



The Use of WebQuest as a Constructivist Learning Tool in Secondary School Geography in Singapore

Chang Chew Hung

National Institute of Education
Nanyang Technological University
1, Nanyang Walk, Singapore 637616.
E-mail: chchang@nie.edu.sg

Keywords: WebQuest, Constructivist Learning, Geography

Abstract

Educational practitioners often assume that students will be more motivated, learn more effectively and attain higher-order learning outcomes when they learn on the web, but little empirical evidence exist to confirm this. This study investigated how the student (subject) interacted with the web (tools) using WebQuest in the learning process (production) to generate the observed learning outcomes (object), involving the views of teachers as stakeholders (community) and the way the students worked in a group (division of labour) within the framework of an activity system. In essence, an adaptation of the Wolcott (1984) conception of a quasi-ethnography was used as the constructivist methodology for this study. The students appeared to be motivated by a number of factors including the presence or lack of intrinsic motivation for the subject matter, grades and marks as well as motivation arising from the use of the web itself. The teachers felt that there was a general lack of self efficacy. The web was a source of frustration and has a negative influence on motivation too. Four main issues arose out of studying the students' interaction with the web, including search strategies, media richness of web pages, web distractions and technical constraints. Students' information search strategies on the web tend to be more novice than expert; more aptly described as starting and chaining than browsing or differentiating using Ellis' (1993) terminology. The web also acts as a source of distraction other than its primary role as a tool. Further, when the students did not seem to be distracted, frustration and hence apathy was more due to the slow bandwidth of internet which in turn affected the students' interests. Apart from the five elements in Johnson and Johnson's (1999) learning together model, time constraint was also an important factor determining the groups worked together. The high amount of extra-curricular activities after school limits the opportunities for students to meet for their information search and group processing. Although both teachers and students have claimed that they have been taught and are familiar with the processes of working in a group, the five elements were lacking in all observations. In terms of



observable learning outcomes, the teachers feel that the students were only able to recall information. However, the students were able to demonstrate to varying degrees and frequency recalling, understanding, applying, analysing, evaluating and creation cognitive processes in both learning content specific and non-content specific knowledge and attitudes, although recalling was a far more common outcome.

Introduction

Before answering the question of how the web can enhance learning, we need to address the issue of what goes on when a student takes on a learning activity on the web. Indeed, the data collected included observations and learning artefacts of the students while performing such an activity. The central research question of this study is “What is really happening when a student is engaged in constructivist learning in a small group using resources from the web?” These discrete sections of observed behaviour, learning outcomes and motivation inferred from the transcripts, video recordings and learning artefacts, reveal different aspects of the “learning” phenomenon.

The conceptual framework for this study was based on the activity system in which the web-based constructivist learning (production) is viewed as the process of allowing students (subjects) to construct meaning out of the information and hence having learnt something (object). Activity theory has its roots in the classical German philosophy of Kant and Hegel (cited in Jonassen and Rohrer-Murphy, 1999), which emphasized both the historical development of ideas as well as the active and constructive role of humans. The activity system comprises the kinds of activities people engage in, who is engaging in the activity, what are their goals and intentions, what objects or products results from the activity, the rule and norms that circumscribe the activity and the larger community in which the activity occurs. Indeed, web-based constructivist learning (production) is viewed as the process of allowing students (subjects) to construct meaning out of the information and hence having learnt something (object). This is achieved through the web using tools such as search engines and scaffolds such as WebQuest. This study occurs within the web (community) and involves some collaborative learning as the students will work in groups (division of labour).

