

Practical Note**Improving the First-Year Biology Educational Experience for Japanese Students at an American University Campus****William STENBERG****Texas A&M University, U.S.A.*

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*Keywords: Biology and Culture, Diversity, Intercultural education***INTRODUCTION**

Interaction between the United States and Japan is essential for the scientific and technological growth of both regions. Communication and sharing of innovation is a two-way street, with both countries dependent on each other for markets, research, education, and defense; in spite of this, the education of Japanese students of biological sciences in America can be very problematic. As with any academic subject, there can be problems with the English language that are difficult to overcome. Even with students arriving in America with good language skills, there are problems specific to biology coursework that can be ameliorated by application of specific pedagogic techniques.

BACKGROUND

Northeastern State University of Oklahoma (NSUOK) is in an American four-year university in the central part of the United States. Historically it was a college of the Cherokee Nation that was unique for the large percentage of Native Americans in the student population. NSUOK enrolls a large number of Japanese *ryūgakusei*, *i.e.*, overseas students, in the science departments. First-year biology students are

enrolled in a course called “General Biological Science”. This course serves as the entry point for biology majors and includes an introduction to the origins of living organisms and the mechanisms of evolution that gave rise to the current diversity of species. It also covers the origins and characteristics of major groups in the three domains of living organisms. The subject matter for the first four weeks is indicated in Table 1. Students arriving in America from Japan would have been introduced to these topics as part of the secondary school education in Unit One of Advanced Biology of the Japanese National Curriculum Standard Course of Study (Nakamichi and Katayama, 2018).

We administered a 12-item survey (See Appendix) to students in the fifth week of the

Table 1: Content of the First-Year General Biological Science curriculum at Northeastern State University of Oklahoma

General Biological Science	
Lecture Topics	
Week 1:	Biology – the Study of Life Basic Chemistry of Cells
Week 2:	Organic Molecules of Cells Structure and Function of Cells
Week 3:	Dynamic Activities of Cells
Week 4:	Pathways of Photosynthesis Pathways of Cellular Respiration

first-year biology course and then stratified the results of the Japanese versus the American students in order to get some insight into the educational process in relation to the overseas students. The survey instrument was based on a survey previously used for Japanese nursing students with permission of the authors (Cox and Yamaguchi, 2010). Students were also allowed to write in comments on the survey.

RESULTS

Two hundred and twenty-three responses were scored on a seven-point Likert scale, and the results of the most significant four items are summarized in Figure 1.

The statements showing the major discrepancies between the American and Japanese students are all related to the style of instruction or the dynamics of the classroom environment. The Japanese students rated the quality of instruction lower in all measured categories. Japanese stu-

dents also expressed discomfort with small group work in groups of four to five students. Following these discussion groups, one individual is selected to present the results to the entire class. While the Japanese students would often have a mastery of the material and adequate language skills, they would often sit back and defer to the American students within their group for the leadership in these assignments. Interviews with students and biology faculty indicated that language ability was not a limiting factor, but that most difficulties were related to teaching style and classroom culture.

DISCUSSION

Understanding the science of biology requires an appreciation of all life on the planet, all continents as well as the sea. This is an international endeavor, so it is important to train biologists to work in overseas assignments, as well as to bring experience gained abroad back

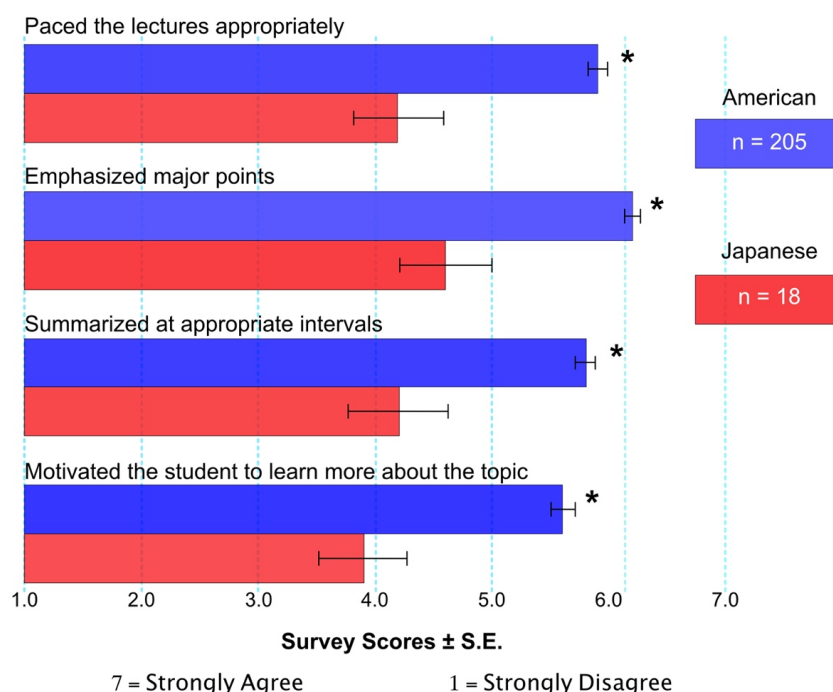


Figure 1: Results showing significant differences of four factors. The statements of the English language version are listed in the table, but statements were also provided in Japanese language. *p<0.05

