A COLLABORATIVE PLATFORM FOR DESIGNING UBIQUITOUS LEARNING

Haruo Nishinosono, Institute for Learning Development, Kyoko Saio, Kansai University,
Kunio Nakamura, Johoka Utopia, Japan

INTRODUCTION

The following three critical factors will help spur solutions to current problems in Japanese higher education. First, skyrocketing expenditures in higher education will challenge educational researchers to initiate new concepts and procedures for developing instruction that will reduce instructional costs. Secondly, the current global recession will also force many people to improve their professional abilities in order to meet new job qualifications and update the competencies required by our increasingly knowledge-based society. Thirdly, the new convenient and inexpensive ICTs being produced in developed nations will allow us to provide higher education to the unemployed and the most vulnerable and marginalized people without excessive personnel costs or facilities. In response, we must change our instructional paradigm from instruction provided by teachers to learning initiated and managed by learners themselves to prevent rising expenditures for personnel and facilities. According to conventional procedures for designing instruction, teachers start by identifying educational aims and specifying them in instructional objectives. This method assumes that teachers are indispensable for effective instruction and requires that they monitor learners' activities to achieve intended outcomes in well-equipped classrooms. On the other hand, learner-initiated learning requires meaning for learning to occur, and clear, tangible outcomes are expected at the outset of the learning process. In this case, the developmental methods and procedures are entirely different from the conventional methodology of instruction.

In contrast to formal education that charges expensive tuition fees, non-formal education, which is defined by UNESCO as 'learning embedded in planned, organized and sustained education activities that are outside formal education institutions, responding to education needs for persons of all ages' (Dada et al. 2006), requires initiative by learners and encouragement by communities. This framework initiates collaborative and autonomous learning and sustains it until we can achieve satisfactory outcomes such as knowledge and competencies useful for enhancing professional careers and enriching learners' daily lives. A country such as Japan, which requires high tuition fees for quality high education, is excluding people in poverty and marginalized and vulnerable citizens from traditional routes of education that might improve their quality of life. We urgently need to establish non-formal educational systems within the so-called developed countries. Our project aims to develop instructional courses that are entirely carried out and managed by students themselves with the support of mentors and are nevertheless effective to sustain society's needs for quality.

Designing Ubiquitous Learning

The conventional method of instructional design requires teachers to decide instructional objectives, content, learning spaces and facilities needed for their instruction in advance. Ubiquitous learning, on the other hand, does not require prior, conclusive decisions concerning such educational components. Learners can select topics, programs, objectives, conditions and other components. Yet despite such flexibility, designers of ubiquitous learning intended to be realized in non-formal education have to make assumptions about learners' interests, background knowledge, learning environments and other influential factors to produce effective learning outcomes and tangible materials for effective learning. This may be problematic for teachers used to conventional, fixed ways of initiating instruction in accordance with their aims, beliefs, intentions and instructional objectives. It is also hard to change their perceptions of students from the perspective of teaching to that of learning and their framework of initiating lesson plans from a logical sequence of subjects to intuitive procedures during the learning process.

At the very earliest stage of developing ubiquitous learning, we have only ambiguous ideas in our mind, which we can best describe by referring to other examples. In other words, these are metaphors (Morgan 1980). The cycle in Figure 1 shows a reciprocal procedure for teachers' personal growth after following a sequence of steps for instruction. The reciprocal sequence consists of metaphors, images, models, instructional propositions,

propositional attitude, pedagogical actions, analysis and inter-subjective interpretation of the students' activities and outcomes after the lesson. Original design often emerges from very ambiguous, intuitive and unique ideas, not from an established, rigid framework for designing technology. Referring to the tacit knowledge accumulated from previous experiences, learning designers develop their concepts and realize them through thoughtful preparation and organization of learning events and appropriate pedagogical actions.

