

The Development of METAKU to Support Learning in Hypermedia Environment

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Abstract: - The development of learning skills is not given attention in many classrooms in all levels of education in our education system today. We assume that students will be able to develop their own learning skills. The challenges students face in hypermedia learning environment need to be considered to help them learn effectively in this type of learning environment. METAKU is developed to assist students to apply metacognitive learning strategies, that is, planning, monitoring and evaluation during the learning process in hypermedia learning environment. This paper discusses the development of METAKU which employed the first three stages of a generic instructional design model - ADDIE which consists of the following stages: 1) Analysis, 2) Design, 3) Development, 4) Implementation and 5) Evaluation. In the analysis stage, the data was collected using a triangulation method done concurrently: a survey of student's preference of studying online versus offline; a focus group interview to identify challenges they face and strategies they use whilst accessing and studying the hypertext materials; and a record of student's interaction with the computer using captivation software. A total of 240 second year university students in two public universities in Malaysia were involved in this study. The analysis stage provides information for stage 2 and 3 where the data collected was used in formulating the content and design of METAKU. It is hoped that METAKU will be able to help students develop learning skills in hypermedia learning environment

Key-Words: - Hypermedia learning environment, METAKU learning strategies, Metacognitive learning strategies, Online study skills.

1 Introduction

Learning how to learn is a very important aspect in preparing students to be skilful in solving problems and managing challenges faced in their learning process. Literature has shown that the concept of "learning how to learn" is not new. Considerable research has been done to gauge the extent of skills and knowledge students should possess to help them become proficient in their learning process.

Traditionally, research on "how to learn" are mostly centered on the development of study skills such as reading skills, time management, information processing strategy and techniques to improve memory. The focus of these researches is

mostly on the kind of skills needed to help them learn better from printed text. In current learning environment where ICT technologies are prominent and students connectivity to the Internet is vast, student are expose to different form of text namely hypertext and hypermedia [1].

Since hypermedia learning environment brings benefits as well as challenges to students' learning process, it is important for us to give our students the chance to experience such a learning environment whilst getting the maximum benefit from it. Therefore there is a need for us to design an education system that plays a greater role to educate students to access information and use the information to achieve their learning objectives [2].

In order to help students learn effectively in this environment, it is very important to determine what are the skills needed and what kind of support could be developed to help them study effectively in this environment.

Information in a hypertext system differs from printed text where it is presented on a computer screen compared to on a printed page [3]. Hypertext based applications linking many different forms and sources of information gives user freedom to browse and access material in any sequence and manner [4]. In this learning environment, students face different form of problems that need different skills to overcome challenges that come with the new technology. Research in study skills and learning strategies suggested that metacognitive learning strategies can help students take charge and subsequently improve their learning process [5]. It is hypothesized that adopting these strategies will allow students to take charge, organize and control their own learning. In hypermedia learning environment the notion of taking charge of their learning process is very important to avoid problems associated with accessing and studying hypertext materials in the Internet, such as, disorientation, cognitive overload and “lost in cyberspace” [1,6,7,8].

This paper discusses the findings of the analysis part of the ADDIE MODEL as a scoping study to develop METAKU, a web based metacognitive learning strategies aimed to help students learn effectively in hypermedia learning environment. ADDIE refers to five steps in developing courseware namely Analysis, Design, Development, Implementation and Evaluation [9]. The paper will also reveal the common patterns of accessing and studying the hypertext material online. METAKU was materialized from these findings.

1.1 Hypertext and Hypermedia

Hypertext is a network made up of non-linear units, in which text chunks (nodes) are related (linked) in multiple ways [6]. Basic elements of hypertexts are nodes and links. Nodes are fundamental unit of information in a hypertext document and can contain a combination of text, graphics and/or other forms of data. On the other hand, links are electronic cross references that connects nodes with each other. Computer screen immediately changes to reveal the contents of the node to which link refers when a reader select a link.

Hypermedia is produced from hypertext [10] and

an extension of it by including visual information, sound, animation and other forms of data [11]. Hypermedia documents normally have multiple connections so that users are free to follow their interests. Hypermedia refers to computer-based applications for consulting multimedia information resources [12]. Hypermedia refers to computer software that uses elements of text, graphics, video, and audio connected in such a way that the user can easily move within the information [13]. Each user chooses the pathway that is unique to his or her style of thinking and processing of information. According to its characteristics, hypermedia provides a learning environment that is interactive and exploratory.

