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Evolution From Collaborative Learning to Symbiotic E-learning: Creation of New E-learning Environment for Knowledge Society

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For people who live in the knowledge society which have rapidly been changing, learning in the widest sense becomes indispensable in all phases of working, living and playing. The construction of an environment, to meet the demands of people who need to acquire new knowledge and skills as the need arises, and enlighten each other regularly, is becoming very important. Thus, we hope to make the best use of the advantages of a rich e-learning environment which aims at "anytime, anywhere and anybody" learning, because participants in lifelong learning for the knowledge society demand to learn at the right place and right time, and with learning content, they can select themselves. However, in a general e-learning environment so far, because the situation is usual in which the instructor is absent and has the asynchronous access without an immediate communication with others, the participants tend to be solitude and it is difficult to maintain the learning motivation. Therefore, the creation of a new e-learning environment becomes extremely important in which various participants can learn and enlighten each other through an occasional and helpful interaction among them in appropriate learning communities in the network environment. In this paper, we present 5 points as basic requirements for the construction of an e-learning environment which can satisfy the various learning demands of the knowledge society, and discuss how to realize them. The key point here is the extension of the usual "strong" collaborative learning to effective "weak collaborative learning". In addition, the evolution of "symbiotic learning" for the knowledge society, that is, the necessity of "symbiotic e-learning environment based on occasional collaborative relationship" and its effective realization are discussed.

Keywords: knowledge society, collaborative learning, weak collaborative learning, participatory learning, symbiotic learning

Introduction

Although the educational method known as e-learning has recently become more and more popular with the spread of the Internet and advances in ICT (information and communication technology), the methodology for realization of socially effective e-learning have not actually developed (Okamoto, 2004; Kayama &

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Okamoto, 2006). For people who live in the knowledge society with its increasingly varied technologies, especially for the core generation who make up the knowledge society consisting chiefly of 30-40 years old people who are, learning activity in the widest sense becomes indispensable in all activities of working, living and playing. Because the learners in lifelong learning have to be able to select learning materials anywhere and at anytime by themselves at their own convenience, the advantages of e-learning that aim at "anytime, anywhere and anybody" can be best put to use. Moreover, in a typical e-learning environment, which is asynchronous, without an instructor or immediate communication with others, learners tend to become solitary, thus, making learning motivation and achievement of learning goals very difficult to maintain. Therefore, the creation of a new e-learning environment becomes extremely important in which various participants can learn and enlighten each other through occasional and helpful interaction in appropriate learning communities in the network environment (He, Saito, Kubo, & Maeda, 2007; 2008).

The future society, in a right meaning, is "The age when the learning is required over the life" and the learning environment required in such a society may be characterized to be based on better collaborative relationship, in a wide sense, among various people as the contemporary who live in the same coetaneous. In this paper, as a mechanism of the lifelong learning in the knowledge society, we propose a concept of "symbiosis e-learning environment" as a valuable place where a rich life will be developed through creating better collaborative relationship with various people living, working and playing in the coetaneous.

Based on the foregoing, we think that the basic requirement for the construction of a new e-learning environment to satisfy indispensable learning demands for people who support this society and the effective realization of the following 5 points is the minimum requirement:

(1) Free and self-directed learning: The basis of e-learning is self-directed learning based on the motivation for achievement of learning goals. It is important that the learner participates freely with their learning goal and learns the problem faced, knowledge and skills needed with self-interest and/or concern;

(2) Appropriate learning material and knowledge resources: To the learners who have various learning motivation and careers, the appropriate learning material and knowledge resources should be provided to the learners' demands, and a possible easy access is necessary. Here, in the sense of responding to the requirement, the construction is assumed to the learning material based on the PBL (problem-based learning), not just accumulate fragmentary knowledge, the mechanism that can do the systematic learning with textbook is prepared, and flexible learning by seamless learning with PBL and systematic learning when needed become possible (Ogasawara, H. Saito, K. Saito, & Takashi, 2006);

(3) Learning outcome and achievement assessment: The important thing for maintaining the learners' motivation is to provide the learning results steadily, as well as confirmation and evaluation of the learners' achievements. If someone has a low achievement situation, the mechanism that provides appropriate advice about learning necessary part of the knowledge and skill is important;

(4) Class participation and occasional collaboration: For maintaining of the learning motivation and learning itself, the important thing is other learners' existence and various interactions with them. Therefore, it is important to be able to participate in the class in which the learner has a similar problem and/or learn the same knowledge/skill. This is a virtual class, extended effectively in e-learning environment, making good use of the role of the classmate and the class in a usual education. In this virtual class, participants can know general information concerning their learning situation. The mechanism of communicating within a possible

range, opinion exchanging and the mutual supporting etc. in the virtual class should be provided;

(5) Participatory learning and collective intelligence of the learning: It has the mechanism of discovering, consolidating and using the useful comments and supporting information obtained from a variety of learning experiences between participants (collective intelligence). Here, it can be useful to take the technology developed in Web 2.0 which is positively suited to learning domain (He, et al., 2008; Arney, 2008; Senaidi, 2008).

