"SNOWBALLS - Self Navigation Web-Based Literacy Learning System" and the Utilization of OCW Resources for Global Education

Kumiko Morimura, Makoto Yoshida and Shinji Suzuki

Center for Innovation in Engineering Education, the School of Engineering, the University of Tokyo

morimura @ t-adm.t.u-tokyo.ac.jp, macyoshida @ t-adm.t.u-tokyo.ac.jp

Abstract

The School of Engineering at the University of Tokyo (SE-UT) is promoting "Bilingual Campus Initiative" in order to foster future global leaders and to develop the organizational strength in supporting the global education and research.

For this purpose, the authors, as members of the Center for Innovation in Engineering Education (CIEE) under SE-UT, have proposed a total learning and education tool, SNOWBALLS, "Self Navigation Web-Based Literacy Learning System." The system provides users an effective means to strengthen and enhance the basic skills/knowledge on the globalization education, preparing a set of modules tuned to the specific needs and environments of students, faculty members as well as administrative/technical staff. It realizes the environment where both Japanese students who would like to improve their English/global skills and the international students from overseas who want to enhance their Japanese literacy enlighten and stimulate each other in learning and research activities supported by globalised SE-UT staff.

The paper first presents the architecture, development plan and major modules of the SNOWBALLS system. Next, it explains background and concept of the system followed by the trial module development. It then discusses how to effectively utilize the existing OCW content resources for SNOWBALLS based on the survey on the existing OCW courses. Multi-lingual learning support will be one of good collaborative work items in the OCWC Consortium.

Keywords

Self-navigation, Literacy, Global Education, Web-based, OCW content

Introduction

In the globalizing world, it is essential for universities to nurture global leaders who can display leadership in either practical or research field or both. The CIEE at the School of Engineering at the University of Tokyo has been developing a Web-based learning system in order to enhance students' global competency. The system is named SNOWBALLS after its functional name, "Self Navigation Web-based Literacy Learning System." The system's targets are not only students but teaching/administrative staff, so that it should provide an effective, easy to use means (target –oriented modules) to strengthen and enhance the global foundation of the university.

Section 1 explains the background of the system development, showing the architecture and major modules of the SNOWBALLS. Next, the paper shows the design concepts of the system developed by a project team followed by Sect. 2, the results of a trial on a module, Basic English Course for Engineers. Section 3 discusses how to effectively utilize the existing OCW content resources for SNOWBALLS, based on the analyses of available materials from the OCW members. Section 4 discusses functional consideration followed by Sect.5 how to combine OCW content pieces and SNOWBALLS module units. Section 6 concludes the paper, also mentioning a challenge to support multi-lingual learning support, which will be one of good collaborative work items in the OCW Consortium.

1   Background

This section explains the motivation, background and process of SNOWBALLS development.

The number of foreign students on the UT campus from all over the world has been rapidly increasing these days. In the case of the school of Engineering, it has increased from 700 to 900 in the last five years. The so-called "Global 30 Project" [1] was launched by the MEXT, Ministry of Education, Culture, Sports, Science and Technology of Japan in the middle of

2009. It will also spur the university to accept more foreign students. Japanese students will have to be prepared for study/activities in the globalized environments, during their academic life. Considering the above, the school is planning to create a "bilingual campus" in the university, so that Japanese and foreign students can educate each other by communicating with each other in both Japanese and English seamlessly. For this purpose, the school needs some tool to let everybody study English or Japanese by self-navigation without bothering teaching staff. This is an original reason why the system SNOWBALLS was planned.

1.1 Objectives

The SNOWBALLS is designed as a collection of multiple modules. The first target user group is Japanese students who should learn literacy in English. Then, it will be added a module for Japanese learning by foreign students and that for bi-lingual teaching methods. Modules for administrative and technical staff will also be developed for enhancing their job skills on international affairs, in the near future.

The module for Japanese students includes engineering basics in English, global literacy, etc, while that for international students includes basic Japanese literacy and global TA training course. Modules for university staff are such as global/bi-lingual education methods for academic staff, global job support for administrative staff, and that for technical staff.

