METAPHOR, IMAGE, MODEL AND PROPOSITION FOR DESIGNING AUTONOMOUS LEARNING

Haruo NISHINOSONO Shiho MOCHIZUKI
Bukkyo University Institute for Learning Development

ABSTRACT

An ever-changing and diversified society requires ceaseless learning to maintain high standards of quality in our profession and highly satisfying daily lives. Conventional lecture style instruction is not suitable to accommodate diverse students satisfactorily, especially those from other cultures and those with special needs. Autonomous learning capabilities are highly valued, but their realization depends on motivated participants who have clear plans and perspectives on their learning. The most convenient media for disseminating distance learning are printed materials, but they require special instructional strategies for motivating participants, including a definite framework and procedures for developing high quality guidebooks, textbook and supplemental materials. This paper discusses four stages of design: metaphor, images, models and propositions for implementing instructional technology. Inexpensive devices such as mobile phones and PDA are powerful tools to satisfy the learning needs of anyone, anywhere and at any time: they can effectively complement text materials at low cost. The proposed framework has been applied to large scale classes participated in by from seventy to two hundreds student teachers. New ways of transferring and reconstructing a wide range of forms of knowledge, from tacit to explicit using different types of knowledge representations is discussed.

KEYWORDS

instructional design, autonomous learning, research framework, knowledge creation, empirical approach, mobile technology

1. INTRODUCTION

Society is changing and diversifying rapidly due to the development of Information and Communication Technology or ICT. Rapid diffusion of ICT accelerates instability of employment and requires everyone to renew professional knowledge and competence, often as his/her own responsibility. The present educational system seems efficient to cultivate manpower for modernizing nations in the economic sense, but is not proving effective to meet personal needs in our turbulent rapidly diversifying society. A new educational system is needed now which will be able to accommodate people who cannot cope with changing and diversifying society. Many senior people working in public education, however, are reluctant or even strongly resistant to major reform the educational system so solidly established in the past century. In these circumstances we have to start instructional designs from personal needs and participants' diversified backgrounds and then proceed to put forward national goals and rationales for them, which can be agreed upon in a democratic consensus.

Most present-day educational technology, however, still starts designing instruction from the standpoint of obsolescent educational goals which reflect the old national policies and interests of twenty century modernity. The goal of promoting the right to learn which is most valuable for all citizens, can provide a common ground for designing autonomous learning, but it does not imply any specific method by itself for instructional development. Japanese students and youngsters are often thought ignorant about political and international affairs, but are actually only unfamiliar with the means to express their thought in logical ways. Now is the right time to explore learner-centered instruction for cultivating discussion competence among students and for promoting autonomous learning rather than passive compliant approaches to learn. There is much literature discussing instructional development, but almost none of us is persuasive to help us change our limiting metaphors, mental models and frameworks which are so deeply embedded in current instruction. One possibility of changing the rigid frameworks is to use

new iconic and figurative representations to express instructional designs. Designing is creative process of imaging learning events and actualizing them in reality. To make this process more flexible and easy to handle, four process layers: metaphor, image, model and proposition, are discussed in the following sections.

2. INSTRUCTIONAL TECHNOLOGY IS A FIELD WHICH MUST COMBINE VARIOUS OTHER TECHNOLOGIES

When following the conventional procedure of designing instruction, we start from specifying instructional objectives and sequencing them, and then take into account other factors such as teaching materials, teaching environment and teaching tools. In that procedure, instructional objectives are usually derived from the national curriculum specifications, developed down into a sequence of sub-objectives and then actualized in various forms of instructional materials. Instructional technologies come into scene after selecting instructional objectives and their sequential development. On the other hand, when we start from learners' needs and learning objectives, we cannot anticipate the instructional process and final learning outcomes at the beginning of a course. We need to use appropriate technologies and scenarios in order to analyze learners' needs, assess the relevance to instructional contents and develop the learning environment in parallel to evaluation related to educational goals.