1.2 Metacognition and Metacognitive strategies

Generally, metacognition is defined as ‘thinking about thinking’ or ‘cognition about cognition’. Flavell defines metacognition as:

“... one’s knowledge concerning one’s own cognitive processes and products or anything related to them Metacognition refers, among other things, to active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal or objective...” [14]

From Flavel’s definition it is the individuals’ awareness about their own thinking processes which enables them to monitor and regulate their thinking activity. Similar to Flavel, Driscoll also refers metacognition as individual’s awareness of their own thinking and the self regulated behavior resulted from the awareness [15]. In a learning context, metacognition refers to student’s knowledge about their own learning process. This knowledge is used to monitor and regulate their cognitive process during learning or thinking activity.

Metacognitive strategies involves three processes that help students control their learning process. They are: 1) planning, 2) monitoring and 3) evaluating. These three processes are not necessarily in a sequential order but operating interactively depending on the objective of the activity at any given point. These three steps can control the learning process through a series of questions that requires students to make self assessments about the learning task they are trying to solve. The characteristics of metacognitive strategies can assist students to overcome problems related with learning in hypermedia environment. Students using

metacognitive strategies adopt the process of consciously controlling their own learning from the process of planning, choosing the right strategies, monitoring the progress and correcting errors, evaluating the effectiveness of the strategies used and changing the alternative strategies [16,17]. In this sense, students are expected to manage their own learning, that is, they need to plan, evaluate and regulate their learning process.

2 Problem Formulation

Learning in hypermedia environment could cause hindrances to student from learning effectively. The nature of hypertext materials that comprises of extensive and interlinked information provides challenges for students when accessing and studying the materials online. Review of literature showed that learning from such an environment is associated with the problem of disorientation, missing context clues and cognitive overload [7,8]. Studies have shown that learning from hypertext brings cognitive loads to students [6]. According to Clibbon, there is a possibility that students will be confused during navigation. Most of the students will also fail in getting the overview of the information presented in a hyperlink manner [18]. Rouet et al. emphasized that without effective strategies in navigating hypertext materials, students are bound to either be lost in cyber space or end up in an area deviate from the original objective of the learning activity [19].

The nature of multiple path inquiry in hypertext has been viewed to cause these problems. In the process of interacting with the interlink documents students are usually lost and not able to figure out where they are and where to go next. They also faced problems tracing back the path they have visited or going back to the path to review the information needed. It can be concluded that the nature of hypertext system bring challenges that need to be addressed in order to help students learn effectively in this environment.

Therefore, students should be equipped with appropriate learning strategies that could help them cope with the challenges. Inevitably, they can enjoy the benefit offered by hypermedia learning environment. Research indicates that using good learning strategies helps students learn, however learning strategies are seldom taught directly in schools or college [20]. Learning strategies refers to ideas for accomplishing learning goals. Different learning environment need different learning strategies to handle the varying nature of the setting

involved.

The problems and challenges faced by students in hypermedia learning environment can be concluded into two categories: first, the process of accessing information; and the other, the process of transforming information into knowledge. The first issue is related to several challenges such as disorientation and phenomena of “lost in cyberspace”. The second issue mainly involves the cognitive tools needed to learn effectively in this learning environment.

In metacognitive literature, these issues refer to two distinct components, that is, knowledge of cognition and regulation of cognition [21,22,23]. Knowledge of cognition refers to individuals’ knowledge about their own cognition and cognition as a whole. While regulation of cognition refers to three mental processes involve in implementing a thinking activity, that is, planning, monitoring and evaluation. It is hypothesized that the first issue is related to the regulation of cognition while the second issue deals with the knowledge of cognition.

Knowledge of cognition or metacognitive knowledge consists of three types of knowledge, namely, knowledge about what (declarative knowledge), knowledge about how (procedural knowledge) and knowledge about when and why (conditional knowledge). The procedural knowledge refers to knowledge about strategies that delineate the steps of doing things such as steps in reading, etc. Meanwhile conditional knowledge refers to when and why a particular strategy is appropriate to be used.

Regulation of cognition which is sometimes referred to as metacognitive skills uses three mental processes of the thinking or learning process, that is, planning, monitoring and evaluation. Students metacognitive skills are somewhat determined by their metacognitive knowledge. They need a range of procedural and conditional knowledge so that it can be used to plan, monitor and evaluate their learning activity. In other words, knowledge of strategies and when the strategies should be used is very important to help them plan, monitor and evaluate their learning process. Related to this point, it is clear that both knowledge of cognition and regulation of cognition play important roles in helping students learn effectively.

