EVALUATION OF WEBQUEST IN BIOLOGY:
Teachers' Perception

Kamisah OSMAN
Faculty of Education
The National University of Malaysia
43600 Bangi, Selangor, MALAYSIA

ABSTRACT

Teaching and learning based on web or web-based learning is a concept which integrates information and technology in education. Teachers and instructors have to assist their learners to learn to function in this information environment. However, teacher trainers and instructors have limited experience in the integration of ICT by using web in their teaching, mainly for Biology subject. The Indonesian Ministry of Education has started to implement ICT in the process of learning and teaching. Hence, it geared our attention to evaluate the suitability of WebQuest to be used in teacher training among Biology teachers in central Kalimantan. Results showed those teachers' perceptions towards WebQuest on technical, content, as well as teaching and learning structure were on the high level. However, there was no significant difference on teachers' perception towards WebQuest based on their experience. Further evaluation study should be done on students to gauge their perception towards the WebQuest.

Keywords: Evaluation, therapeutic stem cell cloning, web-based learning, WebQuest

INTRODUCTION

The advances in technology pervade our entire live. In today's Information Age, we live in the world surrounded by information which comes from radios, television, videos, movies, books, magazines, newspapers, and lately from the internet which is a very powerful source of information. Yet, what we need in today's fast paced, information riddled world is not power *per se*, but power to manage the information we have (Norton & Wilburg, 2003). In conjunction, computer technology in education is becoming an integral part by infusing in the learning and teaching environment. In this context, technology doesn't stand alone as media, rather it is observed as integrated phenomena. Learners learn in technological environment through multiple media (Sethy, 2012). Thus, teachers, as well as instructors, have to assist their learners to learn to function in this information environment. They must learn how to sort the information, judging its reliability, validity, as well as relevance. It is important for educators to design learning opportunities that assist today's students to become effective information users as well as ensuring that the content to be disseminated in the learning process are received by the target audiences.

According to Mayer (2003), learning refers to lasting changes in the learners' knowledge, where such changes are due to experience. Learning may come about through direct experience, vicarious experience, instructional presentation, and combination of any or all of the others.

The selection of the optimal instructional designs depends on several factors: the learner, the learning environment, and the content that is to be taught (Newby et al, 2006).

75

Besides, learning theories have significant bearing on instructional design, as there is a logical development from learning to instruction. Instructional design optimizes learning outcomes while learning theories are the backbone of any instructional design. Instructional design is the articulation or the manifestation of the learning theories, and its main aim is to optimize learning by using the known theories of learning.

Learning Theories
Basically there are three broad theoretical perspectives: behavioural, information processing (cognitive), and constructivist. Each perspective is alive and well today and has both theoreticians and practitioners as adherents. They have different views on what learning is, how it occurs, how instructional expert can facilitate learning, and what role technology can play. Today's, there are many theories in instructional design come out such as Cognitive Flexibility Theory, Andragogy, Minimalist, and Component Display Theory. For the purpose of this study, Constructivism and Andragogy will be presented here as it is more authentic and serve the needs of the generation in this globalisation era.

Constructivism
Constructivism is a theory of learning based on the idea that knowledge is constructed by the knower based on mental activity (Jonassen, 2000).

This perspective was also originated from Piaget, Dewey, and Vigotsky in her paper "social construction". In this world of rapid change, where information is expanding and increasing in complexity, learning is a survival skill. Mastering the basics (reading, writing, and arithmetic) is as important as ever, but it is no longer enough. Today's students may need to learn more than previous generations.

They need to know how to find and use new information, to make informed decisions about complicated issues, and to collaborate as part of a team.

A major theme in the theoretical framework of Bruner (1990) is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. Teachers assist the students in developing new insights and connecting them with their previous learning. Ideas are presented holistically as broad concepts and then broken down into parts.

The activities are student centered and students are encouraged to ask their own questions, carry out their own researches, analyze information and come to their own conclusions. In constructivism, learners build personal interpretation of the world based on experiences and interactions. Knowledge is embedded in the context in which it is used (authentic tasks in meaningful realistic settings). It creates novel and situation-specific understandings by "assembling" knowledge from diverse sources appropriate to the problem at hand (flexible use of knowledge).

