

® ENABLING STUDENTS TO COMMUNICATE STATISTICAL FINDINGS.

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In the University of Canberra general education course “The World of Chance” in 2002, students had to do a web site group project with oral presentation. In previous years they did a poster. Various aspects of “The World of Chance” course were aimed at teaching students to communicate statistics effectively. The web site project and oral presentation were instigated to encourage students to communicate statistics effectively. Students first submitted a project proposal, if this problem was acceptable they then had to proceed to collect their “own” data and then undertake exploratory and statistical analyses of the data using techniques learnt during the course. Feedback on their experience of this approach highlighting their communication skills was mostly favourable and most groups managed to successfully convey the messages in their data.

INTRODUCTION

The general education course “The World of Chance” when first introduced in 1998 at the University of Canberra followed the format of a Chance course. As noted on the CHANCE website (<http://www.dartmouth.edu/~chance/index.html>) “The goal of Chance is to make students more informed, critical readers of current news stories that use probability and statistics.” Being a course aimed at non-specialists, case studies and experiments were used to demonstrate the use of statistics and technical details were kept to a minimum. According to Yilmaz (1996) statistics education for non-specialists must develop the three competences: 1. Ability to link statistics and real-world situations, 2. Knowledge of basic statistical concepts, and 3. Ability to synthesize the components of a statistical study and to communicate the results in a clear manner. Prior to 2002 “The World of Chance” put most emphasis on the first two competencies. In 2002 we decided that it was also important that students be able to communicate statistical findings from their simple analyses as well as be able to be statistically literate when reading articles containing statistics. To this end a Virtual Chance Fair plus oral presentation was incorporated into the assessment. The weekly two hour computer laboratories also encouraged students to report their statistical findings in a manner that could be easily understood by a non statistician. The course outline was influenced by Moore (2001).

As noted by Mackisack (1994) “There is an increasing demand from professional groups and employers for the University community to teach explicitly what are described as generic skills, including problem solving, working cooperatively in groups, and non-technical written and verbal presentation of results”. Smith (1998) suggested one way that students could develop statistical reasoning was by “actually doing statistics -- designing studies, collecting data, analyzing their results, preparing written reports, and giving oral presentations.” A web site group project with oral presentation met these two aims.

To participate in the Virtual Chance Fair students had to work in groups of four and the first task was to come up with a research problem which was then vetted by the course convenor. If this problem was acceptable they then had to proceed to collect their “own” data and then undertake exploratory and statistical analyses of the data using techniques learnt during the course. The Student Projects were assessed during the Final Exam Period and the student projects took the place of a final exam. This was to prevent students from adopting a surface approach to learning which most final examinations encourage (Hubbard, 1997). Assessment of the student

project was through participation, verbal presentation and a written piece of work presented as the web site. Each member of the group was expected to contribute equally to all of these assessments. As noted by Freeman and McKenzie (2002) "Students often enjoy learning in teams and developing teamwork skills, but criticise team assessment as unfair if there is equal reward for unequal contributions." The participation mark in the group determined by self and peer assessment allowed groups to partition the results according to effort. Students did use the peer and self assessment questionnaire to penalize students who did not pull their weight.

In the past a cardboard poster was used instead of a website for the project. Some students viewed the poster as being too primary school and spent little effort on it. The accompanying written reports were treated more seriously. Feedback on doing the web page was positive and most groups put in a great deal of effort.

The "World of Chance" course covered Introduction to Statistical Thinking, Data Ethics in Science, Sampling, descriptive statistics, lying using statistics, correlation, simple linear regression, analysing time series using graphical techniques, attitudinal surveys, basic experimental design, and an introduction to probability. The web site project could be used in any introductory statistics course that has group work.

