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# Developing a Learning Resources CD-Rom for Statistics

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The Department of Statistics teaches the largest first year statistics course at The University of Auckland, New Zealand, with nearly 4000 students enrolled in 2003. As part of our on-going improvement to the quality of the course, we obtained internal University grant money in 2001 to produce a course CD-Rom.

As today's students are increasingly diverse in age, culture, language, work-schedule and commitments, providing a variety of learning options is becoming more and more of a necessity. We want our teaching methods to recognize and accommodate the changing needs of our students. In addition, we introduced a stage one statistics course in distance learning delivery format in 2002.

### ***Existing Resources***

We provide students with lectures, tutorials and an assistance room with trained tutors. Help is also available by visiting or emailing lecturers and additionally through the Student Learning Centre's workshops.

As well as these standard resources, we use Cecil [1] (from Computer Supported Learning): an innovative, flexible and reliable system for online information, web delivery of course materials and course management created by The University of Auckland [2]. It provides a "one stop shop" – a common framework across all courses for students to manage their learning. Lecturers can send out class announcements, students may take review quizzes from a large database of previously examined questions, interact with other class members via forums and so on.

### ***Why a CD-Rom?***

The CD-Rom resources are extensive - the 650 MB disk is almost full. Many of the files are too large to reasonably be downloaded via Internet connections. The need to connect to the Internet to access Cecil and/or websites is minimized with obvious advantages for the University network, households, and those without Internet access at home. Furthermore, the cost of CD-Rom duplication is now inexpensive.

### ***CD-Rom Resources***

The CD-Rom resources include standard course resources (in portable document format) such as the filled-in version of the gapped lecture notes, course assignments, previous term tests and examinations, readings etc. However it also includes a number of additional resources which we have specifically produced in an attempt to enhance the learning process. These are:

- **Narrated PowerPoint Lectures:**

Our complete 52 lecture course is presented in animated, narrated PowerPoint presentations which are displayed in a consistent, clear style. Adding synchronized narration to each lecture was a lengthy and involved process. We chose to offer narrated PowerPoint presentations over video footage as we felt that providing a person's face would add little value to the delivery of our course content. Creating video lectures would considerably increase the cost

and complexity of the project. Almost anyone, with training, could produce narrated PowerPoint presentations. To retain copyright over the material and to provide platform independent delivery, each lecture was converted to Flash format using Wanadu's ICreate software [3].

- **Interactive Computer Tutorials:**

Our course relies heavily on the use of computer programs as tools for statistical analysis. We utilize Excel and MINITAB. In addition to trained computer laboratory demonstrators and tailored computer program manuals, we introduced interactive computer tutorials on the Learning Resources CD. Each section of the manuals has a clickable movie icon that opens a "viewlet" which is an animated narrated presentation demonstrating how to use the computer program. Viewlets [4] are fast being adopted by many businesses, governments and education markets around the world as a way of effectively training people. It is as if a student had a personal tutor sitting alongside them, teaching them how to use the program. Students may fast-forward and rewind each viewlet until they have fully understood the steps required. Viewlets are also in Flash format, which makes them very accessible.

- **Explorative Excel Spreadsheets:**

We have created a number of Excel spreadsheets to enable students to investigate various concepts covered in the course in an interactive way. Some of these were introduced during lecture times and proved very worthwhile.

- Each distribution introduced in the course could be explored.
- Each type of graph used in the course can be explored interactively by dragging data points or entering them into a spreadsheet. This included: dot plots, box plots and histograms, guessing and fitting the least squares regression line, and the effect of outliers on the least squares line.
- Observing the Central Limit Theorem in action. Students could choose a distribution (triangular, uniform, quadratic U, or exponential), see a graph of the distribution they were sampling from on the left, then choose the size of the samples taken from this distribution. The distribution of those sample means is plotted. By increasing the number in each sample ( $n$ ), students could see the distribution of the samples means tended towards a normal distribution shape.
- Finding normal and inverse normal distribution probabilities via an interactive graph.
- Understanding the concept of long-run probabilities via a coin-tossing experiment.
- Trying an interactive version of the famous "Let's

Make A Deal" game, while keeping track of the probabilities.

### Feedback

We web surveyed our first semester students on the usage and value of the CD-Rom resource. Approximately 700 of the 2000 or so students responded. Of those, 60% had used the narrated lectures occasionally and 32% had used them often.

Some comments made by our students in the web survey follow:

- *"Best learning aid I have ever seen at University. I like the narrated lectures because if you miss a lecture or are not clear on something, no need to panic because you can go over things again in your own good time. Brilliant."*
- *"I liked it very much, it's just like a private tutor in my room."*
- *"Have found the narrated lectures invaluable for revision and assignment work."*
- *"I found this CD so far hugely valuable. A couple of times when I was unable to attend lectures due to illness, the lectures on the CD kept me right up to date and made returning a lot easier as I was ready to get back to work as soon as I got back.... I would like to congratulate the Stats team on being so modern in their teaching approach. Many other faculties would be wise to look at the way you have created resources which are relevant and easy to access and which add to the learning process."*
- *"I really liked the CD resource, I failed stats last year and so far I am doing above average. This is all thanks to the CD resource. It allows me to catch up on missed lectures, enables me to use the narrated lectures to go over what I did not get in the lectures again."*
- *"I think it was very well thought out... At the moment I am laid up with two (yes it's true) twisted ankles and I am unable to make it to lectures so having the lectures on the CD means I won't miss out on anything and it also means I can rehash anything I need to go over again. Good work."*
- *"It is very useful as I don't always have time to go to lectures (as I am third year and this is my eighth paper) and I also work during the day. I find that I can miss lectures and not miss anything as everything so far seems to be on the CD. It is a great resource and definitely worth paying the money for."*

- *"I like the CD very much as I'm a foreign student. Sometimes it's hard to understand the English of the lecturer, so I really stick with this CD. It's very helpful to me."*
- *"The narrated lectures are a great idea. I wish I could have one for all my subjects!"*
- *"This CD is like one of my most valuable things this semester. Especially for assignments when you need the manuals. Saves you carrying around papers and books in your bag."*
- *"I found the CD really helpful, particularly the MINITAB manual, really good stuff. It's also very comprehensive - effectively it gives me enough resources to pass the course without leaving my computer. I think it's really good and can only wish my other courses had a comparable resource. Cheers!"*

### **Technology-related Issues**

We acknowledge that there will always be some technology-related issues (for example, out-dated and incompatible computers). We focused on the largest market - PC computers and tested on a variety of configurations. Students are required to have a web browser with the free Macromedia Flash plugin (provided on the CD). NPD Research found in December 2002 that 98% Web users can experience Macromedia Flash

content without having to download and install a player. In addition, the free Adobe Acrobat Reader is needed (provided on the CD), along with Microsoft Excel.

### **Additions**

Overall, 28% of those who responded to the web survey on use of the CD-Rom said that a Mandarin version of the narrated lectures would have been helpful to them. In response, we are in the final stages of production and plan to release this translated version within weeks. The lecture notes are kept entirely in English, along with all statistical terminology in the narration.

We are also keeping aware of developing resources and technologies that others are creating and using, for ideas to incorporate onto the CD-Rom. For further information, check out:

<http://www.stat.auckland.ac.nz/~rachel/cd/>.

### **References**

- [1] <http://www.cecil.edu/>
- [2] <http://www.auckland.ac.nz/>
- [3] <http://www.wanadu.com/>
- [4] <http://www.qarbon.com/>
- [5] <http://www.stat.auckland.ac.nz/~rachel/cd/>