The general structure of the Bi-lingual Campus Action Plan is shown in Figure 1 with the position of the above SNOWBALL modules.
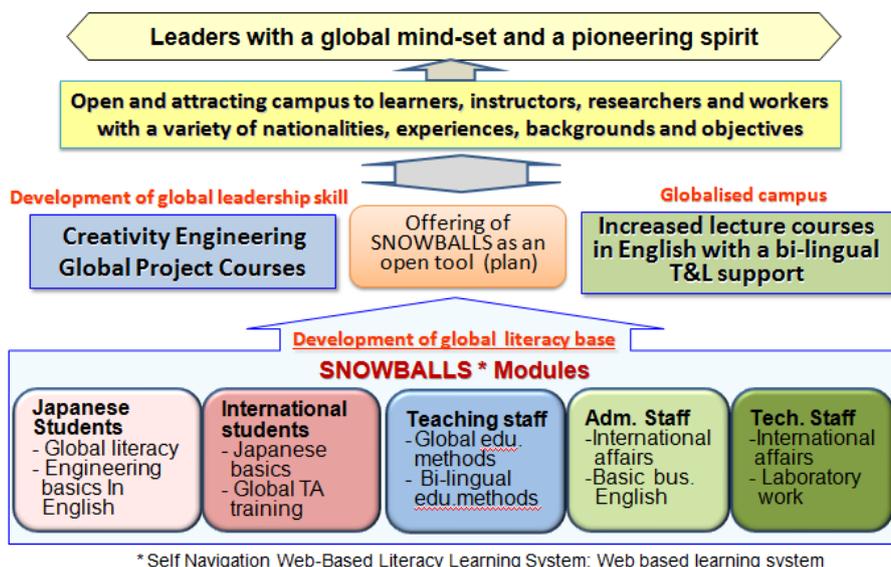
1.2 Concept of the System and a Seminar Course

There exist many e-learning systems in the world. While some are successful, many are just developed and left unused. When we examine the past failed systems, there found several specific reasons as follows: First, they look almost similar without unique attractive features. Second, they are monotonous for users to easily get bored. Learners tend to easily lose concentration when they try to learn languages which they are not familiar with. In short, user involvement in system development is key to a successful system. Thus, the authors decided to build a new attractive e-learning system that should meet user's mindset/preference, involving student users.

The authors launched a seminar course in which students and an instructor, one of the authors, discuss to design the system as a project team. That is, it studied what the system should look like, what field/themes it should first focus on, or which style they would prefer as users. Three students joined the seminar course in winter semester of 2009.

After a few months' team study, students and the instructor as a team listed the following system requirements they wanted to:

i) make it fun to learn foreign languages,
ii) make it like an on-line game, in which users freely join and sometimes compete in progress level, etc.,
iii) for this, have an avatar for each user so that a user do not have to reveal his/her real names, and
iv) have a "time trial" function to show a speed ranking as well.

As for a system platform, the project team selected a company who would help them implement the above concept and develop functions as an IT tool.

2 Materials and Contents

As stated in Sect. 1.1, the Basic English Course for Engineers was selected as the authors' first trail target. The content units of this course under development based on the concept explained in Sect. 1.2 are listed in Table 1.

Figure 1 "Bi-lingual Campus Action Plan"

Table 1 Contents of Basic English Course for Engineers

Unit		Title
Chapter 1		Essential English for Engineers
	Section 1	Figures
	Section 2	Lines and Angles
	Section 3	How to Read Formulae
	Section 4	How to Read Figures
	Section 5	Experiment Device
Chapter 2		Desirable English for Engineers
	Section 6	Nouns
	Section 7	Unit
	Section 8	Verbs
	Section 9	Adjectives
	Section 10	Numeration
	Section 11	Tense
Chapter 3		Preferable English for Engineers
	Section 12	How to Write Papers
	Section 13	How to Write E-mail
	Section 14	How to make phone Calls
	Section 15	How to Make Presentations
	Section 16	How to Present
Chapter 4		Recommended English for Engineers
	Section 17	Conversations at the Banquet
	Section 18	Conversations of Sports
	Section 19	Seasonal Greetings
	Section 20	Other Communication

The authors and the project team implemented a trial system as follows:

i) The module is given two parts of e-learning; i.e., one is a text part, and the other is a quiz part. A text part and quiz part correspond to each other, so learners can take self-lessons with the text part and do their exercises with the corresponding quiz part (See Figure 2), and

ii) By finishing the exercises, a learner can get award points named "snowballs" according to the number of questions he/she have solved. With collected snowballs, he/she can get (in a sense "buy") virtual accessories and enjoy e.g., changing clothes (See Figure 3).

A couple of the system demonstrations were made to internal reviewers as well as other project course participants. They highly evaluated the system's potentiality and usability, especially its game-based approach.