Andragogy
Andragogy comes from Greek: "*Aner* "for "*Man*" or "*adult*" and "*agogus*" for "*leader of* ". Andragogy is an attempt to develop a theory specifically for adult learning. It emphasizes that adults are self-directed and expect to take responsibility for decisions. Adults have already accumulated various types and amounts of information and life experience, which they then transfer into their learning situations. They abide by certain principles, values, beliefs acquired along the time (Creo & Ceobanu, 2006). Adult learning programs must accommodate this fundamental aspect. The assumptions for the design of learning in

76

Andragogy are:

- ➢ **Adults need to know why they need to learn something**
- ➢ **Adults need to learn experientially,**
- ➢ **Adults approach learning as problem-solving, and**
- ➢ **Adults learn best when the topic is of immediate value.**

In practical terms, Andragogy means that instruction for adults needs to focus more on the process and less on the content being taught. Strategies such as case studies, role playing, simulations, and self-evaluation are most useful. Instructors adopt a role of facilitator or resource rather than lecturer or grader.

Designing the task for adult according to Andragogy principles should have 4 elements:

- ➢ **Adults need to be involved in the planning and evaluation of their instruction.**
- ➢ **Experience (including mistakes) provides the basis for learning activities.**
- ➢ **Adults are most interested in teach subjects that have immediate relevance to their job or personal life.**
- ➢ **Adult learning is problem-cantered rather than content-oriented.**

It is accepted that learners are more interested to learn something if the activity of learning itself is interesting so it is important for teachers plus instructors to support the need of providing learning environment which can raise learners' interest as well as their motivation to learn. The research of Jung et al. (2002) deployed that interaction between students and the web resources in web-base learning made them satisfied with their learning. It means that web-based learning is one of the teaching methods by integrating ICT which can be used to make learning as an interesting and engaged activity for learners.

Its importance lies in the fact that people are finding that e-learning can make a remarkable change in teaching or learning: to how quickly they master a skill; how easy it is to study; and how much they enjoy learning (Guemide & Benachaiba, 2012) .However many teachers are still struggling to integrate technology in their teaching, even if they know how to use the technology. In dealing with technology, Russell et al. (2003) speculated that understanding how to use technology is not the same as understanding how to teach with technology. It is because teachers should understand how to integrate that technology in the proper instructional design and to create effective learning environment that meet students' need to get meaningful learning. Teachers must learn how to sort the information, judge its reliability, validity, as well as relevance.

It is important for educators to design learning opportunities that assist today's students to become effective information users. According to Norton and Wilburg (2003), effective instruction design to guide students to become effective information users should help students to learn to *search* for information, *sort* and *judge* information, and *create* and *communicate* ideas and concepts as the results of information use (SSCC).

Each of these activities can be supported by a range of tools, related to a particular problem arising within the domain of particular content areas, and woven together with knowledge, problem solving, and literacy abilities.

Teaching and learning based on web or web-based learning is a concept which integrates Information and Technology in education. According to Jung et al (2002), interaction between learners and learning resources in teaching and learning based on the web can fulfill students' satisfaction in learning. In order to meet learners' satisfaction, teachers or instructors should carry out apposite teaching method. Using web-base learning, such as WebQuest is deemed to be an alternative to be put into practiced in the classroom.

WebQuest

Harris in Norton and Wilburg (2003) asserted an instructional strategy - an activity structure called WebQuest as a powerful way to design learning opportunities that bring the whole process of information using process (SSCC) altogether. The concept and ideas of WebQuest was generated by Bernie Dodge of San Diego State University in 1995. His idea on WebQuest was great on how best to integrate internet into the classroom environment. According to Dodge (1995) a WebQuest is an inquiry-oriented activity in which students interact with information gleaned primarily from resources on the Internet. WebQuest has 6 components: Introduction, Tasks, Process, Resources, Evaluation and Conclusion. WebQuest function as a framework for teachers in developing student-centered learning by using internet (MacGregor & Lau, 2005).

A "WebQuest" is a constructivist approach to learning. Students not only collate and organize information they have found on the web, they orient their activities towards a specific goal they have been given, often associated with one or more roles modelled on adult professions. Since students have to participate in the elaboration of their learning strategies, the level of autonomy and creative production they attain is increased. With the proper guidance and "scaffolding", students can accomplish far more actual learning than in traditional transmission-of-knowledge situations that so often leave them wishing they were anywhere but in the classroom

WebQuests are designed to use learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis and evaluation. A WebQuest is not just a web search.

