1	Topic one: Who really "founded" Singapore?	Much of the information can be found in the textbook. Answer not restricted to one choice.
2		
3	Topic two: The national museum intends to erect a statue in front of its entrance. It cannot decide whether the statue should be of Stamford Raffles or Tan Tock Seng. If you were the representative of the museum, who would you choose and why?	Limited information can be found in the textbook. Students must make a choice based on the given context in the topic.
4		
5	Topic three: Did the industrial revolution change the way people live and work for the better or the worse? Explain your answer.	Much of the information can be found in the textbook but students must make a choice based on the context of the topic. It has characteristics of both topic one and two.
6		

TABLE IB
STUDENTS' WEEKLY BLOGGING ACTIVITIES

Week	Students in each group to blog individually?	Groupmates to provide feedback or comments?
1	Yes	
2		Yes
3	Yes	
4		Yes
5	Yes	
6		Yes

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At the end of each fortnight, that is, week 2, week 4 and week 6, the contents from each student's blogs were transferred out for data collection and analysis.

VI. DATA COLLECTION AND RESULTS

The platform for students to post and manage their weblogs is Blogger (http://www.blogger.com). Each student needs to register for an account with Blogger. This allows each student to own a private blog address which is only known to their groupmates. The blog address looks like this: http://XXX.blogspot.com where XXX is the student's name. With the blog address, the student's blog for every topic can be retrieved and analysed.

A sample of a student's weblog for topic two is given in Fig. 2.

Reflections 2

The National Museum has decided to erect a statue in front of its entrance and they have to choose between Sir Stamford Raffles and Tan Tock Seng.If you were working for the museum, who would you choose and why?

I would most likely choose to errect Tan Tock Seng. Yes, Raffles did do a great number of things for Singapore, and he is well known as the founder of Singapore by most Singaporeans. Many of us would recognise this name; Tan Tock Seng Hospital. But how many of us really know what Tan Tock Seng did for us?

Tan Tock Seng arrived in Singapore in 1819. He founded a pauper hospital in Pearl's Hill which he took in many immigrants, whom which he didn't even know, and took care of them. Considered the richest man and entrepreneur in Singapore at that time, he donated a considerable amount into buying medicine and health care products for these patients.
Being a devoted Taoist, he believed that everyone should have a proper burial when they die. He paid for the funeral expenses for those families that could not afford it. Considering that he didn't know most of these people, this act of kindness earned him a great deal of respect from fellow Singaporeans.
He was also the first Asian to be accorded the title Kapitan of the Hokkien Clan. He was a great leader and helped in settling problems and disputes in the Chinese community.
Tan Tock Seng took money from his own pocket to help the poor and the sick. He was willing to pay for decent burials for people he didn't know. He showed great leadership in leading the Chinese community. Tan Tock Seng has done a great number of good things for the poeple in Singapore. I think that Tan Tock Seng deserves far more respect than anyone of us gives him.
I choose Tan Tock Seng as he should have the recognition of a great man.
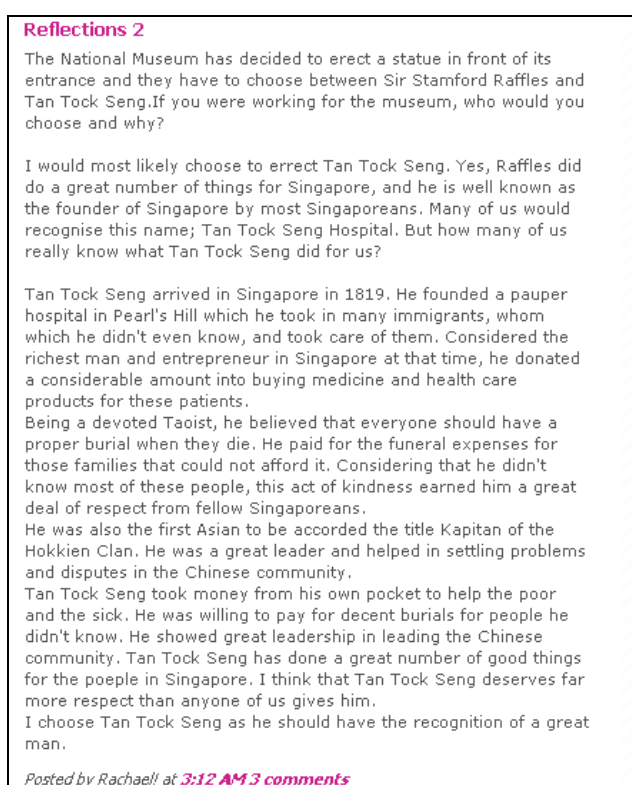
Posted by Rachaell at 3:12 AM 3 comments