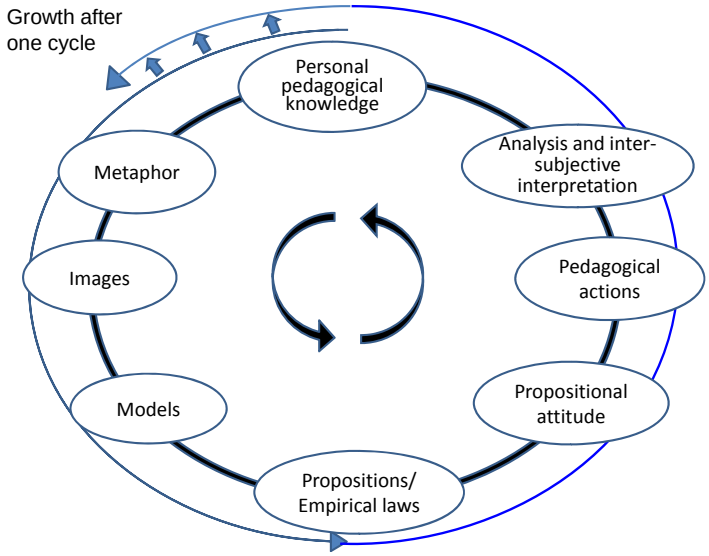


Figure 1 A model of teachers' development through learning from experience

This conceptual framework emerged gradually from past experience in designing large-sized classes for nine years at Bukkyo University(Nishinosono et al. 2006). Since 2000, we have repeatedly designed, implemented, evaluated and revised a university course, 'Introduction to Instructional Technology,' by adopting several different cyclical procedures. The first metaphor for this course was 'brewer technology,' sensitive to changes of materials in the process of fermentation, rather than metalwork or woodwork technology, which can be precisely planned, organized and managed in advance. In the case of brewer technology, we have to wait for biochemical changes in the material, manage the time schedule of fermentation and intervene in the process at the right moment. We repeated our course seventeen times, twice a year for last eight and half years, and we modified the images of the learning process. The development of seventeen repetitions can be divided into three phases: 2000-2002, 2003-2007 and after 2008.

First Phase of Development

In the first phase of revisions until 2002, we developed an image for the procedure for producing learning outcomes shown in Figure 2. The course is composed of 15 units of instruction accommodating more than one hundred students (276 students at maximum). A number of teams (44 teams at maximum) of five to seven students are formed to facilitate discussion and collaborative learning by themselves. A conventional textbook is the major common source of information, but other inputs are welcomed. The course features an LMS (C-Learning, Netman Co., Ltd.) that is compatible with both PC and mobile phone for managing team learning. Figure 2 shows the final image of the first phase between the years 2000 - 2002, which represents the uniform sequence of lessons and partly teacher-led instruction. After assessing the outcome and records, we drastically changed the structure to one that was problem-oriented. The lesson started from students' awareness of educational problems and proceeded to team learning (Senge 1994) to prepare interim presentations to other classmates. Information gathering, surveys and intensive discussion are needed for this preparation.

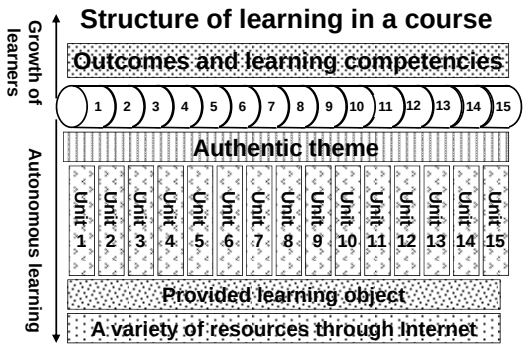
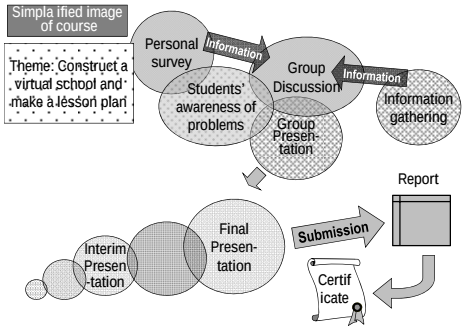


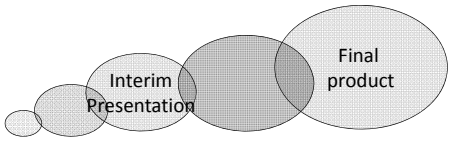
Figure 2 The final image of the first phase

