American Journal of Educational Research, 2013, Vol. 1, No. 8, 290-293
Available online at http://pubs.sciepub.com/education/1/8/4

DOI:10.12691/education-1-8-4

Enhancing Student Learning Through Local and Global Examples in a Statistics Unit

Jahar Bhowmik*

Faculty of Life and Social Sciences, Swinburne University of Technology, Melbourne, Australia
*Corresponding author: jbhowmik@swin.edu.au

Received April 14, 2013; Revised June 18, 2013; Accepted September 05, 2013

Abstract Traditionally, undergraduate students studying social sciences are required to commence with a core unit of quantitative methods. Undergraduate students come from a diverse backgrounds and varied motivations. Teaching statistics to a diverse range of students is challenging. After a review of the existing core statistics unit, changes in the curriculum were effected to address the needs and interests of such a diverse group by broadening the curriculum which includes introduction of local and global examples. These changes of curriculum were designed to improve learning outcomes and student engagement. The paper highlights the value of using accessible and relevant "real life" examples to enhance the learning experience of the wider range of students. Initial results are promising suggesting that curriculum changes have benefited students and improved student satisfaction scores. The use of a range of local and global examples closely aligned to learning activities and assessments have been found to be motivating for students and pilot results demonstrate that students' satisfaction levels have been improved.

Keywords: *teaching statistics, curriculum, feedback, engagement, diversity*

Cite This Article: Jahar Bhowmik, "Enhancing Student Learning Through Local and Global Examples in a Statistics Unit." *American Journal of Educational Research* 1, no. 8 (2013): 290-293. doi: 10.12691/education-1-8-4.

1. Introduction

Teaching statistics is always a huge challenge for academics as well as learners because it involves many mathematical concepts. It has been observed [1,2,3,10] that undergraduate students are more engaged with applied statistics subjects when relevant practical and contemporary examples are used in class activities. Many researchers consistently have shown that involving students in learning experiences where they are actively participating as opposed to passively observing are the most effective ways to engage learners in the learning process [5,11]. Many studies reveal that one of the important principles of good teaching to enhance students learning is to establish the relevance of what is being taught to everyday life, by drawing on real-life cases and current issues [8,11,15]. The notion of relevance refers to the fact that at some point in the course students will be able to relate to the problems presented to them, and see them as their own problems. Relevance is a term used to describe how related, connected, or applicable something is to a given topic. It is assumed that incorporation of real-life examples into the curriculum, and relating these examples to the theoretical concepts being taught, will enhance the learning experience and deepen engagement with the theories and practical activities [6,7].

Kember and McNaught [10] derived a set of ten principles of good teaching, one of which is to establish the relevance of what is taught by: (i) using real life examples, (ii) drawing cases from current issues, (iii) giving local examples, and (iv) relating theory to practice. Later, Kember, Ho and Hong [8] addressed the issue of relevance and motivation using some practical student survey data collected from three universities in Hong Kong. The literature on student learning and engagement reveals that being able to see the relevance of what is being learnt will enhance student motivation, so it is critical to draw on accessible everyday examples in demonstrating applications of the teaching and learning objectives [6,8,10,12]. It has also been shown in some of these studies that it is important to clearly align active learning practices with practical real life examples with stated learning objectives in the curriculum. A simple card game can be used as a class activity to engage students in complex chance theory learning [9]. Caniglia and Leapard [4] recommend that chance theory can be taught using examples from current social issues to engage students in the classroom and to enhance their learning. Student engagement with learning complex theoretical concepts can potentially be increased, for example; in learning probability theory, by using commonly known games such as card games, puzzle games, lottery etc. [14].

This project aims to improve the current curriculum in order to enhance student learning outcomes and increase engagement, by closely aligning learning objectives, class activities and assessments tasks. It is proposed to introduce real life based local and global examples, aligned with relevant activities for students to work on and have these closely aligned to the selected unit (HMA278: Design and Measurement 2) unit learning objectives and

assessments. In this pilot study a wider range of real-life examples were introduced into the curriculum to see if these were regarded as more relevant and accessible to the diverse interests and learning needs of the cohort of students. This research also evaluates whether these new examples enhanced student engagement and motivation to learn and apply statistics theory, and build overall capabilities as a result. The assumption of this investigation is that the learning outcomes of all students, regardless of their background will be enhanced as a result of providing a wider range of real-life examples drawn from local and global contexts. Evidence of the effectiveness of this has been evaluated.

The plan of this paper is as follows. First methodology of the project is explained in Section 2. In Section 3, the key results from the surveys are highlighted. Finally, some concluding remarks are made in Section 4.