Fig. 2 Screen capture of a student's weblog for topic two

The data collection is done at the end of every blogging exercise. Blog posts from the three topics collected from every student are coded according to Newman's et al. critical thinking indicators. That is, when a statement or sentence matches the descriptions of the indicator, it will be labelled using the codes given in Newman's et al. model. For example, if a statement making a claim that is obtained from external sources; it will be coded as "O+" which means a manifestation of critical thinking under the category "Bring outside knowledge or experience to bear on problem".

All categories of critical thinking detected and their corresponding number of occurrence are tabulated and given in Table IIA to Table IVB.

TABLE IIA
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF POSITIVE CRITICAL THINKING FOR ALL STUDENTS FOR TOPIC 1

Critical Thinking Category	N+	A+	R+	O+	L+	J+	I+	Total
Sub-Total	1	13	39	130	0	19	0	202
% Score	0.43	5.60	16.81	56.03	0.00	8.19	0.00	87.06
Importance	N.I.	4	2	1	N.I.	3	N.I.	
CT	-0.50	0.53	0.95	0.98	0.00	0.31	-1.00	

Note: N.I. means "Negligible and Ignored"

TABLE IIB
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF NEGATIVE CRITICAL THINKING FOR ALL STUDENTS FOR TOPIC 1

Critical Thinking Category	N-	A-	R-	O-	L-	J-	I-	Total
Sub-Total	3	4	1	1	0	10	11	30
% Score	1.29	1.73	0.43	0.43	0.00	4.32	4.74	12.94
Importance	8	7	N.I.	N.I.	N.I.	6	5	
Total % of negative criticalness = 12.94								

Note: N.I. means "Negligible and Ignored".

TABLE IIIA
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF POSITIVE CRITICAL THINKING FOR ALL STUDENTS FOR TOPIC 2

Critical Thinking Category	N+	A+	R+	O+	L+	J+	I+	Total
Sub-Total	5	0	53	72	1	16	0	147
% Score	2.65	0.00	28.03	38.10	0.53	8.47	0.00	77.78
Importance	8	N.I.	2	1	N.I.	3	N.I.	Total
CT	-0.23	-1.00	0.93	0.97	1.00	0.23	-1.00	

Note: N.I. means "Negligible and Ignored".

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TABLE IIIB
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF NEGATIVE CRITICAL
THINKING FOR ALL STUDENTS FOR TOPIC 2

Critical Thinking Category	N-	A-	R-	O-	L-	J-	I-	C-	Total
Sub-Total	8	3	2	1	0	10	12	6	42
% Score	4.23	1.59	1.06	0.53	0.00	5.29	6.35	3.17	22.22
Importance	6	9	10	N.I.	N.I.	5	4	7	
Total % of negative criticalness = 22.22									

Note: N.I. means "Negligible and Ignored".

TABLE IVA
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF POSITIVE CRITICAL
THINKING FOR ALL STUDENTS FOR TOPIC 3

Critical Thinking Category	N+	A+	R+	O+	L+	J+	I+	Total
Sub-Total	0	3	36	103	0	21	0	163
% Score	0.00	1.60	19.26	55.08	0.00	11.23	0.00	87.17
Importance	N.I.	6	2	1	N.I.	3	N.I.	
CT	0.00	0.20	0.95	0.98	0.00	0.35	-1.00	

Note: N.I. means "Negligible and Ignored".

TABLE IVB
BREAKDOWN OF OCCURRENCE FOR EACH CATEGORY OF NEGATIVE CRITICAL
THINKING FOR ALL STUDENTS FOR TOPIC 3

Critical Thinking Category	N-	A-	R-	O-	L-	J-	I-	Total
Sub-Total	0	2	1	1	0	10	10	24
% Score	0.00	1.07	0.53	0.53	0.00	5.35	5.35	12.83
Importance	N.I.	7	N.I.	N.I.	N.I.	*4	*4	
Total % of negative criticalness = 12.83								

Note: N.I. means "Negligible and Ignored".
* Refers to the figures are tied and are ranked equally. This causes ranking 5 to skip.