3   Utilizing OCW for SNOWBALLS

The first module of SNOWBALLS aims to develop the Japanese students' bi-lingual
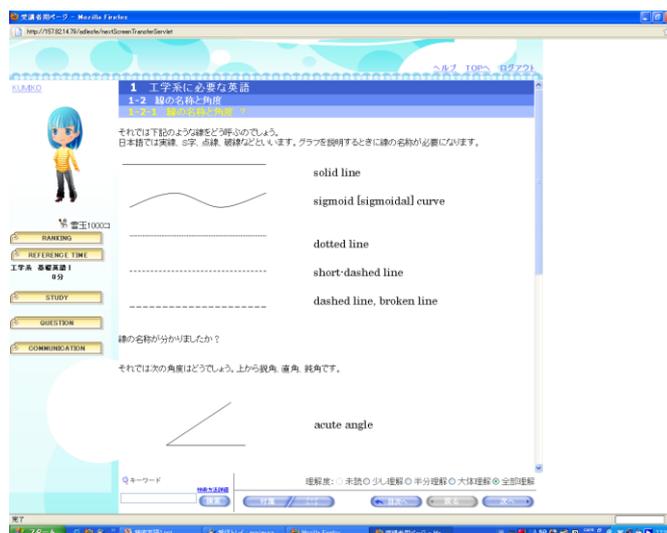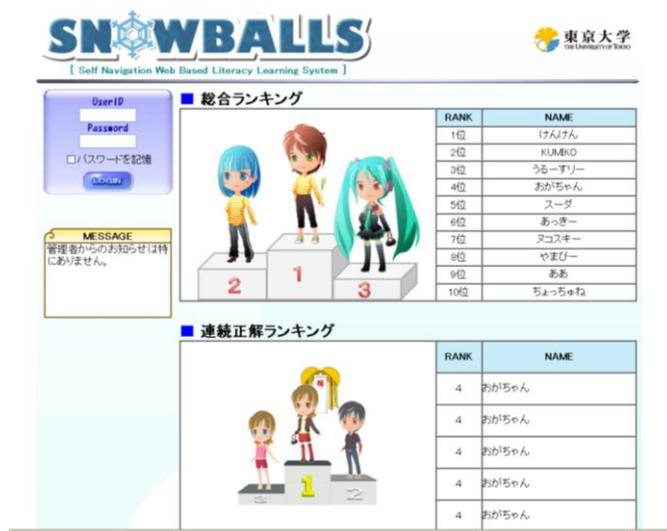

Figure 2: Text part of SNOWBALLS

Figure 3: Avatars are dressed to taste

capability required as engineering and science leaders in the global context. In particular, the system concept lays its emphasis on self-learning by self-navigation. This section discusses how OCW can contribute to this purpose and provide materials usable for the SNOWBALLS development.

3.1   SNOWBALLS' General Requirements for OCW

The OCW in general has a variety of rich lecture and education materials. [2] These are distributed over the worldwide OCW member web sites. The primary objectives of these materials are as follows:

i) Learner's use for his/her study on the subject of her/his interest, and

ii) Instructor's use for the enhancement and/or improvement of his/her lectures

There are other aims to use OCW materials than the above. However, the current OCW sites basically offer only simple search functions for ordinary users. Advanced functions such as editing and remixing for creative activities are usually not equipped with OCW sites. One reason for this is to protect them from undesirable, sometimes malfunctioning, operations from the outside. Therefore, those who have specific needs and want to use new features have to prepare such functions by themselves. Such needs will be suitable study themes for OCWC, and it should first collect member needs on this kind of additional functions.

SNOWBALLS project would like to best utilize the following materials, tools and digital contents developed by OCW and other parties:

i) Self-navigated, self-learning English content for Japanese students who received English education as a second language:
  - Purpose: Japanese / foreign language (mainly English) bilingual capability required as a global leader in engineering and science fields,
  - Target user: Student who has finished general education in the College of Arts and Science, UT and are to proceed or have proceeded to the Faculty of Engineering.
ii) Tools, methods and materials for instructor/ developer:
  - Use for an instructor's classes, and
  - Use for content development
iii) Other: Any other content, tools, etc., useful for SNOWBALLS' modules explained in Sect. 1.