Metacognition strategies refers to three basic steps in learning, that is, planning, monitoring and evaluating the learning process that they have gone through [20]. Zumbach, Reimann & Koch suggested

that metacognitive strategies are important in learning from hypertext because these strategies could help learners control their learning process [24]. According to them, students need to be conscious about their learning objectives and the purpose of accessing information from the Internet. Amongst the questions that they need to ask themselves at the planning process would be: what is the information they are trying to find; what are the ways they could use to access the information; how to judge the relevancy of the information. Monitoring during accessing and learning on line would mean having the students constantly be aware of the links that are related to the information they are searching for and how to integrate the information gained with their aims and the previous knowledge that they already have of the information. During the evaluation process the students are required to ask questions like: what is the relationship or relevancy of the information gained to their learning aims or the task that they are asked to accomplish. Therefore, planning, monitoring and evaluating are important for effective accessing and learning online.

The main issue in this problem statement would be to equip the students with necessary skills to learn in a hypermedia environment. METAKU is developed to assist students to apply metacognitive learning strategies, that is, planning, monitoring and evaluating information during this learning process. The study conducted was aimed to identify knowledge and skills needed by student to learn effectively in hypermedia learning environment. Specifically, the aim was to identify appropriate metacognitive learning strategies in hypermedia learning environment, and later to design and develop a web-based metacognitive learning strategies courseware to help students acquire study skills to learn in hypermedia learning environment.

3 Problem Solution

The development of METAKU employed the first three stages of a generic instructional design model - ADDIE which consists of the following stages: 1) Analysis, 2) Design, 3) Development, 4) Implementation and 5) Evaluation. The analysis stage provides information for stage 2 and 3. This research emphasises users as the heart of the design process which represents the main elements in the analysis stage. This practice is in line with the idea that Internet application demand is to concentrate on

the interest of the user [25]. Based on the information gathered in stage 1, the detailed design of user-friendly interface, content and pedagogical components of the web-based metacognitive learning strategies were scrutinized. It is in stage 3, based on detailed design (storyboard), the METAKU was developed. The contents were formatively tested and evaluated among the team members of the research, as well as, the evaluators and targeted users. In the implementation and evaluation stages, pilot testing was conducted to identify the strength and weaknesses of the courseware. The researchers also observed and evaluate the implementation of the courseware.

In the analysis stage, the data was collected using a triangulation method done concurrently: a survey of student's preference of studying online versus offline; a focus group interview to identify challenges they faced and strategies they used whilst accessing and studying the hypertext materials; and a record of student's interaction with the computer using captivation software. Samples of the study consisted of second year university students in two public universities in Malaysia. A total of 193 students were involved in the survey. 37 students were placed in four focus group interviews (8-10 students in each group) whilst another ten were involved in the study relating to the captivation of data as they interact with the computer while studying the hypertext materials. METAKU was materialized from these findings.

3.1 Finding 1 – Preferences survey

The survey was done to identify student's preferences between online versus offline learning when interacting with hypertext material accessed from the Internet. The respondents were also asked to state the reasons for their preferences. Results of the survey shows that only 26% of the respondents study the hypertext materials online, 67.8% of the respondents study the materials offline and the remainder used both online and offline methods (See table 1).

Gender	Online	Offline	Online& Offline	Total
Male	18	42	6	66
Female	32	89	6	127
Total	50 (26%)	131 (67.8%)	12 (6.2%)	193

Table 1: Students preferences of studying online versus offline

Analysis on reason of preferences showed that students studied the materials online if the task involved is simple, short, and does not need a longer time to study. A more complex assignment that requires an extended time to retrieve and study the information will be done during offline. Since most of the respondents used cyber cafes to access the Internet, they usually save the materials as offline to learn or used the materials at their own time.

This finding revealed that the common practice for most students when accessing information from the Internet would be the tendency of saving the materials accessed so as to learn it later as 'offline' materials without the Internet. Learning hypertext materials in this manner could cause misinformation. The interlinked characteristics in hypertext cause learning offline a disadvantage because much additional information found in related linkages that could be useful and relevant could be missed out by the students [26].

