Teaching Statistics to Students who are Learning in a Foreign Language

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1. Background

We have an increasing number of students at Australian universities whose first language is not English. The English courses which many of these students take before being admitted are frequently inadequate for the study of technical subjects such as statistics which have a language of their own. Very little work has been done on the precise difficulties experienced by overseas students and how these difficulties could be alleviated. This paper discusses some of these problems which arise in first level university statistics courses and suggests some appropriate responses. In general these suggestions would probably benefit all students, not only those from overseas.

I will begin with a quote from the report by Ellerton and Clements (1989) about teaching post-secondary mathematics to students who do not have English as their first language.

> "*16. The Language of Instruction.* About one-half of the Questionnaire respondents drew attention to the plight of students at their institutions who were attending mathematics lectures given in English but who did not have English as their first language. In several countries (e.g. Papua New-Guinea) English is the third or fourth language for most students, and is rarely spoken outside lectures and tutorials, despite the fact that it is also the language of instruction in schools. In some countries (e.g. India) English is the language of instruction at universities but not in most secondary schools. In other countries (e.g. in Australia and in the United Kingdom) there is an influx of foreign students (who have attended schools in their home countries) into first-year university classes, and often these students have difficulty with the style of English used by their lecturers (even if they have attended English language schools at home). Several respondents indicated that students learning mathematics in their first

> language are often troubled by the language of formal mathematics - and if this is indeed the case then the difficulties experienced by those learning mathematics in their second or third language would be compounded."

Australian universities have been actively recruiting students in the Asia-Pacific region for a number of years. The difficulties these students experience because of language and culture have been discussed in a number of papers, most of which appear in the references in a paper by Samuelowicz (1987). Nevertheless many of the students' problems remain unsolved.

I have been particularly interested in the problems experienced by overseas students studying statistics. Some of these problems are peculiar to statistics but others are of a more general nature and refer to their whole study programme. I will discuss the more general problems first.

2. Please help us

At my university we have a student counsellor to look after the problems of overseas students. With his help the students recently listed some of the things that academic staff could do to help them with the difficulties they were experiencing. They asked most respectfully and in my opinion their requests were quite modest. The students also commented that many of their requests would benefit all students, not just those from overseas. They included the following:

(i) All lectures should be taped and available for students to listen to in the library.
(ii) Students should be able to bring bi-lingual dictionaries into examinations.
(iii) Lecturers should attempt to speak clearly and more slowly, acknowledging that some students are not from English-speaking backgrounds.
(iv) All lecturers should provide lecture notes.
(v) Students should be given clear and precise information of what a lecture, tutorial and workshop means within the faculties and what is expected of them in these types of classes.

Although the university has had an equal opportunity policy for many years, I am still the only woman on my Faculty Board. The paper containing the overseas students' requests was on the agenda of a recent board meeting. The responses from my male colleagues were overwhelmingly negative. Tapes were no use because they often referred to diagrams, lecture notes were too much trouble to prepare and students wouldn't attend lectures if the notes were available, dictionaries would have to be searched in case they contained secret notes and this was unworkable.

In many ways this attitude on the part of my male colleagues is very similar to their response to the problems of students who come to universities with inadequate mathematics backgrounds. Both in Australia and in many other countries, most schemes to remedy this problem have been initiated and conducted by women.

As a student of foreign languages I can appreciate the enormous handicaps that these students face. I think that if universities are so keen to take these students' money they should also provide a supportive learning environment. This involves addressing

the above issues and many others besides.

The students' requests above were all of an educational nature but there are social issues with which academic staff should also be concerned. In particular I have observed that the overseas students rarely mix with Australian students. They are almost always to be seen, both in classes and around the campus, alone or with other overseas students. When I interviewed a number of overseas students to discuss their progress in statistics, I asked them whether they ever worked or socialised with Australian students. The answer was no every time. There are opportunities in most courses for group or collaborative work. Arranging the groups so that different kinds of students have to work together should not be unduly difficult.

3. Problems in statistics

Over a number of years I have been keeping records of the kinds of difficulties experienced by students with non-English language backgrounds in their study of statistics. Some of these difficulties relate to problems with language, others are cultural. I will deal with the cultural problems first.

Apart from the general problem that students from some cultures have because they do not view the world in a quantitative way, the most obvious problem is probability. A detailed knowledge of the rules for combining probabilities is not necessary for understanding statistics. However, a concept of what probability means is absolutely essential. Some students from Pacific Island countries and some students from Africa have never played games of chance, either as children or as adults, so the usual introduction to probability via these games is quite meaningless. Australian children start to play games that allow them to develop a concept of probability from about the time they start to count and read, so they have a vast store of experience to draw on when they begin a formal study of the subject. I think the only way to overcome this problem is to play some games. Many probability problems involve games which are peculiar to our culture, for example, our standard deck of 52 cards. It is not difficult to explain cards and roulette wheels, etc., but it needs to be done. Otherwise students are bewildered and feel excluded. Also, to make statistics interesting and relevant to students, examples are often chosen which are peculiar to our culture and lifestyle. For example, references to different sports, foods, leisure activities.

Secondly, there are a number of special problems with the language of statistics. In common with other subjects, statistics has many technical words and phrases. Students who have learned conversational English are not well-equipped to deal with technical English. Technical words are frequently not sufficiently well explained in dictionaries. Some technical concepts do not exist in all languages.

Another problem is that statistical texts and lecturers tend to use the formal, concise language of mathematics to explain the theory of the subject. Many English-speaking students have difficulty comprehending the formal language in which mathematics is generally written. I have explained how I have addressed this problem in another paper at this conference. Sometimes small insignificant words such as prepositions determine what a definition means. The way in which prepositions are used in different languages varies tremendously, so pinning down the exact meaning of a definition can be very difficult indeed.

Many examples and exercises in statistics use ordinary language to set the scene for a problem. This causes confusion between technical and non-technical meanings of words. For example, "normally" may or may not refer to a normal distribution. Then there is all the confusion about "not more than" and "at most". Double negatives are another problem as these are interpreted differently in different languages.

Colloquial language is a problem wherever it occurs. I once overheard an overseas student ask a tutor why a certain number given in an exercise was not used in the solution. The tutor responded, "Oh it is just a red herring"! Other problems are caused by using two different words or phrases to describe the same thing. We often use probability and proportion to mean the same thing. Here is a question that overseas students found it impossible to answer. "According to a certain motel manager, the probability that persons enquiring about a room will want to take the room at the motel is 0.1. If the motel has only two vacancies and 20 people enquire about a room, find the probability that the motel will still not be full." The difficulty was that the statement and question used different words.

Overseas students tend to focus on key words and hope that this will enable them to deduce the meanings of sentences. For this reason they are most successful at stereotyped exercises. I found that the best answered questions were those based on Bayes' Theorem because they always had the same form and were easy to recognise.

4. Can we help?

I think there is no doubt that lecturers and tutors are in a position to help overseas students to learn statistics more efficiently. They need to be aware of the special problems these students face and be prepared to make a few concessions. A little care and self-discipline when speaking to and producing written materials for classes which contain overseas students could go a long way towards improving their learning of statistics and other subjects.

References

Ellerton, N F and Clements, M A (1989) *Teaching Post-Secondary Mathematics at a Distance.* A report to the Commonwealth Secretariat, Deakin University.

Samuelowicz, K (1987) Learning problems of overseas students : two sides of a story. *Higher Education Research and Development* **6(2)**.