2. Rresearch

There are a number of aspects to the evaluation of the existing curriculum of applied statistics subjects/units. The evaluation compares the existing curriculum involving mostly locally based examples and activities, with a revised pilot curriculum that included additional contemporary local and global examples and activities that were closely aligned with these activities. The evaluation of the second part of the survey is important as it provides information about how the curriculum might be improved in the future. The appraisal of the efficacy of this project has been conducted initially on an undergraduate applied statistics unit with 81 (59 in semester 2 2010 and 22 in semester 1 2013) enrolled students. The data collection process included two surveys for the same groups of students in two different time periods using an online questionnaire (delivered by Opinio). Students were invited to respond to a number of statements indicating their agreement on a five-point Likert Scale ranging from strongly disagree to strongly agree (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree), combined with some general demographic information. Students were also encouraged to include their comments to an open-ended question.

The first survey was conducted in the middle of the semester (week 6) to gauge how satisfied and engaged students felt about the existing curriculum materials, and also the use and application of the real life based examples provided in class and within the learning materials related to the theoretical concepts being learnt in the unit. After this initial survey students were provided with additional contemporary local and global examples used to explain the theoretical concepts being learnt in the unit. These additional examples were also used in the lectures and lab classes along with the existing examples (see Table 1) during the second half of the teaching period (weeks 7-12) linking with relevant statistical concepts. Students were given options to choose from a range of examples in lab classes to apply theories and analyse the data to come up with their own conclusions on the basis of the output. A second online survey using the same questionnaire was then conducted at the end of the teaching period (week 12) to seek students' opinions on the above changes. Students were invited via email by a non-teaching academic to volunteer to participate in the two surveys. The online surveys were used to collect voluntary anonymous data and participants were informed that they were not being identified. A computer generated code was provided for each student to compare outcomes from two surveys.

Table 1. Sample of the examples used in the teaching materials

Existing examples (1st survey)	Extra examples (2nd survey)
1. Researchers suggested that there is a difference in average stress level between different levels of alcohol consumption. They were also interested in investigating whether this relationship was the same for those born in Australia and for those born overseas. 2. The mean times, distances and speeds vary significantly for the different types of events as in an AFL (Australian Football League) match.	1. Suppose researchers were interested in the effectiveness of different programs for stress management. Participants were identified as being either Australian born or overseas born, and randomly assigned to one of three treatment groups- (i) a control group given no therapy, (ii) the "relaxation is us" group therapy program and (iii) individual counseling. 2. An experiment was conducted to compare production of three varieties of bananas and to study the response of these varieties to four different doses of fertilizer. 3. In soccer the more ways a team has for a ball to travel and finish on a shot, the better that team is. And the more times the ball goes through a given player to finish in a shot, the better that player performed.

Descriptive statistics were derived for students' opinion on each of the questions included in the survey to display the comparative students' satisfaction score on teaching materials and assessment materials. Results for the two surveys are provided in the following section.

3. Results

The results of this evaluation are provided using some descriptive statistics, involving an evaluation for all the students involved in the project in survey 1 and survey 2 (semester 2, 2010 and semester 1 2013). Some demographics of the students who participated in the surveys are also presented in Table 2. The students come from all over Australia with some overseas students as well.

Table 2. Demographics of students who participated in the unit HMA278: Design and measurement 2 in semester 2 2010 and semester 1 2013

Variables	Levels	Sample size (%)	
		First survey	Second survey
Sex	Male	24 (47.1)	22 (51.2)
	Female	27 (52.9)	21 (48.8)
	Total	51 (63)	43 (53)
Age years	Less than 30	44 (86.3)	36 (83.7)
	Between 30 and 40	5 (9.8)	5 (11.6)
	Above 40	2 (3.9)	2 (4.7)
	Total	51 (63)	43 (53.1)
Student status	Local	44 (86.3)	37 (86.0)
	International	7 (13.7)	6 (14.0)
	Total	51 (63)	51 (63)
Study type	Full time	45 (88.2)	37 (86.0)
	Part-time	6 (11.8)	6 (14.0)
	Total	51 (63)	43 (41)
First language	English	42 (87.5)	36 (83.7)
	Non-English	9 (12.5)	7 (16.3)
	Total	51 (63)	43 (53.1)

The total number of students in the class was 81 (59 in semester 2 2010 and 22 in semester 1 2013) that this survey was drawn from. The overall response rates for

survey one was 63% (n = 51) and survey 2 was 53% (n = 43) respectively. This is a culturally mixed cohort of students in regards to students age, sex, whether students have English as their 1st language, student status (international or local) and study type (full time or part time) which can be observed from Table 2.

