THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

TERTIARY TEACHING EXCELLENCE AWARDS 2009

Nomination for:

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Lecture 1: Why Teach Statistics?

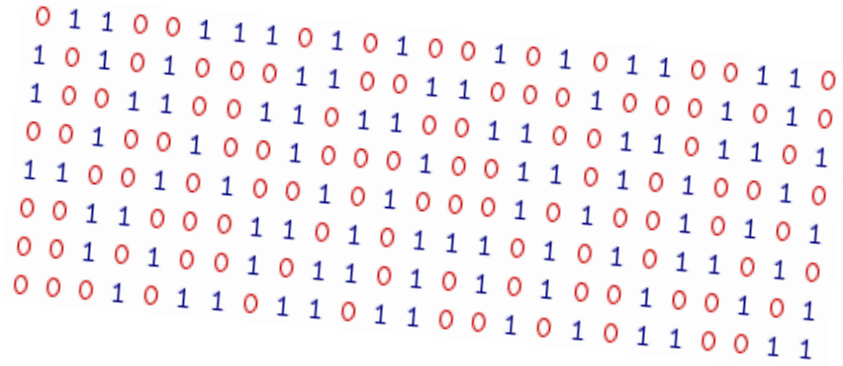
Hello! I'm Rachel Fewster of the Department of Statistics at the University of Auckland, and I'm here to convince you that Statistics is fascinating and fun.

You might be forgiven for thinking that statistics is not the most enticing subject. There seem to be enough statistics in modern life as it is, without having somebody going about spreading them. I love hearing people's reactions when I tell them what I do. *'I know what a statistic is, but what is there to go on about, so to speak?'* Or, *'Is there a whole department just for Statistics?!'* And nearly everybody says *'Ugh! Statistics was my worst subject at school!'*

So why am I here to convince you otherwise? To me, Statistics is the most fascinating subject, because it brings us insight into the realm of chance: how to predict the unpredictable. The single thing I love most about teaching my subject is to communicate an instinct for chance. Some chance is believable, other chance is not. Take the coin-tosses below: 0 for Tail, 1 for Head. The 200 coin-tosses on the left are believable. The 200 coin-tosses on the right are not. In fact, you would not see something as far-fetched as the 200 tosses on the right in millions of attempts!

Believe it?

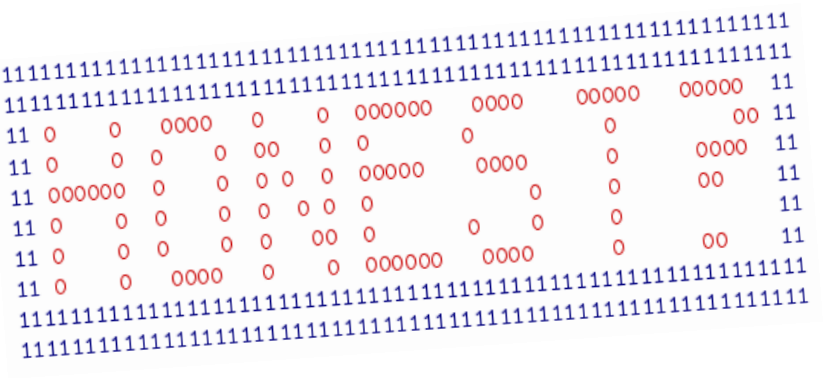
Or not?



What's going on? I enjoy plying my students with this 'magic' trick. I invite them to go home and *either* toss a coin 200 times, *or* cheat and write down a faked set of 200 tosses. The choice is theirs, but I contend that I shall be able to find out who cheated!

Here's the secret. If the coin-tosses are genuine, they are highly likely to contain a long string of consecutive 0's or consecutive 1's. The chance of having at least six consecutive repeats is over 97%. Most people do not expect long runs of 0's or 1's in random data. Therefore, students whose output contains no runs of at least six 0's or 1's are deemed Cheat!

When you're playing with chance in the classroom, you never know what's going to happen next. My method was thwarted by the crafty student who produced the output below. According to stat-magic, this student was indeed being honest ...



I'd like to share with you the experiences I've gained in ten years of teaching statistics at Auckland. My goals as a teacher are three-fold. Firstly, as you learn, I want you to have fun. Secondly, I want you to *understand*, to *internalise,* to experience the exhilaration and satisfaction of deep insight. Finally, I want to give you something to take away with you – to achieve *memorability* – so that in the years to come, you will think back to that catch-the-cheats coin-tossing experiment, and smile sagely at the lesson you learnt. No, you won't move all your money into that investment just yet, even though its value has gone up for the last six months in a row. Well, a run of six heads is just the sort of thing that happens by chance, isn't it!

> *Rachel not only ties in the lecture material with hilarious fictional examples, she also links it to real life situations…*
> ***[student], 2009***

Screenshots from my lecture to the University's Teaching and Learning course for academic staff, showing theory development in my lecture notes using real-world examples for deep understanding and memorability

2.6 Hypothesis testing

You have probably come across the idea of hypothesis tests, p-values, and significance in other courses. Common hypothesis tests include t-tests and chi-squared tests. However, hypothesis tests can be conducted in much simpler circumstances than these. The concept of the hypothesis test is at its easiest to understand with the Binomial distribution in the following example. All other hypothesis tests throughout statistics are based on the same idea.

Example: **Weird Coin?**

I toss a coin 10 times and get 9 heads. How weird is that?

What is 'weird'?

- Getting 9 heads out of 10 tosses: we'll call this weird
- Getting 10 heads out of 10 tosses: even more weird!
- Getting 8 heads out of 10 tosses: less weird.

Start with a low-context examp to focus on ideas

2.7 Example: Presidents and deep-sea divers

Men in the class: would you like to have daughters? Then become a deep-sea diver, a fighter pilot, or a heavy smoker.

Would you prefer sons? Easy!
Just become a US president.

Numbers suggest that men in different professions tend to have more sons than daughters, or the reverse. Presidents have sons, fighter pilots have daughters. But is it real, or just chance? We can use hypothesis tests to decide.

The facts

- The 43 US presidents from George Washington to George W. Bush have had a total of 151 children, comprising 88 sons and only 63 daughters: a sex ratio of 1.4 sons for every daughter.
- Two studies of deep-sea divers revealed that the men had a total of 190 children, comprising 65 sons and 125 daughters: a sex ratio of 1.9 daughters for every son.

Stats dept births since 2000: 12 2 8 5

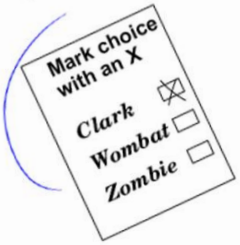
Could this happen by chance?

Follow with more intriguing examples…

2.8 Example: Politicians and the alphabet

What do the following people all have in common: Bush, Blair, Clinton, Clark?

They are all elected presidents or prime ministers … and their names are all right at the beginning of the alphabet!



Is it true that political candidates with names at the beginning of the alphabet have an advantage over other candidates, because their names come at the top of the list on the ballot cards?

The appropriate tool to use is another hypothesis test.

For the 2001 UK general election, names of all candidates and the winning candidate can be found on the internet for 590 constituency seats in England, Wales, and Northern Ireland. (Results for Scotland did not include candidate

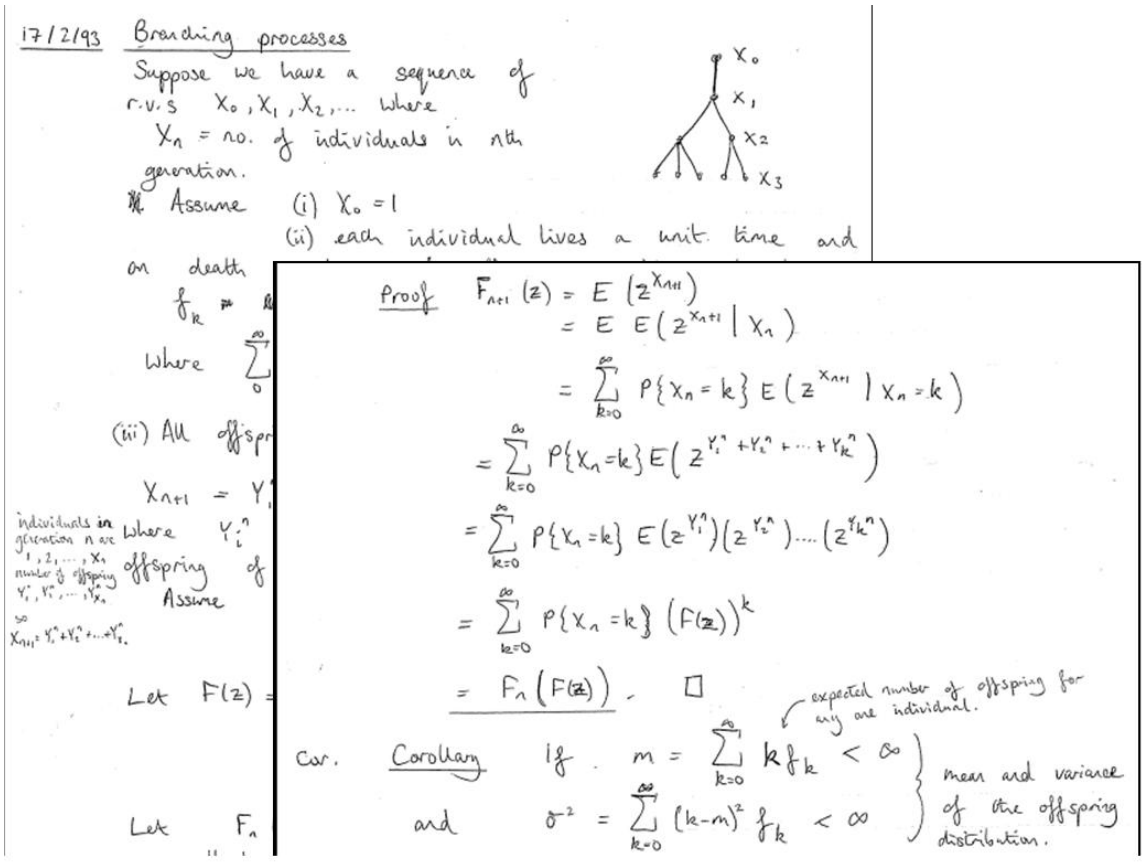
Aim to stimulate CURIOSITY

Lecture 2: How To Teach Statistics

I grew up in Durham, UK, studied Mathematics at Cambridge, and did my PhD in Statistics at the University of St Andrews in Scotland. I joined the Department of Statistics at Auckland in 1999 as a postdoctoral fellow, and became a lecturer in 2001.

