The "SNOWBALLS" Web-Based e-learning System and its Development

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Abstract - **"SNOWBALLS®"** **is a learner oriented system web-based e-learning system. The name stands for "Self Navigation Web-Based Literacy Learning System". The students, the users of the system, have developed it in a seminar style course under the supervision of the authors. Through abundant discussions from diverse aspects, they decided to introduce an e-learning platform with an online textbook and online quiz for the study part, a forum and avatars for communication, and multiplayer quiz battles and rankings for competition among students. Students read the textbook and then do the quizzes to check if they have understood the text. To keep the motivation high, we introduced the quiz battles. When a student wins the battle, he earns 10 snowballs (points). Snowballs are also awarded for good participation in the forum, and for correct answers in individual quiz trials. Students appear as avatars and can choose a nickname in the system, so they do not have to show their actual identity. We believe that this will take away the hesitation to interact with one's peers in a second language. The avatars can be customized by shopping for clothes using the snowballs earned through the quiz-solving, quiz-battle, or communication in forum. Students not only designed or decided what features the platform should have, they also made the content by themselves. They wrote textbooks and made quizzes on the essential fields of engineering. Through close collaboration between teachers and students from several departments during the development of SNOWBALLS, there still is a constant flow of new ideas, improvements and feedback on both the educational content and the system.**

Index Terms *-e-learning, sustainable, game, quiz, learner oriented*

INTRODUCTION

SNOWBALLS®, which stands for "Self Navigation Web-Based Literacy Learning System", is an e-learning system the authors have been developing over the past two years. The University of Tokyo is actively involved in the "Global 30 Project" [1] launched by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) in the middle of 2009. Due to the "Global 30 project" and other new policies of the MEXT with the University of Tokyo, the number of foreign students who came to study from all over the world has been increasing rapidly over the last few years especially at the school of Engineering.

As a part of the "Global 30" program, the school of Engineering at the University of Tokyo is creating a "Bilingual Campus" in the university, where Japanese and foreign students can encounter and educate each other by communicating in both Japanese and English seamlessly. To fill each student's insufficiency in terminology effectively and efficiently, an e-learning tool is needed which enables everybody to study basic English or basic Japanese by self-study, thus minimizing the burden on teaching staff.

The novel e-learning system called "SNOWBALLS" that we discuss in this paper is considered one of the first steps in enhancing students' global competency. In the first phase, SNOWBALLS will be used to teach Japanese students English engineering terminology and phrases they can use in meetings or at international conferences. In a later phase, this will be expanded to target the teaching/administrative staff, as well as foreign students wishing to learn Japanese. We have developed this tool for sustainable self-learning for students as well as staff and faculty.
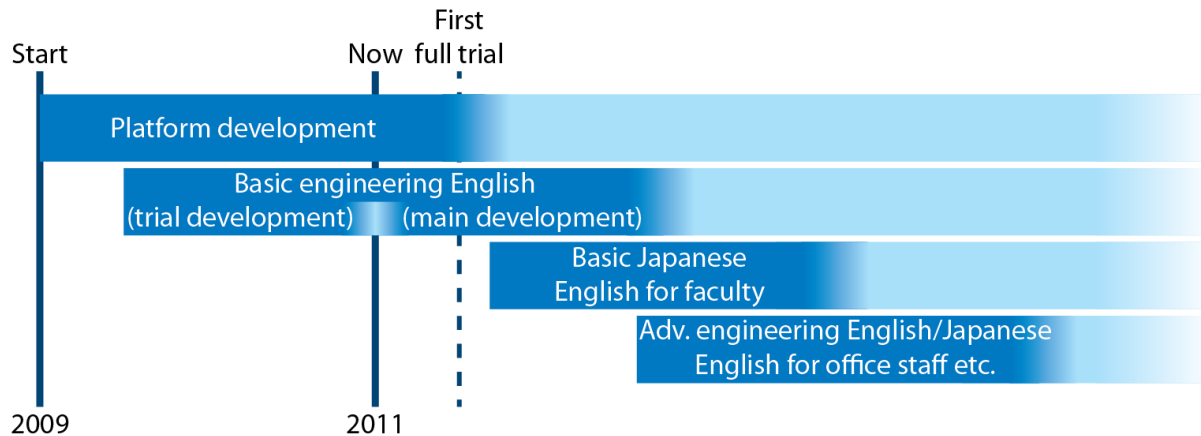
FIGURE 1. TIMELINE FOR THE DEVELOPMENT OF THE SNOWBALLS E-LEARNING SYSTEM AND ITS CONTENT.

