

Copyright by AACE(<http://www.aace.org>).

This is the author's accepted version of the manuscript.

The definitive version is published as:

Entzinger, J.O. & Morimura, K. (2014). Lessons Learned from 5 years of SNOWBALLS: Involving Students in the Creation of an E-Learning System and Its Content. In Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2014 (pp. 537-542). Chesapeake, VA: AACE.

The final version published is available online at:

<http://www.editlib.org/p/148746/>.

# Lessons Learned from 5 years of SNOWBALLS: Involving Students in the Creation of an E-Learning System and Its Content

Jorg Onno Entzinger & Kumiko Morimura  
Institute for Innovation in International Engineering Education  
The University of Tokyo  
Japan  
j-entzinger@t-adm.t.u-tokyo.ac.jp, morimura@t-adm.t.u-tokyo.ac.jp

**Abstract:** In the winter of 2009, we started the development of our SNOWBALLS e-learning system, to help Japanese students learn technical English vocabulary, to help international students in their academic lives in Japan, and for staff and teachers to deal with the needs of a globalizing campus. Despite the limited availability of resources, an ambitious 10 year plan had been formulated, and at this midpoint, we make up the balance. We involve students in the system & content development. This has various benefits, but also drawbacks. Some benefits are that the system is tailored to the needs and likes of the end-users, that the students bring a large variety of (engineering) backgrounds with them, and that they learn various skills through their involvement. Drawbacks are the variation of the style and quality and a lack of continuity, as well as the difficulty of balancing between educational objectives and SNOWBALLS project goals.

## Introduction

Five years have passed since we started the development of the “Self-Navigation Web-Based Literacy Learning System”, or SNOWBALLS for short. SNOWBALLS now not only refers to the e-learning system itself, but also to the for-credit course within the “Creative Engineering Project” that is the vehicle for involving students in the development of the system and its content. Both the system and the course have evolved and matured over the years, and we believe now is a good time to make up the balance.

## Background

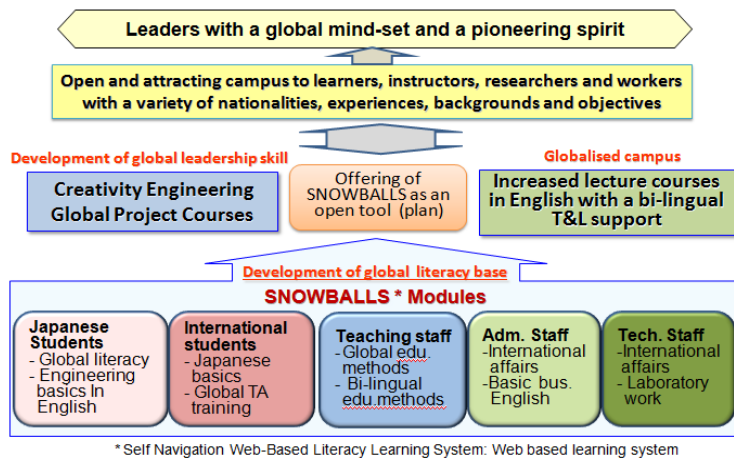
In 2009, the number of foreign students at the Graduate School of Engineering (SE) of the University of Tokyo (UTokyo) had been increasing rapidly, and about 1000 international students were expected for the years to come. This is about 30% of the total student population, while international faculty constitutes less than 5%. At the same time there was an increasing awareness that Japanese students need to be better prepared to answer to the demands of the future globalized workplace. In line with and to support these developments, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) started the so-called “Global 30 Project” in the middle of 2009 (MEXT 2009).

Within the Global 30 Project framework, the SE of the UTokyo proposed a plan 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. To enable this, the school needed to find a way to help everybody study English or Japanese, without increasing the burden on teaching staff. It was decided that a self-paced e-learning solution should be developed to accomplish this. This grew out to be the “Self-Navigation Web-Based Literacy Learning System”, or SNOWBALLS for short.

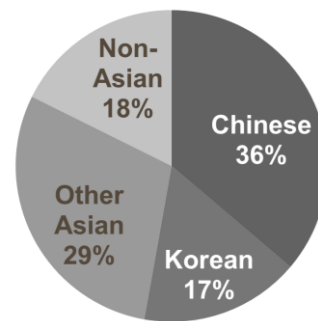
## Original objectives and planning

From the start, SNOWBALLS was envisioned as a platform to enable the internationalization of a wide variety of audiences within the University, as shown in Fig. 1. With the (ambitious) objective of providing 70% of the graduate school lectures in English by 2020, the first priority for SNOWBALLS would be to

provide content for Japanese engineering students to learn the technical English terminology needed to follow classes taught in English. We would also need to teach Japanese to international students, to help them with their daily academic lives and increase their chances to find work in Japan after graduation. Further support would be needed for faculty and staff to handle the increased demand for their services in English. It should be noted that the focus is strongly on engineering English as a lingua franca, in particular because even most international students are not native speakers of English (see also Fig. 2).



