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An Educational Model Based on More Deeply Cooperative Learning

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Upon receiving an official appointment to the faculty of the National University, dealing with both higher education and basic research, the following responsibilities regarding computer and electronic media R&D in education were undertaken; e.g. attainments in the fields of advanced educational environments and software engineering R&D on high quality software using intelligent design schemes and design aids. Especially, research based items such as newly developed system design processes initiated by upper software for the purposes of higher functionality (software dominated) and multidisciplinary R&D on electronic media introducible environments into higher educational situations, along with education based items such as on-site case studies for pedagogical methods and electronic media materials applications to meet internationally accredited engineering education qualifications were daily requirements of this position. Afterwards, practical applications for cost effective educational environments and feasible types of verification including evolutionary R&D, along with pedagogical analyses based on multimedia quantitative data and fundamental practices in highly structured network environments were researched: i.e. distance education and learning, local media to hypermedia, electronic reading, paper to electronic books based on mobile phones, next generation web platforms and so on. Incidentally, works on distance learning research integration in international conferences and societies, reviews of accomplishments in cooperation with USA/ European professionals, paper publications on distance learning with related activities and also international collaborative work on multimedia materials used in higher education in the US continue to be conducted.

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1. Introduction

Currently, our educational affairs and matters have become more diversified in the realm of distance learning. No small quantity of these affairs and issues has been discussed from conventionally stereotyped and pedagogically old-fashioned viewpoints. Many years have passed since the information networking age became a reality, resulting in a large number of types of new generation learners, such as digital natives, different from conventional learners and so on. Therefore, it can be illustrated that it is important to find a more realistic practical approach toward a solution that helps create a more fruitful daily engineering educational life, from the viewpoints of both learning style and form within our communities, which are growing larger in a wide variety of directions.

Under these circumstances, we have studied engineering educational progress through the use of media technology. The first step described tele-education based on images together with the compositional concept of electronic media materials and their authoring tools. At the same time, some practical applications were shown as resulting data in the multimedia material production process, actual tele-operations and useful image capturing, which could be dynamically processed for features extraction[1]. As a second step, emphasis was placed on developing a more interactive interface between humans and computers under the concept of hypermedia and on-hand items like pens and paper. This enabled bi-directional cooperative learning in an easier manner and contributed to the removal of more than a few of the boundaries between learning and teaching[2]. The third step described some essential capabilities for multimedia telecommunications and conceptual models to be introduced. This enabled a realistic solution for the use of multimedia telecommunications in a widespread range of personal and social communities, on the conceptual configuration of multimedia telecommunications schemes with real-time software[3]. Therefore, here are some typical basic concepts, concrete schemes and clinical practices integrated on real higher educational sites that have been focused on to prepare, in the recent decade, for cooperative learning with the introduction of mobile terminals[4,5,6].

2. Electronic Media and its Impacts on Educational to Social Situations

As previously mentioned, the information-oriented society has become a reality and has matured progressively. From a historical infrastructure point of view, a greater shift should be observed from the past adoptions of railways, motor cars and aircrafts in the 19th and 20th centuries to the current schemes or infrastructure in the post-industrial 21st century. At the same time, for example, public education has been changed in significant ways since its historical origins (i.e. classical *terakoya* or private schools to cyber schools etc. have also been changed). From a macroscopic point of view, some issues can be said to have arisen because of mismatches in social principles and paradigms shifting at different speeds, such as those on an infra-level. People all over the world are globally or locally influenced by each other in a variety of ways including politics, economics, business, education, and culture, to social, regional, personal integration and so on, which are finally oriented toward personal and social computing environment integration, according to the international educational and social research contexts. The basic impacts of IT on educational and social environments warrant further analysis of their mutual relationships: IT Basic Impacts on Educational and Social Environments[6].

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We have previously discussed the issues and matters related to possible solutions for such an environment in publications and open lectures/seminars[7] [8] [9] [10] [11]. As an example, one of the more remarkable case studies has been extended thanks to the introduction of mobile terminals into long-distance educational situations which coexist with conventional education environments. This synergy of platforms involving interactive communications helps create mutual understanding between students and their educators[12]. Currently, we are enhancing a new engineering educational environment that may be better facilitated by smoother communications and more integrated knowledge/databases in real-time. With these enhancements, we are able to provide learners with a more deeply cooperative learning environment by applying these great features and functionalities which have been globally studied for learning and teaching into a more mobile-focused environment. Here, it should be noted that it is important to design and develop higher quality communications with minimal disturbance to the individual's mental and/or behavioral processes in any situation regarding typical features such as instantaneousness, portability, physicality, integrity, and reality for unwired real-time architecture.