In fact, in most WebQuests, students never open a search engine like Google at all. Given limited classtime, it is usually better for students to spend their time using information rather than wasting their time finding it. or not finding it.

In most WebQuests, students are refered to a set of web resources pre-selected by their teacher; however, within those resources, they most often still have to find and select what is pertinent to their task, and what to keep, or discard.

WEBQUEST AND THE BLENDED LEARNING PHILOSOPHY AND PRACTICED

According to Heinich et al. (2005), some methods in computer-assisted instruction could be in the form of drill and practice, tutorial, games, simulation, discovery, and problem solving. Another instructional method is cooperative learning, discussion, demonstration, and presentation (Newby et al. 2006). Heinich et al. (2005) divided all those instructional methods into two categories. They are those that students control and direct (student-centered) and those in which teachers assume the major role (teacher-centered). Student-centered methods include discussion, cooperative learning, gaming, simulation, discovery, and problem solving. Teachers-centered usually in presentations, demonstrators, drill- and practiced, and tutorials, even though students can do them as well.

WebQuest is an inquiry based activity where some or all of the information resources taken from the internet, so instructional methods that could be practiced are discovery, problem solving, and cooperative learning. Hence, in a WebQuest, blended instructional methods exist altogether in one lesson.

Discovery Approach

The discovery method enables and encourages learners to find "answers" for themselves. It implements a discovery method places students in a situation where they can learn through personal experience. Such experiences usually require learners to develop and use observation and comparison skills. It uses inductive, or inquiry approach to learning. The aim of discovery methods is to develop a deeper understanding of the content through active involvement with it Some principles for using discovery are:

> ➢ **Be prepared for all types of discoveries.**
> ➢ **Encourage learners to share their discoveries.**
> ➢ **Make sure learners understand that "one right answer" may not exist, and**
> ➢ **Constantly encourage and reward learners for being inquisitive, for asking questions, and for trying new approaches (Newby et al. 2006).**

Problem Solving Approach

Problem-based learning is defined by Finkle and Torp in Savery & Duffy (1995) as, "a curriculum development and instructional system that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems". According to Vanguri et al. (2004), WebQuest are problem-solving activities for students that incorporate the internet, computer-based materials, and other available resources. Problem solving skill is needed in the real world of complexity. Learners need to be able to analyze problems, form tentative hypotheses, collect and interpret data, and develop some type of logical approach to solve the problem. In the problem solving method, learners use previously learned content and skills to resolve a challenging problem. Problem solving is based on the scientific method of inquiry:

> ➢ **define the problem and all major components,**
> ➢ **formulate hypotheses,**
> ➢ **collect and analyze data,**
> ➢ **formulate conclusions and/or solutions, and verify conclusions and/or solutions.**

Through this process, learners are expected to arrive at a higher level of understanding of the content under study (Newby et al. 2006).

Cooperative Learning Approach

Cooperative learning involves small groups of learners working together to learn collaborative and social skills while working toward a common academic goal or task. Some principles in cooperative learning are:

> ➢ **Builds an atmosphere that encourages participation and cooperation,**
> ➢ **2) Teach group processes to the students, and**
> ➢ **3) Learn to facilitate, not dominate**

Project-Based Learning

Project-based learning is a student-centered comprehensive instructional approach in the classroom where students collectively engage themselves in complex learning tasks (Bransford & Stein, 1993). In project-based learning, students work in teams to explore real-world problems and create presentations to share what they have learned. Compared with learning solely from textbooks, this approach has many benefits for students, including:

> ➢ Deeper knowledge of subject matter
> ➢ Increased self-direction and motivation and
> ➢ Improved research and problem-solving skills.

A growing body of academic research supports the use of project-based learning in schools as a way to engage students, cut absenteeism, boost cooperative learning skills, and improve test scores. Those benefits are enhanced when technology is used in a meaningful way in the projects.

Using project-based learning, students can acquire life long learning skills which include the ability to find and use appropriate learning resources. The process used in PBL usually starts with students are presented with a problem (case, research paper, video tape, for example). In groups they organize their ideas and previous knowledge related to the problem, and attempts to define the broad nature of the problem. Throughout discussion, students pose questions on aspects of the problem that they do not understand. Students see during the PBL that learning is an ongoing process, and that there will always be (even for the teacher) new angles, perspectives, problems to be explored.