**Figure 1:** Original plan for and positioning of SNOWBALLS within the “Bilingual Campus Action Plan” (from Morimura *et al.*, 2010)



**Figure 2:** Countries of origin of int’l students in the SE of the UTokyo.

The loosely formulated 10 year plan for the development of SNOWBALLS was to create an original system in the first year, start creating contents for teaching Engineering English in the second year, and then, in parallel, start adding Japanese courses and faculty- and staff development (FD/SD) courses in the following years. From the 5<sup>th</sup> year the system could then be opened to the other schools within the university, and in the final years it could be opened up for collaboration with partners outside the university.

### Approach

At the time, the general image of e-learning was to put lecture videos or textbooks online for learners to access freely. In the e-learning community, there was of course the awareness that this might not be very effective from a learner’s perspective, and various platforms existed that could provide e-learning content in smaller modules. However, most of these existing e-learning systems looked (and still look) very similar, are mostly text-based, and lack unique and attractive features. Additionally, content is often monotonous, so users easily get bored. Especially when students don’t feel the intrinsic motivation to learn a foreign language, conventional e-learning systems have little to offer.

There was a strong desire to develop a new and unique system, and it was recognized that involving the end-users (our university students) throughout the process would be essential to create system that could be embraced by the learners. Together with the fact that there was only one teacher assigned (part time) to the project, there was no experience with e-learning or setting up such a system, and the budget was limited, it made sense to actively involve students. This also matched with the promotion of project based learning, and objectives of nurturing students who can take initiative and leadership, and who have some practical experience next to their theoretical basis.

### Development History

In the winter of 2009, the “SNOWBALLS development project” started as one of the project options within the elective “creative engineering project” course (cf. “Creativity Engineering Global Project” in Fig. 1).

Three students took part, and through brainstorming, class discussions, and creating some prototypes, they sketched the outline for the SNOWBALLS e-learning platform. The following requirements were formulated:

- Make it fun to learn foreign languages
- Make it into an online game, where learners can freely join and optionally compete with each other
- Have avatars so users don't necessarily have to reveal their identity
- Have "time trials" and rankings

These and other features were then implemented by a contracted company at the end of the semester.

The system contains multimedia capable textbook and quiz modules, where learners can earn points (snowballs) for correctly answering questions. Snowballs can also be earned in online "battle" quiz games against other users and by getting "likes" in the forum. Earned snowballs can be used to buy items to dress up one's avatar. Avatars appear in the forum and rankings, and can participate in an occasional fashion show contest. There are also tools for learner's self-evaluation and progress monitoring, as well as teacher and admin interfaces to the learning management system. Details about the system are provided in Morimura *et al.* (2011).

In the following semesters, the classes focused on refining the e-learning system, and especially on developing content. We hired previous students as Teaching Assistants (TAs) to share their experience in the discussions and to help with additional tasks such as creating a user manual and intensive beta-testing of the system. At the start of each semester, we asked students to brainstorm topics that any engineer should be able to talk about in English, after which we would pick up a few topics that would be worked out during the semester.

In the second year, we started a parallel course for international students to explore what kinds of content they would need. In the following semesters, we combined the "Japanese" and "international" classes, and took full advantage of the opportunity to promote intercultural collaboration within the classroom. More details about the course are provided in Entzinger *et al.* (2011).

Several times we hired students as TA during the summer or winter holidays in order to create additional content, revise content created in class, and upload the content to the system. We also hired international students who are native speakers of English to review the content before uploading.

Over the years, the SNOWBALLS system has seen several revisions. There were numerous bug fixes and updates to keep up with new web-browser versions. Some of the major added features include secured registration & login with one's student/employee ID (previously SNOWBALLS-specific IDs were issued by the administrator), more detailed logging of user behavior, and online questionnaires. To limit security risks during the developmental stage of our system, use of SNOWBALLS was restricted to the on-campus network. An alternative web-interface design has been created for use with mobile devices, but due to the rapid changes of these devices and the restriction to on-campus use, it has received relatively little attention.

The SNOWBALLS course has also seen a large change. Whereas it started as a pioneering project with only a few students, it is now a much more systematic course where up to 30 students create content in teams while we support them in developing the skills to do so; skills that will also benefit them in their future careers. We teach small modules on for instance brainstorming, teamwork, project planning, (international & intercultural) communication, educational philosophies, how to create motivating materials, and awareness of intellectual property rights. Students work in groups of about 4, and from time to time brainstorm, discuss, or review with members from other groups.