Because this study is exploratory in nature, it was not too certain what kind of blogging topic is suitable for engendering critical thinking. In particular, the topic chosen must also follow the guidelines from the History syllabus. After consulting the Head of Humanistic Studies (HHS) of the school and the History teacher of the class, topic one was formed (see Table IA) and was assigned to the students in week 1.

A fortnight later, students' weblogs were collected and analysed. Based on the analysis, it was observed that students'

critical thinking seem to form a certain pattern (see Table IIA). Their critical thinking appeared to congregate around three thinking traits: "bringing outside knowledge (O+)", "related it to the argument (R+)" and "use it to justify viewpoints (J+)" with respectively CT ratios 0.98, 0.95 and 0.31.The initial response to such a finding was that the students' way of critical thinking could probably be related to the nature of the topic itself. The reason, as posited, could be that the topic only asked "who" the founder of Singapore is which, by any frame of mind, would imply identifying who fits the meaning of "founder". Because of this, most students turned to the textbook for supporting evidence where the information was readily available (refer to Table IA "Characteristics of the topic"). The textbook, indeed, provided easy access for information and did not encourage diversity. This could have resulted in the limited use of critical thinking skill and hence the congregation. Although the result obtained was not quite desirable, it provided a useful experience for crafting the next blogging topic and more importantly, it appeared to indicate a relationship between the type of topic given and the kind of critical thinking employed by the students; in other words, the corollary of such finding is that critical thinking may be something that could subject to "manipulation" by altering the requirements of the topic.

For topic two, this study hopes to see an improvement by having a wider spread of criticalness in the students' blog posts. Again the HHS and the History teacher were consulted and a second topic was produced (see Table IA). The second topic, unlike the first one, had its question set in a context in which students had to make a decision between two given choices. The new topic used two well-known persons but whose backgrounds were not readily found in their textbooks. This was to compel students to think beyond the given knowledge and hopefully, they would employ more of the other thinking skills in their answers.

The data from the second topic were collected after week 4 and analysed to see if a new critical thinking pattern would emerge. Within reasonable expectations, the results yielded a considerable wider range of critical thinking traits despite having the same concentration of O+, R+ and J+ (see Table IIIA). It also produced more negative criticalness than before, something not quite within what was planned (Table IIIB). However, the results again seem to reaffirm the proposition that "critical thinking may be manipulated". Another point to note is that in topic one, only 8 critical thinking traits (including both positive and negative criticalness in Table IIA and IIB) were found to be significant (see the row labelled as "Importance") but in topic two, 10 critical thinking traits were shown to be significant (see Table IIIA and IIIB). One new negative critical thinking trait "C-" with 3.17% score was detected. "C-" indicated that students accepted others' viewpoints without due criticalness. This could be a result of not able to use information available from ready source such as the textbook to rebut or judge the viewpoints stated by the others.

For topic three, the study needed to work out if it was to replicate the characteristics of the previous two topics. Topic one encouraged students to use information from the textbook which appeared to result in limited criticalness. Topic two

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required students to compare by using external sources resulted in a wider range of criticalness but produced more negative critical thinking as well. It was decided that topic three would be one that combined the strengths of both topic one and two. Hence topic three was to inherit the characteristics of its predecessors and allow students to use textbook information but retained the need to compare and contrast information in order to make a decision.

The result from topic three was collected in week 6. It produced a very similar pattern as for topic one (see Table IVA). With O+, R+ and J+ continue to be the three domineering critical thinking traits (CT ratios are 0.98, 0.95 and 0.35 respectively). Its negative criticalness, totalled to 12.83%, also compares closely with that from topic one which is 12.94%. Interestingly, the negative critical thinking trait "C-" disappeared when textbook information was made available again. This seems to affirm the belief that "C-" is the result of not able to use available information to rebut or judge viewpoints of others critically. The close resemblance in critical thinking traits from topic one and three; also the close resemblance in making textbook information available in these two topics allow one to suggest that information availability has an effect on the habit of thinking. It is also observed that when information becomes unavailable, students' criticalness becomes compromised. As a result, most students resort to personal judgment without objectivity.

VII. DISCUSSION AND IMPLICATION

Since the preliminary data obtained above suggests that students' pattern of critical thinking could be influenced by the nature of the topic, there is a need to look further how the answers provided in the students' blogs can affect such relationship. The following is a discussion on how a topic affects students' answers and how these answers in turn affect their criticalness.

