

A Collaborative Knowledge Management in Wiki-based Project Learning

JinTae Lee · SeonKwan Han*

Dept. of Computer Education, Gyeong-in National University of Education,

요 약

This study is about the system for knowledge management in the Wiki-based project learning. We implement the Wiki-based project learning system which is focused on a new Web paradigm and technology development to grasp the knowledge flow of a learner effectively under a project learning condition. Implementation of the system has used a Web 2.0 technology to easily understand SECI Knowledge Management types which form the Externalization, Combination and Internalization steps. Moreover, the system structure has been designed instinctively for harmonious knowledge use or reuse. As a result of the experiment, we found out that the collaborative knowledge steps moved along the flow of project learning.

Keywords: Collaborative Knowledge Management, Web2.0, Wiki, Project Learning

위키기반 프로젝트학습에서의 협력 지식 관리의 고찰

이진태 · 한선관

경인교육대학교 컴퓨터교육과

ABSTRACT

본 논문은 위키 기반 프로젝트 학습에서 지식관리 유형에 대한 연구이다. 프로젝트 학습에서 학습자에게 일어나는 지식의 흐름을 분석하기 위하여 SECI 지식관리 이론을 적용하여 위키 프로젝트 학습 시스템을 구현하였다. 구현된 시스템을 통하여 프로젝트 학습을 진행하여 단계별 지식관리의 유형을 분석하였다. 분석결과 예비계획 단계에서 암묵 지를 바탕으로 새로운 지식을 만드는 표출화가 두드러지게 나타났다. 그리고 주제결정 단계와 활동계획 단계에서 지식의 연결화 과정이 나타났다. 또한 탐구 및 토의단계에서는 표출화와 연결화가 두드러지며 내면화 유형이 나타나기 시작했다. 결과공유 단계에서는 지식의 연결화가 가장 많이 나타났다. 여섯째, 반성 및 평가단계에서는 내면화 유형이 가장 많이 나타났으며, 지식의 평가를 위한 연결화 과정도 보였다. 이 연구는 프로젝트 학습에서 학습자의 지식관리 유형을 밝혀냄으로써 프로젝트 학습모형의 정교화에 기여할 수 있을 것이다.

키워드: 협력지식관리, 웹2.0, 위키, 프로젝트 학습

논문투고: 2010-11-22

논문심사: 2010-11-23

심사완료: 2011-03-07

1. Introduction

The basic philosophy of Web 2.0 is that users become a main body which ‘attends’, ‘shares’, and is ‘open’. Now, users deny any more receivers of knowledge, and want to create and share new knowledge. Moreover, knowledge created by individual learners should develop to the members’ collective knowledge. Creating, developing and managing this knowledge leads to competition. That is, when the knowledge of the group is stored and shared, developmental knowledge can occur [11].

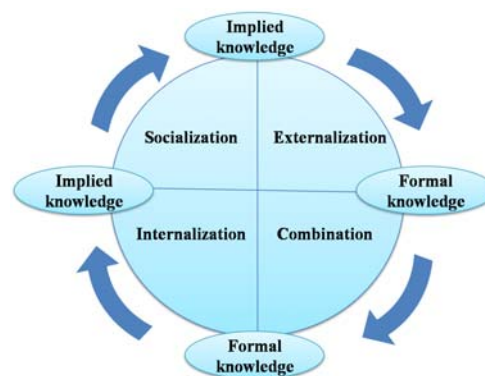
Project learning based on constructivism emphasizes problem-solving through the created knowledge as well as the collaborative learning and knowledge of groups. Learners experience various thinking activities in each step of the project learning. The learners’ knowledge is spread through the steps of socialization, externalization, combination and internalization within the group. At that time, instructors should carry out the role of guide in order to more positively create the learners’ knowledge and the groups’ collaborative knowledge. Moreover, Web-based project learning systems should be supportive so that the thinking activities occur smoothly.

This paper implemented a Web 2.0-based learning environment and applied it to a project class. As a result, we analyzed the collaborative knowledge styles of learners during the project learning.