Sharp (2005) summarized that WebQuest can take a single class session or be a month-long unit. It usually involves a group of students who divide their labour. The lessons consist of materials selected by teachers and used by students. WebQuest can be done on a variety of topics that are not well defined and that require creativity and problem – solvings skills.

According to Grant (2002), WebQuest is one of the implementation of Project-based learning beside project-based science and disciplined inquiry. WebQuest can be created for just about any discipline and are typically interdisciplinary. Like project-based science and disciplined inquiry, WebQuest can incorporate cooperative or collaborative learning and provide scaffolding for learners, often through templates for artefacts and guidance on cognitive and social skills. Also, like many of the projects in disciplined inquiry, the WebQuest often include an embedded scenario or role for the learners to play, sometimes called the anchor. However, while other examples of project-based learning may suggest reflection, the WebQuest are explicit in providing an opportunity to reflect on inquiry process and an individual's results (Dodge, 1997). There are common features across implementations of project-based learning and disciplined inquiry, these include:

> ➢ Introduction to "set the stage" or anchor the activity;
> ➢ Task, guiding question or driving question;
> ➢ Process or investigation that results in the creation of one or more shareable artifacts;
> ➢ Resources, such as subject-matter experts, textbooks and hypertext links;
> ➢ Scaffolding, such as teacher conference to help learners assess their progress, computer-based questioning and project templates;

80

> ➢ Collaborations, including teams, peer reviews and external content specialists;
> ➢ Opportunities for reflection and transfer, such as classroom debriefing sessions, journal entries and extension activities.

Past researches by Jung (2002) showed that web-based learning can be used to make learning as an interesting and engaged activity for learners. As an act to cope with the latest scenario, the Indonesian ministry of education has started to implement ICT in the process of learning and teaching.

Due to that, it is important for researcher to study the development and evaluation of WebQuest to prop up teaching strategy based on WebQuest for teacher trainers and instructors in their teaching. By developing and evaluating WebQuest, it is expected that teacher trainers, as well as ICT instructors will experience WebQuest as a media of teaching with computer technology, World Wide Web, and internet. Emphasize in developing WebQuest will be to design and provide WebQuest which has some of the characteristic of teaching strategy suitable for adult learners such as problem-base learning, project-base as well as collaborative learning. Moreover, teachers as well as teacher trainers and instructors do various job at work. It means that not only teaching, they also do other routine jobs which can take most of their time.

As a result, they do not have enough time to prepare their instruction well. Therefore, from researcher point of view, if internet is already available, it is the right time to introduce the use of WebQuest in teaching and learning. In other words due to the constraint of time, it can help teacher trainers and instructors in the process of teaching & learning.

Furthermore, national syllabus or curriculum for ICT in Indonesia does not apply certain textbooks to be used. There are also no special guidelines to the way Biology teachers can do the integration of ICT, especially Web or internet to their teaching.

With respect to the rationales, this research is interested to evaluate the Biology WebQuest for the topic: Therapeutic Stem Cell Cloning (Indonesian: *Peran Cloning Gen dalam Pengobatan*) based on the WebQuest material developed earlier in this study.

The topic is chosen because cloning is in the curriculum for high school at grade XII and it is a controversial issue in this decade.

The development of teaching material WebQuest was based on Hannafin and Peck Model. It involved 3 phases: the procedure starts with needs assessment phase, design phase, development and implementation phase, and evaluation phase. Needs assessment is the first step which was conducted due to its importance in collecting all information needed before developing a WebQuest. In Needs assessment, researcher as the instructional designer come to the decision whether WebQuest need to be developed or not. To develop a WebQuest, by doing needs assessment researcher will find information about the target learner, content of the WebQuest, teaching & learning strategy to be used, as well as learning theories which will be applied in WebQuest.

On the other side, this study applies the WebQuest design consist of six divisions: introduction, task, process, resources, evaluation, and conclusion. This is the standard form of WebQuest which is designed by Dodge and Tom March.

The second phase is design phase. At this phase, designer figure out information that has been collected with certain learning theories and strategies which is suitable for learners. For instance, in this study, this special WebQuest's design has the application of learning theories such as Constructivism and Andragogy and learning strategies such as problem-base learning, project-base learning, as well as collaborative learning.