All students and staff from the School of Engineering can now use SNOWBALLS with their campus-wide login account. We have sections for Japanese students to learn technical English and for international students to learn Japanese vocabulary needed in their daily (campus) life. Sections for faculty and staff development, as well as sections for safety-education are in the final phases of review and editing. A large number of sections is partially finished, and waiting for rewriting, review, copyright clearance, or simply waiting for similar sections to be finished and integrated into a chapter.

## **Advantages**

Each way of developing e-learning comes with its own advantages and disadvantages. In this section and the following, we like to share what we experienced as the benefits and drawbacks of our approach.

By involving (university) students:

- Manpower increases. Creating educational content requires a lot of time and effort; any help is welcome.
- There is a large variety of ideas to improve both the system and the content. Students with different (engineering) backgrounds join the class, and provide their own expertise. Students are also more familiar with new technologies and tools, and may know better than teachers how to use them for e-learning.
- We get immediate feedback, leading to a system and content that are better suited to needs of learners. This connects to the previous point of technological advances, but also to the issue of how to motivate learners or explain things in an easy to understand manner. Students participating in the class function as peer-teachers.
- Students get an opportunity to improve their knowledge of the content subject and their writing skills. They also gain various other skills/experiences through the problem/project based learning setup.
- Students feel proud that they don't just write an assignment, but that their work remains and will be used by following generations of students.

By having a course:

- We create weekly opportunities for students to discuss with each other (improved teamwork) and enforce a steady workflow towards creating output (e.g., through homework and deliverables).
- We can educate students about for instance pedagogy or (e-learning) course design and support them in creating better content. Students also have the opportunity to deepen their understanding of these concepts through communication with their classmates (peer-learning).
- It is easier to attract students. Most and in particular excellent students are very busy. Offering a course where they can learn something that is not offered in the regular curriculum attracts motivated students.
- Students can learn skills that will be useful in their future careers. It is important to create a win-win situation, and if the needs of the e-learning development project in terms of collaborator preparation have a sufficient overlap with the learning objectives of the students, it can be meaningful to combine the two.

## Disadvantages

Working with students in a course or on a short-term part-time contract may be positive in terms of creating variety an innovation, but it has a number of drawbacks as well.

- Tension between the two objectives of the course: educating students on the one hand, and creating content on the other. Handing out a template and telling everyone what to do and how to do it might be the most effective way to create content, but having students discuss about this, see each other's work, use their creativity, and find their own answers (maybe with some hints), is more effective for education.
- Lack of continuity. Although we hired some students after they finished the course, this is very different from having a fixed team of developers. It is often impossible to create a consistent chapter on a specific topic, because each semester students with different backgrounds, interests, and expertise join the class. Assigning students a topic they have no background in and no affinity with has proven very ineffective.
- Difficult to harmonize: each writer and each designer has his or her own style. Although this variety may be appealing, inconsistent design may be confusing and surely leaves an unprofessional impression.
- Difficult for each writer to see the big picture. It is difficult to guarantee consistency in content, and to guarantee an optimal overall learning experience if different people write different sections of a module.
- Varying quality: there is a large difference in the quality (and quantity) of the output between the students. If the university wants to offer the created e-learning materials as a course, the content should be verified (or ideally even co-authored) by a faculty member working in that field. Maintaining quality standards requires extensive reviewing and editing at several stages during the content development. Although in-class peer reviewing is taught and used at one point early in this process, most students feel unconfident critiquing their peers, many look at minor details rather than the overall structure and conciseness, and some just don't invest the time to look at it thoroughly. Also language, pedagogical soundness, and final design/copy editing should be reviewed by experts with an overall view of the content.

## Recommendations

Since we started out with an ambitious plan, but without the necessary manpower and background in e-learning, we learned a lot of things through experience on the way.