In the rest of this paper, problems (1) and (2) are discussed for their relation to the concrete implementation of this system. As follows, effective realization methods for the main problems ((3), (4) and (5)) discussed in this paper will be proposed. Firstly, the collaborative learning to be expected educational effect will be summarized, and then the difficulties and the ways of realizing these in e-learning, as well as effective implementation methods are described. Secondly, formative evaluation in e-learning, which is important for reflecting the achievements of participants' learning accurately and maintaining the learning motivation is examined and realization methods using the learning portfolio are described. Finally, the ideal way of lifelong learning in the "symbiotic e-learning environment" in a new age with Web 2.0 will be discussed.

Advantages of Collaborative Learning and Difficulties of Realizing Them in E-learning

Collaborative Learning and Its Advantages

In general, based on instructors' guidance in the class, usual collaborative learning as a learning style meets the following requirements: (1) setting of appropriate tasks; (2) the group organization; (3) the discussion and sharing tasks; (4) appropriate guidance by the instructor according to learners' progress; and (5) discussion, integration of solutions for tasks and appropriate presentation. In current research on collaborative learning, generally, the following educational advantages are emphasized (D. W. Johnson, R. T. Johnson, & Smith, 1991; Yano, 2005; Hewitt, 2006; He, et al., 2008):

(1) It focuses on the interaction with others, which is the most important aspect of collaborative activity to make the participant take part in collaborative activity, making him/her strongly connected with other learners. By observing the process of other learners' learning, problem-solving and their interaction with others, the reflection and the refinement of their own problem-solving techniques can be realized;

(2) In the collaborative learning process, benefits are not limited to the learners themselves. The knowledge and skills of participants (teachers) and their in-depth understanding through social interaction may also be broadened;

(3) Fostering meta-cognition ability can be expected through communication with diverse learners. In other words, by creating a social discussion environment through consultation and discussion with various learners, we not only improve our own field of knowledge, but also a wide range of knowledge can be acquired.

We should notice that these results and the expected educational advantages have been obtained under instructors' effective guidance through all the processes.

Difficulties in the Realization of Collaborative Learning in E-learning

Although much research on collaborative learning in e-learning environments is continuing, there have been many serious difficulties in constructing effective collaboration due basically to the absence of an instructor and diverse and/or distributed learners. At least, the following important difficulties can be pointed out (He, et al., 2007; 2008).

(1) Difficulties in appropriate group organization and role sharing. In general collaborative learning, more

effective learning results can be realized by the framework of role sharing and tacit consignment of problems encountered by learners and obligations shared in their learning groups. However, we think that the role of sharing framework is very difficult for learners who have various learning purposes and career requirements, in addition to the different requirement in time and space in e-learning environments;

(2) Difficulties of appropriate communication and summarization. Usually, we solve problems immediately and positively in direct oral communication in the class with others, but it is just difficult for e-learners to have such an effective discussion, but also the adequate summary of the content and the consensus building are difficult;

(3) Difficulties in the agreement of appropriate adjustment and consensus. In a general discussion group, a lively participant with lots of comments can be assigned to a certain group, in which the members are very reserved. But in an e-learning environment, if everybody keeps dead silent, what can we do?

Method for Effective Realization of Collaborative Learning in E-learning

As mentioned above, it is not too much to say that the simple extension of the usual collaborative leaning to e-learning environments is actually impossible. In this paper, we propose a new collaborative learning style of e-learning which can be actually achieved (He, et al., 2007; 2008).

The Concept of WCL

The concept of WCL (weak collaborative learning), which we have proposed, can be characterized as a "weakened" version of the usual collaborative learning as follows. Here, "The learning is basically personal activity, though it also utilizes interaction with others", which is our starting point.

Firstly, in this learning environment, "The collaboration is not an obligation for the participants". Thus, "the collaborative activity" may be limited to "the possible range of participants". Secondly, learners can learn with awareness of other participants' existence, occasionally using their ideas, while seeing the learning contents of other learners in a class. And collaborative connections can be maintained. In the following, we will call the e-learning including this WCL the "collaborative e-learning environment".