From the developed WebQuest material, this paper will describe the teachers' perception towards WebQuest on topic Therapeutic Stem Cell Cloning from the aspects of technical, content, as well as teaching and learning structure.

Besides, this research also investigates the difference of teachers' perception towards WebQuest on topic Therapeutic Stem Cell Cloning based on teaching experience.

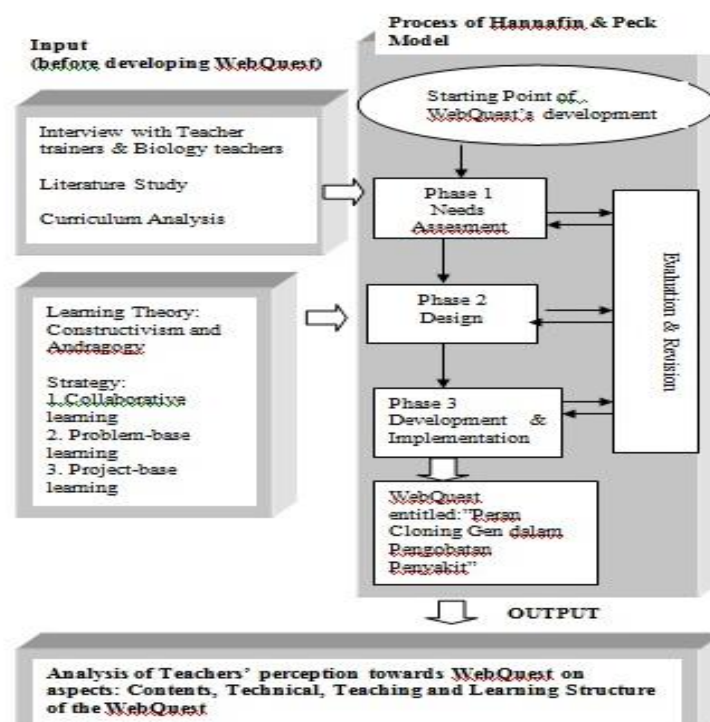The overall conceptual framework of this study is shown in Figure 1

Figure: 1
Conceptual framework of the study

RESEARCH METHODOLOGY

Respondents
Respondents in this study consist of 48 senior high school Biology and/or Science teachers who were randomly chosen from 4 Senior High School in Palangkaraya (SMA 1, SMA 2, SMA Katholik, and SMK 3 Palangkaraya), central Kalimantan Tengah.

Teachers who were chosen to be respondents in this study were training participants.

One of the criteria to choose teachers in the training was the internet facility in their schools. The demographic information of the respondents is presented in Table 1.

Table: 1
Demographic information of respondents

Variable	Category	Frequency	Percentage (%)
Gender	Female	21	43.8
	Male	27	56.3
Age	26 - 30	13	27.1
	31-40	24	50.1
	>40	11	22.9
Teaching Experience	<5	4	8.3
	5 - 10	21	43.8
	>10	23	47.9

Instruments
Questionnaire

This research made use of questionnaire as a tool of measurement. The questionnaire was proposed to measure teachers' perception towards WebQuest in certain aspects such as technical aspects, content, as well as teaching and learning structure. Questionnaire in this research was adapted from previous studies which were done by Dodge (2001) and Hong (2006).

There were three main parts in the questionnaire: Part A, B, and C. Part A consisted of the respondents' background information, Part B was consisted of the information about respondents' ICT competency level, and finally Part C was the items to find out teachers' perception towards WebQuest. There were 44 items in Part C with Likert scale provided, where 1 – strongly disagree, 2 –disagree, 3 – neutral, 4 – agree, and 5 – strongly agree. The distribution of items in Part C is presented in Table 2. The reliability index for this questionnaire was analysed by using alpha Cronbach. The value obtained is 0.9041, and it is interpret as high and is qualified to be used in real study (Pallant, 2002)

Table: 2
Distribution of items in Part C

Construct	Number of items
Technical Aspects	7
Content of WebQuest	6
Teaching and Learning Structure, Learning theory, Learning Strategy	31

Data Collection Procedure

This research is a survey study which is done by using questionnaires which was administered to Biology and/or Science teachers from 4 senior high schools in Palangkaraya (SMA 1, SMA 2, SMA Katholik, and SMK 3 Palangkaraya). Respondents are told that their response is considered very important to be used in the research and they were asked to answer the questions honestly.