- If you start to develop your own system, it is best to think of it as a pilot study, and plan for the development of the “real” system a few years later.
- Choose or create a platform that can re-use content, and content that can be re-used. Standards such as the Sharable Content Object Reference Model (SCORM) can help to achieve this.
- Choose a system that is flexible enough to keep up with technological (and possible pedagogical) innovations. Both software and hardware change frequently. In the past few years we have seen a shift from PC usage, to tablets, and now smartphones. Who knows what is next, or in what manner these devices will be used in a few years’ time?
- When creating an online system, supporting a variety of browsers can be a challenge in itself, and the frequent browser updates and sometimes subtle changes that they cause in the layout or system behavior makes it all the more difficult to continuously ensure proper system operation. With a large use-base and proper technical support, such problems will be found and solved quicker.
- Adapt to your user’s needs. Users are not only learners, but also supervisors, content creators, and system administrators (see following points). In our case, many students spend significant time commuting on Tokyo’s public transport system. It would therefore be meaningful if they can access SNOWBALLS on their mobile devices. If most students commute by car or bicycle, that might be a lower priority issue.
- Provide tools to make content creation and adding content to the e-learning system as easy as possible, without losing flexibility. Teachers won’t be very willing to invest a lot of time in learning how to get content into the system or how to administer it. On the other hand, some may have specific needs or wishes and will be put off if the system only offers basic functionality. Some of our students preferred to bypass the content-creation interface of the content management system, and program directly in HTML and JavaScript, or program added functionality. Some of this may be possible using an open-source platform.
- Involve faculty for developing high-level content, or at least for reviewing student-created content. They should also be involved when developing and evaluating the supervisor and content-creator features of the system. We received important feedback from teachers who tried to put their materials on SNOWBALLS.
- Allowing students (and staff) to register and login to the e-learning system using their student ID and password (campus-wide account) will dramatically increase user-friendliness, and also reduce the administrative workload of creating accounts, setting individual course permissions, and matching local account IDs with those maintained by the student administration. To do this, you can probably make use of your institute’s Lightweight Directory Access Protocol (LDAP) server.
- A dual system with a (highly secured) development server and an (widely accessible) production server could enhance usability and therefore support for the development project in early stages.
- A good team would include at least IT specialists (server maintenance, software development/updates, implementing features to accommodate new types of e-learning content, system administration), content authors (with (expert) knowledge in the field), editors (for making sure all content fit together and to modify content to match the e-learning format), pedagogical experts (paying attention to learners’ needs, advising on specific constraints/possibilities of e-learning), and reviewers (focus groups, beta testers, copy-editors). However, these are not separate tasks, and close collaboration and understanding of the requirements, possibilities and limitations of each of these fields is needed.

## Conclusions

Many of the choices for an e-learning development strategy cannot be chosen freely, but depend strongly on the constraints imposed by the environment, most notably including financial and manpower constraints, as well as the level of expertise in IT, (e-)education, and content subject. Apart from that, institutional politics or visions may lead to a preference for a certain approach, such as in our case to link the

development with a for-credit course and the decision to build an original system rather than using an off-the-shelf platform.

Organizing a course and evaluating students takes time, and only makes sense if you can harmonize it with learning objectives of the curriculum. If there is no need to teach a course, organizing separate workshops and meeting sessions, or supplying online collaboration tools would probably be a more efficient solution. We do believe it is valuable to keep students involved in any such project, but the way and level of involvement may depend on the specific project objectives and circumstances.

Considering the constraints and the advantages, we believe our approach has been successful. If we would stand for the same choices we stood for 5 years ago, the major changes would be in the implementation of the system and content, rather than in the development strategy. In these 5 years, there have been major changes in the use of (mobile) technology both inside and outside the classroom for education and social networking. This is likely to have impact on the user needs and expectations, so a reorientation is needed. Additionally, the increased insight we have gained through developing a new and unique system is valuable, and we want to underscore the importance of having a flexible system that can keep up with the rapidly changing technology. Therefore, we would probably choose for the customization of a more open system with a larger support base.

Regarding the development approach, it would be desirable to have more collaboration with teachers on the creation and review of domain specific content. Additionally, a fixed reviewer/editor who can spend significant time on revising and finalizing the student-created content would greatly enhance the overall output.

## **Acknowledgements**

The SNOWBALLS project received financial support from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) through the “Global 30” and “Reinventing Japan” programs. We also like to thank all the students and teachers, who have enthusiastically participated in the creation of the SNOWBALLS system and its content.

## **References**

Entzinger, J., Morimura, K. & Suzuki, S. (2011). Developing e-learning content to raise global awareness in a seminar style course. In Proceedings: *IEEE International Professional Communication Conference (IPCC 2011)*, Cincinnati, USA: IEEE. ISBN: 978-1-61284-778-8. DOI: [10.1109/IPCC.2011.6087191](https://doi.org/10.1109/IPCC.2011.6087191)

MEXT (2009). *Prioritized Financial Assistance for the Internationalization of Universities - Launching the Project for Establishing Core Universities for Internationalization (Global 30)*. Online: [https://www.jsps.go.jp/english/e-kokusaika/data/00\\_mext2009.pdf](https://www.jsps.go.jp/english/e-kokusaika/data/00_mext2009.pdf) (Last retrieved on 29 Sept 2014.).

Morimura, K., Yoshida, M. & Suzuki, S. (2010). SNOWBALLS and Utilization of OCW resources in Global Education. In Proceedings: *Annual OpenCourseWare Consortium Global Meeting (OCWC2010)*, May 6th, 2010, Hanoi, Vietnam.

Morimura, K., Entzinger, J. & Suzuki, S. (2011). Web-Based e-learning System "SNOWBALLS" and its Construction. In Proceedings: *IEEE International Professional Communication Conference (IPCC 2011)*, Cincinnati, USA: IEEE. ISBN: 978-1-61284-778-8. DOI: [10.1109/IPCC.2011.6087210](https://doi.org/10.1109/IPCC.2011.6087210).