From this conceptual framework, these are the following areas of the learning activity that will be focused on:

1. students' pre-disposition to and perception of the activity (student)
2. interaction between student, tools and the learning process. (student – process-tool)
3. student learning outcomes that can be observed (object)

Methodology

In conventional methodology, the activity system may be thought of as a static model in which a hypothesis about the object is to be proven given the subject and certain conditions about the tools and the learning context. However, this is too simplistic. Human knowledge consists of a series of constructions and have a tendency to be problematic in that it is "indeterminate, unsettled and ambiguous" (Guba and Lincoln, 1989: 68). Constructivism rejects the existence of an objective reality and it denies subject-object dualism, in that the observer interacts with the subject, resulting in the construction observed. Guba and Lincoln (1989) originally proposed a constructivist methodology, which rejects manipulative (experimental) approaches but studies the observer and observed interaction in creating a constructed reality that is "as informed and sophisticated as it can be made at that particular point in time" (Guba and Lincoln, 1989: 44). Indeed, this proposed methodology shares many common elements with ethnographic methods of inquiry in which the subjects and their behaviour are observed by the researcher who is also a participant observer, immersed in the activity itself. The researcher observes studies, participates, observes again and then interprets the meaning of all the observed behaviours (Cresswell, 1998). It is very similar to educational ethnographic methodology which explores "rich, descriptive data about the contexts, activities, and beliefs of participants in educational settings. Typically, such data represent educational processes as they occur" (Goetz and LeCompte, 1984:17). However, this does not mean that Guba and Lincoln' is proposing that the study should be a cultural ethnography. For one, the study need not be conducted within the theoretical framework of cultural anthropology. In fact, Wolcott (cited in Goetz and LeCompte, 1984: 18) proposes the concept of quasi ethnographies, in which the research uses traditional ethnographic concepts and methods while combining other methods and theoretical frameworks in an interdisciplinary approach. By this definition, Guba and Lincoln's proposed constructivist methodology can be considered a quasi ethnography.

According to Creswell (1998:114), it is important that the site or sites selected have an intact "culture-sharing group" that has shared values, beliefs and cultures. The researcher should select a group in which the researcher is a "stranger" but to which he can gain access. Since most classrooms in Singapore practice group work and teachers would usually form groups that the students are members of for the rest of the academic year, the intention then is one of finding a site in which the researcher can gain access to intact groups. Two school teachers who were teaching Normal Academic Geography Elective Students at Secondary Three level were agreeable to take part in the project. Once the school principals gave their verbal consent, a

formal request was made to Ministry of Education (MOE) and the teachers then selected two intact groups who were willing to participate. The period of study was to be during late March to late April 2002, for one month. For ethical purposes, the two schools and all students will be given pseudonyms to protect their identities.

Redhill Secondary School is a small sized school of about 800 students. It is a neighbourhood school in Singapore that is unique in that it has a high percentage of foreign students. The Secondary Three students reading Geography Elective are small in numbers and two classes have combined to form this one class of Geography Elective students. All upper secondary students in Singapore are required to study a compulsory Combined Humanities subject. This subject comprises of a mandatory social studies paper and an elective humanities paper. Students have a choice of History, Geography or Literature for this elective humanities paper. In this case, the other two halves of the classes take History Elective. The total number of students in the class is 18 and the teacher has already formed 6 intact groups of 3 students at the beginning of the year. Peace Secondary School on the other hand has more students (about 1000 students). It is another neighbourhood school but has the typical catchment of a public housing estate. The class chosen for this study has 40 students and the teacher had formed 8 intact groups of 5 students at the beginning of the year.

A careful and purposeful sampling process took place simultaneously as permission was sought to enter the site. Miles and Huberman's (1994) typology of sampling strategies was used as a basis for this purposeful sampling procedure. An intact group was sought in accordance with theory based sampling to explore the interaction between group members within the framework of an activity system. Secondary 3 students were sampled also based on the theoretical premise that constructivist learning builds on existing knowledge as well as meeting the criterion of using the upper secondary level Geography topic of Green Revolution. Further, the groups to be chosen must be proficient at using the web. In other words, the subjects must not be technically deficient in using the web. This will introduce the issue of web-competence which is not within the scope of this study. Normal Academic stream students were chosen as they represent a group of students who are not in the mainstream. Singapore students are admitted to Secondary Schools based on their results obtained at the Primary School Leaving Examinations. Students who perform well at this national level examination will be streamed into a 4 year Secondary Education Programme in either the Special or the Express streams. Students who do not perform as well are perceived to require more time to complete their Secondary Education and are hence streamed into a five year programme. These students are often not as motivated and are academically weaker than the mainstream students. However a