In preface, researcher gave brief description about WebQuest and its use in the teaching process. We clarified WebQuest as an instructional design for integrating technology in Biology classroom.

In the Introduction part, we tried to make learners aware of upcoming problem.

The problem is what learners' views on therapeutic cloning, especially to cure Parkinson's. We tried to grab learners' interest and motivate them to learn by posing some questions. In the Task, we determined the objectives of doing the task, gave the description of what learners should do. In Process and Resources, we presented some steps to be followed by the learners. The resources consisted of the websites and links which were related to the topic of therapeutic cloning. In Evaluation part, we provided a rubric. This rubric was presented to help learners as well as facilitators to always keep in the right track in each activity as well as the performance expected.

The Conclusion part debriefs the learners and review what was learned. Teacher Guidance part can help instructors/facilitator or the user to know standard of the curriculum, implementation, resources, variation of doing WebQuest, evaluation and conclusion.

The WebQuest was uploaded using one of free web posting (phpnet.us). The address of WebQuest developed by researcher is: **http://webquest_cloning.phpnet.us/index.htm** Teachers were asked to open this site to do evaluation or giving their point of view towards WebQuest by answering the Questionnaire. Locating the WebQuest developed by teachers on the website allowed researcher to get the data easily without having to come to the location of the study. All of data collection procedure is organized by and make use of internet facility and email.

RESULTS AND DISCUSSION

Respondents were evaluated on the technical aspects, content, as well as teaching and learning structure of WebQuest. Results showed that the average mean of the three aspects is 4.36, while its standard deviation is 0.41. It means that teachers' perception towards WebQuest was on high level.

In other words, the level of acceptance towards WebQuest in the aspects measured was high. From the finding, it can be concluded that all respondents generally showed positive perception towards WebQuest as teaching strategy in teaching Biology/Science. This finding is consistent with the findings of previous study in web-based learning by Chang (2001), Hamdan (2001), Jung et al. (2002), Brabazon (2002), Bartoshesky and Kortecamp (2003), Law et al. (2002) and Hong (2006) The detail information about the mean value for each aspect is presented in Table: 3.

Table: 3
Mean value for three evaluation aspects

Aspects	Mean	Standard Deviation
Technical Aspect	4.45	0.43
Content of the WebQuest	4.32	0.49
Teaching and Learning Structure	4.32	0.44

Teachers perceived that WebQuest was interesting from the aspects of technical such as navigation, graphics, interface, menus, icons, and the use of the colour. Positive perception towards technical aspects is important because this aspect will influence respondents' perception towards WebQuest as a teaching and learning media. Teachers agreed that the use of language was easy to understand and the content was suitable. Teachers also thought that information presented was useful for cloning topic. Navigation in the WebQuest was smooth and it provided access for e-learning.

The finding also showed that links provided in the WebQuest had a very strong relationship with the tasks and helped learners to solve them, as well as to enhance teachers' understanding about Therapeutic Stem Cell Cloning. This finding supports the research finding of Brabazon (2002) and Law et al. (2002). Their study depicted that by web-based learning, learner will learn information literacy and web as a presentation of their project. Moreover learner will have positive attitude toward internet and not afraid to learn with internet.

Teachers also agreed that teaching by using WebQuest made them accept information easily. Teachers perceived that WebQuest was very interesting as teaching strategy to be used in teaching and learning of Biology. This is consistent with research finding from Burke et al. in their research towards the use of WebQuest laboratory compared with traditional laboratory (without WebQuest) in Biology class.

The finding depicted that students were more enjoyable in WebQuest laboratory than using traditional laboratory.

On the other hand, we conducted One Way ANOVA to find out if there was a significant difference of teachers' perception towards WebQuest on topic: Therapeutic Stem Cell Cloning from the aspects of technical, content, as well as teaching and learning structure based on teaching experience. Results of the ANOVA analysis for the three aspects are presented in Table: 4-6.