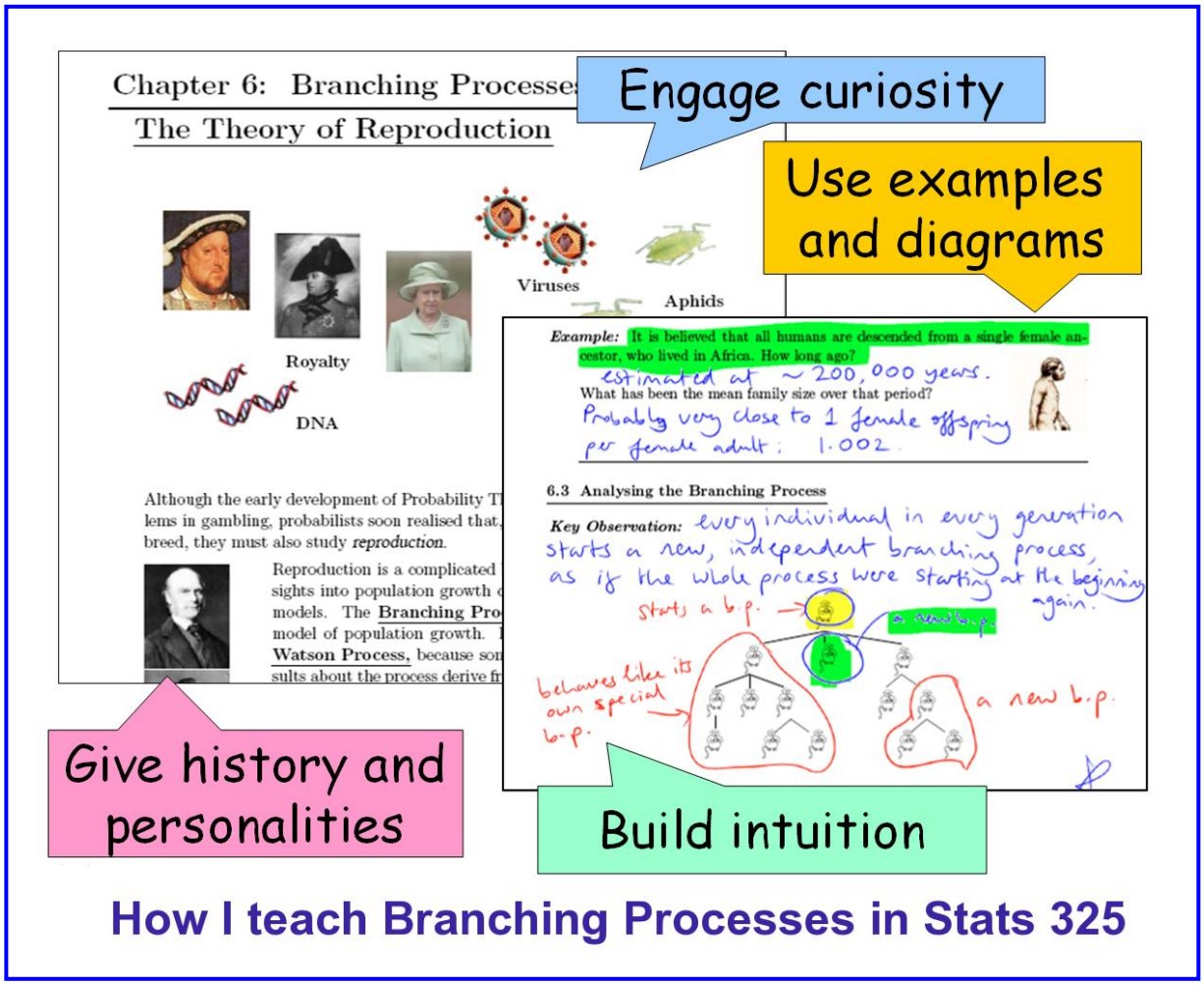
I began my teaching career with the Introductory Statistics team in 1999, and taught Stats 101 for three semesters to classes of about 200 students. I could not have had a better team of mentors than the Introductory Stats team. I emerged from Cambridge believing that 'good' teaching was nothing more than clear lecture notes: Theorem – Proof; Theorem – Proof. All else – motivation, insight, and application – was left to the student. I was initially astonished to see the learning resources produced by my Auckland colleagues. In a shock realisation, I grasped the fact that *their* methods would reach students, and *mine* wouldn't! I revised my teaching ideals completely, and adopted a philosophy of example-driven, lively lectures.

The Old…



How I learnt about Branching Processes in 1993

And the new…



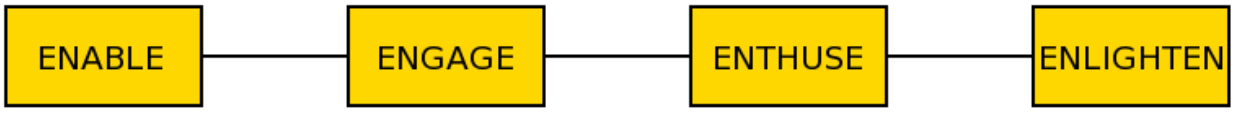
Since 2001, I have had sole responsibility for redesigning two undergraduate courses in mathematical statistics: Stats 210 (Statistical Theory), and Stats 325 (Stochastic Processes), and for the postgraduate course Stats 721, which shares lectures with Stats 325 and has additional coursework requirements. When I took over, both Stats 210 and Stats 325 were seen as formidable theoretical courses among the student body, which is largely drawn to applied areas. I have transformed both courses from ailing anachronisms into vibrant mainstream courses. Enrolments have increased 3-fold and 5-fold respectively, and student feedback is highly positive. For this work, I received a Faculty of Science Dean's Award for Excellence in Teaching in 2004, and the University of Auckland's inaugural Early Career Teaching Excellence Award in 2006.

I am also an active researcher, in the field of Statistical Ecology. Research keeps the subject fresh for me, and ensures that I am always in the role of learner as well as teacher. It also links the material I teach with real scientific investigation, and I bring relevant stories into the classroom whenever possible. One of the best aspects of

research-based teaching is the potential to grow-your-own colleagues, and I have gained three PhD students directly from my classroom interactions. One of these students (James Russell) won second place in the 2007 MacDiarmid Young Scientist of the Year Competition, and is about to start a fellowship at Berkeley. Another (Steven Miller) has just secured a lectureship at Waikato. The third student is in his second year of PhD study. He had a hard time when he started university in New Zealand, and his early undergraduate record was very poor. When he asked a question after class one day, I was sure I detected an unusual flair, and encouraged him into research. After two years as his supervisor I believe he is the most talented research student I've seen.

I have also been advisor to three further PhD students; one postdoctoral fellow; and twenty students on Honours, Masters, and summer research projects. I am on the editorial board of two statistics journals (*Biometrics* and *JABES*), and my research with New Zealand conservation applications has led to numerous outreach activities, communicating statistics to school teachers, school pupils, and the general public.

Classroom teaching remains one of my foremost passions, especially at the formative stages where students meet mathematical statistics for the first time. My Teaching Philosophy is four words long:



Behind each word is a lecture in itself.

Lecture 3: ENABLE – Relating to Students

The teacher's first role is to foster an environment in which learning is possible. Ultimately, I want students to emerge from my courses with their minds full of conceptual understanding of my material. However, currently going on in their minds are a range of other matters:

- **Confidence:** *Can I deal with this material? Should I tune out for self-defence?*
- **Engagement:** *Why am I here? What's this material doing for me? What time is it? What movies are on tonight?*
- **Social concerns:** *Do I fit into this class? Is this class a comfortable place to be? Is the lecturer on a plane of her own? Is it socially acceptable to join in?*

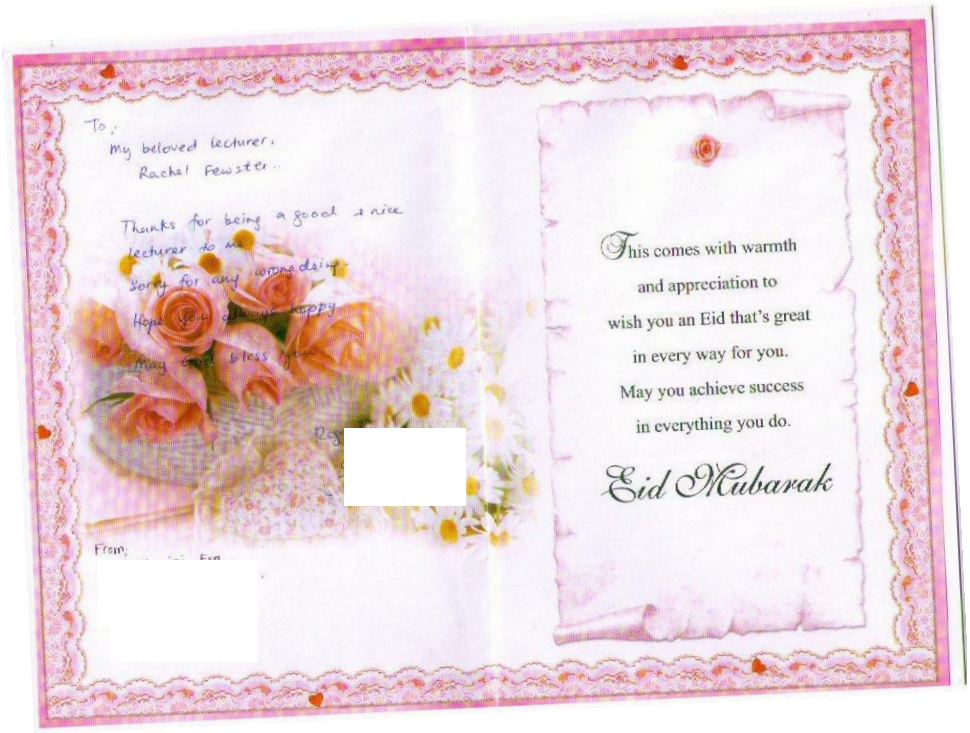
If I wish to build a landscape of concepts inside student minds, I must accommodate all the other things going on in those same minds at the same time. I have two major challenges in my classes: diversity in culture and diversity in mathematical aptitude. About 70% of my students are from Asian countries, themselves with a vast cultural diversity. A few of my students are specialist mathematicians, while many are math-phobes. From the very beginning, each and every student must feel included in the class community. How?