number of them do complete their secondary education and proceed to polytechnic tertiary education and eventually moving on to university. It is my intention that the needs of this group of students should also be researched and hence this selection. And most certainly the subjects were chosen based on their willingness and the convenience as they are already in their intact groups. Indeed the subjects were chosen purposefully by theory based sampling, politically important cases, criterion sampling and convenience sampling.

Descriptions of behaviour through observations, interviewing, documents and artefacts are commonly collected for ethnographic studies (Hammersley & Atkinson, 1995; Spradley, 1980). However, video recordings of the observations was used in this study so that a more reliable quasi ethnography may be constructed based on these four forms of data collection namely, observations, interviews, documents and learning artefacts. Furthermore, each type of data served to triangulate and add on to the reliability of the analysis. The students were then given a WebQuest task (see the url <http://www.hsse.nie.edu.sg/staff/changch/greenrev/intro.htm>) in which they had to solicit information from the web to make an informed decision whether to applying for government grants to adopt green revolution practices.

Findings

Students

The primary subject of this activity is the student. Two areas have been highlighted in the research questions, namely how motivated students were and the type of motivation present, as well as, how the students viewed the activity.

The interviews showed that while some of the students claimed to be interested (overall motivation) in the project, there were others who claimed to be uninterested. Such disinterest was clearly observable in the field and on the recorded video clips as well as from the interview transcript. Moreover, those who claimed to be interested were not always observed to be interested. For example, the behaviour during the observed sessions of a few of those who claimed be interested in their interview, did not correspond to their claims. Nonetheless, the observed behaviour tend to corroborate the lack of overall motivation in the project. The initial enthusiasm shown when volunteers were asked for this project was not seen throughout the project. Perhaps this was due to a general lack of motivation and the frustration arising from using the web.

In the interviews, Nine of the 16 students felt that they were intrinsically motivated in the activity. Of the responses cited, the opportunity to learn more things was the most common reason given for their intrinsic interest in the learning activity. There were two cases in which

the students' motivation was from working with friends and to find out more about his grandfather's livelihood as a farmer. The observations show that at least the second group from Redhill Secondary School was excited while discussing about doing the task together. The sad reality is that 15 out of 16 of them admit to some degree of extrinsic motivation in the form of assessment (either exams or continual assessment) marks. The remainder one subject wasn't interested with the task to begin with. Only one girl stated in her reflections that she can learn new things. However, this itself is insufficient to prove that she was intrinsically motivated as the observations of the research sessions proved otherwise. In addition, all but one of them admitted that assessment marks was a large extrinsic motivation for the task.

Four students felt that using the web was an additional motivation factor while five of them felt that it was not. The remainder had no comments on this. Certainly, it is not an objective of this study to hypothesize if the web was a motivating factor. However such responses from the interview show that the effects of the web on the students' motivation can go both ways. Indeed, the observations of the students during their information search sessions show that they often felt frustrated if they had to wait too long for the page to load or if the information returned by the search engines was irrelevant.

In a sense, the interaction between the subject and the tools does affect the motivation of the subject. Indeed, this illustration shows that it is important to identify the problems with the tools and to provide solutions so that the subjects can perform better in the production (learning) of the object. Indeed, this consideration will change the way the tools are used and eventually improve the subjects' motivation.

Web-Interaction and Behaviours

The tools and production of this activity was examined in terms of the types of behaviour observed during the activity, the interaction between students and the web and the web information searching behaviour.