For topic one, there are basically three types of answers students produced: one that tried to explain by providing a definition of the term "founder" (see Table IA) which most called it "someone who start or establish a business, organization or a country". The second type of answer is one that used "who actually managed Singapore" as their basis of reasoning and the last type of answer is clichéd answers from those who offered no justification but simply used gut feeling. Quite expectedly, those who used the first two types of argument scored higher in criticalness. Students who used the definition as a basis to substantiate their arguments are considered as "bringing relevant outside knowledge to bear on the issue" (see Appendix 1) and hence they scored well in O+ and R+. For those who used "who actually managed Singapore", they provided "a criterion for justification" and they therefore scored more in J+. With these two types of answer, they explain why O+, R+ and J+ are the top three critical thinking traits for topic one. For others who used their own gut feelings for their answers, they are the main contributors to the negative criticalness. Notice that the top three critical thinking characteristics totalled up to a whopping 81.03%. As for the others, the fourth most significant critical thinking skill is "clarifying ambiguities (A+) which took

another 5.60%. The remaining percentages came from negative criticalness which gives an overall of 12.94%. Some critical thinking traits like R- (provide irrelevant statements) and O- (sticking to prejudice or assumptions) have very small contribution, only 0.43% for both and are insignificant for any practical consideration. Hence they are labelled as "Negligible and Ignored" (N.I.). In sum, based on the types of topic given and the types of criticalness obtained, it seems to show when the topic allows a free flow of ideas to make up an argument, most students would prefer to solicit ideas from the textbook to substantiate their arguments. In other words, their criticalness is based on the relevant information available from the textbook.

For topic two, the type of answers can be broadly classified into two categories: one that argued by the notion of fairness which is justified by arguing that Stamford Raffles has already got a good number of statues named after him, it would only be fair that Tan Tock Seng who also has contributed to Singapore be also given a statue. The other category of answer however, is less concerned with statue number and argued on the grounds of humanitarian. They saw saving lives as more tangible than other economic benefits. They argued that personal well-being was utmost important in the early days of Singapore which was often hit by poverty and health problems. Using this as a yardstick to evaluate contribution, this group of students felt that Tan Tock Seng should be given the statue.

Though the viewpoints offered by both categories of answers demonstrated criticalness (total positive criticalness contributed by both categories is 77.78%), interestingly those who argued on the grounds of humanitarian are themselves less critical; they make up 13.20% (out of the total 22.22%) of negative criticalness as compared to those who argued on existing number of statues who show only 9.02% of negative criticalness. Perhaps, it is not easy to dissociate humanitarian with personal feeling especially for students at their teen age. Indeed, more than 65% of the students chose to erect Tan Tock Seng for the statue and close to 90% from those 65% used humanitarian as a reason. This may suggest that criticalness is not an invariant construct but amenable to individual's predisposition such as the belief in humanitarian.

Another unique observation obtained from this episode of blogging is that students seem to retain their habit of thinking by applying the same three types of critical thinking skills despite that the topic no longer allows them to obtain information from the textbook. The three consistent critical thinking skills are: O+ (38.10%), R+ (28.03%) and J+ (8.47%). However, beyond this consistency, students appeared to lose most of their criticalness and argued solely from their personal viewpoints. This is seen from the high percentage of negative criticalness deriving from I- (6.35%), J- (5.29%), N- (4.23%), C- (3.17%), A- (1.59%) and R- (1.06%). Notice that these results produced two findings: (1) there is a wider spread of criticalness across all the different indicators. In topic one, there are only eight significant contributors but in topic two, there are 10. (2) there is one more negative critical thinking characteristic detected, this negative critical thinking is C- which means "accepting viewpoints from the others without any critical assessment".

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These two points have already been mentioned in the previous section. For topic two, the total negative criticalness computed is 22.22%, nearly twice as much as that from topic one with only 12.94%.

From the data analysis, the higher negative criticalness seems to suggest that when a topic fails to allow students to use information directly from the textbook, students tend to resort to other means of information but fail to assess the information critically before applying it to their arguments. This could imply that students may need extra coaching or training in applying critical thinking skills on both incoming and outgoing information. This means that they need the skills for "sieving" incoming information critically as well as for presenting outgoing information critically.