Saegusa (1976) suggested there are two interpretations regarding technology in education. One interpretation is that educational technology is a branch of educational expertise similar to educational philosophy, educational psychology, educational sociology and so on. Another interpretation is that it is an area integrating various technological disciplines similar to brewing technology, food-processing technology, medical technology, nursing technology and many other technologies. The later interpretation gives us a broader view of the role of technology in education. Moreover when we approach instructional design from their perspectives of learners' personal needs, the factors under considerations are too numerous and complex to deal with by simple paper and prescription and conversation. Fortunately, ICT now has become a powerful tool to enable us to deal with such complex problems. It is now applied in almost all disciplines to solve complex problems systematically and to enhance expertise. We can describe the complexity of learners by using a relational database and plan a scheme for future perspectives by adapting simulation technology. In this context, we can borrow ideas from other different kinds of technological expertise to improve education. We take the latter integrative view of instructional technology, and prescribe four activity steps characterized by: 1) metaphors, 2) images, 3) models and 4) propositions in order to create an entirely new instructional process for designing to support autonomous learning.

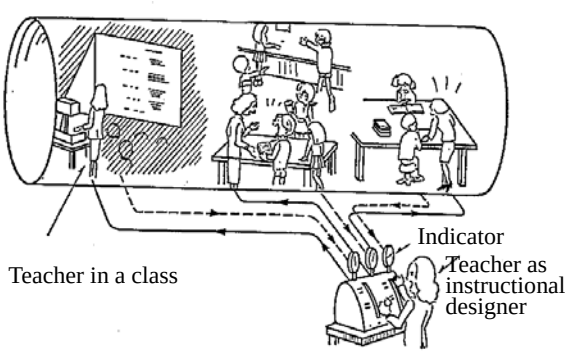
Instructional design is a creating process extending from ambiguous images to concrete procedures, to learning materials and then to tangible outcomes. It is too big a job for lone practitioners; it requires teamwork. And teamwork requires a framework for creating sharable ideas and common outcomes from diversified participants. The use of common metaphors gives a framework to generate sharable images to proceed to more concrete process of developing learning activities. In the project of developing a course 'Introduction to Instructional Technology' for a large class, sometimes attended by more than two hundred students, we fixed two metaphors as a framework, one model called MACETO, several propositions for learning development.

Metaphors: Brewing technology and paragliding technology

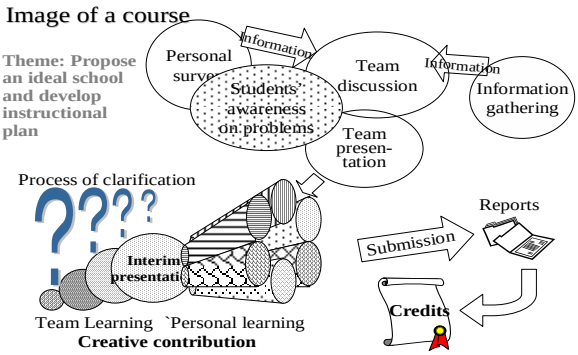
Brewing technology depends on biochemical changes in fermentation and paragliding technology bases on the natural laws of aerodynamics and meteorology. These metaphors suggest relatively passive intervention or roles of facilitators for changing the learning process. In spite of such steering seeming passive, it requires very careful attentions on the learning process and scientific knowledge to produce effective outcomes.

Images: Images emerge from the metaphors common to instructional designers.

We develop many images as figurative elements for designing a flexible instruction and show here only two of them. Using such metaphors makes it easier to arrive at a consensus among instructional designers, material producers and teachers. One of authors - Nishinosono adopted this approach in the late 1970s



(a) Teacher controlling her actions (Nishinosono 1981)



(b) Designing autonomous learning (Nishinosono 2002)

Figure 1. Two Images Showing Gradual Transformation of Instructional Modes

at the first time and has developed it since then to clarify the internal structures using a figurative representation. (see Figure 1)

Models: Models represent more actual and relevant aspects of instructions. The most important model for this instructional design is MACETO which represents meaning (M), actions/activities (A), contents (C), environment (E), tools (T) and outcomes (O). This model consists of two parts: internal and external conditions of learner. Instructional design starts from arranging internal conditions of learners to enable students to learn autonomously. Meaning of learning is of high priority and gives an orientation of whole learning activities. (see Figure 2)

Hypothesis: If we succeed to arrange internal conditions of learners meaningfully, learners can overcome externally difficult conditions and work hard autonomously.