2. Web2.0 and SECI Model

In studying and/or promoting web-technology, the phrase Web 2.0 can refer to a trend in web design and development - a perceived second generation of web-based communities and hosted services (such as social-networking sites, wikis, blogs, and folksonomies) which aim to facilitate

creativity, collaboration, and sharing between users. Web 2.0 websites allow users to do more than just retrieve information. They can build on the interactive facilities of Web 1.0 to provide “Network as platform” computing, allowing users to run software-applications entirely through a browser [2]. Users can own the data on a Web 2.0 site and exercise control over that data [11]. These sites may have the architecture of participation that encourages users to add value to the application as they use it [2][11].



(Figure 1) SECI Model

It is important to manage existing knowledge effectively because it works with new knowledge in a circular pattern creating more knowledge. The SECI (Socialization Externalization Combination Internalization) model is one that explains knowledge management theories. It shows that knowledge changes among groups, both implied and formal. Implied knowledge cannot be expressed by words gained from individual experiences. Conversely, formal knowledge is expressed by relying on implied knowledge. There are cases where it is easy to make exchanges between implied and formal knowledge. In some cases one must first undergo the learning process by experience before it is possible to fully understand implied knowledge. The exchange process refers to the

SECI process [10]. The SECI model explains the transition of knowledge for collaboration among groups in the four modes: Socialization, Externalization, Combination, and Internalization.

3. The Web 2.0 based Project Learning System

3.1 Consideration of Designing System

To improve the effect of learning, it is important that the learner has various thought processes and does cooperative activities while learning collaboratively. We analyzed the collaborative knowledge theory and the problem of web-based learning, and proposed the design perspectives of effective project learning system as follows:

- 1) We design simple and systematic architecture for supporting easy project learning activity.
- 2) We use Wiki and Blog with posting and trackback functions to analyze the flow of knowledge in a collaborative learning space that has an SECI model.
- 3) We design it to induce reusing and easily sharing knowledge.
- 4) We consider web2.0-based systems for supporting learners' participation positively.

3.2 Development of System

The architecture of the system consists mainly of User Interface, Learner & Tutor module and Database. User Interface uses an intuitive learner-centered design. The basic form of the menu was arranged by steps in order to support easy project learning activities. The Learner & Tutor module was designed for promoting learners' accessibility, reuse and motivation to participate. The proposed system has a Blog database, a multimedia DB with learning contents, a learner profile and a Wiki database. Figure 2 shows the

interface and structure of web 2.0-based project learning system.



(Figure 2) Overview of System

In this system, learners work through the project learning steps in regular sequence: Planning; Deciding subjects; Planning activities; Investigation/Discussion; Sharing results; Reflection/Assessment. The proposed system supports various adequate application tools for each learning activity step. The system is composed primarily of 7 main modules that have the learning procedure module, group activity module, individual learning module, learning support module, learning management module, assessment module and community activity module.

The learning procedure module aids the learner in studying the contents of learning procedure in each step. This module assigns the order of tasks and announces the learner series subjects. Also, this module monitors the learner's activity by each step and analyzes the type of knowledge management. The group activity module promotes learners' collaborative thinking. Through these activities, individual knowledge is improved and expanded widely by other learners' collaborative knowledge. This module has a group-based Blog, group-based bulletin board, group-based chat room and group-based Wiki page. The individual learning module has an individual Blog and

mind-map tool. The individual Blog acquires and maintains the learner's knowledge. Also, this Blog lends the learner motivation through collaborative learning with other learners. The mind-map tool promotes divergent thinking from learners. The learning support module helps a learner through various web-based applications. Also this module grasps other group members' processes and states of learning. This module has a search engine, scrap tool and tag-list table.

The learning management module has the bulletin management and reply management module. The bulletin management module supports the expanding learner's thinking by solving the learner's given tasks. This module has a function to easily remove any unnecessary knowledge from the bulletin board. The assessment module is composed of the vote system and the recommender system to evaluate the classified group project results effectively. The learners check the shared results of other groups and evaluate the result using this module. Through this module, learners' collaborative knowledge passes an internalization process. The community activity module induces the learners' aggressive participation. The results that are produced by community activities can be used as collaborative knowledge for project learning.

4. Analyzing the types of the knowledge management

In the SECI model, the collaborative knowledge management goes cyclically through the stages of socialization, externalization, combination and internalization. In this way, the study analyzed the various types of collaborative knowledge at each project learning stage with Korean 6th grade elementary school students over a six-month period in 2010. After the project learning, we

analyzed the students' learning results and system logs as in Table1.