For topic three, the types of answers were more uniform. Almost all use "industrialization brings in more jobs and trades" as the cause and "more business means more jobs and better lives" as the result in their arguments. This shows that most students are able to link industrialization from the past to the benefits they obtained at present time. They did this by using the information from the textbook to substantiate their choices. Perhaps the third topic produced the same kind of setting as the first which motivated students to adopt the same kind of approach to manage their answers and hence the similar thinking pattern observed. Statistically, this similarity is given by their close positive criticalness (87.06% vs 87.17%) and negative criticalness (12.94% vs 12.83%) with the first figure in the brackets representing "% score" for topic one and the second representing the same for topic three.

In sum, it seems plausible to say that availability of information is a crucial factor in producing the types of critical thinking students use. Topic one and three are similar in terms of providing source of information (from the textbook) but differ in question requirements but yet they produce a very similar critical thinking pattern. This shows that demand of topic may not change the students' habit of thinking but the availability of information does. This is also justified by the change of thinking pattern from topic two when the availability of information is removed. Information unavailability also results in more negative criticalness implying that students would need extra coaching on how to apply critical thinking skills on externally available information.

In conclusion, the findings provide good justification to believe that students do apply critical thinking skills in writing their weblogs and by doing so, their critical thinking can be improved over time and hence weblog has the potential to help promoting students' criticalness.

However, the claim is made on the basis of overall observation; there are other aspects of interaction such as the comments made by the students' fellow groupmates during the blogging process which are not included in the analysis of this study but could have caused an influence in the students' thinking. Also, it is not sure if interest for blogging can be sustained for longer period in the same manner - students' enthusiasm can wane off if the activities were to repeat without change. All these are issues which future research could help to address.

APPENDIX 1

NEWMAN, WEBB AND COCHARANE'S CRITICAL THINKING INDICATORS
(REPRODUCED FROM NEWMAN ET AL., 1996)

Category		Positive Indicator		Negative Indicator
R±	Relevance	R+	Relevant statements	R-	Irrelevant statements, diversions
I±	Importance Unimportant, trivial			I+	Important points/issues I- points/issues
N±	Novelty; new info, ideas, solutions	NP+	New problem-related information	NP-	Repeating what has been said
		NI+	New ideas for discussion	NI-	False or trivial leads
		NS+	New solutions to problems	NS-	Accepting first offered solution
		NQ+	Welcoming new ideas	NQ-	Squashing, putting down new ideas
		NL+	Learner brings new things in	NL-	Dragged in by tutor
O±	Bringing outside knowledge or experience to bear on problem	OE+	Drawing on personal	OQ-	Squashing attempts to bring experience in outside knowledge
		OC+	Refer to course material	O-	Sticking to prejudice or assumptions
		OM+	Use relevant outside material		
		OK+	Using previous knowledge		
		OP+	Course related problems brought in (e.g., students identify problems from lectures and texts)		
		OQ+	Welcoming outside knowledge		
A±	Ambiguities: Clarified or confused	AC+	Clear, unambiguous statements	AC-	Confused statements
		A+	Clear up ambiguities	A-	Continue to ignore ambiguities
L±	Linking ideas, interpretation	L+	Linking facts, ideas and notions	L-	Repeating information without making inferences or offering an interpretation
		L+	Generating new data from information collected	L-	Stating that one shares the ideas or opinions stated, without taking these further or adding any personal comments
J±	Justification	JP+	Providing proof or examples	JP-	Irrelevant or obscuring questions or examples
		JS+	Justifying solutions or judgments	JS-	Offering judgments or solutions without explanations or justification
		JS+	Discussing advantages and Disadvantages of solution	JS-	Offering several solutions suggesting which is the most appropriate
	without				
C±	Critical assessment	C+	Critical assessment or evaluation of own or others' contributions	C-	Uncritical acceptance or unreasoned rejection
		CT+	Tutor prompts for critical evaluation	CT-	Tutor uncritically accepts
P±	Practical utility (grounding)	P+	Relate possible solutions to familiar situations	P-	Discuss in a vacuum (treat as if on Mars)
		P+			Discuss practical utility of P- Suggest
	impractical solutions		new ideas		
W±	Width of understanding (complete picture)	W+	Widen discussion (problem within a larger perspective. Intervention strategies within a wider framework)	W-	Narrow discussion. (Address bits or fragments of situation. Suggest glib, partial, intervention)

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