In "World of Chance" a ninety minute lecture was delivered each week to the whole class. Less use of guest lecturers was made in 2004 than in 2002 due to financial pressures. Both years three members of staff were involved in teaching the course because of work load considerations. The weekly two hour tutorials, held in the computing laboratories, had at most twenty students each in them. The students had to submit their statistical laboratory write up each week and this accounted for 20% of the total assessment. They also had to do two assignments worth 20% each and the web site group project with oral presentation was worth 40%. In 2002 there were one-hundred students enrolled and in 2004 fifty-three students. The reduction in student numbers in 2004 was due to the removal of the compulsory general education subject requirement for IT courses.

VIRTUAL CHANCE FAIR

The major innovation for 2002 for The World of Chance course was replacing the Chance Fair of posters and accompanying detailed written reports by a Virtual Chance Fair (web sites instead of posters) and fifteen-minute oral group presentations during the examination period. There also was a peer and self-review of each group member's contribution to the project (this component was called participation).

The project document including instructions and a project proposal sheet was handed out in Week 5 of lectures. Students were given until Week 10 to hand back the project proposal sheet (numbering includes non teaching period of weeks 8 and 9) but websites were being allocated from Week 7 to encourage early submission. A web site was allocated after the project proposal had been signed off by the subject convenor. Students had to work in groups of 4 and produce a web page containing their project. Projects could not entail any activity that required ethics approval. The web site had to be completed before the examination period commenced in Week 16.

The talk was worth 10%, participation 10% and the web site 20%. In the first instance the students formed their own groups. The oral presentation involved each group member speaking about aspects of the research problem studied and their results. They walked the audience through their web site using data projection facilities while discussing the problem studied and their results. Since web sites were not allocated until project proposals were accepted there were no surprises. It also was possible to break up the groups with the weakest proposals and redistribute the group members to those groups with stronger proposals that did not have the requisite four members. In 2002 only one group was redistributed. Due to there being 100 students enrolled in 2002 the course convenor stipulated that groups should have four members. Email and the course web site were used to ensure that this mostly happened. Most students in their talks did mention future advice they would give to students doing a project in this course.

The project specifications required students to utilise any four weeks worth of lecture and tutorial material, which forced students to check what topics had been covered. The lecture overheads and handouts for most topics were available from the course web site.

Presenting a project via a web site in a statistics course is novel even though IT students frequently have to do this in their studies. Part of the motivation for the web-based project was the high enrolment of IT students in The World of Chance at UC. About 70% of the cohort in 2002 had an IT background. Most of the non-IT students found Microsoft FrontPage easy to use so it would be possible to use this approach in Chance courses with students from other cohorts. Assistance on using Microsoft FrontPage was available for the non-IT students since there was no prerequisite that students possess Web page creation knowledge/skills. Most non-IT students were familiar with Microsoft Word and Microsoft FrontPage is very similar so not much use was made of this assistance.

STUDENT COMMENTS

Student feedback on doing the website and oral presentation in 2002 and 2004 was mostly positive. A significant number commented that a web presentation was definitely preferable to a poster presentation. Six of the ninety-seven students who filled out the questionnaire in 2002 expressed concern for students who did not have an IT background. Five students in 2002 identified themselves as not having an IT background and only one of these was negative about doing the website project, though only mildly so (“If I didn't have someone in the group with IT knowledge I would have been stuffed”). Most of the students thought that the project utilized their IT skills well. Several commented that the web project was good preparation for the workforce (“I think that this was a good option as it helped develop skills that are required within the workforce of today”). A lot of students enjoyed the collegiate nature of the group project (“The project gave us a good experience for working with other people so we can exchange ideas, thus we can learn a lot of things from each other”). Some commented favourably on the freedom of choosing a topic to work on (“It was really an interesting thing to do because you can choose your favourite topic. And can evaluate in your own way”). One person noted that it was a “nice change to do web projects -> everyone can see other projects whenever they want”. Only one person in 2004 was negative about the website project.

Eighty-eight of the ninety-seven students who responded in 2002 were in favour of retaining the same format for the project in 2003. Forty-eight of the fifty-three students who responded in 2004 were in favour of retaining the same project format for 2005. Three students in 2002 preferred that the project consist of just the website with no oral presentation. The rest in 2002 either did not comment or their comments were not relevant about retaining the same format for the project. In 2004 one student preferred the previous approach in 2003 of a project based on a poster and written report, another student found “the oral presentation part awkward and not really necessary. A supporting document may be adequate.” A third student wrote “I think just do the project and post on website.” Two students did not write anything.