In the Web 2.0-based learning environment, the different types of collaborative knowledge management were as is shown in Table 1. The externalization of knowledge figured in the planning and investigation/discussion amongst the project learning stages. This combination resulted in planning the activities, in investigation/discussion and in sharing the results; its internalization resulted in reflection/assessment.

<Table 1> The types of collaborative knowledge management to the flows of the project (%)

Steps of the project	The types of the collaborative knowledge management		
	Externalization	Combination	Internalization
Planning	31.3	5.0	5.7
Deciding the subjects	7.0	7.3	12.1
Planning the activities	16.2	23.9	8.0
Investigates/Discussion	27.1	20.0	11.2
Sharing the results	11.5	30.0	13.3
Reflection/Assessment	6.8	13.8	49.7

4.1 Socialization Step

The socialization that is the first stage among the flows of collaborative knowledge is implied knowledge. That is, common sense and basic social values which are not expressed externally. However, the web-based learning system has many limitations when it comes to actually analyzing implied knowledge. Thus, socialization is realized by lectures, pre-experiences or preceding knowledge, which is carried out in the learning-guide step before the learning processing basically.

4.2 Externalization Step

Externalization is the expressive process to let other people know their own knowledge; it also acts as a new knowledge-making process by sharing and integrating the implied knowledge of different groups. Along this line, we investigated posts for searching information, scraping posts and opinions posted at a Wiki in the web-based project learning system for analyzing the externalization of collaborative knowledge.

As a result, over 20% of the learning steps that led to the externalization of knowledge were found to be the steps of Preliminary Planning and Investigation/Discussion as in table 2.

<Table 2> The externalization of the collaborative knowledge to the flows of the project (%)

Steps Types of Externalization	Preliminary Plan	Deciding the subject	Planning the activities	Investigation /Discussion	Sharing the results	Reflection /Assessment
Post for searching information	98	24	28	60	1	2
Scraping posts	10	0	25	43	8	10
Opinions posted at Wiki	42	10	25	27	46	21
Total	150	34	78	130	55	33
%	31.3	7.1	16.2	27.1	11.5	6.8

In the step of sharing the results, expressing one’s own opinion was frequent. Therefore, we find that searching information and exchanging opinions with each other is essential to planning the project learning. The process of collecting learning information and expressing knowledge are involved in the investigation /discussion step. Expressing learners’ thoughts or opinions figured in the results-sharing step.

4.3 Combination Step

Combination is a knowledge-spreading process leading to more valuable knowledge by combining new with existing knowledge. We investigated abstract information, recommendations to posts, meaningful replies, modified posts at Wiki and tract-backs amongst blogs in order to analyze the combination of collaborative knowledge.

In Table 3, we found out that the learning steps which resulted in over 20% of knowledge combination are the planning activities, the investigation/discussion and the results sharing steps.

On the one hand, in the deciding subjects step, the learners accomplished tasks which modified shared texts and elaborated on existing knowledge. In the Reflection/Assessment step, knowledge was evaluated and decided as highly wrought forms by passing the track-back process about related texts. In other words, the learners integrate previously-generated explicit knowledge in the planning activities, the investigation/discussion and the results-sharing steps. Then they make the combination knowledge form for creating new knowledge by generating explicit knowledge.

<Table 3> Combination of the collaborative knowledge to the flows of the project (%)

Steps Type of combination	Preliminary Plan	Deciding the subject	Planning the activities	Investigation /Discussion	Sharing the results	Reflection /Assessment
Abstracted information	1	4	0	7	1	1
Recommendation to posts	11	0	15	20	49	35
Meaningful replies	12	8	147	88	176	40
Modified posts at Wiki	13	40	15	21	5	3
Tract backs among blogs	2	5	11	21	5	30
Total	39	57	188	157	236	109
%	5.0	7.3	23.9	20.0	30.0	13.8

4.4 Internalization Step

Internalization is a process whereby each person realizes a group's knowledge. The internalization analysis is last step among the flow processes of collaborative knowledge. In order to analyze internalization, we selected items that are a number of posted learner's thoughts, a number of learner-created contents and a number of replies by other learners.

Table 4 shows the various types of internalization knowledge. The highest internalization knowledge presented was at 49.7% for the reflection/assessment step. In the investigation/discussion step, we found out that the significant replies texts implied internalization knowledge between learners, while a learner represents one's own thoughts and shares created results. Especially in the Web 2.0 environment, the process of internalizing knowledge comes at the Investigation/Discussion step of a project and the learner realizes internalized knowledge by transferring an individual's tacit knowledge to a group's explicit knowledge.