Construction of WCL

Based on the idea of WCL, we will consider a concrete framework to achieve an effective collaborative e-learning environment (He, et al., 2007; 2008).

Participation in WCL and collaborative intention. First of all, learners should confirm whether they want to participate in WCL when they join this e-learning environment. Here are the conditions for participation: (1) When they notice a problem or difficulty of other learners, try to support them within what is possible; and (2) They should promise to keep basic manners, such as taking care not to disturb other participants' learning and privacy.

Participation in class and collaboration. Dealing with the same learning subject or learning problem nearly simultaneously, one class which is composed of about 100 learners is called a virtual classroom (class). In general, learners have a variety of learning histories and careers. The classes are made mechanically one by one according to the number of participants to subjects. Also, the class is for the group (3-6 learners in usual collaborative learning), but it is composed of more participants in the virtual environment and viewed as a kind of learning community (For problem (1)).

Class (group) learning and communications. The participant (member) in a class can advance his/her

own learning while remaining aware of other participants' existence and learning situations about the same subject or learning problem by sharing information. Moreover, communication, such as the questions and comments concerning a learning problem are possible freely through the use of an alias while registering (For problem (2)).

Promotion mechanism of WCL. Here, we introduce the promotion mechanism of collaboration and cooperation. For example, the collaborator or participants in the answering/assistance of some questions may be given a point for collaboration by the person who receives the benefit. These are recorded in the portfolio as an assessment of the participant for collaboration, and it is possible to use these when doing the summative assessment (For problem (3)).

WCL facilitator. The facilitator agent, which supports learning progress, monitors the management situation of the classroom. And it can offer good advice or introduce other learners who have experience on overcoming the same problem to the learners who encounter difficulty when necessary (For problem (3)).

Implementation of the WCL System

The basic requirement for achieving the WCL mentioned above is brought together as follows:

Reference to learning activity and achievement situation. Basically, individual learning of the subject and the problem on which the learner is working can be effectively accomplished. The learning achievements are recorded for each individual participant, accumulated in the learning portfolio as the learning outcome, and an appropriate reference to those contents (other learners' learning situation) can be done.

Contribution of questions/comments and recognition of the topic. The topic list of the question/comment is realized as the class's "small window". In the main screen of the learning activity, only the icon of this "small window" can be seen. And it is possible to participate in the discussion by opening the interesting topic.

Collaborating with classmates. They can participate in the discussion of questions and problems presented in the "small window" at anytime, and can add comments and advice or declare their opinions. An interesting topic in the "small window" is selected, a new discussion forum (learning community) is developed, and it is possible to participate in the substantial discussion.

Presentation of points for collaboration. It is possible to vote for the assessment of the contribution and the contribution level in collaborative activities.

Facilitator. An appropriate promotion and adjustment of the collaborative activity is performed.

For these requirements, our collaborative e-learning environment has been implemented effectively based on a combination of the content management system named "Xoops Cube" (Xoops Cube official site) and "Wiki" (Hewitt, 2006; Nishida, 2007).

Formative Evaluation and the Learning Portfolio in E-learning

In general, e-learning is based on individual learning goals and learning motivation. It is important for all the participants to achieve effective learning that makes the best use of occasional collaborative relationships with other participants within what is possible. Thus, each one's "learning situation" can be checked more correctly, and his/her learning results can be evaluated regularly which is extremely important. According to the idea of the so-called "mastery learning", the learning assessment is composed of the diagnostic evaluation, the formative evaluation and the summative evaluation (Bloom, Hasting, & Madaus, 1971). Especially, we

think that the realization of the formative evaluation which shows learning achievements actually is a key-point in e-learning.

In this research, each participant studies the learning material and the knowledge resource at his/her own pace while evaluating the achievements based on the results of the exercises and quizzes in the learning process concerning the knowledge unit. The contents are composed as a formative evaluation, and all of them are collected in the learning portfolio (He, et al., 2007; 2008). The portfolio in this research is composed of two parts, one is the collaboration portfolio concerning collaboration and the coordinated activities, and the other is the learning portfolio that records the participants' learning activities for the composition of the learning material, and the knowledge resource and the answer situation to the exercise.

Conceptual Development From Collaborative Learning to Symbiotic Learning

E-learning and the Learning Community in Lifelong Learning

The knowledge society is full of rapid change that forces people to acquire new knowledge, technology and skills. The core generation that makes up the knowledge society consists mostly of 30-40 year olds who are learning while working. It is important to support these people with diverse learning as they need to acquire new knowledge and skills (Yano, 2005). Because the learner in lifelong learning wants to select the learning material anywhere at anytime by himself/herself at his/her own convenience, the advantages of the e-learning environment with its "anytime, anywhere and anybody" features are most efficient (He, et al., 2008; Senaidi, 2008).

