Learning How to Learn with Web Contents

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ABSTRACT
Learning Web contents requires learners not only to navigate the Web pages to construct their own knowledge from the contents learned at and between the pages, but also to control their own navigation and knowledge construction processes. However, it is not so easy to control the learning processes. The main issue addressed is how to help learners learn how to learn with Web contents. This paper discusses how to design a meta-learning tool.

Categories and Subject Descriptors
H.5.4 [**Information Interfaces and Presentation**]: Hypertext/Hypermedia – *navigation, user issues.*

General Terms
Design, Human Factors.

Keywords
Meta-Learning, Navigational Learning, Web Contents, Hyperspace, Learning Affordance.

1. INTRODUCTION
Learning how to learn, which is called meta-learning, often contributes to learning more effectively and efficiently and to developing learning skill [1]. In this paper, we focus on meta-learning on the Web.

The Web can be viewed as a promising learning platform, which opens up new possibility for learning. In particular, Web contents have a potential beyond textbooks. Web contents generally provide learners with hyperspace where they can navigate the Web pages in a self-directed way. The self-directed navigation involves making a sequence of the Web pages, which is called navigation path. It also involves constructing knowledge, in which the learners would make semantic relationships among the contents learned at the navigated pages. The navigation path often includes the pages belonging to different Web sites. The constructed knowledge is also composed of diverse ideas/contents since each Web site is designed by its own author. The learners can accordingly learn more widely in an individualized way [4]. In this paper, such navigation with knowledge construction is called navigational learning [4].

On the other hand, the navigational learning is not always achieved since it is not so easy for learners. In learning Web contents, learners are required not only to navigate the Web pages to construct their knowledge, but also to control the navigation and knowledge construction processes. In order for learners to succeed in learning Web contents, they need to learn how to control the navigation and knowledge construction processes, which corresponds to meta-learning for learning Web contents.

In order to facilitate meta-learning, we have developed tools, which scaffold controlling the navigational learning process [2], [6]. This paper discusses key issues of designing a meta-learning tool, which have been obtained from the experience of developing the tools.

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2. META-LEARNING TOOLS
Let us first introduce two tools, which scaffold controlling navigational learning process in hyperspace provided by Web contents. There are two ways of controlling the navigational learning process, which we have proposed [4], as follows:

(1) Navigation planning, which is to plan a navigation path to be followed for achieving a learning goal before navigating the hyperspace, and

(2) Reflection, which is to reflect on the navigation and knowledge construction process carried out so far, the knowledge constructed, and incompleteness of the knowledge construction process after/during navigating the hyperspace.

In this paper, we regard learning how to learn with Web contents as learning how to plan and reflect on the navigational learning process. On the other hand, it is quite difficult for learners to plan/reflect on the navigational learning process concurrent with learning the contents of Web pages. In Web browser-based learning environments, in addition, they often have difficulty in planning which navigation path should be followed from a current page the Web browser shows, although they can pay attention to understanding the contents of Web pages. It is also difficult to get information about how their knowledge has been constructed.

In order to address these problems, we have developed the tools called Navigation Planning Assistant (*PA* for short) and Interactive History (*IH* for short), with which learners can reify the activities for navigation planning and reflection.

PA helps learners plan navigation paths to be followed before navigating hyperspace with Web browser [6]. PA consists of hyperspace map, page previewer, and path previewer. Taking an overview of the hyperspace map, the learners can preview the contents of the Web pages and navigation paths by means of the page and path previewers, which help them plan a navigation path.

IH enables learners to annotate a navigation history, which includes the Web pages sequenced in order of time they have

visited, with semantic relationships between any visited pages [2]. The learners can also directly manipulate the annotated navigation history such as deleting/changing annotated semantic relationships.

IH also transforms each semantic relationship between visited pages, which is extracted from the annotated navigation history, into a visual representation. *IH* generates a knowledge map by combining visual representation of each semantic relationship in the annotated navigation history. It would be substantially fruitful to reflect on what they have constructed.

3. DESIGN ISSUES

Let us here discuss key issues of designing a meta-learning tool, which are (1) providing learning affordance, and (3) defining criteria for assessing the meta-learning tool.

3.1 Learning Affordance

From the results of the case study with *IH*, we have ascertained that the annotation operations make navigational learning more constructive and afford reflection on knowledge construction process more properly compared to using only Web browser (See [3] in detail). We can consequently say that operations/manipulations within the meta-learning tool should afford learners information of how to control their learning processes, and also produce their control activities with the information. Such feature of the tool is called *learning affordance* [5], [3], which is indispensable in facilitating meta-learning. If learners can control their learning processes more properly with less instruction how to use the tool, the tool provides more proper *learning affordance*.

Web browsers, for example, are regarded as web-based learning tool for popular use. Do they provide proper *learning affordance* for controlling their knowledge construction processes? The web browsers provide learners with back buttons and browsing history. Although these facilities afford the information of revisiting the Web pages that have been visited, they would not always create activities for reflecting on the knowledge construction process. The browsing history also provides no information of how they have made semantic relationships between the navigated pages, which information plays a crucial role in reflecting on knowledge construction.

We can say that the web browsers are not very suitable for reflecting on the knowledge construction process. On the other hand, *IH* gives learners proper *learning affordance* via the annotation operations.

3.2 Assessment Criteria

The results of the case study with *PA* indicate that *PA* produced more efficient navigation for integrating the contents of some Web pages in a more complicated hyperspace. We can consequently say that the meta-learning tool should contribute to efficient and skillful learning. This paper proposes the following two criteria for assessing the meta-learning tool, which play a crucial role in designing and redesigning it.

(1) Learning Utility

Meta-learning contributes to learning more effectively and efficiently. The meta-learning tool should be accordingly designed so that such learning effectiveness and efficiency can be enhanced. It should be also redesigned/refined according to the results of the evaluation whose purpose is to ascertain if the meta-learning tool enhance the learning utility compared to no use of it (using only Web browser, for example).

We think the effectiveness/efficiency of learning processes is the most important criterion for assessing the meta-learning tool.

(2) Learning Skill

Meta-learning also contributes to developing learning skill. Learners are expected to be able to learn more effectively and efficiently even without the tool. The use of the meta-learning tool should be decreased in accordance with their experiences of using it. The tool fade-out shows whether they acquire the skill of learning. We think the possibility of the tool fade-out can be viewed as a criterion for assessing the meta-learning tool.

4. CONCLUSION

This paper has discussed key issues of designing a meta-learning tool, which are *learning affordance* and *assessment criteria*. The meta-learning tool should be designed so that a proper *learning affordance* can be provided via the operations/manipulations. It should also designed/redesigned so that learning utility and learning skill can be enhanced.

In future, we will need to conduct a case study to ascertain the possibility of the tool fade-out to assess the development of the learning skill. We would also like to integrate *PA* and *IH* to develop the meta-learning tool for navigational learning of Web contents.

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