First of all, I learn all my students' names. This is a challenge in a class of 100 students with largely foreign names, but it is well worth the effort. I study photo-lists from the first lecture, and aim to learn all names within the first half of the semester. In a typical semester I will know about 150 students by name. The impact on student participation is emphatic.

But I'd better remember that my name looks funny too! Two Chinese students have furnished me with a better version, phonetically based but meaning *Auspicious Autumn.* This is fabulous – because the real meaning of my name *Rachel* in Hebrew is *Sheep.*

22nd July 2008
Hi, Rachel
I really like your chinese name which you showed us today in our lecture! I feel really well after the first lecture, you makes this course really interesting and easily to understand.
Hope you doing well!!
[student]

I actively seek out examples from Asian countries to use in class – recent examples include stories from Chinese and Malaysian folklore, as well as serious examples such as kidney stones in Chinese babies. I try to find out about special festivals, and the appropriate greetings to give in class. My Malaysian students were startled to be wished a happy Aidil Fitri, and warmly responded in kind:

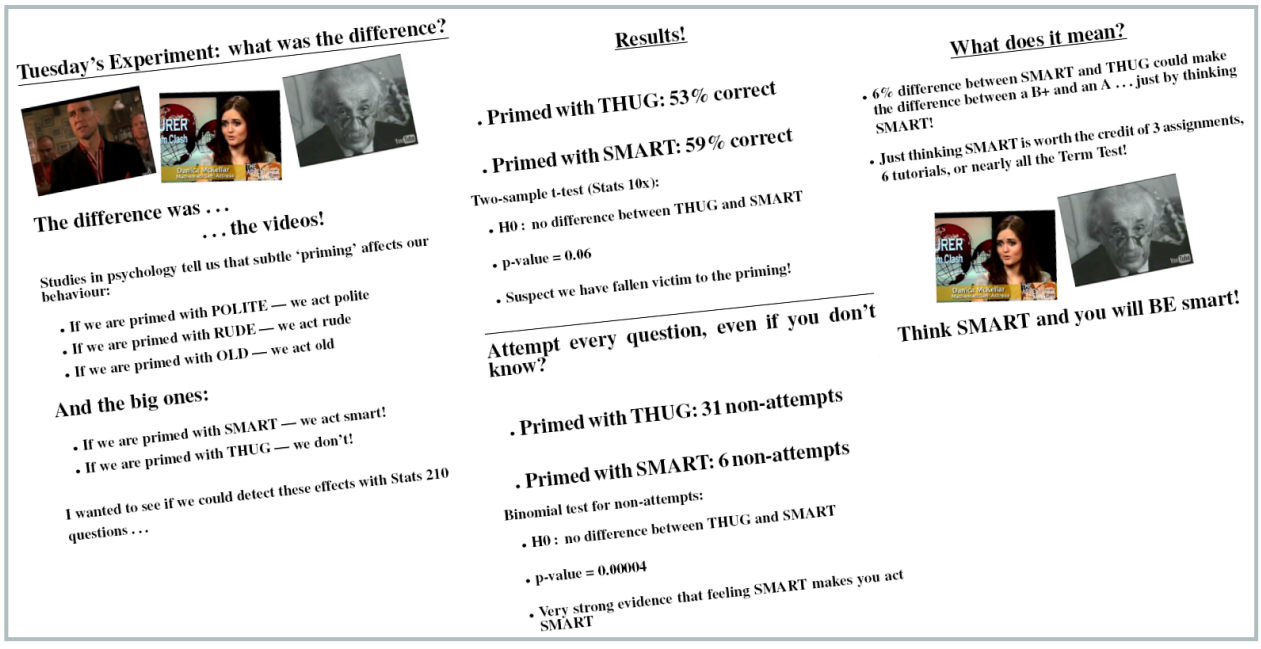


ENABLE – Growing Confidence

A major part of my job is to help students to develop confidence in their own abilities. A confident mindset makes the difference between success and failure, both in the classroom and beyond.

After years of trying to communicate to students the importance of a confident approach, and seeing little progress, I picked up an idea from Malcolm Gladwell's book *Blink*. Studies have shown that people 'primed' with opposite stereotypes – **Professor** and **Hooligan** – perform differently on general knowledge quizzes. People asked to think about professors before their quiz do significantly better than people asked to think about hooligans. Was this the way to convince my students that mindset *really does matter*...?

I designed a class experiment to see if I could demonstrate the same effect with my students – using quizzes on the course material. From the students' perspective, we were doing two quizzes and watched videos before each quiz simply to 'clear our minds'. One set of videos was from the Scottish movie *Soccer Hooligans*, the other set featured gifted children and Danica McKellar, illustrious actress and author of the book *'Math Doesn't Suck.'*



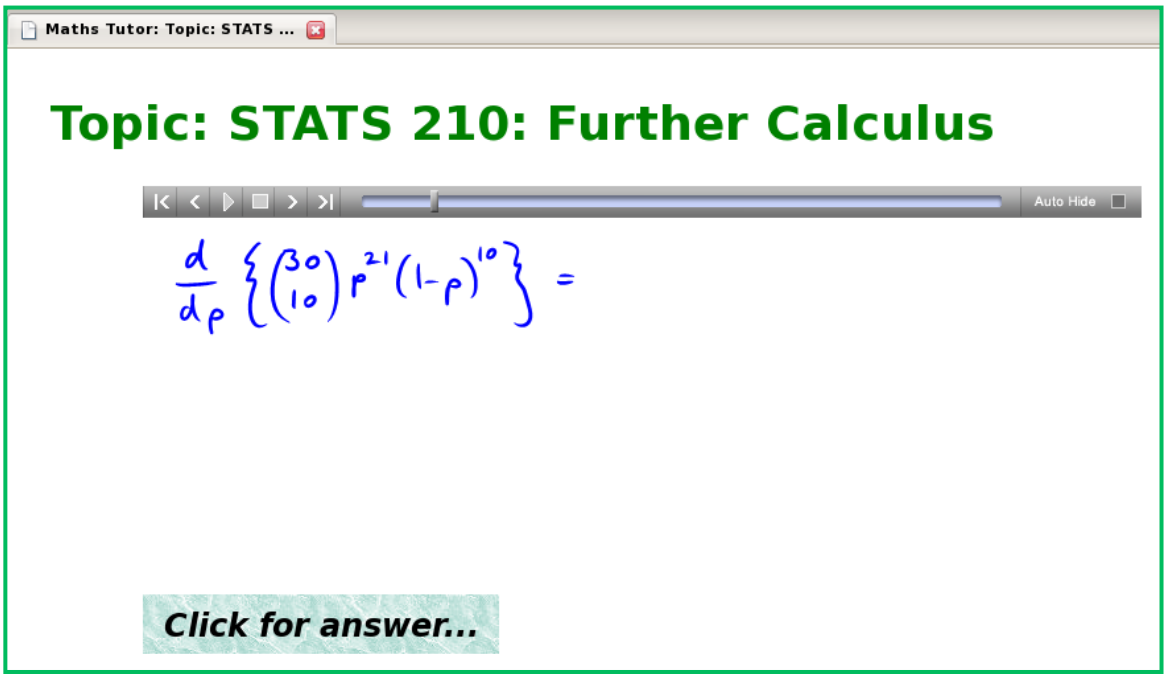
Doing this experiment for the first time was nerve-wracking – I had no idea whether it would demonstrate the point I wanted to make. But marking the results was extraordinary. After the 'Smarts' videos, student answers were careful and analytical, including extra working and diagrams drawn in the margins. After the 'Thugs' videos, the answers were sloppy, careless, and often missing. Students even noticed for

themselves their different feelings as they approached the two quizzes. The difference translated into a small, but significant, improvement in marks due to nothing more than 'thinking smart'.

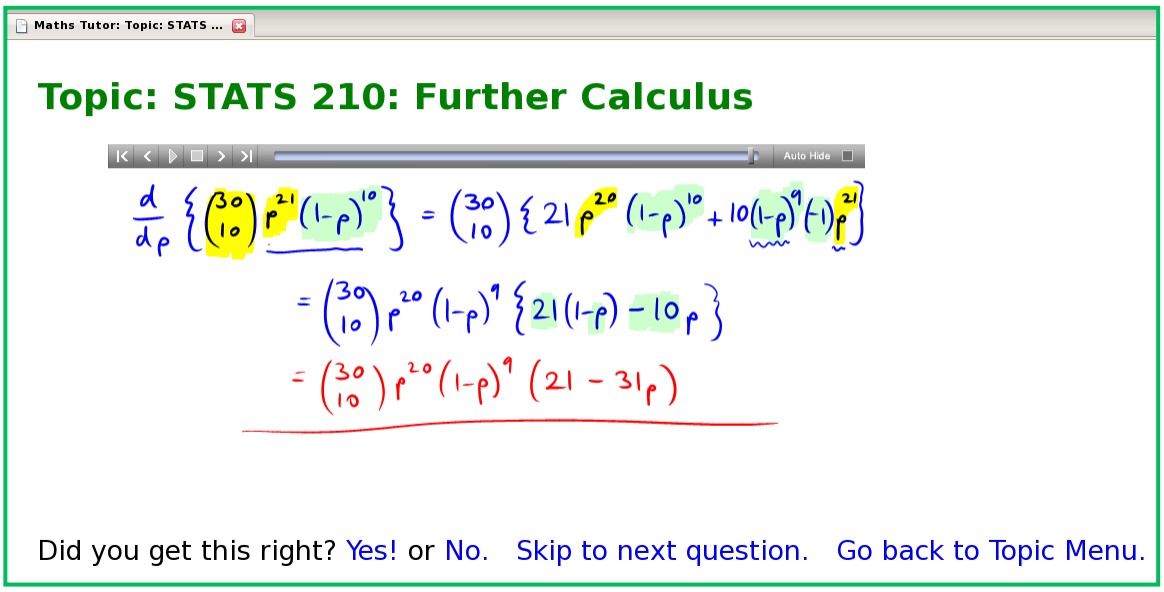
As statisticians, we then set about analysing the results. Thinking smart might make 6% difference today, but the positive feedback will snowball and you will be primed for much greater success in the future. Here at last is the hard evidence I need! The 'Smarts and Thugs Experiment' is now a permanent feature of the course. I also put the Smarts videos online so students can watch them just before the exam.

