

# Active Learning of English for Science Students (ALESS)

## — コースの紹介 —

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### 概要

この論文の目的は ALESS プログラム（東京大学教養学部一年生の理工生向け英語コース）について紹介するためのものです。このコースの概要及び主要な要素つまりコースデザイン、コミュニケーションタスク、インプット、協調活動について簡単に説明します。それに加えて、英語を勉強している日本人理工学生の典型について論評します。そしてプログラム開発とそれについて掲載された研究成果を述べ、課題と解決法を手短かに解説します。最後に ALESS プログラムでの教職の経験と貢献を基に、日本の大学や高等専門学校での理工生向けの英語コースについて考えます。

# Active Learning of English for Science Students (ALESS)

## — A personal introduction —

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### Abstract

In this short paper I present a personal introduction to the Active Learning of English for Science Students (ALESS) program. I provide an overview and discuss some of the central elements of the course including the course design, communicative tasks used, input, cooperation and a note on the stereotype of the Japanese science major learning English. I then discuss the program development and the published research related to this development. Next, a number of challenges that we face are outlined and solutions proposed. Finally, the question of whether 'English courses designed for science and engineering students in Japan are effective' is considered based on my experience teaching and contributing to the development of the ALESS program.

### 1. Introduction

In this paper I will introduce the Active Learning of English for Science Students (ALESS) program and summarize what I believe are the key elements of the course that define it as an effective method of teaching English for science and engineering students. The view presented here is largely compatible with the official view of the program [1], but nevertheless it is my own. In the following

sections I shall discuss some of the challenges that we face in our teaching practices and those that face Japanese science and engineering students studying English.

### 2. Overview of ALESS

The ALESS program was born out of a noble aim: to give young Japanese science and engineering students the best possible English education. This means equipping them with the language skills and knowledge they need to

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perform in the international arena as leaders in their respective fields. The University of Tokyo has a very high rate of science students continuing into postgraduate education and research (around 80%) and these students will need to write and present in English in their future careers in order to publish, present and develop international collaborations. Many of them will spend time abroad as part of this process and by doing so will use and learn English in an environment where it is the lingua franca. This will be essential experience for them. The question becomes what do we need to do now for freshmen science students, many of whom have had little experience with using English in authentic communicative situations, and who have no knowledge of English for Academic Purposes (EAP)? This is where the ALESS program fits into their English curriculum as a small, but not insignificant component.

### **2.1. Course design**

ALESS is a one-semester course taken by all first-year science and engineering students at the University of Tokyo. Students research their own topic and conduct a simple science experiment, then using the data and experience from their research they write a formal science research paper and finally present their findings. The course aims are documented elsewhere [1] but I will summarize them here as follows: by the end of the course students should be able to recognize the difference between genres and registers and produce appropriate language for the context (either a written science paper or research presentation); students should be able to review both each others' and their own writing and evaluate it critically in terms of content, rhetorical organization, use of vocabulary, grammar, and mechanics; they should be able to research a question, use

citations and write references; students should thus be able to give and make use of peer feedback; they should be able to develop hypotheses that can be tested and that are based on fact, logic and previous research; they should be able to think critically about both language use and aspects of the scientific process of research. As these aims reveal, the ALESS course is primarily an EAP course, but with a focus on science and engineering topics (such as how blade angle influences the efficiency of windmills, how wave motion works, the turning behavior of insects and so on) and genres (research papers and research presentations). Most important is that students develop skills that they can take with them into their futures; although by the end of their degree they may forget the name of their teacher, the topic of their ALESS project or the specific content of the course, they should have developed implicit skills that have become part of their outlook and academic behavior. Throughout the course these skills are nurtured in what can best be described as a task-based framework for language education.

### **2.2. Communicative tasks**

The most fundamental element of language is the motivation to communicate. Repetitive drills (*"repeat after me..."*) may be useful for practicing pronunciation and articulation, but they do not form an authentic communicative situation in which learners have an implicit motivation to convey their ideas to others. One of the greatest difficulties, but also the most imperative of duties for language teachers, is to create such situations. The innovation of ALESS is to allow students to research their own scientific topic, either individually or in a small group, and to talk and write about their project through the successive stages from conceptualization,

planning, experimentation and analysis of data. At each stage students write and discuss their work, giving them a personalized and authentic topic of communication. This, in my opinion, is one of the greatest assets of the program. However, making students conduct their own experiment within a language course design is not without its challenges and I shall return to this at the end of this report.

### **2.3. Input**

Another fundamental issue is the input provided in language courses. Input including its content, provider and timing is also central to task-based syllabus design. Input can be both in the form of subject-related content (e.g. the scientific method) or language-related content (e.g. formal register). It can be provided by the teacher or by peers (i.e. other students). It can be provided at a stage before, during or after any task within a task sequence. In ALESS, the instructors are not all scientists; therefore we circumvent the problem of content-specialization by keeping the level of science to one which students are currently at and allowing them to explore a topic using practical experimentation in order to provide the +1 level of knowledge important for learning. In a sense, because the students' research topics are so varied, they can teach each other aspects of their chosen subject area, which keeps the content interesting and at an appropriate level for the students. Once content input has thus been controlled, it is the instructors' duty to provide language input at the appropriate stages in the course in order to support students in accomplishing their tasks in English. Such language input includes primarily awareness raising tasks related to genre and register features of scientific communication, as well as key

vocabulary related to the scientific process, reporting results, and giving suggested reasons for those results. Instructors also provide activities to force students to think critically about their own and others' research. In addition, instructors must manage the timing of such input depending on the task objectives (i.e. whether the focus is on accuracy, fluency or complexity).