3.1 Detailed Schemes in the Research

There are different and more numerous types of questions and answers between learners and teaching staff in the distance learning environment. Fig.1 shows an example of questions and answers (denoted Q/As) from learners (denoted S1 to S4) and teaching staff (denoted T), respectively. For instance, there may be a volley of answers for Q3 if it is assumed to be of the highest priority at a certain time during the process of lectures/seminars. It is more effective to timely enhance dynamics between learners and teaching staff by making the usage of shared space mobile Q/A integration. It is also possible for any S to get an answer for each question uploaded if it can be found and matched in the knowledge/databases (hereafter referred to as db). How a class context policy is designed and developed impacts whether it will be decided by learners and teaching staff, and not only by the T's decision. In the current research, it should be noted that some ways to timely prepare smoother intentional communications between learners and teaching staff, even at events in different time-space dimensions during the process of lectures/seminars, include: formal class context, question and answer dialog channel, dynamic and/or static comments related to the process of lectures/seminars and so on. For further information on case studies in this research, a more detailed scheme for better interaction among learners and/or teaching staff is depicted in Fig.2. Detailed information transmitted from one to another is conventionally called one's own message form[12] through the intentional communications tool in Fig.2 (abbreviated "own message" in the figure).

3.2 Extended Case Studies on Software Engineering Education

With intelligent electronic media, which has become more widely and thoroughly cultivated, even under severe engineering educational conditions; it is still more feasible to educate learners' communication abilities with physically sensible skills. It could be possible to precisely grasp a state of mutual understanding based on both the human brain and more physical types of intelligence regarding individuals, smaller or larger communities all the way up to the larger masses through the introduction of their mapping, on a real-time basis.

The overall system scheme in the current research is viewed with an educational model to be facilitated by knowledge/databases under improved interactions in real-time as shown in Figs.3 and 4. Especially, there are more in-depth knowledge/databases to be integrated at the stages of confirmation and registration for lectures/seminars, which are referred to as multimedia contents in Fig.3. This knowledge/database scheme is flexibly available for not only software engineering, but also for other widespread engineering curricula which specifically require more in-depth concepts and knowledge. Open-ended lectures/seminars are also able to perform good deeds, when used together with general purpose databases on far-reaching social networks. It is not too much to say that related participants should turn their attention to making the best use of their knowledge/database with other databases.

Here, it's worth noting that such case studies on software engineering, as exist in a complex engineering curriculum, are showing improvements, on a real-time basis, for more deeply cooperative learning enhanced from the previous version of cooperative learning with the introduction of mobile terminals.

Fig.4 shows an example of mapping in educational situations on practical lectures/seminars. "Items" refer to typical questions uploaded through the intentional communications tool from the learners' side during the intermediate process of lectures/seminars. The count increases in any number of possible S or T caused ways, such as, for example, when a new item is submitted. The rank on the left-most side situates items in order with the current count integration uploaded through the intentional communications tool from any learners participating in the overall distance learning. The previous highest priority means a top-ranked item at a previous moment during the intermediate process of lectures/seminars. Of course it may also depend on the teaching staff's decisions and coordination to properly organize the ranking system. In addition, the transition status in Fig.4 is sharable with learners and teaching staff to participate at any time in the current process of lectures/seminars.

This new educational model environment is facilitated with the practical functionalities that are available in higher engineering educational situations through smoother communications and with more integrated knowledge/databases in real-time. Therefore, for lectures/seminars, teaching staff can be provided with resources such as educational options and more refined coordination, not only in the standard engineering curricula, but also in a variety of engineering areas, especially those that specifically require more in-depth concepts and knowledge: i.e. contextual guidance on lectures/seminars, a widespread conceptually sharable space ranging from personal to smaller or larger learning groups, integration of conceptual mapping in-class situations, more qualified educational processes with minimal to no delay in the individual learners' reconfirmation (cf. flipped class). Some kinds of concrete application examples for learners' better understanding of more in-depth conceptual lectures/seminars can also be given as resulting quantitative data in more severe engineering educational situations.

4. Concluding Remarks

This is an educational model which has been developed for an engineering education with a mobile focus, and especially oriented toward a complex engineering curriculum that requires more in-depth learning, such as an engineering design course based on deep comprehension from an international context.