Given the predisposition of some of the subjects to be unmotivated by the task, the finding that several of them were restless, distracted and even violent appear to concur with this understanding. The violent behaviour (hitting the monitor and printer), in response to frustration arising from the impatience with seeking and retrieving information on the web, is a disturbing one. This indicates that closer monitoring of student using the web will be advisable. Even in this activity where instructions were given as to what some starting sites could be and what information should be sought, students seem to have difficulty in searching, retrieving, organising and applying relevant information. Nine out of the 16 students interviewed felt



frustrated with waiting for web pages to load. Impatience with the wait time, when results are being processed by the search engine, is an area that is cause for concern on two counts. First, the searches may not proceed very far before impatience stops the student from trying further. This has been observed during the sessions. Secondly, information that is first available while searching may be taken readily due to such impatience. This information may not be accurate. Indeed, little evidence of validation of information can be found in the observations or the web tracks.

A reasonable induction is that the students lack self-directedness in their search strategy. Indeed they appear to be inexperienced in searching for information and will require more specific instructions than those already given.

Another interesting interaction between student and the web during such sessions is that they get easily distracted by other more “interesting” activities such as online music and games. This distracts the students from their task and often reduces the efficiency of their work and their train of thought. When asked during the interviews, four of them admitted point-blank that they would engage in activities such as listening to music or check email, in addition to their assigned task.

Web information science research mostly concentrates on developing sophisticated search tools and technologies rather than exploring and developing effective human search strategies. The Kuhlthau (1993) model looks at human search strategies rather than developing search tools. Ellis (1993), on the other hand, defines six characteristics of information-seeking behaviour, without typifying them as stages: Starting, Chaining, Browsing, Differentiating, Monitoring and Extracting. Kuhlthau’s (1993) and Ellis’s (1993) models can be considered to be closely related when a stage process applied on Ellis’s characteristics (Spink et al, 2002). For this study, Ellis’s (1993) model will be used to frame the discussion of students’ information seeking behaviour (See Table 1).

Table 1 Categories of information search patterns

Category	Description
Starting	Activities characteristic of the initial search for information
Chaining	Following chains of links or other forms of referential connection between material
Browsing	Semi-directed or semi-structured searching in an area of potential interest. Eg. Broadening, narrowing, coordinates or word form changes.
Differentiating	Using differences between sources as filters on the nature and quality of material examined
Monitoring	Maintaining an awareness of developments in a field through the monitoring of particular sources
Extracting	Systematically working through a particular source to locate material of interest

(Source: Ellis, 1993)



The student interviews showed that most of the students' description of their search behaviour could be classified under starting and chaining of Ellis (1993) model. A couple of students, Zinnira and Yani showed that they performed some "browsing". In terms of validating information, Zinnira uses other websites such as "MSN Search, ahm Googles, sometimes ...Lycos-Asia." to find addition information on what she has found. Yani has a very pragmatic search strategy. She would first read the title and then decides if the information is relevant, if it is, she would continue to read the first paragraph. She would skip the pages without relevant information in the title or the first paragraph. As for the observable navigation styles, the students largely perform starting, chaining and browsing. There is very little evidence of differentiating, monitoring and extracting. Most of them do not go beyond simple starting type of navigation. While the results from the web tracking software showed evidence of starting, chaining and browsing. Skills such as differentiating, monitoring and extracting were not evident.

In summary, the web was used in a rather novice manner by the students. Although, the students largely used starting, chaining and browsing information search strategies, they were still rather diffident. They lack self-directedness in their information searching and would probably do better if more guidance was given. Some of them also get distracted easily and are impatient with waiting for information to be returned on their searches on the web. They also prefer media rich web pages and internet connection with higher access speeds.