From the results, it could be concluded that students need to learn to save the materials in a systematic way so that the materials they saved can easily be traced when needed. A systematic saving procedure will help students to identify the relationship between materials that they saved and organized it in a meaningful way. METAKU could be useful in providing learning strategies for these groups of students who need to access the materials online and save it for later used.

3.2 Finding 2 – Focus group interview

Data from focus group interviews were transcribed and coded using NVivo 7. Two types of data were analyzed from the focus group interviews: 1) problems related to accessing and studying the materials online, and 2) strategies used while accessing and studying the hypertext materials. Thus, findings were reduced into thematic categories representing problems student faced in relations to the used of hypertext materials and common strategies adopted by them while accessing and studying hypertext materials online.

3.2.1 The problem associated with learning the materials online

The analysis revealed that there are two main problems emerged from the data: i) Problems associated with retrieval of linked pages in the hypertext system and ii) Problems related to the difficulty in linking the information. For the first problem, respondents claimed that the hyperlink

provided in the materials sometime led them to pages that are not very useful and sometimes out of context thus wasting their time. They also experienced a sense of lost when they try to explore the links that sometimes dragged them away from their initial goal of learning. Among the comments from the participants were:

"... There are too many links and I don't know which one to visit first..."

"... I don't know where I am going..."

"...sometimes I couldn't retrace the pages that I already viewed..."

"... sometimes I end up going to other pages that are not related to my task..."

These results showed that during the browsing and navigation process, students have the tendency to experience the sense of lost, not knowing where to go first and how to go back to the visited pages. These findings support the literature regarding the problems of disorientation and the phenomenon of "lost in cyberspace" [6,7,8].

The nature of interlinked of hypertext material also caused cognitive overload. This leads to the problem of failure to make connection between the information accessed. They claimed that it is quite difficult to understand and determine online the relevance of the materials they accessed. One of the respondents noted that:

"...just cut and paste from the links that I think relevant and study it later..."

Another respondent claimed:

"I am not very sure how to make connection between information from various links online..."

Most of the respondents agreed the benefit of the links provided in the hypertext materials. One respondent concluded that

"...the materials in the link might be important to understand the subject..."

However, they also claimed that the process of accessing the pages in this manner took a longer time. Sometimes the process could end up leading them to nowhere.

Generally, most of the respondents agreed that they just "cut and paste" the materials they thought are relevant to be studied during offline. In other words, the students failed to construct knowledge from the process. In the end, they were trapped with the activity of "cut and paste" syndrome. These findings showed that students were unable to process the information effectively, therefore failed to make connection between the materials that they

have found. Thus, it is suggested that students should be equipped with cognitive tools to help them in the knowledge construction process.

3.2.2 Strategies students used in accessing and learning the materials online

The strategies used by students were analysed using metacognitive framework, namely; the planning, monitoring, and evaluating. From the analysis, it could be concluded that most of the respondents did show some process of planning, but the monitoring and evaluating process is very minimal. The planning process includes understanding the materials needed and the identification of key words for searching the materials. One respondent suggested listing out what is the relevant information they need to find in relation to the assignment they tried to solve. However, most of the respondents agreed that they only did their planning mentally. One participant responded "... *I just do it in my mind...*"

Regarding the monitoring and evaluation process, most of the respondents claimed that they did monitor and evaluate their learning process. However, when asked whether they use certain tools to monitor their learning process, most of the respondents agreed that they only do the monitoring and evaluation mentally in their mind. These findings showed that even though they claimed that they did some form of monitoring and evaluation, but there is no clear indication of how it is done.

These findings are evidences of the students' lacked in metacognitive skills required to learn effectively in a hypermedia environment. Without proper planning, monitoring and evaluation, students will not be able to manage their learning process in this environment. The use of metacognitive strategies would be appropriate to help them develop these skills so that they can take charge of their own learning in hypermedia environment.

3.3 Captivation Data

Further analysis was done on ten students to identify their interaction with the computer while studying hypertext materials online. The interaction was captured using Screen captivation software. From this recorded interaction, the pattern of interaction was derived. Findings have revealed that the main strategies adopted by the participants were to save the information using word processing software. Most of the participants were found to translate the materials portion by portion, using a home page that

provides translation services to translate the materials into their native language (From English language to Malay language). This process of translating and saving the materials were used for all the materials they accessed from the Internet.