An educational model based on more deeply cooperative learning is expected to emerge rapidly from the former, more constrained, manners and roles of distance education, leading to an altogether more innovative approach to the standard educational model based on scientific evidence being made available for all learners with potential. Such an approach is required to educate learners who are anticipated to take an active part in advanced engineering sites. In the future, through the use of the concept of electronic media education, we will be able to provide extensive options in modern educational theory and practices that will enable individuals to keep up with next generation learning at every stage of life and in any educational situation faced by local to global communities.

References

[1] T. Ichiko, M. Yamamoto and M. Hanano. "Tele-education Based on Images in a Multimedia Computing Environment." Proc. of 3rd IEEE International Conference on Robot and Human Communication Roman 94, pp. 240–245, 1994.

[2] T. Ichiko. "Conceptual Software in Hypermedia Environment – Cooperative Learning in Electronic Distance Education." CD Proc. of USA / AACE, Site 97 Florida, pp. 885-888, 1997.

[3] T. Ichiko, M.Yamamoto, and M.Hanano. "Multimedia Telecommunications using a High Speed Broadband Backbone Network beyond All Aspects of the Current Internet (Revised)." *International Journal of Computers and Education* (UK/USA), No.37, pp 211 – 224, 2001.

[4]D.Tapscott, A.Williams. "How Mass Collaboration Exchanges Everything" (Portfolio New York),2006

[5] T. Ichiko. "Possibilities for Extending Media with a Sense of Immediate Reality in their Applications (Upgraded Version)." *International Journal on Global Issues and Solutions*, Sept-Oct 2008.

[6] T. Ichiko. "Possible Extension for Electronic Media in the revised Applications." CD Proc. of ASEE (American Society for Engineering Education) Midwest 2012 Conference (USA), 2012.

[7] A. Fox. "From MOOCs to SPOCs," Communications of the ACM, Vol. 56, No.12, pp38 – 40, 2013.

[8] P. J. Denning. "The Whole Professional" (The Profession of IT), Communications of the ACM, Vol. 57, No.12, pp24 – 27, 2014.

[9] I. Jacobson, E. Seidewitz. "A New Software Engineering", ibid, pp49 – 54, 2014.

[10]A program of the CSU http://www.merlot.org/merlot/index.htm
[11] SERC at Carleton College http://serc.carleton.edu/introgeo/cooperative/index.htm
[12] T. Ichiko. "A Case Study on Highly Cooperative Learning in Distance Education." Wikinomics,2014.

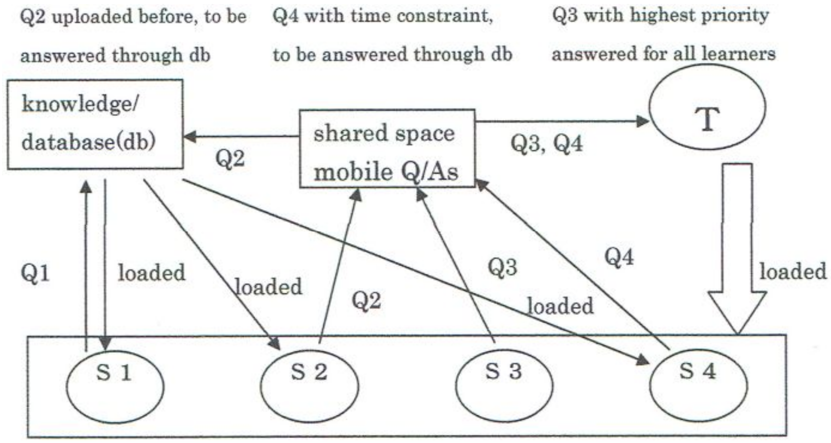

Figure 1. An example of questions and answers between learners and teaching staff