Learning Outcomes

The product of the activity refers to the observable learning outcomes of this activity. The classification of observable learning outcomes was adapted from an article by Krathwohl (2002) on a critique and revision of Bloom's taxonomy as well as a comparison between Gagné (1974), Ebel and Bloom's (1956) taxonomy. Krathwohl (2002) suggested that instructional objectives were constructed around descriptions of intended learning outcomes arising out of the prescribed instruction. In that, these statements of objectives are constructed based on subject matter content and a description of what is to be done with this content. As a result, the statements typically consist of nouns or noun phrases with a verb or verb phrase, corresponding to the subject matter content and the cognitive processes, respectively. For example, a statement such as "The students will be able to remember the cycle of cultivation in traditional wet rice farming" is framed around the noun phrase "cycle of cultivation in traditional wet rice farming" and the verb phrase "to remember", reflecting the content knowledge as well as the cognitive process. In Bloom's taxonomy, Ebel's guide and Gagné's outcomes, the categories proposed incorporate one or both of content and the cognitive aspects. A distinction between the two



concepts is not present in these schemes. Krathwohl's critique is that this unidimensionality causes categories within the taxonomy to be inconsistent as some categories represent both content and process while others simply refer to cognitive processes. Krathwohl's knowledge dimension proposes factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge. His cognitive dimension includes remembering, understanding, applying, analyzing, evaluating and creating.

However, the categories within the two-dimensional knowledge taxonomy are still not mutually exclusive. In fact, there are some categories that may overlap. For example, application of factual knowledge may also be interpreted as the creation of conceptual knowledge, and vice versa. To further illustrate this point, take the case of a student learning about the viscosity of molten lava and its rate of cooling. A student may interpret that basaltic lava tends to cool faster and hence forming gentler sloping volcanoes, after having read about the low viscosity of basaltic lava. Certainly, one can argue that the creation of this conceptual knowledge rests not only on the application of a piece of factual information but also of recalling many other related concepts. This illustrates that the two dimension taxonomy of learning outcomes is problematic, at least in its classification of the knowledge dimension.

However, this two dimensional approach of examining learning outcomes is at least illuminating, in that it clarifies the dimension of the proposed taxonomy in this study. To put the proposed taxonomy in perspective, the categories are organised in Table 2 below.

Table 2. Proposed classification of cognitive learning outcomes

Recalling	Recall
Intellectual Skills & Cognitive Strategies	Understanding
	Applying
	Analyzing
	Evaluation
Creating	Creating new knowledge
	Acquiring attitudes

From the interviews we can conclude that while most of the students were able to regurgitate some advantages and disadvantages of adopting Green Revolution, this is possibly due to the nature of the task in which they have to make these comparisons in order to arrive at a decision as to whether to adopt Green Revolution or not. Only one student verbalized that a cognitive strategy of "imagining" being a farmer was used to arrive at that decision. This was probably the only concrete instance of a student analysing the information collected, evaluate it and then arriving at a decision. There were a couple of instances in which the students were able to generate evaluative and attitudinal learning outcomes, especially with reference to their own personal experience.

The observations and learning artefacts showed that recalling of information was the most common cognitive process at work. Almost all the groups were able to provide definitions and list advantages and disadvantages. Only one group enacted a role play to explain how they have arrived at a decision. As this qualitative study does not endeavour to quantify the instances to draw generalisations, the whole range of cognitive processes involved will be simply included in the discussion.

However, the students have “higher-ordered” learning outcomes in terms of things that they have learnt about working in a group or using the computer to surf the web. A few of them have learnt that it takes plenty of cooperation for the group to function well. A few of them even have self-discoveries, admitting their own weaknesses after careful and harsh self-evaluation. In the self-reflections one student admitted to having learnt to understand others’ feelings.

On the whole, the types of learning outcomes that can be observed from various sources show that, while recalling information is the most common cognitive process, there were instances of analysis, application, evaluation and creation of attitudes. Indeed, the students have shown that while they generally recall domain/content knowledge, they have also learnt how to understand others’ feelings and develop attitudes about farmers’ use of artificial fertilizers.