As figure 1 shows, we are currently at the stage where most of the platform is ready, although we are still working on a small additional features to further improve the usability. Students developed content in seminar style classes, and discussed about the most appropriate presentation style. Based on those discussions and the resulting content we have now created a style template to which we want to convert all existing content, and we are working on a quality control system. Soon we will have a first full trial with a significant number of students studying several modules to evaluate SNOWBALLS as a whole.

For these reasons, we will mainly focus on the original features of the platform and our collaborative development process. An evaluation of the effectiveness of the system and the educational content will be discussed further in a next paper.

BACKGROUND

It is essential for universities to nurture global leaders who are front-runners in their research fields, but also feel comfortable in the international arena. In our university, globalization is one of the most urgent issues as well. We have been planning to establish the Bilingual Campus Initiative and have been working for that purpose. Aiming to establish a globalized campus, the university is trying to increase the number of lectures taught in English and practices executed in English. Prior to that, the students need to learn English jargon frequently used in their field which have to be taught in the context. With the SNOWBALLS e-learning system, students learn vocabulary with example sentences, which makes it easier for them to understand the usage of the words in the context.

The number of faculty who teach English at the School of Engineering is insufficient and they do not have time to be consulted by each student, and thus IT facilitation is used.

THE SNOWBALLS PROJECT

1. Student Involvement

The authors launched a seminar course in which students and an instructor discuss the design of the SNOWBALLS e-learning system as a project team. Participating students could obtain a course credit, or they could choose to be employed as a junior teaching assistant. In this team, we studied what the system should look like, what fields/themes it should first focus on, and which style would preferred by the users. Three students joined the seminar course in the winter semester of 2009 and the project started.

In the first few months, the team discussed the requirements of the SNOWBALLS system. First, the teaching style to be adopted in the system was discussed and decided, then the appearance, and finally the educational content were discussed.

As for the style, the team considered that there are many existing e-learning systems for language learning, but students easily get bored when using them and it is difficult to keep the learners' motivation high. The students therefore suggested to use a game-like style. Computer games are so popular now in Japan, and the students' generation is so used to playing games, that a game-like setting will help them keep their motivation high, even when learning foreign languages.

Next, the team decided to use avatars, so the students do not have to show their own names or faces in the games, and can behave freely. Avatars are getting increasingly popular in all kinds of games, as well as on

internet forums. In SNOWBALLS, students can put their nicknames on them and dress up their avatars as they like. They can buy clothes for their avatars using the "snowballs" (points) they got from winning games. Gaining snowballs from solving problems and winning the online games is a merit of the system because seeing one's points rise or one's avatar getting dressed in fancy clothes provides a direct feedback of one's progress.

A ranking of the students' performance in study or games is displayed on the log-in screen (Fig. 2) to further motivate students and increase competition between friends.

This is the general framework the team set after a three month study and discussion. After deciding the structure and style of the system, they created a prototype system, and we searched a market party to make a professional design and implementation based on the students' ideas.

The current interface and implementation of SNOWBALLS has been developed by students and IIIEE staff in close cooperation with ICOM Corp.[3]

FIGURE 2. RANKING OF THE BEST STUDENTS AND EXAMPLE AVATARS. USING THE SNOWBALLS (POINTS) GAINED BY STUDYING, STUDENTS CAN DRESS THEIR AVATARS ACCORDING TO THEIR OWN PREFERENCE.

II. System features

In this subsection, we discuss the features of SNOWBALLS. Since SNOWBALLS can be used to teach many different things, this subsection is split into a "system features" and a "content features" part. The system is made up of four "rooms": Study room, Battle room, Shop, and Forum (Fig. 3). A detailed description of each room will be given below.