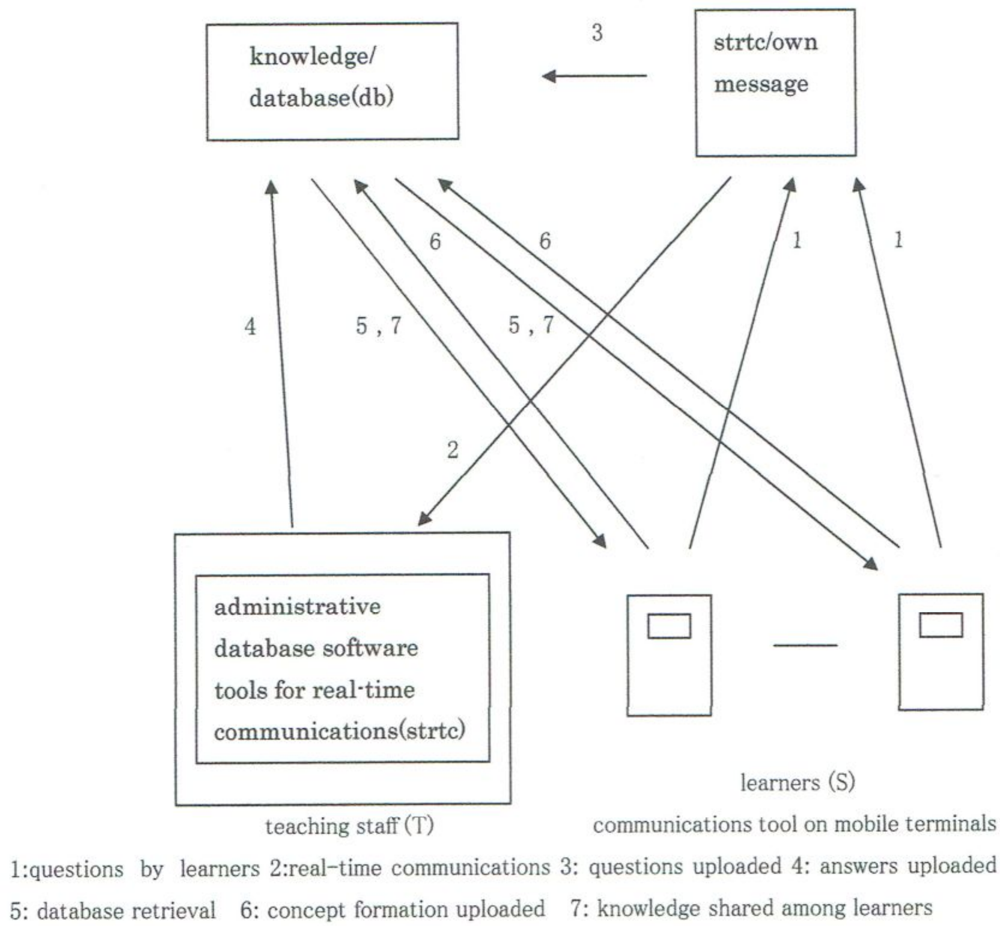

Figure 2. More detailed scheme among learners and teaching staff

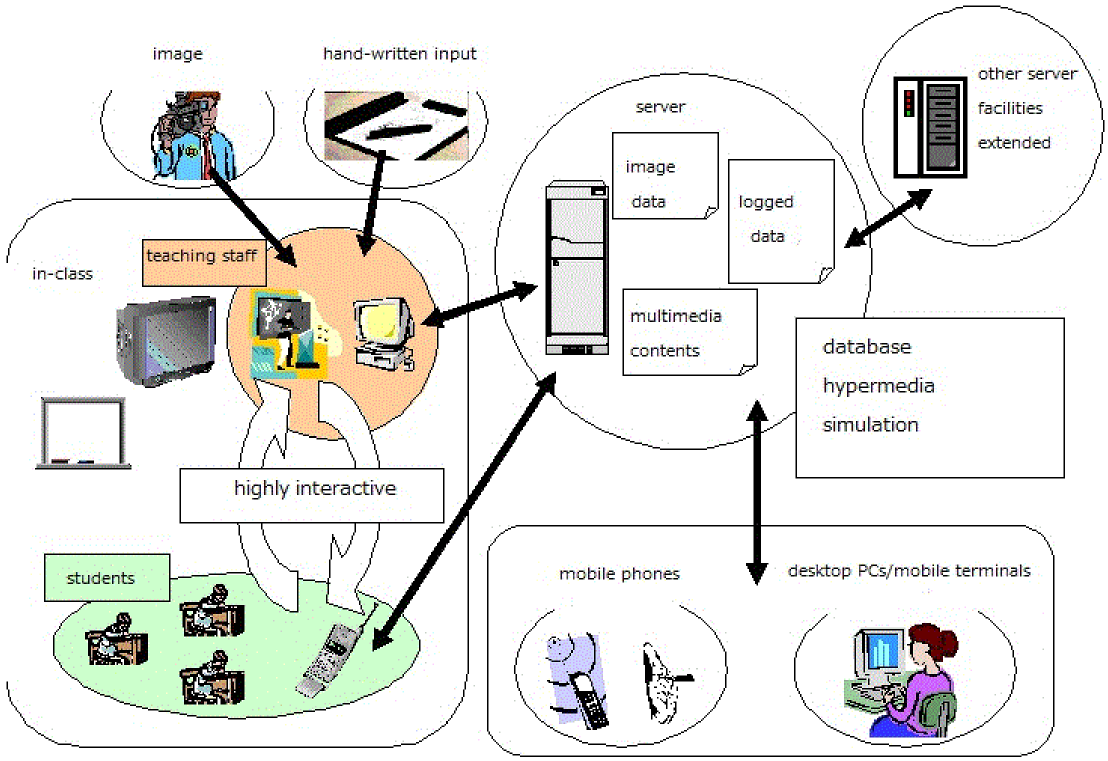

Figure 3. An educational model facilitated with knowledge/databases under improved real-time interactions