Propositions: Instructional design heavily depends on empirical and tacit knowledge and know-how which is hard to transfer to other instructors through media. To overcome this difficulty, it is indispensable to train instructors to express their experience in form of models and propositions. Five propositions out of 65 emerged from one lesson are listed in Table 1 as examples.

Norms: Norms are indispensable to maintain effective and collaborative teamwork. Five norms are suggested to team members who are requested to discuss their own choice or addition of new norms. The original norms and logo are shown in Figure 3. Participants are suggested these five norms as an example for further discussion: Autonomy, Collaboration, Contribution, Responsibility and Respect.

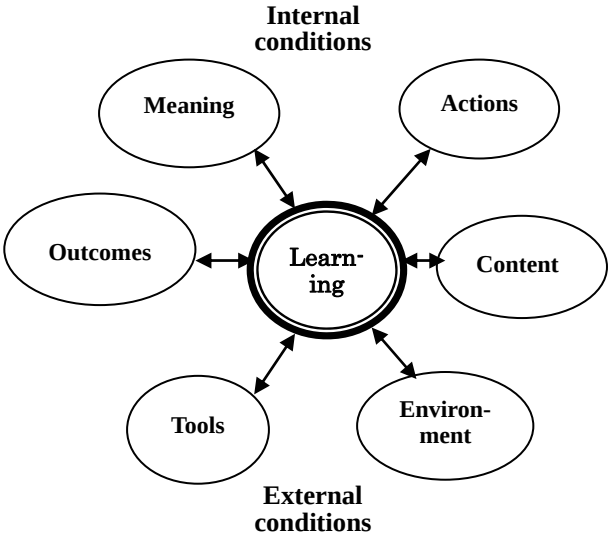


Figure 2. MACETO Model for Instructional Design

Table 1. Examples of Propositions

Some instructional propositions emerged from this project. (5 propositions out of 65)

- Transformation from image to key concept, graphic presentation and modeling is indispensable but hard to achieve in student teachers with success. Modeling requires a great leap from the previous step.
- Realization of autonomous learning requires cultivating the students' heightened attitude towards learning. To cultivate such an attitude, it is effective to require repeatedly the same behavior of filling in the framework sheet (MACETO format) before students can organize learning by themselves.
- Alternative strategies of degrees of freedom in learning:
  1. When we increase the degree of freedom in learning and give more initiative to the students, learning results in a wide range from excellent to poor in quality and quantity.
  2. When we decrease the degree of freedom in learning and give less initiative to the students, learning results in a reliable but mediocre outcome of both less excellent and less poor quality.
- To manage a large group of students to learn autonomously, it is effective to form groups and clusters of groups, encourage active participation and let them recognize their responsibility towards autonomous learning.
- To make learning meaningful, it is effective to start the lesson from one's earlier experiences relevant to instructional contents.

The four-stage framework of instructional design and five norms for effective team learning are still at the stage of hypothesis and to be confirmed by further scientific research.

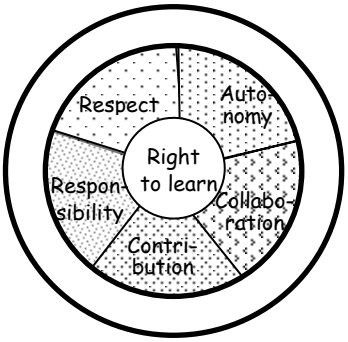


Figure 3. Norms for Teamwork

3. INSTRUCTIONAL TECHNOLOGY AS A FIELD OF COMBINIG VARIOUS TECHNOLOGIES

In the conventional systematic procedure of instructional design, we start by identifying educational goals, specifying instructional objectives, developing a teaching process, implementing the instruction itself and then evaluating outcomes. On the other hand, in the case of starting by identifying learners' needs and motivations, we proceed to clarifying the meaning of learning, assessing learning outcomes, encouraging learning activities, specifying instructional contents and arranging learning environment. Figure 4 shows a framework and procedure for designing learning-oriented instruction which starts from the Right to Learn, according to the learners' various needs and their own learning objectives. The results of following this procedure are active participation in teamwork, reports of more than 10 pages submitted by participants, important elements which are missing from our present educational system practices.