Figure 1 showed the pattern of accessing and studying the hypertext materials used by the ten participants. It is found that majority of the participants tried to translate the material using the translation services from the web before saving the materials using the word processing software. Two participants were found to save the materials without an attempt to translate the materials. In the word processing software, some participants did edit the materials before saving it but majority of the participants just copy and paste the translated version bit by bit into the word processing software. Finally, the materials accessed were saved to be read or studied later without the Internet (offline).

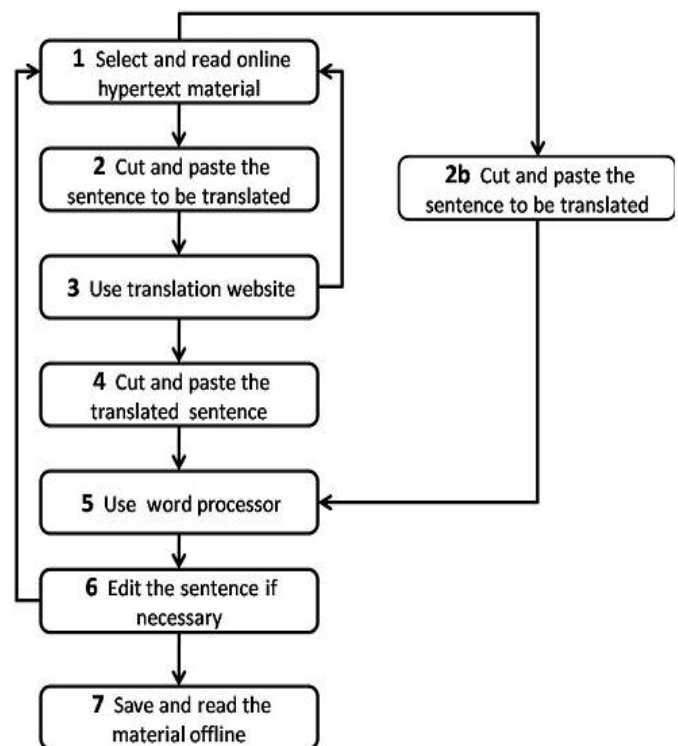


Fig. 1: Pattern of interaction between students and the computer

The procedures adopted by the participants showed that the students relied solely on the translation without an attempt to process the information retrieved. In other words, they fail to construct meaning or knowledge from the process. The pattern of interaction indicated that students did not attempt to process the information online. This

pattern supported findings from focus group interviews as reported by one of the respondent:

"... I try to translate into Malay and do the summary and conclusion later during offline...."

From the patterns of interaction, it can be concluded that effort to process the information was only done when students learn the materials that they saved during offline learning. This explains why students failed to make connection between information retrieved as the materials were not view as a whole concept but in a piece meal manner. These findings supported the data from the survey that concluded that students were unable to process the information effectively.

These results are indications of the students' lack of skills to process the information and to transform the information into knowledge. It supported the data from the focus group interview that detected the problem of the "cut and paste" syndrome and the failure of making meaningful representation of the materials learned. Thus, there is a need for them to be equipped with the skills on how to process the information they retrieved from the Internet. Tools that can help them synthesize the information would be beneficial to promote knowledge construction thus avoiding plagiarism.

In accordance with the results from the preferences survey, it can be concluded that general strategies adopted by students can be categorized into four main activities, namely: 1) accessing the materials, 2) selecting the materials, 3) learning the materials online and 4) saving the materials to and for future used. Most of the respondents have reported that they did most of the searching, selecting and saving materials online; and study the materials during offline. If the learning objective is simple and short, some respondents agreed that they will study the materials online. Generally, the respondents used the "cut and paste" approach during online sessions and study the materials later during offline sessions.

In conclusion, data from the three methods of data collection supported each other in explaining the challenges and strategies students used while interacting with the hypertext materials in the Internet. Results of this study have provided the data for the second and third phase of ADDIE, that is, on designing and developing METAKU.

3.4 Implication of the Analysis Stage Finding

Results of the study has shown that, during the browsing and navigation process, students

encountered problems associated with: the tendency to be lost in space; the inability to process information effectively; and the failure to make connection between the materials they found from the links provided in the hypertext materials.