Through the survey questionnaires students were asked whether the examples used in the teaching materials were easy to understand or not. From the survey results we noticed that about 69% of the participants in the second survey broadly agreed as compared to 51% in the first survey which is encouraging but the parallel test through ordinal regression revealed that this difference is not statistically significant (Chi-square(2) = 0.587, p = 0.746). In a response to the statement "The examples used in the unit materials are useful to understand the basic concepts of the unit" an increase from 57% (1st survey) to 83% (2nd survey) broadly agreeing with the statement is observed and this improvement is found to be statistically significant (Chi-square (2) = 7.19, p = 0.027). For students' response to another statement "the examples used in the unit materials could be applied in any location in the world" an increase from 58% (1st survey) to 73% (2nd survey) broadly agreeing with the statement again is encouraging but not statistically significant (Chi-square (3) = 2.81, p = 0.422).

One of the objectives of this research project was to examine whether weekly learning activities (which include examples related to the statistical theory being learnt), were perceived by students to be closely aligned to the overall goals of the unit. Results from the surveys showed that about 84% of the participants in the second survey believed the weekly learning activities and examples provided were closely linked to the overall goals of the unit. Whereas previously in survey 1 only 67% of the participants broadly agreed to this statement. Again this change is not statistically significant (Chi-square (3) = 3.11, p = 0.375). While this is early days in the project, it is encouraging to have some agreement between students as to the perceived value of the newly introduced examples into the curriculum in the second half of the semester.

It has been observed by the instructors that students appeared to be more engaged in class (lecture and tutorial) in the second half of the semester as compared to the first half (more interactions among peers and instructors were observed in each session, students asked more questions on each of the topics taught in the lecture when applying those concepts to examples). This could be due to inclusion of a wider range of local and global examples in the latter half of the semester.

For those students who attended both the surveys, a comparison of mean responses on survey 1 and survey 2 showed an improvement of students' mean satisfaction score for all questions which are displayed in Table 2. Overall results collected from the online surveys partially supported the research hypotheses although tests of significance have not been used for all hypotheses in the shorter version of this paper. The findings from this study were compared with the university's regular student feedback survey (SFS) and a similar improvement on students' satisfaction level have been observed. Using upgraded teaching material an overall increase of 5% (4.60 to 4.84) student mean satisfaction score have been observed as compared to the previous year's SFS on the same questionnaire. In this comparison previous year SFS results have been used as control group outcome.

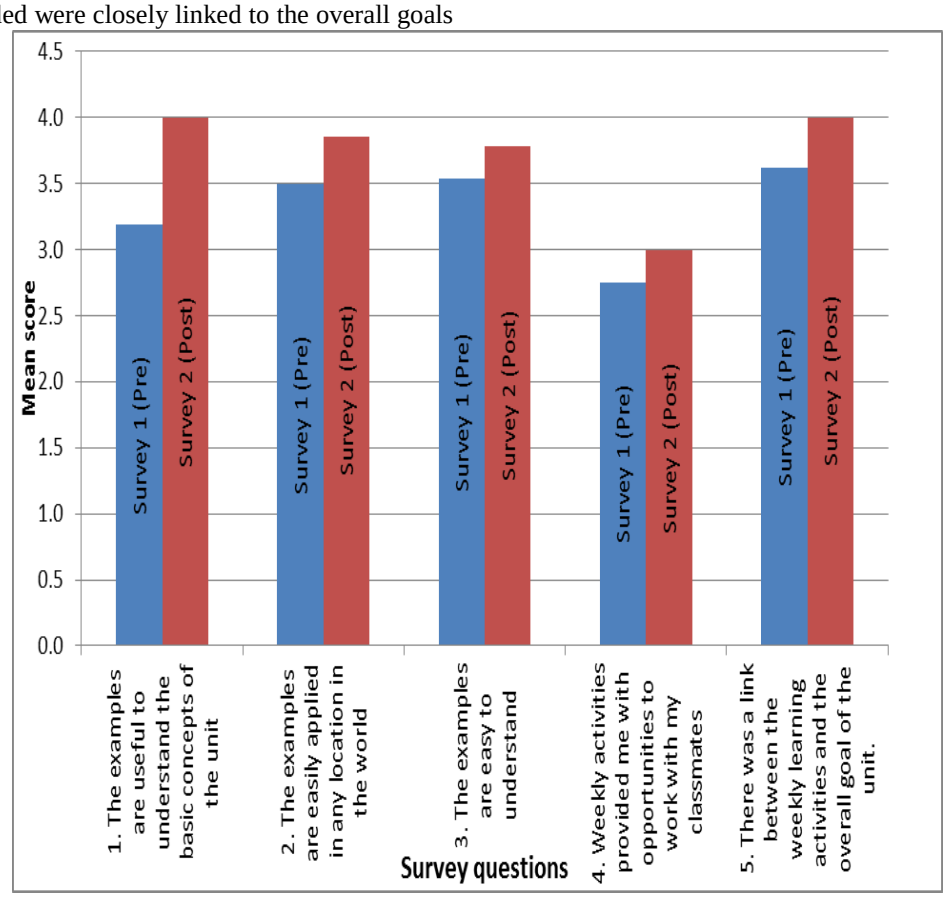

Figure 1. Mean satisfaction score on survey 1 and survey 2 for 5 surveyed questions (N = 39)