Table: 4
ANOVA result for teachers' perception towards Technical Aspect of the WebQuest

	Sum of squares	df	Mean Square	F	Sig
Between groups	5.919	10	0.592	1.615	0.141
Within groups	37	37	0.367		
Total	19.479	47			

Table: 5
ANOVA result for teachers' perception towards Content of the WebQuest

	Sum of squares	df	Mean Square	F	Sig
Between groups	6.140	9	0.682	1.944	0.075
Within groups	313.339	38	0.351		
Total	19.479	47			

Table: 6
ANOVA result for teachers' perception towards
Teaching and Learning Structure of the WebQuest

	Sum of squares	df	Mean Square	F	Sig
Between groups	8.812	21	0.420	1.023	0.473
Within groups	10.667	26	0.410		
Total	19.479	47			

Based on the tables, the significant value are 0.141, 0.075, and 0.0473 whereby the value are higher than α (0.05). It means that there is no significant difference on teachers' perception towards WebQuest based on teachers' experience.

Teaching experience is one of teachers' backgrounds which were needed to be taken into consideration. Discussion on Constructivism involved discussion about experience of learners as one of the factors in order for "learning process" to be occurred. Newby et al. (2006) emphasized that learning may come about through direct experience or vicarious experience. Differences in teaching experience means that teacher have different "learning" in teaching area. Teachers with longer time of teaching considered to learn more in teaching in terms of time. Due to this reason, ANOVA is performed to analyze whether there is a significant difference of teachers' perception towards Web-WebQuest. However, ANOVA analysis indicated that there was no significant difference of teachers' perception towards WebQuest based on teaching experience. It means that in this study, teachers from variety of teaching experience do not have significant difference in their perception towards WebQuest. In this study, teaching experience is not a factor considered to be significant which affects differences in teachers' perception.

CONCLUSION

It can be concluded that teachers' perceptions towards WebQuest on the aspects of technical, content, as well as teaching and learning structure of the WebQuest were on the high level. However, there was no significant difference of teachers' perception towards WebQuest based on teachers' experience. Teachers as changing agent in education should have open mind towards changes and alternatives offered by technology in order to improve the quality of teaching and learning. They should make use of the WebQuest provided in the internet or make their own WebQuest to be implemented in their teaching and learning process. However, skills of searching meaningful information to be put as resources in the WebQuest are needed. The choice of websites as information resources should meet the learners' necessity to get meaningful learning. This research focused on teachers' perception as an evaluation on WebQuest which acts as teaching strategy in Biology. We suggest that an advance study may be performed to find the effectiveness of using WebQuest in the process of teaching and learning. Besides that, study also can be done on students to find out their perception towards the WebQuest. Teachers and students should have different perceptions on the WebQuest. Hence, comparisons between the two sets of data would produce another study in the future.

BIODATA and CONTACT ADDRESSES of the AUTHOR

Assoc. Prof Dr Kamisah OSMAN is currently the Deputy Director, Centre of Academic Advancement, the National University of Malaysia. She obtained her Masters in Science Education from the Centre for Science and Technology Education, The University of Manchester, UK in 1996 and continued her doctoral study soon after that at the same university. In 1999, she successfully completed her Phd in Science Education and then joined the National University of Malaysia as a Science Education Lecturer in 2000. Currently, she is actively engaging herself in the Science Education Programme, at the Faculty of Education, the National University of Malaysia. Her research interest includes science education, thinking skills as well as curriculum innovation. Besides, she is also immersing herself in maintaining the Quality Assurance and Programme Accreditation processes, not only at the university level, but also national and international levels. She is an Executive Editor of Asian Journal of Learning and Teaching in Higher Education, an Editorial Board member of the Eurasian Journal of Science and Mathematics Education, Science Education Review, Malaysian Journal of Education and Malaysian Action Research Journal.

Kamisah OSMAN
Faculty of Education
The National University of Malaysia
43600 Bangi, Selangor, MALAYSIA
Tel: +60192884814 (HP):   +603 89213858 (of)
Fax: +603 89264816
Email: kamisah@ukm.my

REFERENCES

Criu, R. & Ceobanu, C. (2006). E-learning implications for adult learning. *Turkish Online Journal of Distance Education, 14* (2), 56-65.