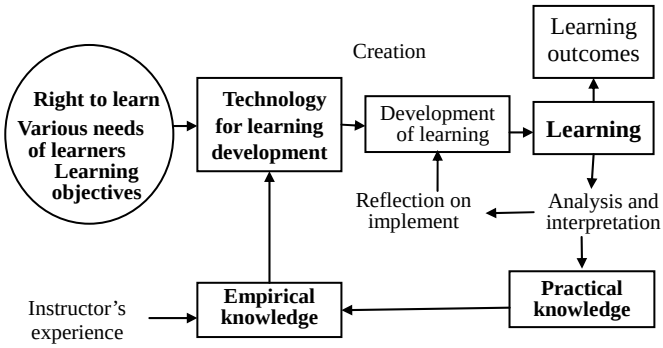


Figure 4. Framework for Learning-Oriented Instruction

Current education in Japanese schools, even in universities, emphasizes the importance of absorbing instructional content, thereby learning towards teaching crammed with factual knowledge. Innovation in school and university education is urgently needed to change education from teacher-led instruction to collaborative student-planned learning to meet the diversified needs of learners and to take advantage of information-rich learning environment provided by our ubiquitous ICT. In this circumstance, teachers are expected to develop their professional expertise, enrich experience and communicate with their colleagues and professionals on the web, even at a distance, to enrich their professional competences. It is indispensable to explore a new type of communication means to promote effective sharing of their experiences. It is indispensable for educational faculties to explore new types of communication means to promote effective sharing of their experiences and collaborative innovation.

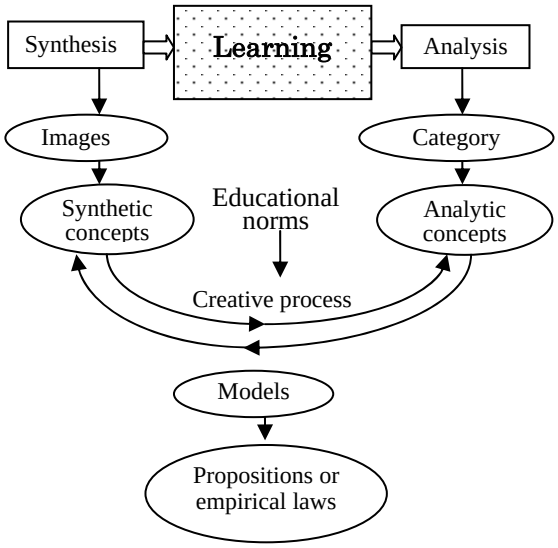


Figure 5. Framework for synthesis and

Hypothesis: Our experiences with instruction are accumulated tacitly as well as explicitly, of which explicit knowledge can be described in a set of iconic and/or figurative representations and formal propositions to be easily communicated among instructional professionals for enhancing the Right to Learn.

Effective sharing of experiences on practical instruction requires a common framework to conduct research and report the result among other expertise. Figure 5 shows four possible approaches to designing novel instruction: 1)practical syllogistic derivation from educational norms to actions, 2)application of scientific findings, 3)learning from others' experiences, and 4)use of intuitive and creative ideas enhanced by tacit knowledge, which has accumulated from our previous experience. We start to generate intuitive and creative

ideas by referring to the tacit knowledge emerging from our past experience. The concern in this paper is to develop a framework instructional design for a research method for formulating explicit knowledge in the forms of images and iconic representations, as well as statements and propositions.