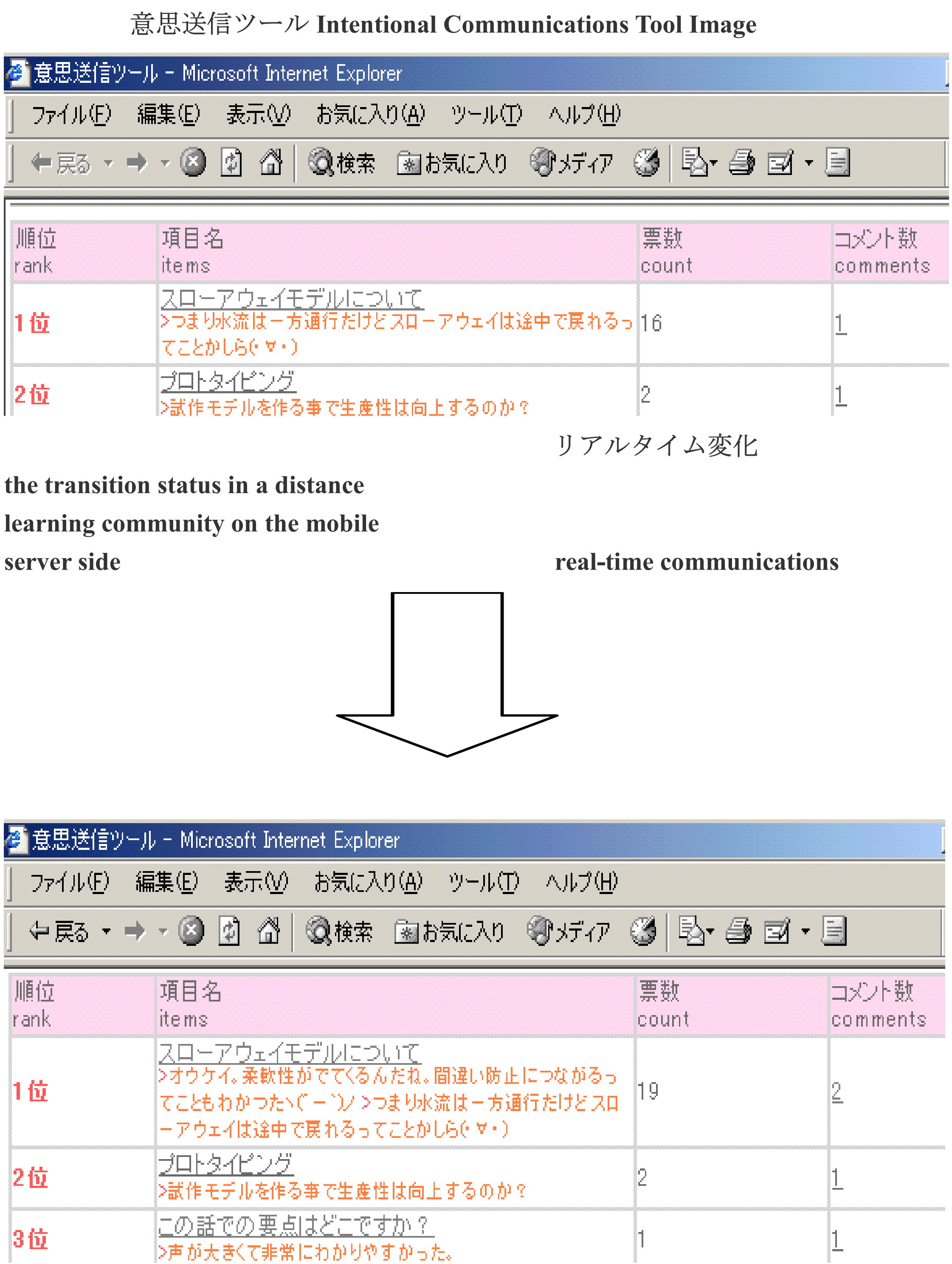

Figure 4. Mapping in educational situations on practical lectures/seminars