Learning together

The five elements of Johnson and Johnson’s (1999) Learning Together model, including positive interdependence, face-to-face promotive interaction, individual accountability, social skills and group processing, were examined for the learning activity. In this study, intact groups were chosen to take advantage of their existing group structures. It was surprising when the research reveals that these elements were not well developed or even missing. Although both students and teachers claimed that the students have learnt to work in a group before, these elements were neither taught nor learnt properly.

The interviews indicated that several students claim to enjoy working in a group. However, some members work rather independently, showing a lack of group processing which generally arises due to the lack in awareness of positive interdependence and individual accountability. In other words, they are not really proficient with working in a group. Perhaps this is something that they have not been taught. After interviewing the teachers, they claim that the students have already been taught how to work in a group and have been doing so at least for the past two years. This presents an interesting mismatch of teacher perception of how the students have learnt to learn in a group and how they are actually learning in a group. In fact,

some of the students would cluster together into smaller groups or pairs within their groups to work closer together.

The observations showed that while there were a few cases whereby group members taking on extra role when there is a need (eg. Nicole's mother's death and Chieh taking on the Nicole's role), learning to lead in a group, learning to carry out the roles, learning to cope with uncooperative people and exclusion from the group, the five elements of the learning together model are not well developed in the groups studied. Furthermore, the students also complained that time was a constraint. They usually had activities after school that hinder them from meeting for discussions or internet search. Certainly there are other cooperative learning models, but these groups were not working well to begin with. If most of the basic elements of the Johnson and Johnson (1999) model, which is a very general and applicable model, are not well developed, then there is a serious problem of students not knowing how to work well in a group.

Stakeholders' views

Only one type of stakeholder was studied – the teacher. The teachers' view represented one view among the many that the community has in using the internet for learning. Certainly parents, school administrators and policy maker views are important too. However, it is the teachers' views that have direct bearing on classroom practice. The only source of information comes from the interview with the teachers. Five main views were referred to including the, learning process, motivation, learning outcomes, constraints and suggestions.

The teachers felt that the students were rather unmotivated by nature, given that they are from an academically weaker stream. The teacher perceived that the students would prefer information that is not too wordy. This is confirmed by the students' interviews and observations. Information and instructions was given through spoon feeding and is often too structured or summarised, despite the fact that this was an inquiry based activity. After grading their work, the teacher felt that the students often visited only a limited number of sites. Further, the information found was simply "cut and paste" into their work, in other words, students simply recalled facts, comparisons and even decisions. Group work was also something the teachers thought did not work, although the teachers claimed that the students have learnt how to work in a group at least for the two years they have been with their school.

Issues arising and recommendations

The discussion so far has several implications. Among them are the types of learning, degree of instruction in constructivist learning, collaboration in learning and finally the issue of

prescriptive learning activities. There are probably more implications that can be discussed but these are directly related to the research questions asked at the beginning of this study.

What did they learn?

While the teachers candidly admit that most of the observed learning involved some recalling, they are fairly contented if the activity will motivate the students and hence contribute to the overall education over a long period of time. In fact, one teacher felt that the students were clearer about the topic on Green Revolution as a result. Although his remarks were based on his anecdotal observations, this is still an important view of one of the stakeholders that needs to be addressed. While the teachers primarily focus on getting the students to learn just anything, since the students are perceived to be so weak and unmotivated, we should be reminded that these students are capable of more than just simple recall of information. While much needs to be done to encourage students to use other cognitive processes and the degree of this can only be studied at a later date, the potential of such an activity in allowing students the opportunity to develop other cognitive strategies cannot be ignored. Indeed, a personal recommendation would be to keep an open mind about what students can or cannot learn and allow them the opportunity to develop these skills. Certainly, there are other considerations in designing activities that encourage higher order cognitive skills, which should also be incorporated in the considerations. Clearly a possible future study stemming from this observation is on how the types of learning outcomes associated with web based constructivist learning activities.