Although students can choose to do anything at any time, the typical (and intended) flow of SNOWBALLS is as following:
1) Study:
   The study is made up of two different parts, text book and quizzes, which correspond to each other.
   (a) Students read a text book (Fig. 4) and try to learn the new vocabulary, or brush up their knowledge. Texts often contain extra

FIGURE 3. THE START SCREEN OF SNOWBALLS FEATURES A CARICATURE OF THE UNIVERSITY CAMPUS. THE FOUR MAIN ROOMS ARE "STUDY", "BATTLE", "SHOP", AND "FORUM".
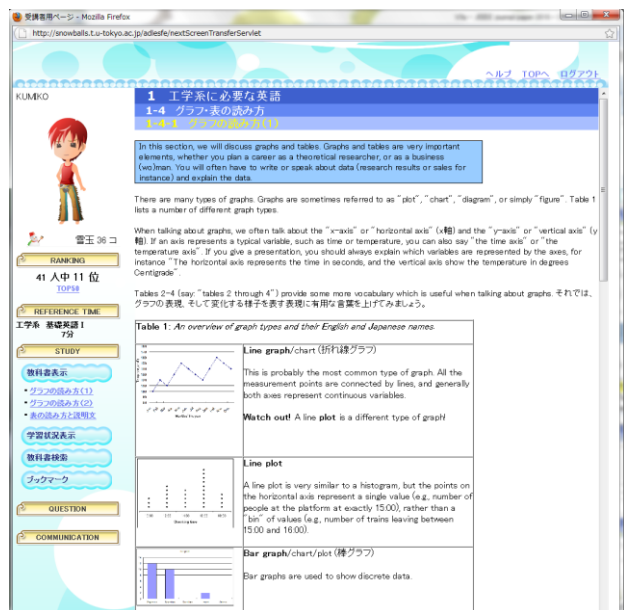

FIGURE 4. SOME EXAMPLES OF EDUCATIONAL CONTENT. THIS SCREENSHOT WAS TAKEN FROM THE FIRST CHAPTER ON BASIC ENGINEERING TERMS DESCRIBING GRAPHS AND TABLES.

information on the use of a word (e.g., a context example), etymological notes which can help students understand similar words, or just fun facts.

(b) After reading the text, the student can score how well he understood the text for later self reflection

(c) A set of questions is provided so the student can test how well he actually learned the provided vocabulary (Fig. 5). For each correct answer, a snowball is rewarded.

There are several kinds of quizzes:

▷ Training quiz

Questions are provided in a fixed order and corresponding to a specific text

▷ Timed quiz

The order of the questions is randomized, as many questions as possible have to be answered within a fixed time

▷ Final test

At the end of the semester, the students have to pass a final exam.

▷ Battle

A multiplayer quiz to increase student motivation. It will be detailed in the following item.

2) Battle:

A student can invite a friend to compete with the number of correct answers in a minute. The person with the highest number of correct answers wins and gets 10 snowballs (Fig. 6). It was decided not to decrease snowballs for incorrect answers for motivational reasons. The quiz questions are similar, but not necessarily identical to the training quizzes.

3) Shop:

In the shop (Fig. 7), goods for one's avatar can be bought using the snowballs (points) earned by answering training quizzes, by winning a battle, or by getting praised for a good comment in the forum. Although this might seem a bit childish for university students, reflection groups (which will be discussed later) seem enthusiastic about this, and some even seem to spend more time on (re)dressing their avatars than on studying. This option is one of the main motivational incentives to study and to persuade friends to join them for a quiz battle. In this way, the students will be motivated in learning things so that they can answer the questions faster than others and win the game.

4) Forum:

The forum can be used to discuss about the game or about English. Teachers and teaching assistants will keep an eye on the forum and may answer questions,
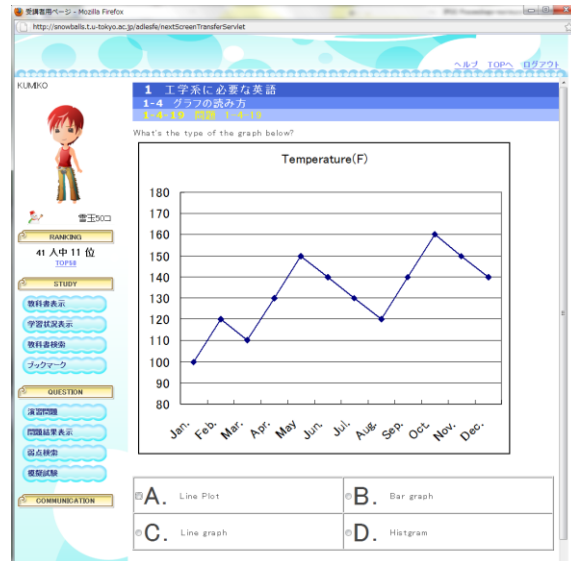

