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Research on Learning Support Systems for Web-based Self-directed Learning

Hangyu Li

**School of Information Science,
Japan Advanced Institute of Science and Technology**

The world is now developing so fast that today's knowledge is quickly becoming outdated. This requires us to constantly conduct self-directed learning in order not to be lagged behind. With the fast renovation of internet technologies, it has become really convenient for us to use the internet as an important tool to facilitate our learning. Hence, the field of web-based learning has been drawing attentions from fields of researchers. It has become possible to overcome the restrictions of time and space for people who are learning by themselves.

The most recognizable feature of self-directed learning is that the learners are given full control of their learning activities, which also means that they are completely on their own. It is true that fast development of information technologies especially the ones on World Wide Web have greatly increased the learning situations for self-directed learners nowadays. However, as always, the conveniences new technologies bring to us often come with new difficulties and challenges needed to be addressed in order to take better advantages of Internet technologies. Firstly, it has become difficult for us to locate suitable learning resources that the Internet provides. We easily lose sight of the learning goals and get drowned in the ocean of information. Even we might finally manage to find the resources we want, how to get them organized is not easy either. Moreover, learning skills (also referred as cognitive skills) have been recognized as important especially in self-directed learning. How to learn the things we need from piles of learning information effectively by ourselves is perceived quite demanding. When at school, we can learn from teachers or skilled classmates. But on the Internet, where all are virtual existence, getting our learning skills polished seems really difficult. Thirdly, as the final stage of learning, we extracted and absorbed the knowledge from piles of learning resources. But without appropriate forms of recording it down, the learnt knowledge can be easily faded away. This is probably why we take notes, doing after course exercises at school as a way of constructing knowledge. But when faced with the useful information scattered here and there in various forms on the Internet, how to build up perceivable knowledge structure proves to be challenging. All of these problems limit learners engaged in web-based

self-directed learning from effective control and assessment of their learning activities.

In order to address these issues, the purpose of this research is to further improve the learning situations for web-based self-directed learners in the three major aspects of learning: Resource Finding & Organization, Learning Skill Cultivation and Knowledge Constructing In the context of this research: resource organization means arranging one's learning resources found from the web in a way to facilitate later learning activities such as reviewing or revising. Learning skill cultivation means improving learner's cognitive capabilities (how to learn) in order to attain knowledge or abilities in a more effective way; Knowledge Constructing means creating one's knowledge structure from various types of learning resources. Since mapping theories have been prevalently studied in many research in both the educational and learning setting and have been proved to be effective in knowledge attainment and reflection, I proposed a Multi-layer Map-oriented Model (MLM)-a model to offer multi-dimensional management over concepts/topics with hierarchical relations via superposed layer representations, by introducing the concept of Topic Maps through considering the characteristics of self-directed learning on the web and its challenges. And then designs and develops three learning support systems in an attempt to tackle these issues. Finally, the according cased studies were carried out to evaluate the effectiveness of the developed systems.

Topic Maps are an ISO standard for describing knowledge structures and associating them with information resources. Because of the numerous factors and elements of various kind being involved in the self-directed learning on the web, this model not only offers one-dimensional management over the concepts/topics in the same categories/domain through associations, but also other concepts/topics with hierarchical relations via superposed layer representation (occurrences). I put this model into practical use by basing it to develop three learning support systems: (a). A resource organization system enabling leaners to quickly locate their wanted learning resources and organize the resources to facilitate later learning activities via multi-layer map visualization; (b). A strategy object mashups system enabling learners to build up their own effective learning environment while being made aware of the application of the related learning strategy and tactics; (c). A note-taking systems enabling learners to take non-linear, map-oriented notes for better revision and reflection in VOD (Video on Demand) based learning. These attempts are meant to explore the chances of exploiting this model in the three major aspects of resource finding/organization, learning skill cultivation and knowledge constructing in self-directed learning.

Keywords: web-based learning, self-directed learning, multi-layer map model, topic maps, strategy object mashups