### **2.4. Cooperation**

Because students have to work together constantly in classroom activities, we hope to foster a work ethic of cooperation and collaboration as opposed to competition. For students of the University of Tokyo as in other high-ranking institutions, competition has certainly helped them to obtain entrance. However, in society and in scientific research particularly, peer feedback and collaboration is an unavoidable necessity for success. Through peer review and other cooperative in-class activities, students develop skills in working together to solve problems and in giving and receiving feedback. This feedback includes focusing on improving language and dealing with experiment design issues. It is important to train learners in peer review and for this reason we have developed an educational DVD which students can access via the ALESS website. Feedback forms are also used to assist students in noticing areas to be improved. Once students have finished discussing each other's work, I always have students thank each other; this gesture helps emphasize the importance of their feedback and the nature of cooperation in writing.

### **2.5. But science students are different....**

There is a stereotype for science and engineering students of English that portrays them as unwilling and unable to learn foreign languages. However, like other stereotypes,

this tends to be inaccurate. Individual differences in language learning aptitude certainly exist, and may relate to working memory capacity or the ability to discriminate between sounds, for instance. However, to use stereotypes for groups of students by their chosen university major is of little practical validity or utility. I believe science and engineering majors are equally capable and willing to learn languages if they have the motivation to do so. It is a case of providing structured tasks and authentic communicative situations in which learners genuinely need and want to communicate in the target language. In this sense, science students are no different from humanities students.

### 3. Program development

The ALESS program has achieved many successes in the resources made available for students, including a writing centre (Komaba Writers' Studio), laboratory for experiments (ALESS Lab), website, two DVDs teaching aspects of peer review and presentations, a textbook (To be published April 2012 by Tokyo University Press) and a bi-annual collection of student research papers (ALESS Collection\*). These achievements have established the program as a beacon for change in the teaching of English at the University of Tokyo. In addition, research has also been undertaken to better understand the genre and register of English used in science papers. In 2009, Allen compared the lexical bundles used in students' writing with those used in published science articles finding that in most cases learners' language was converging appropriately with the target register [2]. In 2011, Allen and Middleton conducted a genre analysis of *Nature's* short research articles and found rhetorical and structural differences between these short articles and full-length papers [3], the findings

of which have helped us in selecting appropriate texts and designing materials for teaching students how to write research articles in English. Future research will look at the impact of peer review upon the revision process and the linguistic features of revised texts, which will help us to improve teaching and facilitation of peer review in the language classroom.

### 4. Future challenges

Nevertheless, the ALESS program, like any educational endeavor, is not without its issues and controversies. In my personal opinion, I have found that while conducting a real experiment in the course works in the promotion of authentic communication, it also considerably adds to the students' workload. Moreover, while writing a full-length paper about research can be done successfully within a single semester (as evidenced each term by our students), it necessitates that many fundamental skills and areas of knowledge required at this level (i.e. those at an introductory EAP level) can only be covered very briefly. This issue is compounded by the fact that the students' subsequent English education is not specified to continue developing the skills and knowledge taught in the ALESS course. The solution to this is to increase the length of the course and better still, develop a systematic program that takes students through a 4-year course in learning English for science and engineering. Only by knowing what comes before and what comes after can we really develop a satisfactory program of English education that will assist students in reaching their required (and desired) level of language ability. A second requirement is that more applied research be conducted into writing pedagogy, learner processes and teaching methodology. This is absolutely essential if we are to develop internationally recognized language materials and methods for

teaching language to science and engineering students. Continued research is required if we are really going to understand how best to help our students achieve a high proficiency in English.

## 5. Conclusion

In response to the question of whether English education that is specifically designed for science and engineering students in Japan is effective, it is difficult to answer conclusively. Firstly, some courses exist that claim to be designed for science and engineering students while clearly they are not. For example, for a course involving nothing other than extensive reading (of fiction), it is difficult to argue for its validity as a course specifically for science and engineering students; clearly at best such a course is a general English reading course. As I am not aware of a broad enough range of other domestic universities' courses, it is difficult to argue about the general trend in Japan. However, I am confident that it is possible to develop effective courses and I have presented one such course here today. I am also aware of talented and dedicated teachers and researchers in applied linguistics and related fields who are working towards this goal. Therefore, I am optimistic for the future and believe by holding meetings such as this (理工生の英語を考える), it will be possible to deepen our understanding of the best approaches to developing ultimately effective language courses for science and engineering students.

\*The ALESS Collection can be obtained by contacting the ALESS main office (see <http://aless.ecc.u-tokyo.ac.jp>).

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