Second Phase of Development

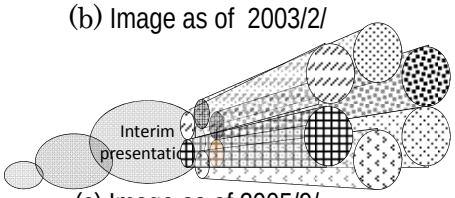
The image of Figure 3(a) represents a complete image of the course in the second phase. Figure 3(b) shows the straight-forward development of activities in the early stage of ice breaking and collaborative teamwork for preparing the interim presentation. In Figure 3(c) from 2005, the image of later units represents more autonomous learning. At that time, we realized the importance of the early units to create more productive outcomes. In the later stages of Figure 3(c), students experienced difficulty maintaining their motivation to write final reports. Figure 3(d) shows enhancement of the initial units by providing more time for discussion. As Figure 3(e) shows, we later introduced a step in which students assessed their three short reports mutually with team members and refined their reports to complete their final outcomes. During this period, students had enough time to consult and verify their ideas in other books and websites and refine their reports. These examples of successive modification show that instruction is always provisional, changing and unique. During these modifications, more than eighty propositions were extracted in the process of revisions and instructional interventions in practical lessons, describing perception of learning situations, recognition of learners, judgments about instructional actions and educational norms for collaborative and autonomous team learning.



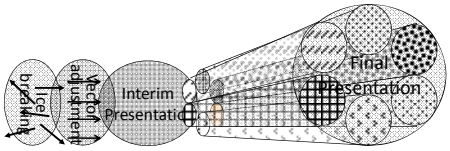
(a) The initial image of the second phase



(b) Image as of 2003/2/



(c) Image as of 2005/9/



(d) Image as of 2007/3/

(e) Image as of 2008/8/

Figure 3 Changing images of learning process

After clarifying images, a more concrete framework was needed to develop real lesson plans and learning objects. The MACETO model was developed for this purpose. This model emerged gradually from the first author's long experience in developing instructional materials for vocational education, science education and teacher training. MACETO stands for Meaning, Actions, Contents, Environment, Tools and Outcomes. The following hypothesis emerged from these successive improvements and experiences.

Hypothesis: The design of the learning process can be described by a set of metaphors, images, models and propositions.

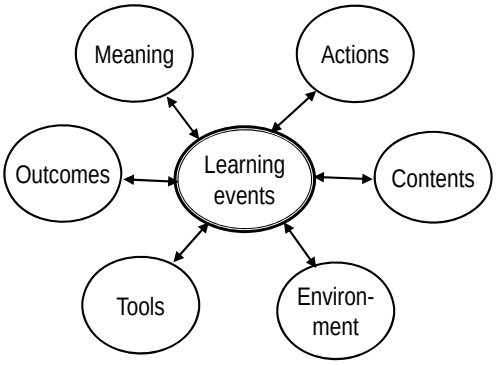


Figure 4 MACETO Model for Instructional Design

At the initial stage of the second phase of designing collaborative learning, the developers already possessed some implicit images or ideas for developing program-based learning which would refer to their previous experience. At this very early stage of design, they needed to communicate with collaborators in the form of ambiguous and personal tacit knowledge (Polanyi 1974). If it was difficult for students to clearly comprehend these images and ideas, they would be unable to communicate effectively with other colleagues or work together collaboratively and efficiently. Nevertheless, designers must describe intuitive ideas and implicit plans when developing a new learning program with their colleagues. In these circumstances, they can express their ideas with the help of metaphors, images, models and propositions. Frameworks for developing m-learning were needed to transform such implicit ideas into concrete courses for desired learning.

Figure 5 shows an example of a learning guidebook and mobile phone connected to LMS compatible with personal computers. In this system, the ordinary textbooks shown in the photo are used as main information providers and other reference materials are also welcomed.