Bartoshesky, A. & Kortecamp, K. (2003). WebQuest: An instructional tool that engages adult learners, promotes higher level thinking and deepens content knowledge. In C. Crawford et. al (Eds.), *Proceedings of Society for Information Technology and Teacher Education Interational Conference 2003*, 1951-1954

Brabazon, T. (2002). Bonfire of the literacies? The internet and challenge to literacy. *Social Alternative, 21* (3): 55-62

Bransford & Stein. (1993). *Project base learning space*. Houghton Mifflin

Brunner, J. (1990*). Acts of meaning*. Cambridge, MA: Harvard University Press

Chang, C. (2001). A study on the evaluation and effectiveness analysis of web based learning portfolio (WBLP). *British Journal of Educational Technology, 32* (4), 435-459

Dodge, B. (1997). Some thoughts about WebQuest. *The Distance Educator, 1* (3), 12-15

Dodge, B. (2001). "FOCUS: Five rules for writing a great WebQuest*". Learning & Leading with Technology, 28* (8), 6-9

Grant, M. M. (2002). *Getting a grip on project-based learning: theory, cases and recommendations.* [On line]. http://www.ncsu.edu/meridian/win2002/514. [March 14, 2007]

Guemide, B., & Benachaiba, C. (2012). Exploiting ICT and e-learning in teacher's professional development in Algeria: the case of english secondary school teachers. *Turkish Online Journal of Distance Education, 13*, 1302-6488.

Hamdan M. (2001). Penggunaan internet sebagai bahan proses pembelajaran kerja kursus di kalangan guru pelatih Maktab Perguruan di Johor. Tesis Sarjana. Universiti Kebangsaan Malaysia.

Hannafin, M. J & Peck, (1998). *The design, development and evaluation of instruction* (4th ed). New York: Macmillan Publishing Company.

Heinich, R., Molenda, M., Russel, J.D & Smaldino, S. E. (2005). *Instructional media and technologies for learning* (8th ed.). Ohio: Merril Prentice Hall.

Hong, N.C. (2006). Penggunaan WebQuest dalam pengajaran dan pembelajaran mata pelajaran ICT dalam kalangan pelajar-pelajar tingkatan empat: satu tinjauan. Tesis Sarjana Pendidikan. Universiti Kebangsaan Malaysia.

Jonassen, H. D. (2000). *Computers as mindstools for schools: engaging critical thinking* (2nd ed). Englewood Cliffs, NJ: Prentice Hall

Jung, I. C., Seonghee L., Cheolil. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. *Innovations in Education & Teaching International, 39* (2): 153-163

Law, N., Lee, Y. & Chow, A. (2004). Practice characteristics that lead to 21st century learning outcomes. *Journal of Computer Assisted Learning, 18*: 415-426.

LPMP Kalimantan Tengah. (2006). *Laporan Tahunan LPMP Kalimantan Tengah*

Mac Gregor, S.K & Lou, Y. (2005). Web-based learning : How task scaffolding and website design support knowledge acquisition. *Journal of Research on Technology in Education, 37* (2): 161-175

March, T. (2004). The learning power of WebQuests. *Educational Leadership, 61*(4), 42-47.

Mayer, R. E. (2003). *Learning and instruction*. New Jersey: Pearson Education Inc.

Newby, T. J., Stepich, D. A., Lehman, J. D., & Russel, J. D. (2006). *Educational technology for teaching and learning* (3rd ed). New Jersey: Pearson Education, Inc

Norton, P. & Wilburg, K. W. (2003). *Teaching with technology, designing opportunities to learn* (2nd ed.). California: Wordsworth/Thomson Learning.

Pallant, J. (2007). *SPSS Survival Manual* (3rd ed.). Crows Nest:Allen & Unwin

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use implications for preservice and inservice teacher preparation. *Journal of Teacher Education, 54* (4), 297-310.

Savery, J. R., & Duffy, T. M. (1995). Problem based learning: An instructional model and its constuctivist framework. *Educational Technology, 35*, 31-38.

Sethy, S. S. (2012). Cognitive skills: A modest way of learning through technology. *The Turkish Online Journal of Distance Education, 13* (3)

Sharp, V. (2005). *Computer education for teachers. Integrating technology into classroom teaching* (5th ed.) New York: McGraw-Hill International edition.

Vanguri, P. R., Sunal, C.S., Wilson, E.K & Wright, V.H. (2004). WebQuest in social studies education. *Journal of Interactive Online Learning.*