4. Concluding Remarks

Results for the surveys reveals that contemporary, local and global examples that were introduced in the second half of the semester, and aligned with the learning activities seemed to be appreciated by this cohort of student respondents in this applied statistics unit. Introduction of a broader range of examples drawn from local and global environments, appeared to assist students in learning critical concepts in this statistics unit, learning being more relevant and motivating and therefore easier for students to learn. The data also revealed that student engagement in learning these statistics concepts is likely to be increased by including real-life local and global examples drawn from everyday life. This project suggests that by incorporating a wider range of examples based in real life local and global issues in a culturally mixed statistics class, it is possible to engage a wider range of students.

Potential Limitations

The survey data is based on students self-reported perceptions of aspects of the unit e.g. "examples used were useful to understand the basic concepts", whether they saw the "links between weekly learning activities and overall goals of the unit" etc. To observe overall behavioural change among students from semester to semester or year to year we need at least to use a few years of data which was not available as yet. Initially this research was developed as a response to the recognition that students come from a diversity of cultural and educational backgrounds and this study was attempting to broaden the curriculum to meet the diverse interests and needs of these students. However, there were a few (7) overseas students who attended this course. There was no control group of students although results from the pilot survey data have been compared with SFS results where previous year SFS results were considered as control group outcome.

Acknowledgement

The author is grateful to Swinburne Ethics Committee for their helpful suggestion and cooperation in the data collection process. Author wishes to thank Kay Salehi, Lariane Fonseca, Cathy Pocknee and Vida Weiss for their helpful suggestions on the earlier version of this paper. An earlier version of this paper was presented at the 2012 OZCOTS conference held in Adelaide, Australia.

Competing Interests

The author has no competing interests to declare.

Abbreviations

SFS	Student Feedback Survey
OZCOTS	Australian Conference on Teaching Statistics

References

[1] Biggs, J. (1999). *Teaching for Quality Learning at University*, SHRE and Open University Press, UK.

[2] Biggs, J. (2003). *Teaching for quality learning at university: what the student does*, 2nd Edition, Buckingham: Society for Research into Higher Education and Open University Press, UK.

[3] Biggs, J. and Tang, C. (2011). *Teaching for quality learning at university*, 4th Edition, Open University Press, UK.

[4] Caniglia, J. & Leapard, B. (2010). Analysing the World Population: using Population Pyramids and If the World Were a Village. *Teaching Statistics*, 32, 41-44.

[5] Drake, P. (2001). Mathematics and All That: Who Teaches the Number Stuff? *Active Learning in Higher Education*, 2(1), 48-52.

[6] Cavanagh, M. (2011). Students' experiences of active engagement through cooperative learning activities in lectures, *Active Learning in Higher Education*, 12(1), 23-33.

[7] Feu, C.D. (2009). Having a Whale of a Time, *Teaching Statistics*, 31, 66-71.

[8] Kember, D., Ho, A. & Hong, C. (2008). The importance of establishing relevance in motivating student learning, *Active Learning in Higher Education*, 9, 249-263.

[9] Lesser, L.M. & Pearl, D.K. (2008). Functional Fun in Statistics Teaching: Resources, Research and Recommendations, *Journal of Statistics Education*, 16(3), 1-10.

[10] Kember, D. & McNaught, C. (2007). *Enhancing University Teaching: Lessons from Research into Award Winning Teachers*, Abingdon, Oxfordshire: Routledge, UK.

[11] Milburn, M. (2007). Statistics in the Kitchen: Ordinary Least Squares and Turkey Cooking, *Teaching Statistics*, 29, 10-12.

[12] Kolb, D. (1984). *Experimental Learning.* Englewood Cliffs, NJ: Prentice Hall.

[13] Mvududu, N. & Kanyongo, G.Y. (2011). *Using Real Life Examples to Teach Abstract Statical Concepts, Teaching Statistics*, 33, 12-16.

[14] Quinn, R.J., Ball, T.S. and You, Z. (2010). Engaging Probability Students in Playing and Analysing a Simple Card Game, *Teaching Statistics*, 32, 45-48.

[15] Reid, A. & Petocz, P. (2002). Students' Conceptions of Statistics: A Phenomenographic Study, *Journal of Statistics Education*, 10(2), 1-18.