ENABLE – Maths Tutor

Many students in our department are hampered by weak maths, an issue that has been the despair of many a departmental meeting. Through my mathematical courses, I have taken a proactive role in addressing the problem. I believe the real issue is *rusty* maths. Within our degree structure it is quite possible for students to have a gap of a year or two between mathematical courses, and maths skills evaporate quickly. Targeted practice is needed, but within an engaging forum: students won't countenance endless exercises from text books. In 2008, I developed our online Maths Tutor, with the help of Webmaster Stephen Cope and colleagues. With their home computer and a pair of headphones, students listen and watch as exercises appear on the screen. My voice and writing appear in real time, talking them through the exercises. Practice is immediately relevant to the current assignment or test.



After attempting the exercise, students click to see and hear me working the answers myself. I spell out my thinking processes in constantly reinforced phrases or 'mantras':



It's more fun working with a friend, and a friend is what Maths Tutor aims to be. Feedback so far is great. Freedom from rusty-maths angst is not only a significant confidence boost for students, but also helps to clear brain-space for the really important concepts in the course.

To: fewster@stat.auckland.ac.nz
Subject: Feedback from Math Tutor
Date: Thu, 23 Oct 2008 19:14:49 +1300 (NZDT)
From: apache@stat.auckland.ac.nz (Apache)

For the session: http://www.stat.auckland.ac.nz/~kimihia/maths/admin.php?s=23798
Question: end

It's really helping!! Thank you so much!!

130.216.172.11 23/Oct/2008:19:14:49 2008-10-23 19:14:49

To: fewster@stat.auckland.ac.nz
Subject: Feedback from Math Tutor
Date: Fri, 3 Oct 2008 11:56:42 +1300 (NZDT)
From: apache@stat.auckland.ac.nz (Apache)

For the session: http://www.stat.auckland.ac.nz/~kimihia/maths/admin.php?s=82335
Question: end

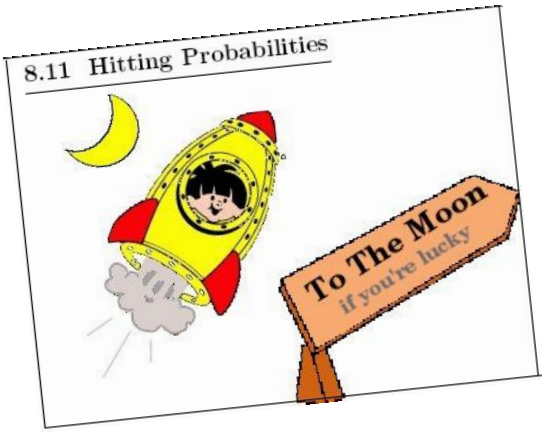
Brilliant revision

203.211.124.5 03/Oct/2008:11:56:42 2008-10-03 11:56:42

Maths Tutor, together with in-class lecture recordings and other teaching resources, are linked from my website at www.stat.auckland.ac.nz/~fewster.

Lecture 4: ENGAGE – Curriculum Design

Engaging students with the subject matter is a task with many layers. In the top layer, coursebooks should look and feel attractive, with colour, pictures, cartoons, and informal wording. These devices stimulate *curiosity*, making students want to see how a comical picture relates to the subject matter.



In the next layer, a carefully chosen progression of examples provides motivation, intrigue, and immediacy for the student.

At the most fundamental level is *what* we teach, with what emphasis, and in what order. The discipline of Statistics has burgeoned through the computer age, and subject matter priorities have changed accordingly. I have refocused and redeveloped both of my undergraduate courses – especially Stats 210, which I have redesigned completely.

My focus in course design is *conceptual understanding*. For Stats 210, I isolated two fundamental concepts: likelihood and hypothesis tests. The previous content laid the mathematical groundwork for studying these in later courses – but I want students to reap *immediate* benefits from their studies. I redesigned the course to make these two concepts central: students first meet them in simple, structured contexts, then the same ideas reappear until the contexts are elaborate, deep, and open-ended. This approach paves the way for deeper understanding in other courses, and makes it clear *why* we are bothering with the difficult mathematical tools.

The result is not entirely conventional – for example, my students meet the advanced concept of likelihood before the basic concept of mean/average – but ideas appear only when they can be properly motivated.

My lecture notes are open to the world via the course webpages, and I have received several emails from academics overseas who have browsed their way to my notes.

Subject: Theorem of the Day: the Total Probability Theorem
From:
Date: Fri, November 21, 2008 11:27 am
To: r.fewster@auckland.ac.nz
Priority: Normal
Options: View Full Header | View Printable Version

Dear Dr Fewster,
I've prepared a 1-page description of the Total Probability Theorem
for inclusion in my website
I've illustrated it with the deuce rule analysis and I chose your fine
lectures notes (from <http://www.stat.auckland.ac.nz/~stats325/>)
as my recommended web link because they were the nicest I could find.

I thought I would let you know before I posted the theorem. And
besides, it occurred to me you might be prepared to take a quick look
at the page and say if you were to spot any inaccuracies or possible
improvements. I attach the draft in case you have time...

Yours

Faculty of Business, Computing and Information Systems
London South Bank University, London SE1A 0AA
,

F:
T:

Subject: your notes
From:
Date: Tue, August 12, 2008 5:43 pm
To: r.fewster@auckland.ac.nz
Priority: Normal
Options: View Full Header | View Printable Version

Dear Rachel,

Let me introduce myself. I am an economist by
training, with a new-found interest in picking up statistical tools.

I have had the delight of reading your notes on math stats. Right
now I'm in the midst of your notes on stochastic processes, and I
must confess that I am no less amazed by your keen ability to convey
ideas in an interesting and 'real' manner. Your notes are a treat to
read, and I must ask you to notify me of any new material you
develop. I think I'm quite of fan of your tantalizing pedagogical
methods.

Regards,

Senior Research Fellow
Malaysian Institute of Economic Research
Kuala Lumpur

Download this as a file

Lecture 5: ENTHUSE – The Role of Assessment

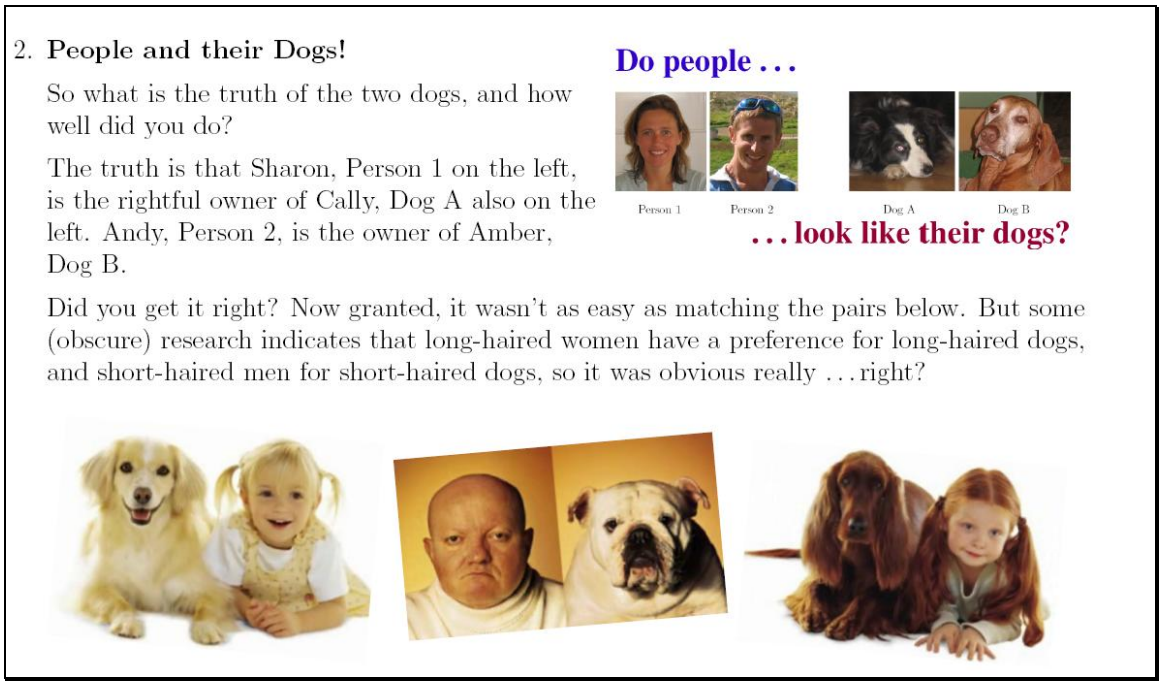
It is one thing to be engaged, entertained, and convinced by course materials provided, but if you really want to develop a passion for something – anything – you will have to try it for yourself.

The traditional modes of assessment open a world of opportunities for getting students to learn, understand, explore, and develop instinct for the subject matter. An assignment or tutorial is the student's first real interface with the material, so it is essential to use it as the vehicle for enthusiasm.

Assignments should be fun and interesting, and clearly relevant to the key concepts in the course. They should provide encouragement and reward – attainable targets and positive feedback. It should be clear to the student that they have *advanced* in some way – often students will not notice their own progress until the teacher points it out to them.

I try to make my assignments interactive and adventure-packed, blending comic fictional examples with immediate real-life examples, and creating an atmosphere of fun by pitting myself against the students. *Will I be able to catch you cheating? Can you spot the liar? Guess which dog belongs to which of my friends?*

Here are some screenshots of my assignment questions. In a teaching semester, I produce 12 assignments in this vein for Stats 210, 325, and 721.



2. **People and their Dogs!**

So what is the truth of the two dogs, and how well did you do?

The truth is that Sharon, Person 1 on the left, is the rightful owner of Cally, Dog A also on the left. Andy, Person 2, is the owner of Amber, Dog B.

Did you get it right? Now granted, it wasn't as easy as matching the pairs below. But some (obscure) research indicates that long-haired women have a preference for long-haired dogs, and short-haired men for short-haired dogs, so it was obvious really . . . right?

Interview 1:

Interviewer: *So, Sir Robin, what's your favourite film?*
Sir Robin: Gone With The Wind.
Interviewer: *And why's that?*
Sir Robin: *Oh, it's, it, it's a classic. Great characters; great film star — Clark Gable; a great actress — Vivien Leigh. Very moving.*
Interviewer: *And who's your favourite character in it?*
Sir Robin: *Oh, Gable.*
Interviewer: *And how many times have you seen it?*
Sir Robin: *Um . . .* (pause) *I think about half a dozen.*
Interviewer: *And when was the first time that you saw it?*
Sir Robin: *When it first came out. I think that it was in 1939.*

One is a lie, the other is the truth. Which is which?