The study revealed that most of the students used very minimal effort to study the materials online. They have no intention to understand the materials being studied but more to enable them to reproduce the material in the original form without an attempt to analyze, integrate and synthesize the materials into a more meaningful form. They are trapped with the activity of the "cut and paste" syndrome. At the same time, such a syndrome could also expose them to plagiarism. It can be concluded that the note taking activities and process of knowledge construction is very minimal in this approach. This approach limits their opportunity to construct meaningful and organised knowledge from the process. From the perspective of cognitive psychology, attention should be given to the construction of knowledge during information processing process [26]. From the findings it could be concluded that students using this approach lacked the skills to synthesize and structure the information they studied during the online learning activities. Thus, it is very important to equip the students with the awareness of the process involved in the knowledge construction.

Results of the study also indicates that students learning activity can be classified into four stages, namely, the searching stage; selecting the materials stage; learning online; and saving the materials for future used during the offline stage. Most of the students save the materials during their online sessions to be used during offline sessions. Thus, it is suggested that students should be equipped with skills in these four activities. They should be guided so that they can learn how to access, select, save and study the materials online or offline.

Technical skills that are needed to browse and navigate effectively and related knowledge needed to select, save and learn the materials effectively, should be addressed to help students become expert learner in hypermedia learning environment.

These requirements relate to three types of knowledge that is declarative, procedural and conditional knowledge. The students should be equipped with declarative, procedural and conditional knowledge in order to plan, monitor and evaluate their learning process.

The declarative knowledge refers to knowledge

about things or object related to the activity they are doing. In this context, students need to be aware of the basic skills they need to have in order to learn effectively in hypermedia environment. This declarative knowledge includes the availability of tools that can help them to function effectively such as the browser and the search engine that can be used to help them navigate in the Internet.

The procedural knowledge refers to knowledge about how to do things; meanwhile the conditional knowledge refers to when to use it. In this context, they need to learn how to browse, select, save and finally how to learn the materials effectively. Step by step tutorial will help them understand the procedures and when to use it.

These three types of knowledge should be designed in a meaningful way in order to help them be aware of the importance of knowing the necessary skills and mastering the skills and applying the skills at the appropriate time.

Results of past study proposed that adopting metacognitive strategies will allow students to take charge, organize and control their own learning. From the result of the study, it can be concluded that students in this study still lacked metacognitive skills that are needed to help them study effectively in hypermedia environment. The planning aspect was done in a non-systematic manner at the beginning of the search. Meanwhile the monitoring and evaluating process was very minimal. This leads to ineffective strategies. No specific tools such as mind maps or concept maps are used in the planning process. There are traces of monitoring in terms of identification of the materials access in relation to the objective of the searching process. However, the self-questioning process is not very clear and the respondents failed to bring the process into conscious level. The use of cognitive tools such as mind map that are prepared during the planning stage is helpful in a monitoring process. Thus, it will be beneficial if the students are taught to use such strategies to aid their learning process. It was concluded that many students failed to acknowledge the importance of planning, monitoring and evaluating their learning process. These results suggested that students need to be equipped with online learning skills to help them control their learning process in hypermedia environment.

At a practical level, metacognition could be taught to students. Similar to teaching students to use certain strategies to improve comprehension of textual materials, students could be taught to use

metacognitive strategies to help them plan, monitor and evaluate their learning process. It is suggested that the process of planning, monitoring and evaluation should be emphasized in all the stages in order to facilitate students learning activity in hypermedia environment.

3.5 Development of METAKU

METAKU was developed based on the data gathered from this study. Problems faced by the students and general strategies used by them provided the basic concept in designing and developing the courseware. Data from literature review were also used to guide the development of METAKU. Specifically, it uses minimalist theory to avoid boredom and increase engagement of the users while interacting with METAKU. The courseware consists of three main contents, namely: 1) self analysis, 2) pre-requisite skills and 3) METAKU learning strategies. It also provides information, objective and advantages of METAKU courseware (see figure 2).