In 2004 a few students commented that they would have preferred working in smaller groups and one person was not “keen on the idea of continuing to do group work” but liked the website plus oral presentation approach.

STUDENT FEEDBACK ON PROJECT EXPERIENCE

One student in 2004 wrote of his/her project experience that “The experience and learning outcome of this project were really helpful. I have studied statistics for the first time in my life, I enjoyed it and liked working on the project.” Another wrote “I found this project an excellent way to reinforce knowledge gained in lectures and tutorials. The unit followed logically upon Statistics 1 – using in an every day way statistics.” Most students wrote they found doing a web based project a good experience, “By doing this project it has enhanced my learning and brought together all the information I have received through this subject during this year. This project presented me with a very valuable experience.” Also the project was found to be “a good way of showing applied knowledge.

PROJECT MARKING

As there were 100 students enrolled in The World of Chance in 2002, the 24 project oral presentations were spread over four two-hour blocks during the examination period of 2.5 weeks. Students registered for a presentation time slot with the agreement of all group members. The same three teaching staff attended all talks and finalised this part of the assessment immediately after the oral presentations in each block. When the virtual fair approach was used again in 2004 there were 53 students enrolled in the course, the same approach was used in the marking since it had worked well in 2002. In 2004 the oral presentations were held over two weeks on Tuesday and Thursday evenings. A list of available times was put on the subject webpage so that the teaching staff could sign groups up for a time of their choosing and the students could see what times were available. It was first in best dressed. One group was surprised that we expected all group members to attend but they did. Students were encouraged to attend all the presentations, most students attended the presentations in the session they did their presentation.

Students filled out the confidential peer and self-evaluation form straight after their oral presentation and, on completion, handed them back to the designated staff member. One student in 2004 thought that even though an attempt had been made to allow for unequal contributions to the project by group members “that each member should be rated separately on all aspects.”

We first viewed the web sites during each group’s oral presentation. However, the web sites were examined in greater detail and assessed after the final presentation block and over three days.

Two of the teaching staff who were involved in the course assessment in previous years found the web based project easier to grade than the ‘poster and detailed written report’ combination used for the major project in earlier years. The paper by Richardson (2001) gives more details of how the course was run before 2002.

SUMMARY AND CONCLUSION

Students in their oral presentation demonstrating their web site had to clearly define the problem they chose to investigate. They had to discuss how they went about collecting the data for their project. Then they presented some of their statistical investigations which had to encompass four weeks of material taught in lectures. Finally they had to present their findings and recommendations. On their web site they also provided reflections on their experience of doing the project. Most websites also provided advice for future students which included for most the essence of the sentiments expressed on one website: “Another point we would like to raise is to have more communication between the group. This will bring out more friendship and co-operation with the team. This will for sure help in project management.” Some groups also detailed what went wrong with their project like “There are some wording problems which confuse people, and some questions were worded in a bias way (indicating the answers that we wanted)”. This sort of reflection allowed students to demonstrate what they had learnt from their mistakes. Actually encountering problems at the analysis stage made the students reflect upon what they had not done well at the design stage: “Always do a proper research before you start.”

The main teaching staff in the course after each group oral presentation asked questions of a statistical nature to see how well students could communicate and how well they understood the material they presented. This sort of interaction was not available in the old poster project format.

The oral presentation and website were used to assess the students’ statistical communication skills. The web site project plus oral presentation worked well for most groups. Students did demonstrate through their projects that they had found a “clear link between statistics and its uses in the real world” which according to Yilmaz (1996) is what students in most introductory courses fail to do. Establishing this link, in our experience of teaching this course, makes communicating statistical findings much more straightforward for students. The web site project was a better vehicle to demonstrate such a connection than the old poster project because the students took it more seriously. They considered the medium to be more relevant and modern.

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