Interview 2:

Interviewer: *So, Sir Robin, what's your favourite film?*
Sir Robin: Some Like It Hot.
Interviewer: *And why do you like that?*
Sir Robin: *Oh, because it gets funnier every time I see it. There are all sorts of bits in it that I love. And I like them more every time I see it.*
Interviewer: *Who's your favourite character in it?*
Sir Robin: *Oh, Tony Curtis, I think. He's so pretty . . .* (short pause) *and he's so witty, and he mimics Cary Grant so well and he's very funny the way he tries to resist being seduced by Marilyn Monroe.*
Interviewer: *And when was the first time that you saw it?*
Sir Robin: *I think when it came out, and I forget when that was.*

Example from Richard Wiseman's book 'Quirkology'

Answer: Interview 1 is the lie. People are not much better than random at guessing this.

As the course proceeds, I use assignments to blend simple questions on new material with more searching questions on material from previous assignments. As the material becomes consolidated, I set open-ended questions where the student has to *explore* for themselves and any well-justified answers are acceptable. I don't tell students what technique they need to use to solve a problem – they must work it out for themselves. I learnt this the hard way, after marking an exam in which everyone knew *how* to use a particular technique but nobody knew *when* to! I am now pleased that nearly all my students can identify appropriate techniques to use even when the context of the exam question is quite unfamiliar.

Each semester I provide over 50 hours of one-on-one assistance to help students with assignment work, striving always to be friendly and patient.

She is very good at guiding students in the right direction, letting students work the solution out themselves instead of just telling students the answer. I ended up not only knowing how to do the assignments, but also felt like I gained a deeper understanding of the material.
– Stats 325 student, 2008

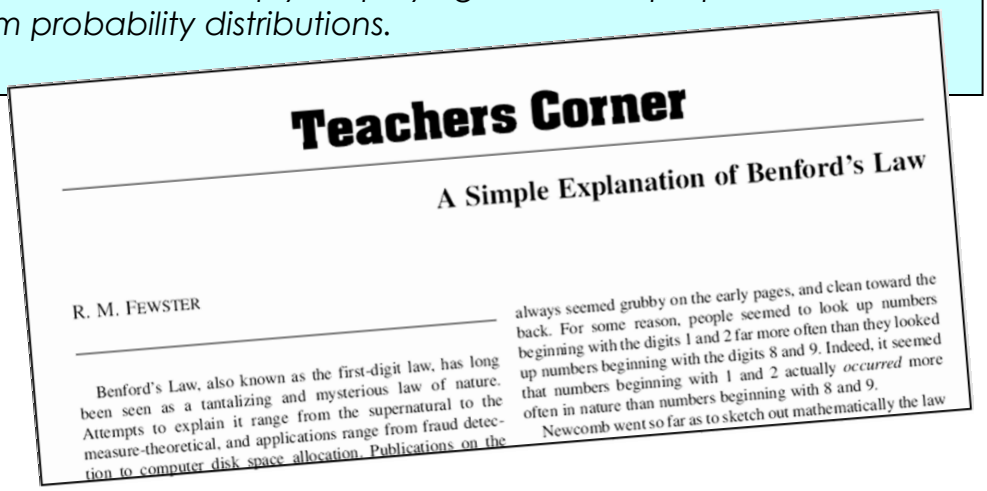
The conceptual focus of my courses means that they can be examined at many levels of understanding, from ability to do questions in structured and familiar contexts, to understanding how the same principles apply in completely new settings. All my exams have a publicised mix of easy, moderate, and hard questions, and I have developed numerous mock exams with worked solutions so that students are completely prepared for the length, style, and difficulty mix on the exam. Every exam includes questions that are easy and predictable, advanced but familiar, and entirely unfamiliar but readily tackled if the student's understanding of the concepts is excellent.

Overall, I try to enthuse students through *their own progress* and by real-world immediacy and fun in assessment tasks. The approach seems to appeal to most students, including the brightest and the mainstream. There is always more work to be done, though, and after much effort redeveloping my courses to suit the mainstream student, my next major goal is to work on extending and challenging the very top students.

Lecture 6: ENLIGHTEN – Bringing it to Life

I believe I am a creative communicator of concepts. Some evidence of this is provided by my recent publication in *The American Statistician:* A simple explanation of Benford's Law (volume *63, 26–32, February 2009.*) Benford's Law is a mysterious phenomenon claiming that numbers, in general, are more likely to begin with the digit 1 than any other digit. (Look at population or area figures in any atlas and see for yourself!) It's exactly the sort of attention-grabbing example that I like to use in teaching – and by analysing how best to teach it, I was able to see a simple explanation for the mystery that appeared not to have been seen before.

Referee (Comments to the author):
The author conceives a beautiful and easy to follow explanation of the famous Benford's law while simply employing arithmetic proportions and basic tools from probability distributions.



Teachers Corner

A Simple Explanation of Benford's Law

R. M. FEWSTER

Benford's Law, also known as the first-digit law, has long been seen as a tantalizing and mysterious law of nature. Attempts to explain it range from the supernatural to the measure-theoretical, and applications range from fraud detection to computer disk space allocation. Publications on the

always seemed grubby on the early pages, and clean toward the back. For some reason, people seemed to look up numbers beginning with the digits 1 and 2 far more often than they looked up numbers beginning with the digits 8 and 9. Indeed, it seemed that numbers beginning with 1 and 2 actually *occurred* more often in nature than numbers beginning with 8 and 9.

Newcomb went so far as to sketch out mathematically the law

Less than a month since publication, Professor Stan Wagon, author of acclaimed book *Mathematica in Action*, has adapted my explanation into a section of the upcoming edition of his book.

From: *Stan Wagon*
I can only repeat how much better I feel for having some understanding of this (why Benford works).

I bring this same creativity and curiosity to bear with all my teaching. I aim for students to finish my courses with a rich conceptual landscape in which the material comes to life in their minds. When I deliver material in lectures, I am always attempting to experience it for the first time through the eyes of my students. I aim to create the outline of the conceptual landscape, and inspire students to delve into it themselves through problems that I provide. Only by exploring the landscape independently will students be able to develop a deep understanding. My role as a teacher is to make them *want* to do so!

Lecture 7: Does it work? Evaluations

Students say what they think, and they vote with their feet – so evaluation surveys and enrolment increases give evidence of teaching effectiveness from the student perspective. Peer review from colleagues gives a further perspective.

Evaluation Surveys

I have taught thirteen undergraduate courses since 2001, each assessed with a university-run lecturer evaluation survey. I believe that evaluation surveys are a *good*, although not *complete*, assessment of teaching effectiveness. I don't believe that scores can be increased by easy course material or lenient grading. Students want to gain something from a course and don't want to feel short-changed, and they want their assessment to be fair, not shallow.

> *Her lectures are interesting, her material infinitely better than textbooks and her assessments are a fair measurement of student learning and effort.*
> ***Stats 210 student, 2008***

The Table shows class responses for the three survey questions I consider most important: lecturer enthusiasm, student interest, and overall effectiveness. The numbers are out of 10, and summarise student responses over the categories *Strongly Agree* to *Strongly Disagree*. A score of 9.0 means that at least 60% of students have responded with *Strongly Agree*, while 9.4 means at least 75% *Strongly Agree*.

A score of 9 or above is a high target to aim for, but I care about it because it is a good indicator of the 'critical mass' that is so important to class dynamics. If a clear majority of the class are exhibiting a strongly positive reaction to the material, then we have succeeded in creating an environment in which learning is supported and even popular. *Is it socially acceptable to join in?* – Yes!

Over the years, I have used evaluation surveys to identify areas for improvement. I've been encouraged that my enthusiasm and overall effectiveness have been on track, but *Interest* was lagging behind. *Interest* is fundamental to drawing students to the subject and fostering deep understanding, so I wanted to do better. I believe the key to interest is in choice of examples, especially on assignments, and I have invested much effort in designing examples that are immediate and interactive to students. I believe this is behind the steady rise in *Interest* scores. It is a job never finished, and when next year's students arrive with their own unique zeitgeist, it will be time to look for a whole new suite of fascinating examples of mathematical statistics in their daily lives.

Course	Year	Enrolments	Enthusiasm	Interest	Overall
210	S1 2001	30	9.35	7.83	8.98
210	S1 2002	55	9.41	8.48	9.46
210	S2 2002	67	9.63	8.85	9.47
210	S1 2003	67	9.57	8.27	9.75
210	S2 2004	72	9.46	8.09	9.40
210	S2 2005	82	9.67	8.75	9.28
210	S2 2006	70	9.90	9.38	9.90
210	S2 2008	101	9.57	9.22	9.51
325	S2 2003	63	9.56	8.62	9.74
325	S2 2004	44	9.80	8.26	9.03
325	S2 2005	82	9.40	8.29	9.40
325	S2 2006	66	9.26	8.60	9.12
325	S2 2008	43	9.56	9.26	9.71

Table: Mean evaluation scores for all courses taught since 2001. Scores give the average class response (out of 10) to the following questions:

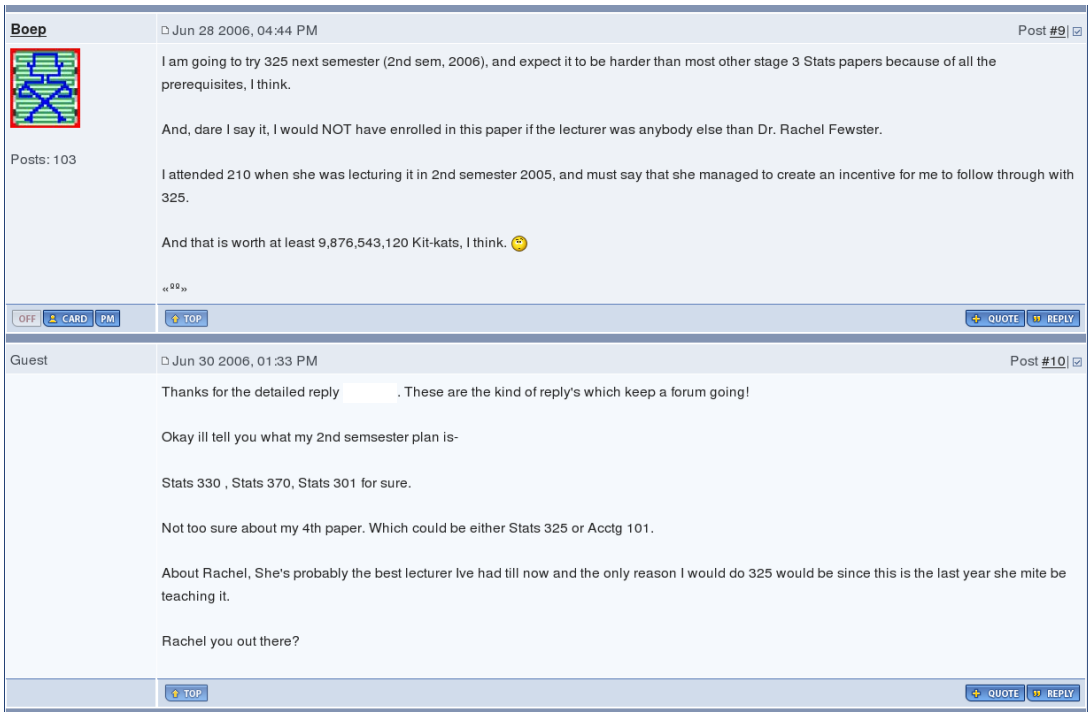
Enthusiasm: The lecturer was enthusiastic about the subject.
Interest: The lecturer stimulated my interest in the subject.
Overall: Overall, the lecturer was an effective teacher.