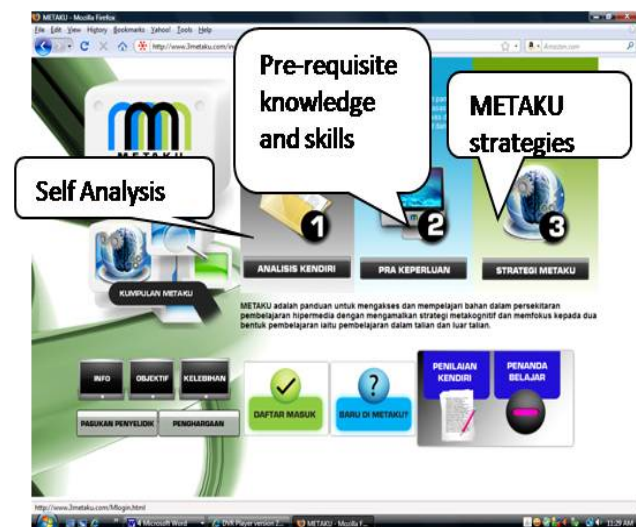


Fig. 2: METAKU main page

The self analysis aimed to help users to identify their knowledge and skill to learn effectively in hypermedia environment. The prerequisite technical skills are aimed to provide knowledge and skills necessary to help students access, select and saved materials from the Internet. The basic skills provided in this section includes the web browser, the search engines, search techniques and ways to save materials that are accessed during online session (see Figure 3).



Fig. 3: Pre-requisite knowledge and skills

The METAKU strategies are aimed to help students used metacognitive strategies to learn effectively in hypermedia environment. It provides two modules, namely, first: the online learning strategy and secondly the online and offline learning strategies. For the first module, it covers three activities namely: 1) accessing/searching the materials, 2) selecting the materials, and 3) learning the materials online. The overall strategy for this module is presented in graphic with the explanation of the diagram to help students conceptualized the main element that is needed to be considered in using this strategy (see figure 4).

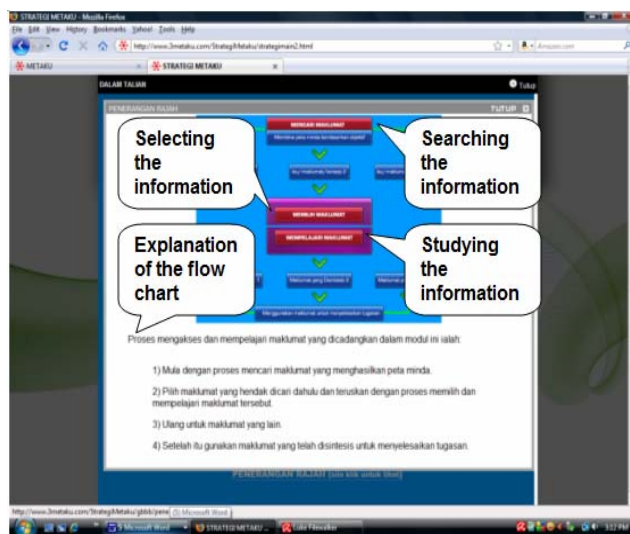


Fig. 4: Module 1

The first module is meant for students who are studying the materials during online session. Based

on the data gathered from the analysis stage, students using this method usually when studying online if the topic under study is simple and do not need much materials to be covered. In other words, they search the information, select the suitable materials and process or synthesize the information to solve their problems or to help them formulate or understand new things in online mode. In this module, students are guided on how to plan, monitor and evaluate the three activities, namely, when they access the materials, when they select the materials and when they learn the materials.

Whereas for the second module, it covers all the four activities namely 1) accessing the materials, 2) selecting the materials, 3) saving the materials and 4) learning the materials offline (see figure 5).

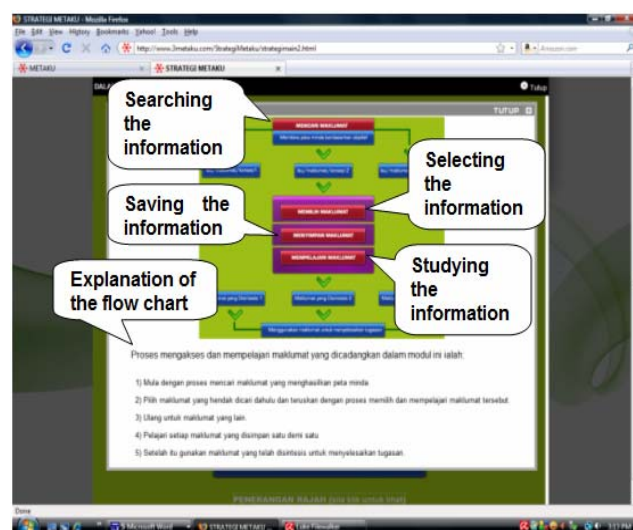


Fig. 5: Module 2

Module 2 is meant for students who search, select and save materials during online sessions to be studied during offline. From the data gathered in the analysis stage, students are found to face difficulties to trace information that has been saved and to find connections between the materials. Thus, the module provide strategies to save the materials in a systematic way that can assist students to conceptualised the relations between the materials accessed with the task at hand.