It is the mother language for any person to construct his/her logical ideas. Therefore, it is essential for a Japanese student raised in a Japanese environment to build solid skills on logical thinking and communication in Japanese. Thus, it is necessary for a Japanese student to study what are
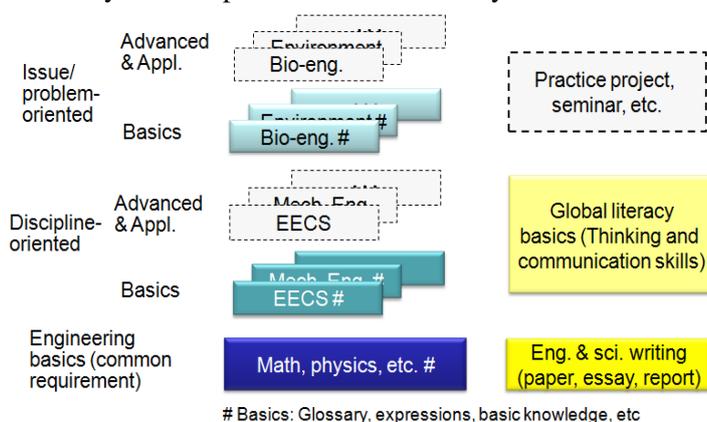

Figure 4: OCW Materials suitable for SNOWBALLS modules

equivalent English expressions corresponding to Japanese lecture content descriptions on engineering basics, theories, methods, etc. Providing a self-learning method for this purpose is crucial to Japanese students, the largest group in the

university.

3.2 OCW Contents Needed by SNOWBALLS

From the above discussion, the requirements of SNOWBALLS for OCW are summarized as follows: (see Figure 4)

Regarding the subjects aimed at by SNOWBALLS in general:
i) If possible, a pair of each corresponding high quality English and Japanese materials, and
ii) If not, at least English materials suited to self-navigated, self-learning.

The following will be useful for the first module of SNOWBALLS:
a) Common engineering requirements
  - Glossary, basic expressions, knowledge base, etc. on common subjects such as mathematics, physics, etc.,
  - Basics on engineering and scientific writing (paper, essay and report),
b) Discipline-oriented engineering basics (e.g., EECS, mechanical eng., chemical eng., etc.)
  - Discipline-wise glossary, expressions, knowledge base, etc.,
c) Materials which can show relations between engineering basics, discipline-oriented basics and application fields,
d) Materials on the basics of problem-/ issue-oriented fields such as environmental issues, bio-engineering, information technology (IT) and nano-technology.
  - Field-wise glossary, expressions, knowledge base, etc.,
e) Materials for global (leader) education
  - Global communication, leadership and global literacy.

The OCW started as a text-base resource repository; however, it has recently been increasing visual and audio resources. Language study needs aural comprehension exercises, and a learner is required to read aloud numerical formula, etc. correctly. For this reason, it is desirable for the content of engineering English basics to have audio clips. In addition, explanatory video and animation clips are effective especially in studying the communication skills. For example, adding adequate explanations and instructions to a video file of a model presentation at an international conference will make an effective self-learning material.

3.3 Existing Global Education Contents in the OCW Repository

In this section, examples of OCW course materials

usable for SNOWBALLS are shown based on the survey of several OCW sites.

3.3.1 General

From the perspective of SNOWBALLS, key words are English (foreign language), global, international, communication, writing, engineering basics, etc.

The following are general situations on not only OCW contents but courses of the western higher education institutes:

Many lectures with a key word "English" are categorized into several groups. The first group is related with linguistic studies in the field of literature. The second group includes courses on English communication and writing. This group is further broken down into two groups depending upon target users; i.e., courses for native students to build a foundation of a citizen and academic life in that nation, and those for a foreign student to build a university life base. In addition, the Western higher education institutes, especially those in the U.S. give a meaning of "foreign student affairs" to the word "international."

Aims of courses related to "global" are basically local culture studies, but there found some courses to develop communication and leadership skills from the global point of view.

3.3.2 MIT

MIT has already uploaded the contents of all lectures on the OCW site. [3] However, not all of the OCW lectures have a complete set of lecture elements; i.e., syllabus, calendar, readings, lecture notes and assignments. For learners of English language, lecture notes are essential materials, while calendar and assignments are also useful for instructors and developers of SNOWBALLS. Table 2 shows OCW lectures which seem to be usable for SNOWBALLS.

Materials for the basic English communication skills are found in the Undergraduate Communication Requirement. These are searched under "Foreign Languages and Literatures" at the MIT OCW site. Several parts of mathematics and physics courses will be used for engineering basics, but an explanation on how to read formula is to be newly developed and supplemented. Materials for global communication skills are found in courses provided by the Sloan School of Management.

