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Fundamental Support and Reflection Support for Report Writing from Web

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Abstract: In educational institutions,it becomes the problem that students just copy-and-paste the information onto their reports because knowledge is not constructed. We are developing the knowledge construction support system for effective report writing from the web. In this paper, we describe the fundamental support functions and the reflection support function.

Keywords: Report writing, reflection, knowledge construction, copy-and-paste, web

Introduction

By the spread of the Internet, nowadays, we can collect much information easily from web and construct knowledge. In other words, web pages can be used as unlimited resources for knowledge construction. Knowledge construction from the web has been known to be highly effective because we can apply our self-directed ways to knowledge construction [1]. However, information written on web pages is not entirely reliable as it is not always written by specialists, but instead, in many cases by the general public, who might not have proper knowledge. To construct knowledge effectively, we need to evaluate the information from multi-perspectives.

In educational institutions, students are often given report writing assignments. Many of the students will make maximum use of web pages as one of the information resources for report writing. Information written on web pages is digital data. Therefore, the students can easily copyandpaste the information onto their reports. Here, such a copy and paste can be seen as a problem in report writing. This is because they may just copyandpaste the information onto their reports and finish report writing. This problem means that students cannot construct knowledge and those reports are not written based on the students' knowledge― not externalized as their constructed knowledge. As a result, those reports may have superficial and low-quality contents. For example, they may write reports from the misinformation written on a web page without multi-perspectives evaluation. We call this problem "unproductive copy and paste". A survey report says that quarter of university students was suspected of plagiarism by the unproductive copyandpaste [2]. To make matters worse, the unproductive copyandpaste can be regarded as copyright violation. This serious situation must be eradicated as an adverse effect of report writing from the web.

In this study, we proposed a model of knowledge construction from the web and developed the system that supports knowledge construction (report writing) [3]. In this system, a student compares and/or applies information written on two web pages, write a note as their short constructed knowledge, and finally write a report from the written notes. The most characteristic point of this system is to forbid the student to copy and paste the information to the note. Therefore, it is expected that students construct knowledge and write high-quality reports without the unproductive copy and paste. This characteristic can be regarded as load application approach, where giving load is considered to be effective for knowledge construction. For example, Kashihara et al. have succeeded in enhancing students' explanation skills by inducing them to make as many cognitive loads as possible [4]. In

adaptive hypermedia research, Hübscher and Puntambekar have argued "the use of too much navigation support can be detrimental to the learner because it frees him or her up from thinking" [5].

For more effective report writing, we think that report writing should include the phase of "reflection" where students revisit their visited web pages, reflect on their notes, and/or refine their reports— reconstruct their constructed knowledge. Therefore, the system should support the reflection phase, implementing a new function.

1. Knowledge Construction from Web and Report Writing

An advantage of knowledge construction from the web is that students can construct a lot of knowledge by using the web as unlimited resources. On the other hand, knowledge construction from the web is not always easy. For effective knowledge construction, the students have to not only read the content of their visited web pages but also think about the content from multi-perspectives.

We made a simple model of knowledge construction from the web (Figure 1). The following focuses on the activity of "web exploration" in the knowledge construction phase and the phase of "reflection".

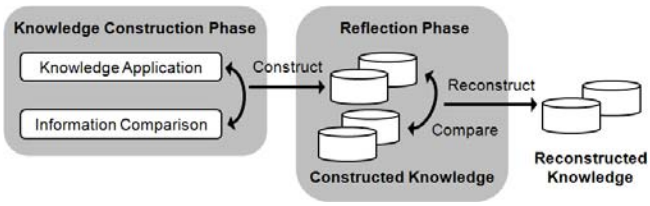

Figure1. Model of Knowledge Construction from Web

1.1 Web Exploration

Students visit web pages by following hyperlinks and read the content of their visited web pages. And, the students construct knowledge by thinking about the content. We have proposed multi-perspective thinking as a model of web exploration (web-based exploratory learning) [6][7]. Figure 2 shows the multi-perspective thinking model. Multi-perspective thinking is defined as follows: "a student constructs knowledge by thinking about his/her target topic from multi-perspectives."