The main characteristic in each activity in Module 1 and 2 is the three metacognitive processes, that is: 1) the planning aspect, 2) the monitoring aspect and 3) the evaluation aspect (see figure 6). The procedural knowledge on all these three activities is provided and students are also given the opportunity to try out the activities through hands-on activities in the activity section.

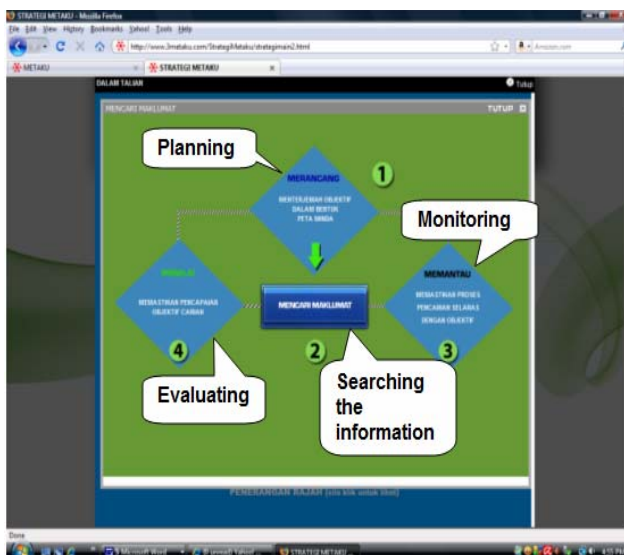


Fig. 6: Three metacognitive processes in searching information

For the studying of information activities, the module provides the tools in the form of templates that can be used to help students synthesize the information learned. An example of the tool can be seen in figure 7. This tool is aimed to aid the knowledge construction process thus promoting a deeper understanding and a more effective learning process.

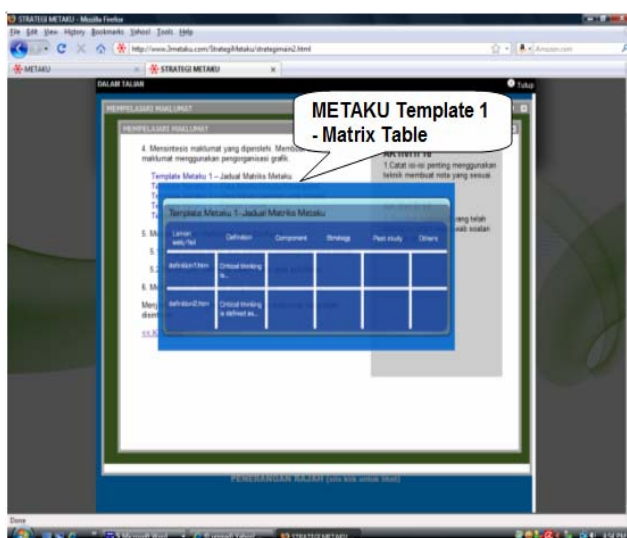


Fig. 7: Tools to synthesized information

It is hypothesized that after following the module, students will be able to take charge of their learning process thus be able to manage and overcome the problems such as disorientation, lost in cyberspace and cognitive overload issues.

4 Conclusion

METAKU is a web based metacognitive learning strategies aimed to help students acquire study skills to learn effectively in hypermedia learning environment. METAKU was developed based on the results of the analysis stage as well as suggestion from literature review related to challenges and suitable strategies that can help students overcome the problem faced in accessing and studying hypertext materials from the Internet.

Based on review of literature, metacognitive approach was used as a basis in developing the METAKU learning strategies. The three metacognitive processes namely the planning, monitoring and evaluation processes were used to help student to take charge of their learning process. This characteristic is very important as a tool to prevent students from cognitive overload problems as well as protecting them from the risk of 'lost in cyberspace'. It can be concluded when the students are aware that they need to plan, monitor and evaluate; and know how to plan, monitor and evaluate their activities, they will be able then to avoid problems that are associated with cognitive overload, disorientation and the phenomena of losing in the cyberspace. It is hoped that by providing students with these skills, they could achieve competency in accessing and studying hypertext materials in a hypermedia learning environment. The aim of the future study of METAKU, will later be to evaluate its effectiveness in helping students learn in this environment.

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