3.3.3 The United Kingdom

"LearningSpace," the OCW site of the Open University, includes very useful materials for learners who are good at English. [4] Since major contents are English text-base HTML files, explanation support is necessary for Japanese learners who have not sufficient English language base. In this regard, there are some kind of lecture materials with a useful voice support function which reads out sentences, technical terms, etc. [5] For example, lecture "Language, Notation and Formulas" (MU120_4M6) provides an voice explanations attached to a slide. Furthermore, it presents examples which give an instruction on how to read that example, when a user clicks.

As another example, Mathematical Institute of Oxford University offers OCW lecture contents. To use them, supplemental explanations are needed as the MIT case.

Table 3 lists usable contents of the Open

Table 2 MIT OCW Course Candidates for SNOWBALLLS

Category	No.	Lecture Title	Note
Engineering common req. (communication)	21F.222 (Fall 2002)	Expository Writing for Bilingual Students	
	21F.223 / 21F.224 (Fall 2004)	Listening, Speaking, and Pronunciation	with video lectures
	21F.228 / 21F.227 (Spring 2007)	Advanced Workshop in Writing for Social Sciences and Architecture (ELS)	
Global/International communication skills	ESD.932 (Spring 2006)	Engineering Ethics	Multimedia content, MP3 lecture files can be downloaded
	15.996 (Fall 2004)	Cross-Cultural Leadership	Sloan School of Management
	15.974 (Spring 2003)	Leadership Lab	Sloan School of Management
	15.974 (Fall 2004)	Practical Leadership	Sloan School of Management
	15.978 (Spring 2007)	Leadership Tools and Teams: A Product Development Lab	Sloan School of Management
TA training	5.95J / 6.982J / 7.59J / 8.395J / 18.094J (Spring 2009)	Teaching College-Level Science and Engineering As taught in	Electrical Engineering and Computer Science

Table 3 The Open University Course Candidates for SNOWBALLLS

Category	No.	Lecture Title	Note
Engineering Basics	MU120_4M6	Language, notation and formulas	Slides with a voice clip Self-test clips
	MU120_4M4	Squares, roots and powers	Basics and how to write, read elements, etc.
Engineering common req. (communication)	LDT_5	Essay and report writing skills	Language-independent useful materials
	GSG_1	What is good writing?	Technical paper, report
	U072_1	Key skill assessment: communication	Skill development on presentation, etc.
Global communication skills	LDT101_2	Extending and developing your thinking skills	
	LDT101_10	Giving presentations	Language-independent
	A215_1	Writing what you know	For advanced learners
	T205_2	Groups and teamwork	
	B823_1	Managing local practices in global contexts	
TA training	E111_1	Teaching assistants: support in action	
For instructors	TL_SCIT5	A global dimension to science education in schools	Why global education is necessary for science education

University. There are many useful materials, such as:

i) mathematical expressions in engineering basics, writing a paper/report, presentation skills, etc. for engineering common requirement (communication basics), and

ii) thinking, project, communication skills, etc. for global communication applications.

Some lectures provide multi-media materials very helpful for foreign learners, such as explained in the above.

3.3.4   OCW in Japan

i) UT-OCW: The UT has been adding a limited number of selected lectures every year to the UT-OCW site. These lectures' content materials are both in English and Japanese. In general, lecture courses dealing with English aspects are related with language information science, international relations, etc. The materials of these courses are not appropriate to English learning. On the other hand, there found directly usable elements such as lecture notes of "Math IB: Differential and Integral Calculus."

At present, any element directly usable for bilingual learning and teaching without any modification is not found at the site. There are pieces usable, but linking them with SNOWBALLS needs the detail examination of individual lecture materials on the site with the human eyes.

ii) Other Universities: Searching the OCWC/ JOCW sites by keying words such as "Engineering, Science, Technical/technology" + "English" obtains the following results:

a) Tokyo Institute of Technology: There are a number of candidates; English for Engineers, English for Science, English Presentation Training for Materials Science and Engineering I & II, a series of Academic Writing. However, most of these have a short syllabus only without a substantial material for SNOWBALLS use. Only usable materials are found in "Fundamentals of Technical English for Electrical and Electronic Engineers." The materials will be usable not only for the EE field but as engineering common basics.

b) Kansai University: A part of "Technical English" is a usable candidate. The course is offered by the System Management Department.

c) Nagoya University: "English (reading)2" should be noted.

4   Functional Consideration

This section discusses several functional requirements to be considered during the development stage.