1.1.1 Information Comparison

Information comparison is that a student compares the content (information) of more than two web pages on one target topic in order to construct the correct knowledge. To be more precise, the correct knowledge comes from the repeat of thinking about common points and different points that exist in the compared content. A perspective in the information comparison shows up as a difference in the content of web pages on the target topic.

1.1.2 Knowledge Application

Knowledge application is that for one target topic, a student applies his/her constructed knowledge about the related topics to his/her constructed knowledge about the target topic in order toconstruct the widely connected knowledge of the target topic. To be more precise, the widely connectedknowledge comes from the repeat of thinking about the relations between

the target topic and the related topics. A perspective in the knowledgeapplication shows up as a difference in topics.

These two activities in the multi-perspective thinkingmodel are seamless.

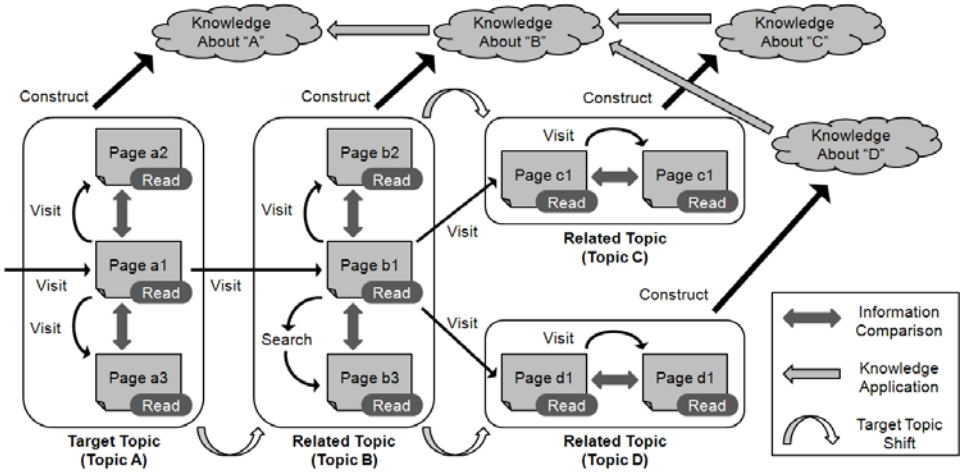

Figure2. Multi-perspective Thinking Model

1.2 Reflection

Reflection can be rephrased as knowledge reconstruction, which is done after knowledge construction. At this phase, a student reconstructs his/her constructed knowledge by some reflection methods. One of the principal reflection methods is that the student compares their constructed knowledge. Reflection leads to making their constructed knowledge more correct and well-structured.

1.3 Report Writing

A report writing assignment is suitable for seeing students' inquiry capability, organizational skill, and constructed knowledge. Teachers often give students a target topic of report writing not having a single correct answer and recommend the students to use the web as the primal resource, expecting that the students will do multi-perspective thinking in knowledge construction from the web. Therefore, report writing will result in— can be regarded as— knowledge construction from the web.

On a routine basis, students complement and stabilize their constructed knowledge by externalization—note taking is a typical example. This activity can be applied to knowledge construction from the web. The student would externalize their constructed knowledge as digital media (e.g., annotation) in the recursive process of the information comparison and the knowledge application. If well compiled, the externalized knowledge can be a report (product).

1.4 Report Writing Model

It is important to consider how the externalized knowledge can be well compiled for a report. The compilation activity can be regarded as a certain kind of reflection. Therefore, students should compare and apply their externalized knowledge in order to complete their reports.

We think that reflection is important for effective report writing and propose a model of report writing from the web, which is based on the multi-perspective thinking model and

consists of the four steps (Figure 3). This model represents the process of effective report writing.