FIGURE 5. EXAMPLE OF A QUESTION. BOTH MULTIPLE-CHOICE AND OPEN QUESTIONS ARE CURRENTLY SUPPORTED.
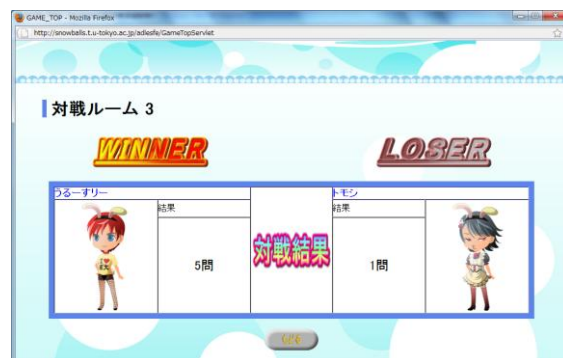

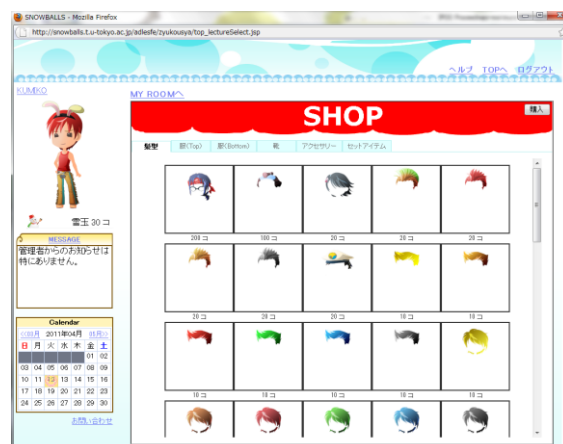FIGURE 6. THE WINNER GETS 10 SNOWBALLS AFTER PLAYING AN ONLINE QUIZ BATTLE.

FIGURE 7. IN THE SHOP STUDENTS CAN SPEND THE SNOWBALLS (POINTS) THE EARNED AND BUY ITEMS TO CUSTOMIZE THEIR AVATAR. BESIDE HAIRCUTS, SEVERAL EYES, MOUTHS, SHIRTS, TROUSERS, SKIRTS, SHOES AND ACCESSORIES ARE AVAILABLE.

but the idea is that students help each other as much as possible. To promote this, students who answer questions or write useful comments on the forum can be "praised" by others through a button click. Subsequently, they will receive a snowball as reward for their good comment.

III. Content features

As SNOWBALLS is developed as an educational tool for students at the University of Tokyo, the quality of the contents has to be high and worthy to learn. The team studied hard to find what third year engineering students actually need to learn before entering their specific study field. They made a list of fields they will deal with and arranged them in an appropriate order.

There are several occurrences where the students encounter unknown English words, for instance in lab meetings, courses, discussions with international students, at conferences, or when reading journal papers. Students are asked to list these words, and sets are formed to include this new vocabulary in SNOWBALLS. Graduate students know better about the field and can tell undergraduate students what they need and what not.

So far, we have covered a relatively large part of the mechanical engineering field because most of the students were from this department. We need more vocabulary from other departments such as chemistry or electricity. We now have textbooks and quizzes on

1. Geometry
2. Lines & Angles
3. Reading Formulas
4. Graphs & Tables
5. Measuring Instruments
6. Units
7. Linear Algebra
8. Statistics
9. Materials
10. Manufacturing Tools
11. Robotics

Additionally, we have done some research with the Nuclear Engineering department on which words are used in discussions on their current topic, "Where should the nuclear waste be disposed". We have collected the vocabulary they used in their discussion, and plan to work this out to create a major-specific e-learning module.

Cooperation with teachers, researchers, and students from different departments is considered indispensable for the success of SNOWBALLS, and will be discussed in more detail later in this paper. Although the system starts from learning easy figures, things written in the text have to be something they should know but did not know. The explanation has to be correct and academic. The instructors of the team wrote a few texts and the students commented on them and made some quiz questions with these texts (Fig. 5). Then we asked the students to choose a general engineering topic on which they have to know more vocabulary, and they wrote their own textbook and quiz questions.

IV. Administration

Teachers can watch how far students have proceeded during a certain period and check students' progress from the administrator's account. From this site it can also be learned which were the hardest questions and which were the easiest, so the content may be adapted accordingly for the coming semester.