The e-learning environment that we are assuming is a community based on making the collaborative relationship occasional, so that learners can freely participate and leave. Moreover, since the participating in each community people's knowledge and statistical information of the learning situation can be inspected after considering individual information, the learning community corresponding to one's purpose can be selected. In each learning community, knowledge that studies independent can be accumulated as a shared knowledge, and it is possible to make knowledge edited and refined by other learners (He, et al., 2008; Senaidi, 2008).

The great features of Web 2.0 can be described as creating and making good use of an available community based on the users' participation and the collective intelligence. The user, who is participating in the consumer community like the encyclopedia Wikipedia (Hewitt, 2006) and/or YouTube, participates with self-learning in depth, establishment of status and a sense of belonging, and the result of their activity is to make good use of the shared knowledge which gets accumulated as a "collective intelligence" (Arney, 2008; Senaidi, 2008). The collaborative/participatory e-learning environment may have some features in common with the so-called Web 2.0 technology.

The Symbiotic E-learning Environment as Lifelong Learning

The phenomenon called "the learning divide" become clear, as the condition of economic property has been proposed by acquiring knowledge in the knowledge society through the development of ICT (Senaidi, 2008). In the future, the construction of life-long learning environments will become important as social infrastructure and continue such learning and the learning community with its occasional cooperation is necessary. In addition, the participant recognizes the thing which connected to benefit among participants is used to aware other participants' existence and compose the tacit collaborative/competitive relationships in the learning community. Learning and society with such features have already been considered in the "the philosophy of symbiosis". The "weak collaboration" idea that we have been pursuing is very similar to a "symbiosis" concept (Kurokawa,

2005). If you have understood that the usual "collaborative learning" shows the learning method by close collaboration in a small group, the open collaborative e-learning based on learner-centered and occasional collaborative/competitive relationships between learners might be appropriately called "symbiotic e-learning" in the knowledge society. "Symbiotic e-learning" has the following advantages:

(1) Promotion of learning motivation: Learners who want to participate in learning and take communications with other learners with occasional collaborative/competitive relationship living as a contemporary in the same knowledge society can make the maintenance and the promotion of the motivation lacking in the old e-learning environment;

(2) Assessment of learning achievement in stages: Because the learners can understand how far they have advanced with an authentic assessment of the learning results to the achievement goal of each studied knowledge/skill unit (for instance, chapter, paragraph and item), it becomes possible that the field and topic which are not good can be fully mastered;

(3) Making effective use of collective intelligence: Collective intelligence can be constructed by accumulating, arranging and refining the individual learning content and the immediately communicating and discussing between the learners. This collective intelligence is not only accessible by everyone, but also can help new participants;

(4) Learning from learning communities: It is expected that the participant can aware the existence of other learners who are doing similar learning, and can support other learners within the possible range, and we have the mechanism which promote that. It is thought that the organizing of and constructing organic interactions within a variety of learning community become an extremely important task for future (collaborative/symbiotic) e-learning environment.

Concluding Remarks

In this paper, we have presented a new effective collaborative e-learning environment together with basic 5 requirements for such an environment in the knowledge society, with extension of some advantages in conventional collaborative learning as "WCL". Then, the concept of "symbiotic e-learning environment" is discussed as an evolution suitable to the knowledge society and the so-called Web 2.0. Participants in e-learning in the knowledge society might strongly require diverse learning environments sufficiently meet their objective learning goals and real demands of time be able to spend for learning in their busy lives. The learning materials may be constructed so as to be suitable for the idea of EBL (enquiry-based learning) meaning learnable independent appropriate knowledge/skill units (topics) is corresponding directly to participant's interest, concern or questions rather than "systematic learning" according to a number of chapters as such a typical textbook. These issues of learning materials are left as a future problem as far as realizing basic requirement (2) in collaborative e-learning.

Finally, it is desirable that participants in e-learning be able to grasp their stage of knowledge and skills learned, and learning results through introducing authentic assessment methods in addition to the formative evaluation. Making a definite assessment standard (rubric) necessary to knowledge and competence for each carrier may allow participants to set up learning goals for their carrier and form a carrier path for their lives. The achievement of more adequate assessment methods in symbiotic e-learning environment presented in this paper might be an important problem for the future along with the shaping up our symbiotic e-learning system.

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