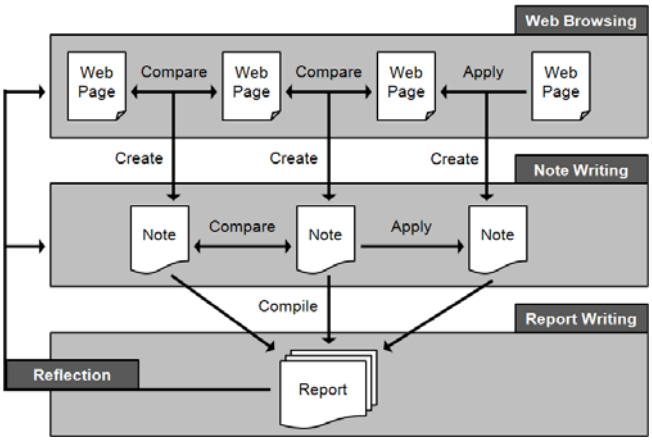

Figure3. Model of Report Writing from Web

(1) Web browsing (web exploration)

The content of web pages about a report topic differs among the page authors. At the first step for effective report writing, a student visits as many web pages as possible and does the information comparison and the knowledge application to construct the correct and widely connected knowledge.

(2) Note writing

A report should be written from their constructed knowledge. Therefore, the student externalizes their constructed knowledge as a note in order to write a report. At this step, his/her note is a temporary resource for report writing.

(3) Report writing

The student writes a report by doing the multi-perspective thinking toward and then compiling the written notes.

(4) Reflection

The report written through the above steps is not the completed version but just a draft version. In this model, the student is required to revisit his/her visited pages, do the multi-perspective thinking, and reflect (revise) the written notes. Then, the student does the multi-perspective thinking toward the reflected notes and refines the draft version. Such a reflection is repeated one or more times, and the final version of his/her report is completed.

2. Report Writing Support System

We developed a report writing support system based on the report writing model. This system, which is integrated with a LMS server, works on a client PC with Microsoft .NET framework.

2.1 Fundamental Support Functions

This system has the following fundamental support functions forencouraging students to do multi-perspective thinking andpreventing them from the unproductive copy-and-paste.

(1) Two embedded web browsers

Two web browsers are embedded alongside in this system so that a student can do multi-perspective thinking smoothly(without split-attention effect [8]) for his/her visited webpages. In the step of "report writing", these browsers display not web pages but notes that the student wrote. The student can easily compare or apply his/her created notes to write a report.

(2) Ban of copy-and-paste

In this system, it is banned to copy and paste text data on web pages. The function cannot copy-and-paste from other applications such as Internet Explorer directly. Therefore, the student has to type their constructed knowledge into the note as text data. As a matter of course, the student can transcribe text data on his/her visited web pages by typing the text data precisely. If seeing the superficial result of this transcription, teachers may be suspected of the unproductive copy-and-paste. However his/her typed text data may have been constructed as knowledge, because a typing load is much bigger than a copy-and-paste load. This function is the fundamental for effective report writing. Currently, the student is exceptionally allowed to copy and paste image data. This is because duplicating image onto the note requires him/her extra skills and gives high load.

(3) Storing note and report files on the LMS server

In this system, the written notes and the written report are always stored not on the student's client computer but in the LMS server. This function prevents him/her from copying assignment products created by peers. The text-based note is stored as RTF (Rich Text File).

2.2 Reflection Support Function

The early version of the system did not have a reflection support function. It is difficult for students to totally reflect report writing because they only have web browsing histories, which are provided byte two web browsers and only arranged in order of time axis. Therefore, we implemented a reflection support function in the system.

Figure 4shows the architecture of the reflection support function. This architecture, which stores data of web browsing history and notes linked to two compared web pages (two displayed web pages when a student wrote a note), visualizes the data to simplify the reflection operations by the reflection support module. For example, as soon as the student clicks on the title of a note, the note and its linked web pages are displayed.