4. CASES OF IMPLEMENTATION

The first experimental approach for exploring autonomous learning started in 1980s' at Kyoto University of Education where we used it to develop printed materials for guiding micro-teaching as an initial practice of student teachers. The cultivation of autonomous learning was urgently needed to facilitate the effective management of a large number of learning groups. It was entirely empirical procedure used to develop printed materials. The textbook developed then and there is still a valid tool and continued to be used at the university. During the last five years since 1999, we have developed other distributed learning materials synchronized by mobile phones and by ordinary computers through the Web to facilitate mutual communication and discussion among students on bulletin board. In this second trial system, a class can accommodate more than two hundreds students aiming to develop large scale on-line learning based on team learning and active involvement in product-oriented teamwork. During this development, the above-mentioned frameworks and procedures have been and are applied and monitored by the authors.

Figure 6. Scenes in a class

5. CONCLUSIONS

In the conventional process of planning instruction, educational objectives are always prescribed at first for developing instructional process and materials. Detailed characterization of diverse learners comes later and is not considered definitive for developing the instructional materials. Considering diverse backgrounds of learners, we choose team learning as our strategy to accommodate the diversity and by making all participants get really involved in teamwork they show their different talents and capabilities for collaborating with each other. This kind of instruction requires highly talented human management and appropriate support technology to implement the needed complex learning. In this study, we adopted concept of '*education as technology*' and developed a framework of '*metaphor, image, model and proposition*'. To activate team learning, five norms: autonomy, collaboration, contribution, responsibility and respect, are proposed to participants who are free to: accept them, select some of them or add other norms to them. Knowledge obtained from professional experience is described in form of images, iconic representations and propositions which can be currently found among instructional designers on the Web. Images and iconic representations are easy to use to generate new ideas and to modify them after the initial implementation.

In the process of developing educational courses, there are four possible approaches for applying a rational procedure for instructional development; practical syllogistic derivation from educational norms to actions, application of scientific findings, learning from other's experiences and refinement of intuitive and creative

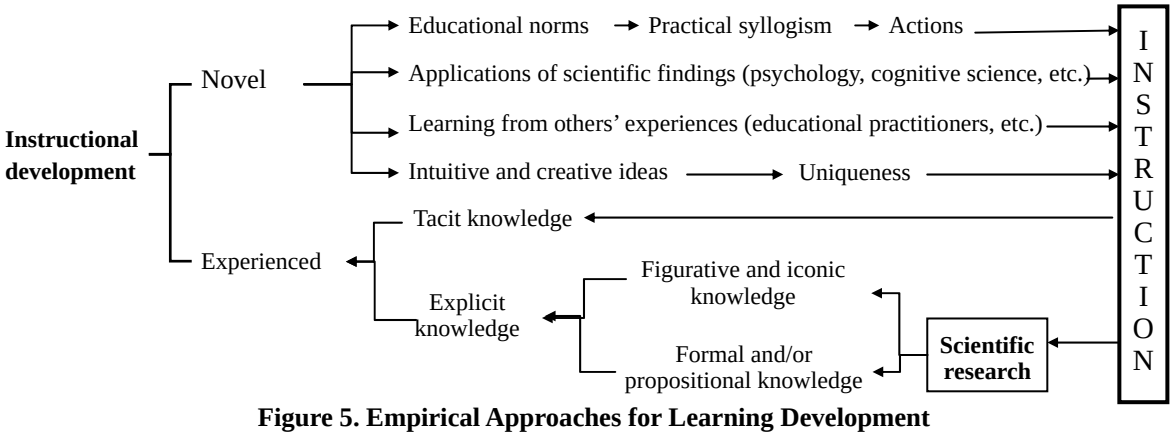


Figure 5. Empirical Approaches for Learning Development

ideas. Actual instruction is too complex to manage from a single concept: it is impossible to cover the whole process according to only one specific scientific standpoint. Learning from other designers and practitioners is always very fruitful. At the same time, we often face many entirely unfamiliar situations, but nevertheless have to conduct our instruction. We cannot wait for the needed knowledge to emerge from scientific meetings or information from others' experiences. In many cases in daily teaching, we start from our intuitive ideas and confirm their validity empirically.