Students can manage their progress as well. Graphs indicate how well they solved the questions, or on which topic they did well. They can see which were their weak points, so they can work on those specific chapters again (Fig. 8).

By the end of the semester, the students should have finished reading all the text books and solved all the questions. Teachers can grade them based on whether they completed all modules, as well as on overall study results or scores on a final test.

FIGURE 8. GRAPHS INDICATE HOW FAR THEY HAVE PROCEEDED OR HOW WELL THEY SOLVED QUIZZES

V. Development

As mentioned before, collaboration between teachers and students of different departments is vital for the success of SNOWBALLS. The project greatly benefits not only from the feedback of the students —who represent the end-users— but also from their active participation in generating content and coming up with vocabulary they ran across in their study.

Conducting the development of SNOWBALLS in a seminar with teachers and students at a high level of equality has several merits. First of all, there is a constant flow of new ideas, feedback, and comments from error checking. Since there is close cooperation with the students, we are sure that the end result will be appealing to the target group students.

Another merit is that the students now involved in the development of SNOWBALLS are learning English vocabulary and conversation as well, since the team discusses mostly in English.

At each seminar, the instructors and students discuss the handed in homework. Homework can be making a set of quiz questions from a text, generating a list of vocabulary they need for their study, or listing basic topics any engineer should know about. The students even try to write texts on the topics they think should be included in SNOWBALLS.

Although undergraduate students sometimes don't understand the details of what they are working on, graduate students help them by explaining precisely in Japanese. This creates a nice mixture of the languages, just as intended by the bilingual campus project. This means the students will learn proper English as a side effect without too much effort and surely with high motivation.

WORK IN PROGRESS AND FUTURE PLANS

I. Evaluation by students

A reflection group of students meets once a week, and report what they find or feel while using SNOWBALLS. Sometimes they find a minor failure of the system, such as "t" can't be typed in some web browsers because SNOWBALLS is programmed to prevent keystrokes which may order the browser to stop calculation.

One of the major points they discussed was how to speed up every procedure by cutting wasted time in the action of the game (quiz and navigation). As a result from this discussion, it was decided to change the position of the "Next"-button, so that they don't have to move the mouse too far while playing the game (Fig. 9).

For the first platform, we had some inconveniences such as the place of the buttons as we mentioned, width or the length of the site so they can see the site at a glance. They wanted the "enter" button for the fashion show to be higher, so they cannot miss it. Some people got stuck while playing battles, which ruined the time trial, or another person could not go forward even though he tried to skip a question because he did not know the answer.
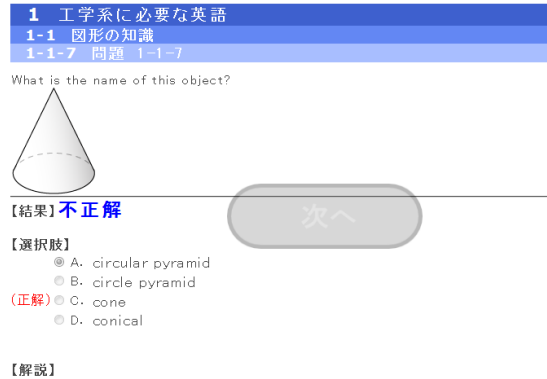

FIGURE 9. THE "NEXT"-BUTTON WAS PLACED IN THE MIDDLE OF THE SCREEN SO THAT THEY CAN SPEED UP.

For the next semester, we will convert the system according to the trial use by a specific major group.

The whole system and its content are still under construction. We improve both the structure and content while using it. Students' voices are important clues for further improvement. Online questionnaire to assess the program will be built in the program.

Further improvement and assessment will be discussed in a next paper.

II Future work

Currently, the interface is mostly in Japanese. We are considering changing this to English, so the students will be exposed more to English language and hopefully pick up some new words. However, it is important to keep a good balance between education and usability, so the reflection group of students will have an important voice in this decision.

Another point which deserves attention is the interface. Now more and more people use their telephone, iPod, or similar devices to access the internet, providing an interface where at least a part of SNOWBALLS can be accessed for example during a long commute is an interesting option.

We also expand this course to international students to make contents for learning Japanese and getting settled in Japan. Two courses for Japanese students and international students for that purpose will be given next semester.

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