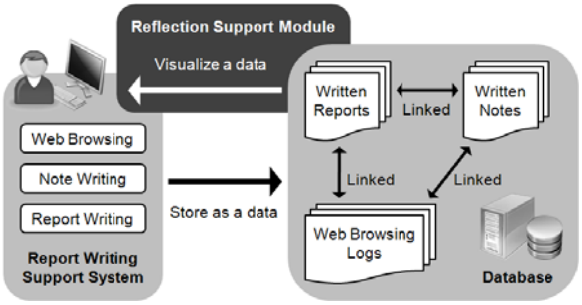

Figure4. Architecture of Reflection Support Function

2.3 Usage Flow and User Interface

(1) Login and report selection

A student who has done registration can activate the system by logging in through password authentication. After the login, the list of the student's report assignment is displayed as shown in Figure 5.In this list, "Lecture Name", "Report Name", "Submission Deadline", "Last Update", and "Condition" are displayed by each report. When passing the deadline of a report, the condition automatically become the status of "completed". Before the deadline, the condition remains the status of "editing" and the student can edit a chosen report.

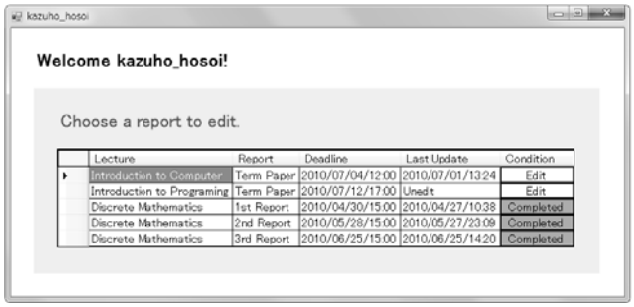

Figure5. Screen of Report Choice

(2) Web exploration

The main user interface of the system roughly consists of two web browser components ("WB components" for short) (top-left and bottom-left) and the note writing component ("NW component" for short) or report writing component ("RW component" for short) (right). Figure 6 shows the main user interface. First, a student may often input a search query (keyword) into a search engine to find web pages. After web search, the student compares the two displayed web pages.

(3) Note Writing

On the NW component, the student can write the note in a manner similar to popular word processor software. As soon as he/she presses the "Save" button, the written note is stored as RTF in the LMS server.