Constructivist Learning

Recent developments in education point to a shifting paradigm (maybe a paradigm-shift already exists) towards learner-centered or learner-focused instruction. Indeed, “tools and resources traditionally focused on mastery of external bodies of knowledge via on-line, direct instruction, [while] contemporary notions focus on facilitating knowledge construction by relating new ideas to personal knowledge, beliefs and experiences” (Hannafin et al, 1996). Perhaps the use of the term “learner-centered instruction” is a misnomer in that instructions are usually perceived to be highly structured activities in which, a “one size fits all” approach to design is adopted. This may not be universally accepted. Reigeluth (1999) argues that there should be a shift from standardization to customization of instruction so that learners’ needs are met; teachers shift from a “sage on the stage” to a “guide by the side”. Reigeluth further argues that instructional designs should include what cognitive theorists refer to as “construction”.

On the other hand, this study has shown that an ill-defined problem was not sufficient in guiding the students to really solving the problem. Invariably, recall of information rather than analysis of information and subsequent application of this analysis to form a decision and solve the problem, was more prevalent. The teachers, students and the researcher all felt that more guided instruction will likely improve the situation. Certainly, many hybrids of constructivism in which more structured and guided scaffolds have been thought to be effective. Therefore, the improvement to the existing activity may be to create more structured and well-thought scaffolds that will guide the students towards solving the problem posed. Such structures will include information search strategies, organising and analysing the information found and even managing group dynamics. Indeed, McAllister (1995) suggests that “the teacher should be prepared to give his or her time with groups of inexperienced pupils, offering encouragement showing interest and asking questions. However, advice and direction should be kept to a minimum” (McAllister, 1995: 404). Clearly teacher intervention should be present but it should not interfere with the students’ co-construction of knowledge. The perfection in guiding groups will probably grow with practice. This is also a possible area for future research, especially in how task designs and group management might influence learning.

Learning together?

While the teachers and students have strong claims about their group work abilities, the observations did not find any supporting evidence. In fact, the opposite is true. The five elements of Johnson and Johnson’s (1999) model are not working well in this study. One may argue that there are many other models of collaborative and cooperative learning, but the Johnson and Johnson (1999) model is so generally defined to begin with that any group operating normally, to some extent at least, should indicate evidence of some or all of these elements. The groups in this study generally show a lack in almost all elements. Clearly, there is a need for teachers to monitor the groups’ progress for these elements. Surely they can choose and use whichever cooperative learning structures they desire but the key problem is that the teachers assumed that the students were proficient group workers. The students began the project believing that they were equipped with group work skills too. Monitoring and facilitation should be present at each stage of the project.

Furthermore, there is the perennial problem of insufficient time after school for students to meet. This is not helped by the numerous activities in school after curriculum time, including, study hour, remedial lessons, extra-curricular activities and so on. While the ideal situation is for students to conduct their own research at their own time, this problem of time constraint may



indicate the need to rethink the design of the activity so that at least some parts of the research and group work should be done during class time. Teachers may protest that this is not viable as there is already insufficient class time to cover the topics in the syllabus. This is perhaps one area where future studies may be conducted to ascertain the viability of incorporating such student-centred activities within curricular time.

Doctors and their clients.

One intention of this study was to explore the “client-side” views. There is a dearth of empirical research on learners’ perception about using constructivist learning tools on the internet. Literature on constructivism has been well documented and many teachers all over the world are using such approaches. However, this does not automatically make it the right thing to do. Although generalizations of the results cannot be made in this study, they nevertheless indicate some of the problems that potentially arise if we simply prescribe such strategies without listening to our clients – the students.