Enrolment Increases

When I first began teaching Stats 210, the enrolment had been steady at about 30 students per semester. Over three semesters from 2002 to 2003, I was the only lecturer teaching the course. During this time, I revised the course material and produced my first coursebook. Enrolments doubled to about 70 students per semester. In 2005 I completely redesigned the course, and produced a new coursebook. By 2006, enrolments were high enough for the department to institute Stats 210 as a requirement for the statistics major. This has had an important impact throughout the statistics programme, because it means that all majoring students now have a grasp of basic theory.

I began teaching Stats 325 in 2003. The previous year, only 13 students were enrolled. In my first 325 class, enrolments were 63, including 8 enrolled in the postgraduate option. The class size had increased almost five-fold from the previous

year. It now oscillates between about 40 and 80 students per year, ranking at moderate to large compared with other Stage 3 courses in the department.



Boep — Jun 28 2006, 04:44 PM — Post #9

Posts: 103

I am going to try 325 next semester (2nd sem, 2006), and expect it to be harder than most other stage 3 Stats papers because of all the prerequisites, I think.

And, dare I say it, I would NOT have enrolled in this paper if the lecturer was anybody else than Dr. Rachel Fewster.

I attended 210 when she was lecturing it in 2nd semester 2005, and must say that she managed to create an incentive for me to follow through with 325.

And that is worth at least 9,876,543,120 Kit-kats, I think.

OFF CARD PM TOP QUOTE REPLY

Guest — Jun 30 2006, 01:33 PM — Post #10

Thanks for the detailed reply . These are the kind of reply's which keep a forum going!

Okay ill tell you what my 2nd semsester plan is-

Stats 330 , Stats 370, Stats 301 for sure.

Not too sure about my 4th paper. Which could be either Stats 325 or Acctg 101.

About Rachel, She's probably the best lecturer Ive had till now and the only reason I would do 325 would be since this is the last year she mite be teaching it.

Rachel you out there?

TOP QUOTE REPLY

Screenshot from the Student Forum

Peer Review

The following statement is from [name removed] of the Introductory Statistics Team which won a National Tertiary Teaching Excellence Award in 2003:

I have also had the opportunity to observe Rachel lecture to a Stage II class. I have never seen anyone present theoretical concepts so concisely and clearly. Rachel exhibited these same skills with the [secondary school] teachers. In a few brief minutes, with a teaching prop consisting of a bread roll and a drinking straw she was able to connect with her audience and successfully convey the fundamentals of the arcane multivariate technique of principal component analysis.

From [name removed, Department of Statistics]:

The effectiveness of Rachel's teaching results from her creative and imaginative approach to presenting material, the meticulous preparation that she puts into her courses, and, finally, the real rapport that she builds with students. She has put a phenomenal amount of creative energy and sheer hard work into these courses.

Rachel has been extraordinarily generous in sharing her materials and teaching practice. […]Rachel has a beautifully and carefully crafted set of course notes, as well as other materials such as tutorial and assignment questions and extension exercises. Her novel assignments, year after year, continue to astonish me with their inventiveness, and always test the students' ability to both do the mathematics, and think critically about building models.

[…]In all my experience I have not seen a teacher to compare with Rachel Fewster, and her uniquely fresh mix of originality, dedication and infectious enthusiasm.

From [name removed], teacher educator and researcher in Mathematics Education:

Rachel does the two things that set great teachers apart: she takes an interest in her students and inspires them to take an interest in the subject.[…] In my class were two students who had studied with her as undergraduates. Their contributions in class showed that their understanding of statistics was deep and relational. I knew she cared about them because she would often ask me about their progress.

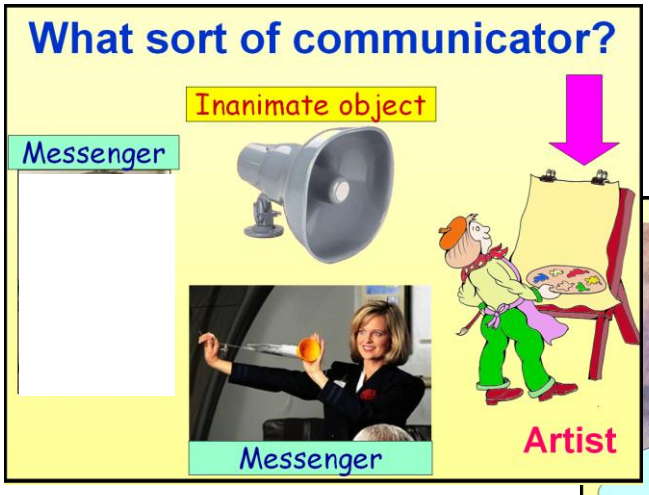
I have watched Rachel teach secondary mathematics and statistics teachers in a variety of forums. … To each of these presentations she brought a rare mixture of insight, statistical expertise, humour, technical know-how, consideration of the audience and a sense of being in the presence of someone who knew what they were thinking at the same time as being aware of how you might be thinking. …Perhaps the most important aspect of Rachel's pedagogy is her ability to use the input of her audience in the thinking process and to make the participants feel valued.

Lecture 8: Leadership and Outreach

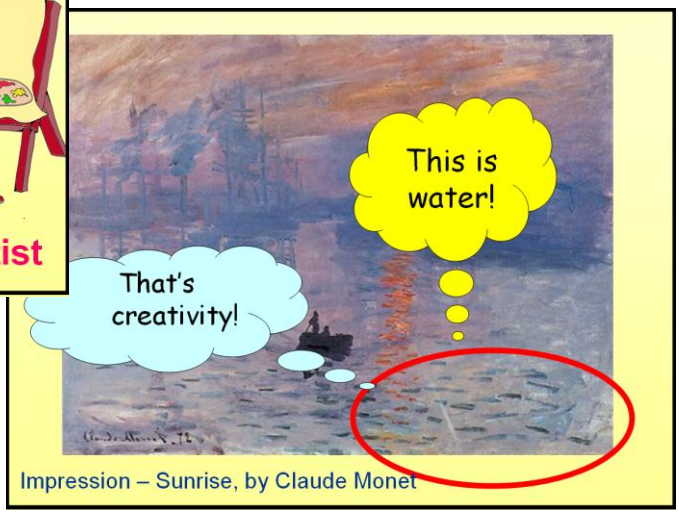
Since gaining a university teaching award in 2006, I have worked with the University's Centre for Academic Development to disseminate my teaching experiences. Activities include recording a video clip for the centre's website, membership of the colleague mentorship scheme, guest panellist at class sessions of the centre's Postgraduate Certificate in Academic Practice, and speaking several times at the biannual Introduction to University Teaching and Learning course for new academic staff. This includes taking the 90-minute lecture and discussion session *Teaching Large Classes*.

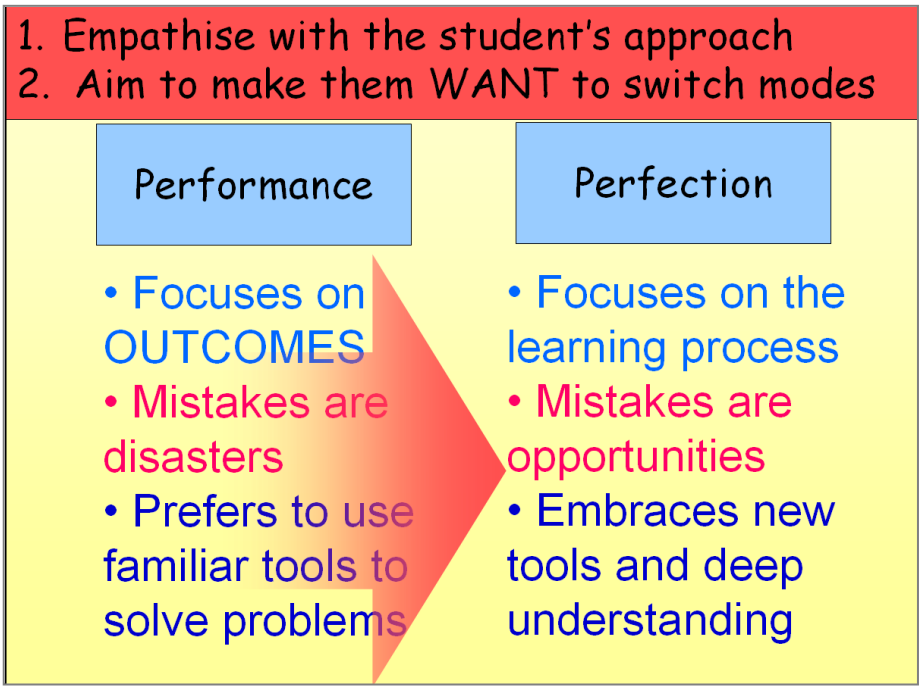
> ***From: [name removed]***
> *I enjoyed your presentation as ever, and thought you conveyed the energy and inventiveness needed in university classrooms. In particular, the clapping tactic for that boring lecture was talked about over the next few days with much enjoyment.*
> ***From: [name removed]***
> *You have been an inspirational contributor to our work with UoA staff in recent years, and I hope you will be able to help out again.*

Many academics focus primarily on their research, so I aim to show that teaching is like research: an outlet for creativity. Unlike air hostesses, we don't just stand at the front and mime. We are *artists*: discerning the *essence* of the subject matter, creating a balance between concept and detail, and recreating it in a form fit for everyone. Teaching, like research, is a way of *doing something creative with our subject*, and that is why I enjoy it so much.