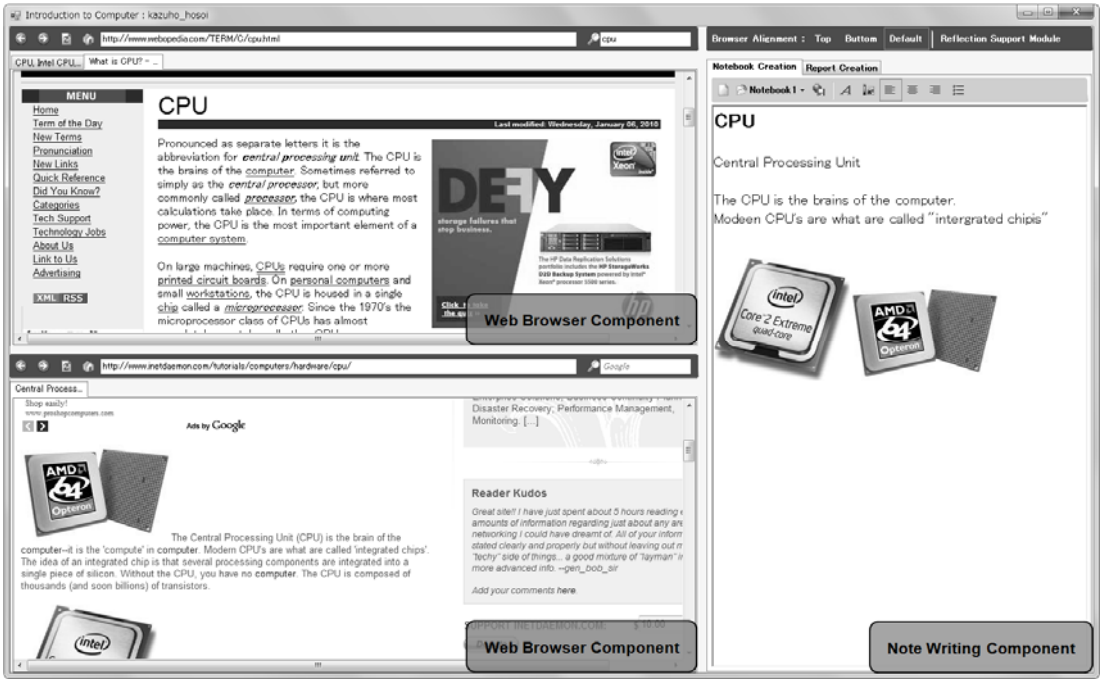

Figure6. Main User Interface

(4) Report Writing

After the successive note writing, the student tries to write a report. At this step, the two WB components change to two NW components and the NW component changes to theRW component, which has the same functions as the NW component. Therefore, the student can write his/her report in the same manner as the note writing. In this step, the student is allowed to copy and paste text date on the two NW components into the RW component, because the text date has already been typed by the student— he/she has already constructed the knowledge written on the NW components.

(5) Reflection

When being stuck at report writing, after writing the draft version of his/her report and so on, the student shifts to the reflection phase. The student presses the "Reflection" button and the reflection support function runs. Figure 7 shows the user interface for reflection. The user interface consists of “Note” objects, “Browser” objects, “Tab” objects, and “Web Browsing Log” objects. Each object is mutually related, and shows report writing logs (histories) concerning the report the student is editing. The title of the web page that had been displayed on two web browsers when the student saved a note is highlighted in a bright color. Therefore, the student can look down at the process of the note writing and the report writing.

After looking down at the process, for reflection, the student selects the title of a note or a web page, and clicks the "Note" object or the "Web Browsing Log" object. When the "Note" object was clicked, the selected note is displayed as a new tab to the web browser component. At that time, the student can choose a web browser that displays a new tab by mouse operation. By left-click, the student can display the selected note to the top web browser, and display it to the bottom web browser by right-click. In addition, the state when the note was written (saved) is recreated to the NW component and the WB component by middle-click. The web page that had been displaying when the note was written is displayed to the WB component and the written note is displayed to the NW component. When the "Web Browsing Log" object was clicked, the selected log is

displayed as a new tab to the WB component. In the same manner as the "Note" object, the student can choose a web browser that displays a web page by left-click and right-click. By this reflection support function, the student can easily look down at the report writing process and revisit web pages.

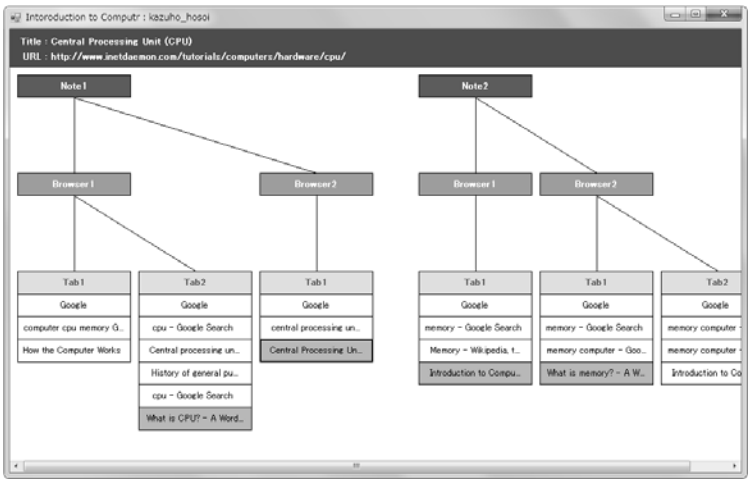

Figure7. User Interface of Reflection Support Function

3. Conclusion

In this paper, we described the fundamental support functions and the reflection support function for effective report writing from the web. This system is based on the model of knowledge construction from the web and the model of report writing from the web that we proposed. By the system, students can base on these models and effectively construct knowledge with report writing.

As future works, we will develop the function is visualized by a new method on the reflection module. As one of the new visualization method, we propose the visualization by time axis. We conduct experiments to evaluate whether the system will be accepted by students and will actually lead to effective report writing.

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