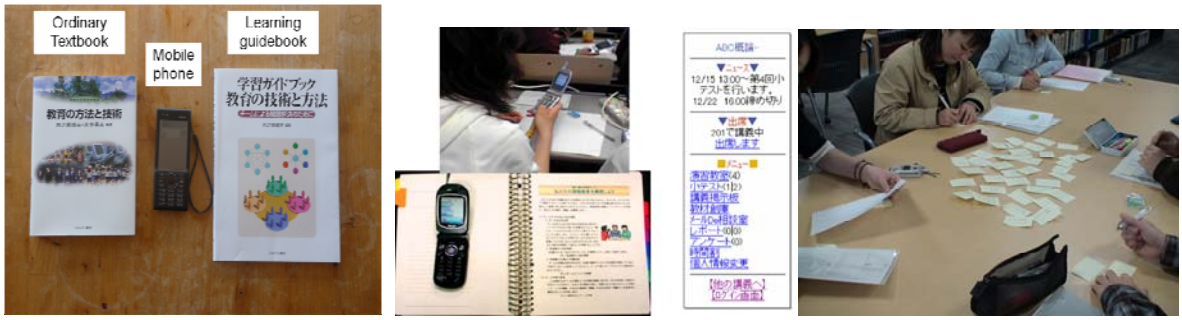


Figure 5 Developed learning guidebook and team learning managed by mobile phone

We have not yet derived quantitative outcomes from our implementation, but we are confirming the validity of the above-mentioned hypothesis.

Collaborative Platform for Designing Ubiquitous Learning

Third Phase of Development

Realization of tuition-free higher education is urgently needed to cope with the drastic change in the economic situation caused by the global monetary crisis and unemployment issues. We have to take into account the potential of ICTs as well as rapidly developing learning science and technology for constructing a new pedagogical paradigm of cost-effective instruction. While conventional teaching methods are often derived from philosophical approaches developed by eminent philosophers and educators, the new pedagogy starts from real problems faced in all educational settings, at home and the workplace, and in daily lives. In this sense, personal pedagogical knowledge should be communicable among learning designers. However, the widely used PDCA (Plan, Do, Check and Action) model does not give us a framework for extracting our empirical knowledge explicitly. Learning designers focus their attention on learners' intentions, learning processes and outcomes, not on designers' objectives. Designers thus find that a model of learning design is indispensable to help their professional development. In this context, a set of propositions are derived not only from objective analysis, but also from subjective and/or intersubjective interpretation of learning processes (Davidson 2001).

The third phase of the project started in 2008. In this phase, we applied this methodology to an introductory training course of 81 novice teachers from Kyoto municipal lower secondary schools. This course will accommodate 90 teachers, beginning in the summer of 2009. We are also preparing other courses to provide professional qualification certificates for a large number of unemployed people. A comprehensive system of planning, production, implementation, monitoring, assessment, quality assurance and management should be implemented for specialized professional positions for which national qualification examinations are available and high-quality textbooks are already published and other professional officers or specialists. In this context, we need efficient and systematic development of learning guidebooks and management systems for dealing with a great number of applicants at the Hello Work Centres and the Job Park, or public employment offices.

Management of Collaborative and Autonomous Learning

Figure 6 shows a platform on a computer screen representing a cyclical procedure, which supports designers in creating course plans, producers in creating guidebooks and other materials for autonomous learning, and mentors in enhancing professional competencies referring to previous empirical laws and already acquired propositional attitudes. To achieve common understanding among participants, group discussions are indispensable for mutual awareness of problems and, intersubjective interpretation and sharable consensus. Boxes in Figure 6 show course discussion sessions.