to their home countries. A large percentage of biological science graduate students in the US are International, often 25 to 35% at major universities. The majority of these students are coming from Asian countries, so biological education in America certainly has an effect on the status of biology in Asia. Students primarily come from China, South Korea and India, but Japan continues to rank in the top eight places of origin (*Open Doors Report on International Educational Exchange*, 2020).

The problems faced by Japanese biology students are often related to culture rather than language ability (Hwang and Roth, 2008). Biology itself is something that may be foreign and strange, *i.e.*, the language of biology is often incomprehensible to the average American speaker of English. In order to teach science, professors must translate the language of science into the vernacular of the students. By reference to common ideas and experiences in everyday life, a professor can make abstract ideas into tangible concepts that serve as the building blocks of the students' knowledge. Much of the material that an American professor would use for real-life examples is laden with cultural values that are not easily interpreted by non-English speakers, even those with a substantial level of English proficiency.

OUR PLAN FOR IMPROVEMENT

Introductory biology courses at American universities are often large with 30-70 students. It is difficult for the professor to customize the course for the benefit of the few non-native students. Our intent involved improving integration of Japanese students while concurrently administering a survey Japanese and American students to better understand the dynamics involved for future refinement of the process. From our survey we determined that maintaining motivation was a main disparity between

American and Japanese students, Figure 1. Our results show that the problems with this cohort of international students are related to cultural issues rather than language problems or lack of scientific background. Our approach was to concentrate on motivation and acculturation, expecting that this would concurrently improve the other identified problem areas of pacing, emphasis and recapitulation. Many approaches have been adopted to increase motivation in biology coursework including conducting laboratory experiments and research projects (Kaga and Arai, 2004), a "Meet a microbiologist" program (de la Cruz *et al.*, 2013), and conducting field-based observation (Sato *et al.*, 2004).

Our approach at NSUOK attempted to combine the best attributes of these programs into activities benefitting students who are new to the United States. Our approach centered on acculturation and included the following activities.

- Students were adopted by a biology graduate student who acted as a mentor.
- Students came to their mentor's research lab and were allowed to participate.
- Students attended the weekly lab meetings with primary investigator, graduate students, and international undergraduate biology students (Figure 2).
- Students shadowed their graduate student mentor during off-campus employment in a



Figure 2: Weekly lab meeting.

local hospital.

Benefits: The time spent with their mentor walking across campus from the classroom to the lab provided an opportunity to discuss the biological topics of the day in what would otherwise be considered downtime. This gave the graduate students additional teaching experience and understanding of the difficult parts of the day's lesson. The students felt freedom to speak up and discuss their difficulties, which they were often hesitant to do in the crowded classroom. The Japanese students often expressed a desire to socialize outside of their Japanese cohort, and they appreciated this opportunity.

Difficulties: Students participating in this program were required to complete additional laboratory safety training requirements of the university. Their limited time and experience did not allow them to complete their own research project during this time. The credentialing process to act as observers at the local hospital was prolonged, although not overly burdensome.

Summary: Our survey indicated that cultural factors are important for Asian biology students studying in America. Although program participants as well as non-participants were able to successfully complete their four-year biology degree in America and return to successful employment in Japan, post-graduation interviews indicated that participants saw the program as a helpful and rewarding experience directly contributing to their educational success. We believe this may serve as a model for other biology courses delivered to students with mixed cultural backgrounds, Japanese, as well as other foreign students.

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Note: The research portion of this study was approved by the IRB of NSUOK study number 101-11.

APPENDIX

The twelve points surveyed are listed below.

The points discussed in this paper are indicated in bold type.

1. Previewed main points of lecture
2. Organized content logically
- 3. Paced the lecture appropriately**
- 4. Emphasized major points**
5. Gave adequate examples to clarify major points
6. Adapted content to student's level of comprehension
- 7. Summarized at appropriate intervals**
8. Made the content interesting
- 9. Motivated student to learn more about the topic**
10. Used visual aids effectively
11. Used instructional aids effectively
12. Provided opportunities for questions