Some students have indicated that they still prefer the “traditional” method of learning whereby the teachers “dishes” out information to them in readily digestible forms, like tables and study notes. Is this a mindset that needs to be changed or is the activity not motivating enough to allow the students to see the benefits of exploration on their own? Indeed, there were also students who claim that using the web to research for information and then forming their own conclusion allowed them to “learn more”. One future study that could be conducted will be to ascertain if students see the value in self-guided and exploratory learning.

Conclusion

In reality, there is not clear cut answer to the research question posed at the beginning of this study. Certainly, what goes on when students learn in a web-based constructivist learning activity is better understood now in terms of the students’ motivation, the interaction with the web, the way they work together in a group, the types of observable learning outcomes and even the teachers’ view on their learning. However, there are dimensions within these observations which lead to further questions about the learning activity in terms of how the students can be motivated, how the web can be used more efficiently, how to help them work in a group better and how to encourage them to learn beyond facts and analyse and apply what they have learnt. These are beyond the scope of this study but they form a basis for future studies that will allow students to perform self-guided learning on the web more effectively. This study perhaps will



form the first steps to improve our understanding, and perhaps provide the basis of constructing new knowledge about how students learn with the web.

Reference

- Bloom, B. S. (1956). *Taxonomy of educational objectives, Handbook 1: The Cognitive domain*. New York: David McKay Co.
- Creswell, J. W. (1998). *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. London: Sage.
- Ebel, R. L., & Frisbie, D. A. (1991). *Essentials of Educational Measurement (5th ed.)*. Englewood Cliffs, New Jersey: Prentice Hall.
- Ellis, D. (1993). Modeling the information-seeking patterns of academic researchers: A grounded theory approach. *The Library Quarterly*, 63(4), 469-486.
- Gagné, R. M. (1974). Educational Technology and the Learning Process. *Educational Researcher*, 3(1), 3 - 8.
- Goetz, J. P., & LeCompte, M. D. (1984). *Ethnography and Qualitative Design in Educational Research*: Academic Press, Inc. (London) Ltd.
- Guba, E. G., & Lincoln, Y. S. (1989). *Fourth Generation Evaluation*. Newbury Park: Sage.
- Hammersley, M., & Atkinson, P. (1995). *Ethnography: Principles in Practice (2nd ed.)*. New York: Routledge.
- Hannafin, M. J., Hannafin, K. M., Hooper, S. R., Rieber, L. P., & Kini, A. S. (1996). Research on and Research with Emerging Technologies. In D. H. Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology* (pp. 378 - 402). New York: Macmillan.
- Johnson, D.W. & Johnson, R. (1999). *Learning together and alone: Cooperative, competitive, and individualistic learning (5th ed.)*. Boston: Allyn and Bacon.
- Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity Theory as a Framework For Designing Constructivist Learning Environments. *Educational Technology Research and Development*, 47(1), 61 - 79.
- Krathwohl, D.R. (2002). A Revision of Bloom's Taxonomy: An Overview, *Theory into Practice*, 41(4), 212-218
- Kuhlthau, C. C. (1993). *Seeking Meaning : A Process Approach to Library and Information Services*. Norwood, New Jersey: Ablex.
- McAllister, W. (1995). Are Pupils Equipped for Group Work without Training or Instruction? *British Educational Research Journal*, 21(3), 395 - 404.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis : an expanded sourcebook (2nd ed.)*: Thousand Oaks : Sage.
- Reigeluth, C.M. (1999). What is instructional-design theory and how is it changing? In Reigeluth, C.M. (ed.) *Instructional-design theories and models – A new paradigm of instructional theory*, Volume 2. New jersey: Lawrence Erlbaum.
- Spink, A., Wilson T. D., Ford, N., Foster A. & Ellis D. (2002) Information-seeking and mediated searching. Part 1. Theoretical framework and research design. *Journal of the American Society for Information Science and Technology*, 53(9): 695-703.
- Spradley, J. P. (1980). *Participant Observation*. New York: Holt, Rinehart and Winston.