Monet creates a balance between concept and detail, communicating 'water' in a few masterful succinct brushstrokes





Teaching in the Community

Since 2004, I have led the Marsden-funded *Rodent Invasion Project*, managing a team of fieldworkers and research students to investigate how rats invade sanctuary islands. Using genetics, we have turned up some fascinating facts about the swimming activities of rats around the country. Because the topic is so relevant to conservation in New Zealand, I have been involved in numerous outreach activities, communicating statistical genetics to diverse audiences.

I have spoken about a dozen times to community groups about our work in the Bay of Islands and Great Barrier Island. This includes presenting at a hui to gain iwi consent for a major eradication in the Bay of Islands, and guest speaker at the opening meeting of the community group Guardians of the Bay of Islands. Our results have been reported in the media on many occasions, including the *New Zealand Herald*, *The Dominion Post*, *New Zealand Geographic*, and National Radio.

While the science for this project has been fascinating, the greatest benefit has undoubtedly been in public relations. People love to hear scientists taking a special interest in their local patch. Being an impartial outsider, I am also divorced from any historical tensions between different community factions. The public can simply sit back and enjoy the statistics. I do believe that we have made a real difference in gaining public support for rodent eradication programmes, in the interests of restoring islands for native New Zealand wildlife.

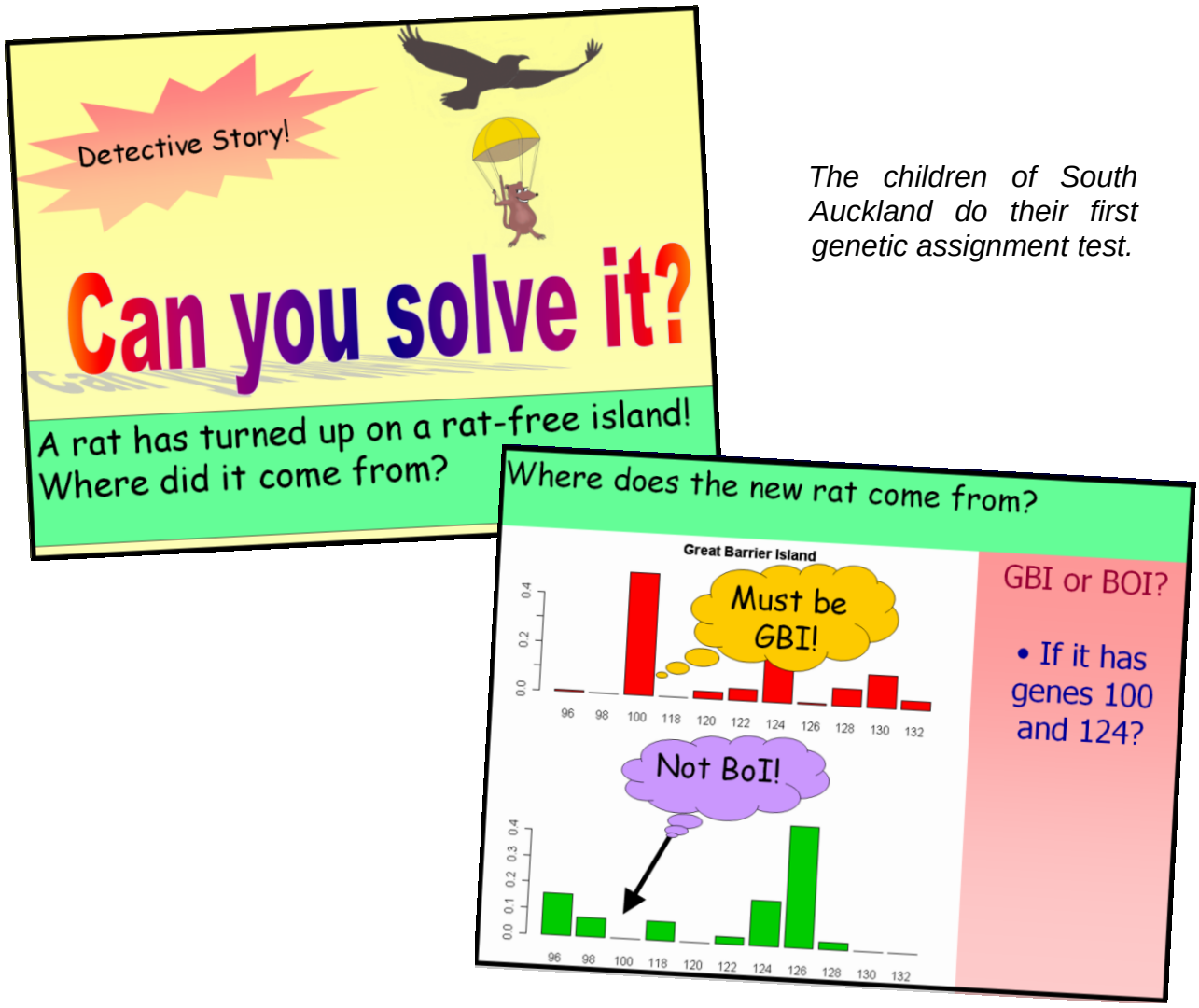
February 10th, 2007
From: [name removed] Guardians of the Bay of Islands
…We appreciate that on a number of occasions you have travelled to the Bay of Islands, in your own time and at your own expense, to present scientific information to the community in an informative and witty manner. In many cases, your presentations have been instrumental in obtaining local hapu and community support for the restoration project.

Rats make a great conversation topic, and after talking about them to secondary teachers at my department's annual *Statistics Teachers' Day,* the teachers drew me into a host of other activities. This includes five invited lectures at teacher workshops and conferences, and two working groups for teaching probability and curriculum development. I am currently running my second course in Judy Paterson's Community for Mathematical Content in Teaching. Each course is an 8-hour evening class aimed at inducting teachers into research processes, showing how the material they teach at school is used in active scientific investigation.

From: [evening class student]
This course last night was really interesting and I commend Rachel on her style of delivery and her enthusiasm for the subject which was so evident. The time seemed to go so fast last night and I am really looking forward to the next one.

From: [evening class student]
Thanks so much for the last four weeks. I have found it really stimulating to be reminded of why I enjoyed studying Stats so much – the relevance, practical application etc.

Never one to miss an opportunity to convert youngsters to statistics, I have happily accepted invitations to take my presentation *Rats and Stats* to school pupils, ranging from a small group of interested students at ACG Senior College, to 200 pupils at a decile 1 school in South Auckland. The latter was an eye-opener – it was great fun, but easy to see what massive hurdles are to be overcome by students wishing to learn against a very boisterous background.



The children of South Auckland do their first genetic assignment test.

Finally, over many years I have maintained a strong interest in the career development of my own students, past and present. By getting to know students in my classes, I have forged many ongoing relationships. My address book is now a rich source of advice on career paths in statistics, and I am often able to use the advice of a past student to help a current student. I have frequently gone the extra mile to help students with applications or bureaucratic hurdles. I am delighted to have played a small part in the success of Robyn Scott […]. From there she made her own success, including her book *Twenty Chickens for a Saddle*, selected last year for serialisation as Book of the Week by BBC's Radio 4.

In 2007 I was contacted by a former student working in Risk Management for Westpac. His group was having recruitment difficulties, and he wondered if I could circulate an advert to our graduate students. After some discussion, we decided to arrange an evening presentation. We would provide the captive audience, Westpac would provide internships for our students – further requiring that Stage 3 students should return to our department for a year of postgraduate study. I advertised the

event intensely, and everyone (especially Westpac) was astonished when 100 students turned up. Within a week they had 35 qualified applicants for their positions: they had never before had more than five. The result since 2007 has been several appointments and internships for our students, and joint research supervision. For myself, as the global financial crisis gathers pace at the start of 2009, I can sit back safe in the knowledge that I have six former students in my address book who are experts in financial risk management.

From: [name removed] Risk Management, Westpac
During 2007 the Risk Analytics team in Westpac commenced a successful partnership with the Auckland University Statistics Department. Our objective was to present to statistics students employment opportunities in Banking specifically Risk analytics. Our liaison at the university was Rachel Fewster.

We had a high level concept that we presented to the University that Rachel assisted in shaping to make it more attractive to the audience. The result was that we took on two extremely talented students for the summer of 2008.

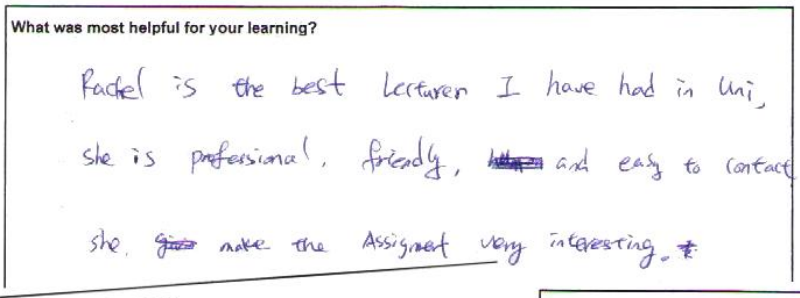
The success of this initial programme meant that we created a new graduate programme during 2009/10 year employing 2 graduates across analytical areas with the bank. A great outcome driven by the promotion of students by Rachel that has forged an ongoing relationship in the business community.

Lecture 9: Back to the Future

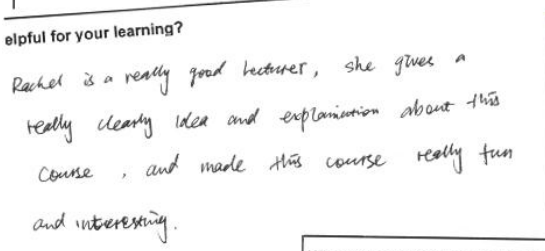
As teachers, we thrive on talking about teaching. Every teacher has insights and experiences to contribute. Every time I have written or read a teaching portfolio such as this one, I emerge from the experience energised by the things that have worked, and with a clear vision of the scope for improvement that still remains. Each time, I have been fired with ideas about how I can improve for the next semester. My hope is that this document captures something of this spirit of discovery, and that my experiences will inspire others just as others have inspired me.

Above all, this portfolio is a tribute to the mentorship of my colleagues. They have written selflessly about my teaching, never making mention of the innumerable times that they have been the ones providing support, ideas, inspiration, and wise words. Teaching is a selfless activity – in some ways, the better we do it, the less evident it is that we are doing anything at all. Our aim is for students to make the subject their own, not to keep it for ourselves! By my colleagues' selfless support of my teaching development, they have shown themselves to be the great teachers and mentors that they are. Ten years since I first arrived in Auckland, I find myself thinking a familiar thought: I want to be like them! It is my hope that I will be able to support others in the pursuit of tertiary teaching excellence as selflessly as my colleagues have supported me. And my first and most important piece of advice is to enjoy it.