1) Editing and remixing functions:

It is difficult for an individual Japanese user to directly edit and remix the foreign (English) OCW content pieces for his/her own use. Therefore, organizational support in each institute or its association such as OCW is needed for this kind of expert level processing. Furthermore, it is desirable for reducing the development cost by automating human labor in digging out usable material pieces from huge OCW and other content bases. In this

regard, the USE page on the OCWC site provides "Google across all OCW courses" which allows convenient multi-language search. [1]

1) Multimedia (voice/video/text) capability:
As mentioned earlier, OCW lecture content has not necessarily a complete set of elements and the lecture note records are PDF files in most cases. Learning the communication skills requires a so-called aural-oral approach, and a voice function is essential, sometimes with visual aids. Video materials are a prerequisite for learning the presentation skill.

2) Reinforcement for correct understanding:
Even during a face to face class, instructor's intension may not be precisely conveyed to students, not to mention that of the lecture note on the Web. For example, there given an example sentence following a sentence "Adjust the language to achieve an academic tone", in some lecture note. However, there's no concrete instruction on which part and how to adjust. It is supposed that the instruction is to be given during the real lecture in the class. On the other hand, such a case as "correct vs. wrong" is directly or indirectly understood is usable for other applications, as it is. The former case where the content cannot be used without any modification or addition requires adding the supplemental explanations in Japanese.

Note: This is an issue for our aim to use OCW. However, it is not a defect of the original lecture format from the viewpoint of education, since a classroom is a kind of interactive theater, and the materials for those should not necessarily be complete.

The development of supplemental materials and tools for this purpose should be done by those who need them. If a specific need is shared by a group, then collaborative work will be possible. Development of multi-lingual contents and tools from the needs of global and foreign languate education will be one of study themes of OCWC and AOCW.

5 How to Combine the Japanese Materials and OCW English Contents

There are two methods for combining Japanese and OCW materials; i.e., URL linking and full integration by remixing.

1) Direct linking via URLs
This is a method that Japanese contents and a set of corresponding OCW materials (here, called a unit) are appropriately linked via URLs. A case where only a unit in English exists requires the production of Japanese materials. When a unit is composed of several sub-units such as lecture notes of multiple classes, each sub-unit becomes a unit to be linked.

In this case, return path control should carefully be made, when one jumps from a Japanese unit element to an English unit and then returns back to the original unit element. Usually, this frequently happens during the study of a course, making users feel very busy, troublesome and even confused. In particular, when a unit element is too small, the method is not appropriate forcing complex and busy to and fro changes; e.g., paring each English technical term in an established glossary with its corresponding Japanese term.

2) Full integration by remixing
In this method, some appropriate size of English content and the corresponding Japanese guide and explanation for this are merged (remixed) into one new piece, as an easy-to-handle unit. Development of this format contents requires much labor and brains, but the results are easy to understand and convenient for users with scarce IT knowledge. The above processing is made under the OCW policy and rules on free use and modification of OCW contents.

6 Conclusions

Globalization became a buzz word in the last decade of the 20th century. The School of Engineering at the University of Tokyo (SE-UT) is now implementing "Bilingual Campus Action Plan" to nurture future global leaders and to develop the organizational strength in the global context.

This paper presented one of its major activities, the development of self-navigated, self-learning web-based tool SNOWBALLS for the enhancement of global literacy and engineering basics skills and knowledge. Having selected the Basic English Course for Engineers as a trail target, we employed a user (student)-led development style, by launching a new project course. After a couple of months study, the project team made a list of unique game-base features and requirements. Based the project team presented successfully demonstrated a prototype, which potentiality was highly evaluated.

The latter half of the paper discussed how to best utilize the OCW content materials for SNOWBALLS. It first presented general requirements from SNOWBALLS to OCW. It then listed the search results of lecture materials meeting with these conditions on the OCW sites. The paper finally presented two methods for combining to produce a mixed Japanese and English content, i.e., URL linking and full integration.

Future issues are the further development and enhancement of SNOWBALLS functions and teaching and learning contents. Regarding the

utilization of OCW materials, we would like to try to find effective methods.

References

[1] MEXT (2009), Launching the Project for Establishing Core Universities for Internationalization （Global 30）
http://www.mext.go.jp/english/news/ 1283454.htm

[3] MIT OCW courses,
http://ocw.mit.edu/OcwWeb/web/courses/ courses/index.htm

[2] OCWC Use,
http://www.ocwconsortium.org/use/ use-dynamic.html

[4] The Open University, Open Learn,
http://www.open.ac.uk/openlearn/home.php

[5] http://www.open.ac.uk/browsealoud/