As shown in Figure 5, the authors start from the intuitive and creative ideas referring to tacit knowledge hard to express verbally but which is certainly embedded in their own experiences. We may express them in the form of figurative or iconic representations which are easier to grasp and use than strictly logical statements. Young students are quite familiar with expressing their ideas in non-verbal-linguistic ways. Taking advantages of such familiarity, students start expressing their original ideas, discussing the issues and refining them towards final concrete outcomes, or products of instructional materials and iconic models representing the instructional situation. At the beginning they find it feels difficult to express their ideas in logical statements and propositions needed to communicate with their peers in written form. In this process, ceaseless communication and critiques among students through direct discussion in the class as well as on the Web at home are indispensable to encourage their active involvement and clarify their logical reasoning. This is why we request students to write more than 10 page long reports to express their ideas using a variety of resources.

Mobile phones so familiar to students are still largely out of bounds as educational instruments. However, mobile phones have become an important part of their daily lives. They never forget them at home or anywhere else. On the other hand, instruction of diverse learners has become too difficult to tackle for teachers working alone. They need to help each other, obtain public support and communicate personally with students, colleagues and the citizens in the community. Ubiquitous equipment is a very powerful tool to facilitate mutual and micro-political communication and, in this sense, it can contribute to truly universal education. However, such use of technology requires us to become more imaginative and creative, and to develop accessible scientific procedures in pursuit of rational systematically situated reasoning for instructional development as the core of our professional discipline. Starting from ambiguous but intuitive and creative ideas, we can refine them and express our ideas rationally and then contribute to the scientific development of instructional design technology. Thanks to recent technological developments in qualitative and quantitative analysis, we can easily investigate the validity and relevance of empirical knowledge during real classroom instruction. For this purpose, we need to develop a scientific procedure to clarify our experiences and refine them to be able to communicate with each other around the world.

AKNOWLEGDEMENTS

We would like to express our gratitude to Dr. Gary Boyd, professor of Concordia University in Montreal Canada, for his comments and corrections of our English.

REFERENCES

Books

BOAK, George, David THOMPSON 1998. *Mental Models for Management*, Random House UK Ltd. (translated in Japanese)

JOHNSON-LAIRD, P.N. 1983. *Mental Models*, Cambridge University Press (translated in Japanese)

NONAKA, Ikujiro and KONNO Noboru 2003. *Chishiki Souzou No Houhouron (Methodology of Knowledge Creation)*, in Japanese, ToyouKeizai Shinpousha, Tokyo, Japan

POLANYI, Michael 1983. *Tacit Dimension*, Gloucester, Mass. Peter Smith Pub Inc, U.S.A.

SAEGUSA, Hiroto 1976 *Gijutsu No Tetsugaku (Philosophy of Technology)* Iwanami Shoten, Japan

Journal

NISHINOSONO, Haruo, HINO Eiichi & FUJITA Tetsuo 1978. *Two Symbol Systems for Designing the Instructional Process*, Educational Technology Research Vol.2, No.1, Tokyo, Japan

Conference paper or contributed volume

Europe Commission reports, 2000. *Education and Training in Europe: diverse systems, shared goals for 2010*, http://europa.eu.int/comm/education/policies/2010/et_2010_en.html

NISHINOSONO, Haruo 2001. *Right of Learning, Autonomous Learning and u-Learning* (in Japanese), Proceeding of Annual Conference of Educational Technology

NISHINOSONO, Haruo 2002. *Instructional Development for Knowledge Creation in Large-scale Classes*, Proceedings of SITE2002, March 18-23, 2002, Nashville, Tennessee, U.S.A. pp.2558-2562

NISHINOSONO, Haruo 2004. *Universal and Ubiquitous Learning in an ICT Society for Enhancing the Right to Learn*, Paper presented at SEAMEO-UNESCO Education Congress and Expo, 27-29 May 200 4, Bangkok, Thailand