<Table 4> Internalization of the collaborative knowledge to the flows of the project (%)

Type of internalization \ Steps	Preliminary Plan	Deciding the subject	Planning the activities	Investigates /Discussion	Sharing the results	Reflection /Assessment
Number of posted learner's thoughts	12	23	23	35	5	52
Number of learner-created contents	1	5	1	2	8	41
Number of replied by other learners	6	13	3	1	32	75
Total	19	41	27	38	45	168
%	5.7	12.1	8.0	11.2	13.3	49.7

5. Conclusion

In this study, the Web 2.0-based project learning system on the new web paradigm and the development of technology was designed and implemented for studying knowledge management in web-based learning. In this study, the system allows understanding the flow of knowledge in the project learning situation. Thus, we designed the project learning and tested the course on one class of 6th grade elementary school students. All of the log and learning results were analyzed by the styles of collaborative knowledge based on the SECI model on each step of the online project learning.

We found that the externalization of collaborative knowledge appeared a lot in the beginning of the project learning, and its combination was figured out in the middle of the learning. Its combination was shown widely from the planning step to the reflection and assessment steps, and the internalization happened most actively at the reflection and assessment steps - the last step of the project learning.

As a result, we suggest a future study on how the types of collaborative knowledge management might improve the quality of final products created by users. In addition, research should be carried out to develop and improve the online project learning model, based on the various types of collaborative knowledge.

References

- [1] Katz, Lilian G., & Chard, Sylvia C (2000), *Engaging Children's Minds: The Project Approach* (Second Edition). Stamford, CT: Ablex Publishing
- [2] Graham, P (2005), Web 2.0. Retrieved on 2006-08-02. "I first heard the phrase 'Web 2.0' in

- the name of the Web 2.0 conference in 2004.
- [3] Heeseop Han (2006), Exploring the Web-based Collaborative Learning Environment for Fostering the Collaborative Thinking, Korea University, PhD paper
 - [4] Hinchcliffe, D (2006), The State of Web 2.0. Web Services Journal. Retrieved on 2006-08-06
 - [5] Jintae, Lee (2008), A Study on Knowledge Management Type in Web2.0-based Project learning Environment, Master paper, Gyeongin National University of Education,
 - [6] Kilpatrick, W. H (1919), The Project method NY: Teachers College, Columbia University
 - [7] Kirkley, J. R., & Duffy, T. M (1997), Designing web-based electronic performance support system. In B. H. Khan, (Ed.), Web-Based Instruction, Englewood Cliffs, NJ: Educational Technology Publications, Inc.
 - [8] Leith, S (1982), Project work: Research and practice in the primary classroom(55-64), London: Routledge & Kegan Paul
 - [9] Macintosh (1997), A. Knowledge Asset Management. Airing
 - [10] Nonaka, I. and Hirotaka, T (1995), The Knowledge-Creating Company, Oxford University Press
 - [11] O'Reilly, T (2005). What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software. Technical Report, O'Reilly
 - [12] Trepanier-Street, M. (1993), What so new about the project approach, Childhood education
 - [13] Watson, I (2002), Applying Knowledge Management: Techniques for Building Corporate Memo-ries. Lecture Notes in Computer Science, Springer Berlin, 2416, 235-245.

저 자 소개



이 진 태

2003 경인교육대학교(교육학 학사)
 2007 경인교육대학교 교육대학원
 (컴퓨터교육학석사)
 2002~현재
 인천 안남 초등학교 교사
 관심분야: 초등정보교육, s-Learning,
 웹2.0, 소셜 웹과 교육, 위
 키시스템, 스마트 앱스
 e-mail: diosam@naver.com



한 선 관

1991 경인교육대학교(교육학사)
 1995 인하대학교 교육대학원(컴퓨터교육학석사)
 2001 인하대학교 전자계산공학과
 (전산학 박사)
 2002~현재
 경인교육대학교 컴퓨터교육과
 교수
 관심분야 : 지능형교수시스템, 초등정보
 교육, e-Learning, u-Learning,
 게임중독치료, 정보통합영재
 교육, 소셜웹과 교육, Web2.0
 e-mail : han@gin.ac.kr