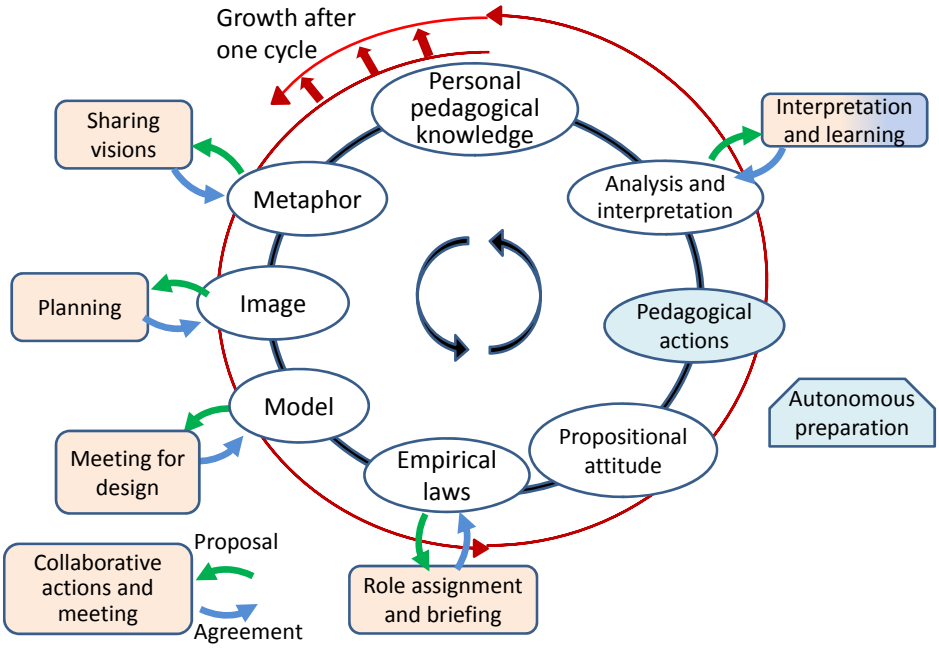


Figure 6 A collaborative platform for developing ubiquitous learning

In our rapidly changing society, corporate restructuring and bankruptcies are increasingly common phenomena, often requiring even highly qualified people to change their specialities. Unemployed and other vulnerable citizens cannot afford to pay tuition fees to gain competence in other professions. Their incomes are very limited and opportunities for attending classes for professional qualifications are few, especially in areas apart from large cities. When we provide this kind of professional education to many unemployed or disadvantaged people at conventional institutions, we incur burdensome personnel costs for instructors and expenditures for educational facilities.

Figure 7 represents the possibility for forming learning groups or teams to learn from each other and encourage continuous learning for applying for qualification examinations for professional certificates. Learning objects are developed by content specialists, media developers and learning developers. Developed materials are provided to learners, who are supported by mentors and technical assistants. Recent IC technologies such as Avatars and 'Second life' can assume the roles of mentors and technical assistants in order to support learners.

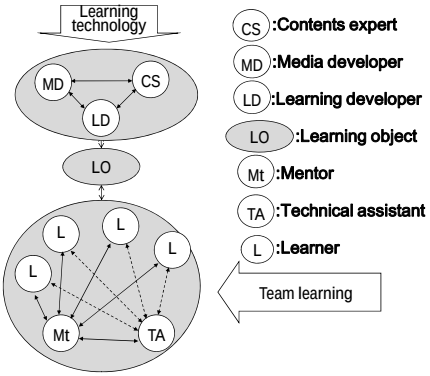


Figure 7 Management of autonomous learning

Conclusion

The above-mentioned methodology for designing ubiquitous learning has emerged from trial and error in holding large-sized classes over the past ten years. These ten years of experience can be divided into three phases: a conventional framework of instruction-oriented courses for a large number of university students, learner-led courses in a problem-solving approach in similar classes and a course following an experience-based approach for teachers' professional growth and enhancement. In the third phase, a symbolic approach was applied to a training course for novice teachers in the summer of 2008. Building on this trial, a second training course is being designed for teacher training of 90 novice teachers in the summer of 2009.

The design of ubiquitous learning with ICTs requires a framework and procedures entirely different from conventional instructional design technology, which starts from specification of instructional objectives and systematic procedures for material development. Teamwork, workshop learning and other types of action-oriented learning are indispensable components of active learning, requiring a new framework and procedures that emerged from conventional systematic approaches, but encountered two breakthroughs from the first phase to the third phase. Designers' tacit knowledge and previous experience were very important factors in improvement.

When developing a new approach, it is very difficult to assess the effectiveness of ubiquitous learning quantitatively. We propose a symbolic approach for developing procedures for collaborative and autonomous learning, based on the extensive personal experience of the learning developers. A procedure for converting personal pedagogical knowledge to socialized knowledge is essential for the professional growth of learning designers. It is clear that designs always change after any implementation of designed instructions, and that every design is unique and provisional. No definitive conclusion can be drawn from any instruction. Further theoretical and philosophical considerations are needed to refine the proposed procedures and models.

Acknowledgement

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