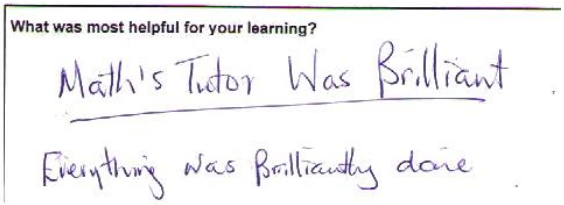
Evaluation comments from Stats 210, 2008


What was most helpful for your learning?

Rachel is the best Lecturer I have had in Uni, she is professional, friendly, [redacted] and easy to contact she ~~give~~ make the Assignment very interesting. ☆

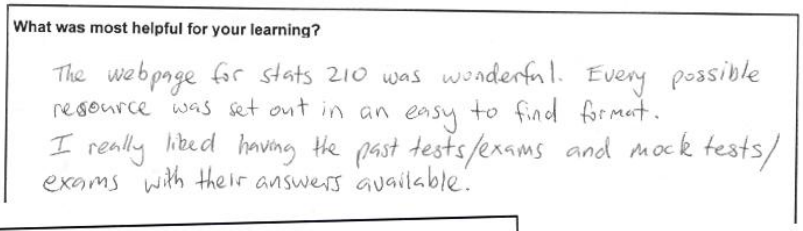

elpful for your learning?

Rachel is a really good lecturer, she gives a really clearly idea and explanation about this course, and made this course really fun and interesting.

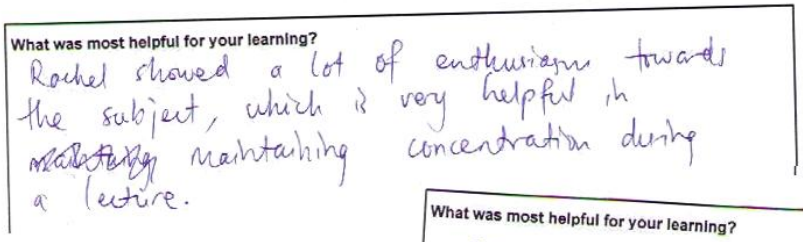

What was most helpful for your learning?

Math's Tutor Was Brilliant

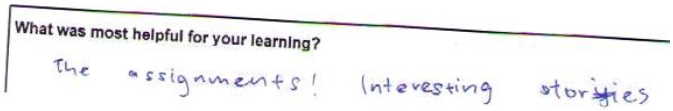
Everything was Brilliantly done


What was most helpful for your learning?

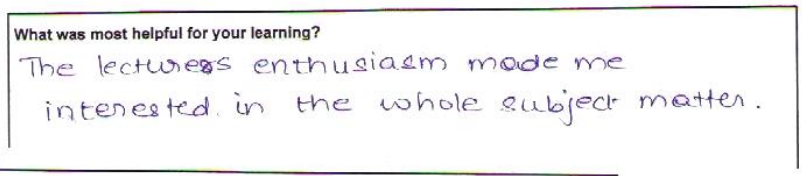
The webpage for stats 210 was wonderful. Every possible resource was set out in an easy to find format.
I really liked having the past tests/exams and mock tests/ exams with their answers available.


What was most helpful for your learning?

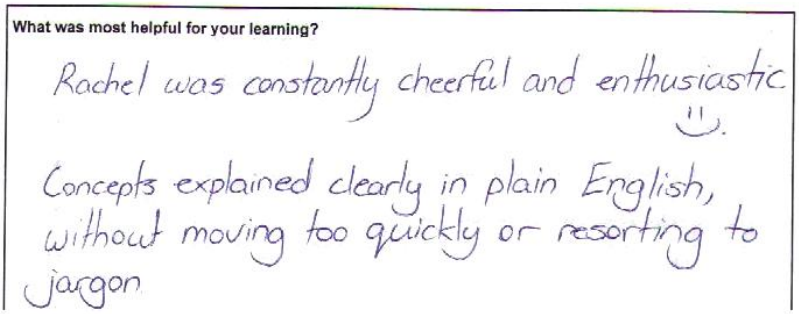
Rachel showed a lot of enthusiasm towards the subject, which is very helpful in ~~maintaining~~ maintaining concentration during a lecture.


What was most helpful for your learning?

The assignments! Interesting ~~stories~~


What was most helpful for your learning?

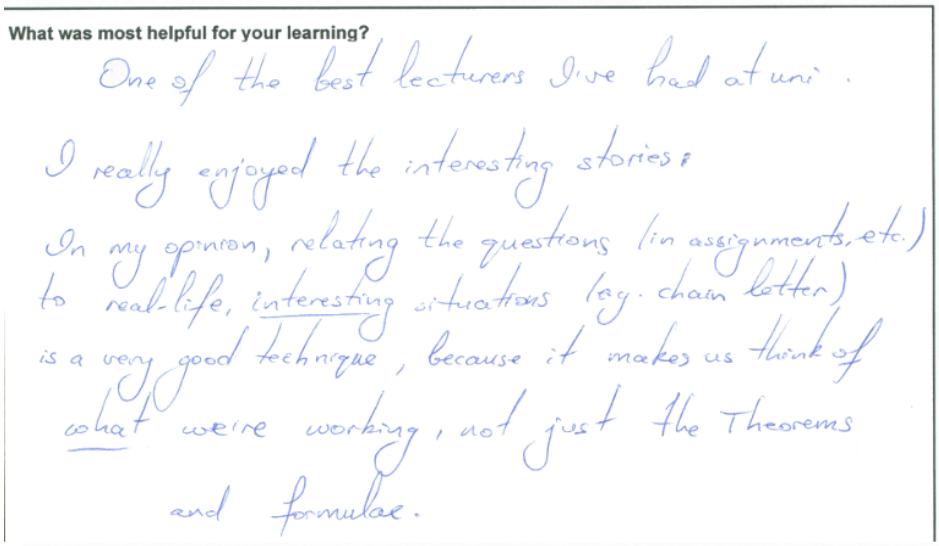
The lecturers enthusiasm made me interested in the whole subject matter.


What was most helpful for your learning?

Rachel was constantly cheerful and enthusiastic :).

Concepts explained clearly in plain English, without moving too quickly or resorting to jargon

Evaluation comments from Stats 325, 2005

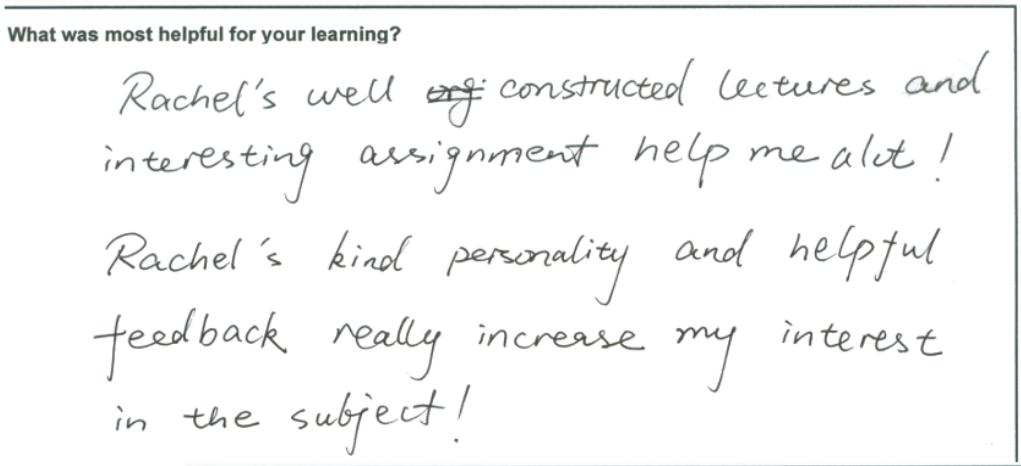


What was most helpful for your learning?

One of the best lecturers I've had at uni.

I really enjoyed the interesting stories.

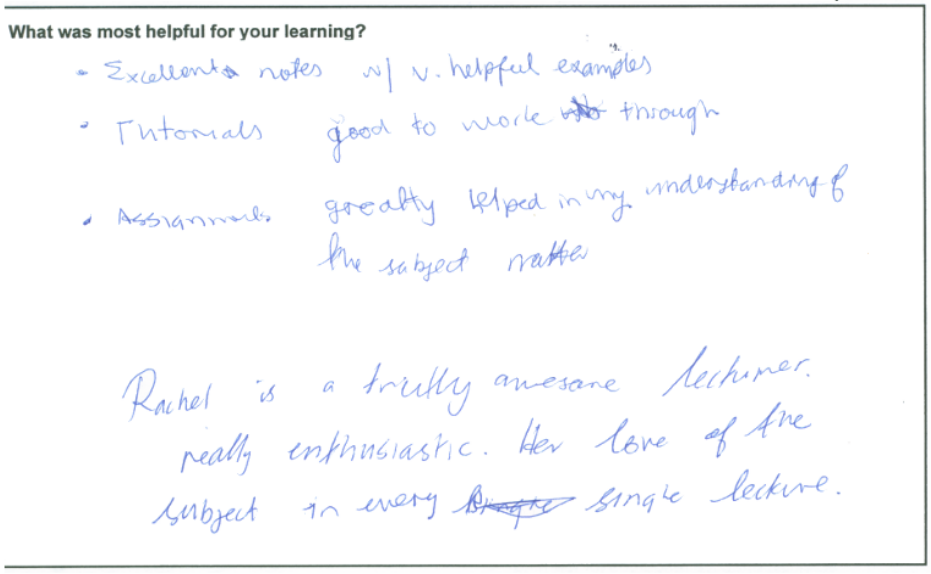
In my opinion, relating the questions (in assignments, etc.) to real-life, interesting situations (eg. chain letter) is a very good technique, because it makes us think of what we're working, not just the Theorems and formulae.



What was most helpful for your learning?

Rachel's well ~~org~~ constructed lectures and interesting assignment help me alot!

Rachel's kind personality and helpful feedback really increase my interest in the subject!



What was most helpful for your learning?

- Excellent notes w/ v. helpful examples
- Tutorials good to work through
- Assignments greatly helped in my understanding of the subject matter

Rachel is a truly awesome lecturer. really enthusiastic. Her love of the subject in every ~~Single~~ single lecture.