MAA Session

Quantitative Literacy across the Curriculum

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Building the mathematical and computational skills of science students

– **Kelly E Matthews, PhD student & Student Experience Manager, Faculty of Science, UQ**

Wednesday, 7 Jan 09

MAA Session

Quantitative Literacy across the Curriculum

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Building the mathematical and computational skills of science students

- Merrilyn Goos, Professor of Mathematics Education & Director, Teaching and Education Development Institute, UQ
- Peter Adams, Professor of Mathematics & Associate Dean (Academic), Faculty of Science, UQ

The University of Queensland
Brisbane, Australia

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- Established in 1909
- Research-intensive ($215 million research income in 2006)
- 37,000 students (undergrad & post-grad) with 5600 employees

2006 Review of the Bachelor of Science

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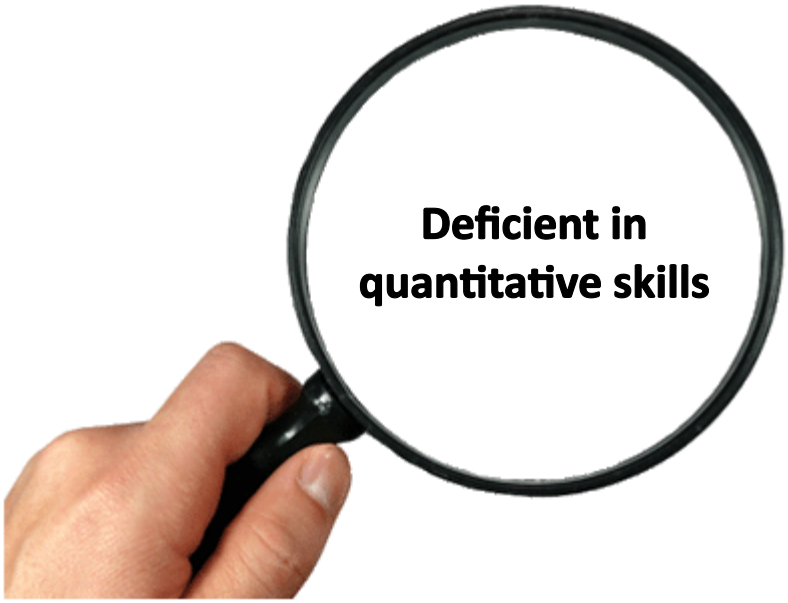
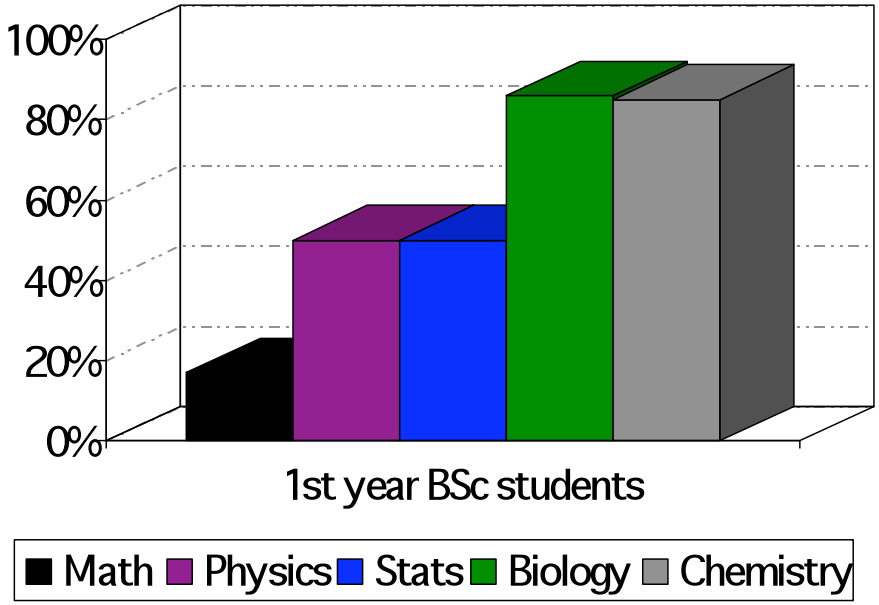


2005 BSc 1st year course enrolment



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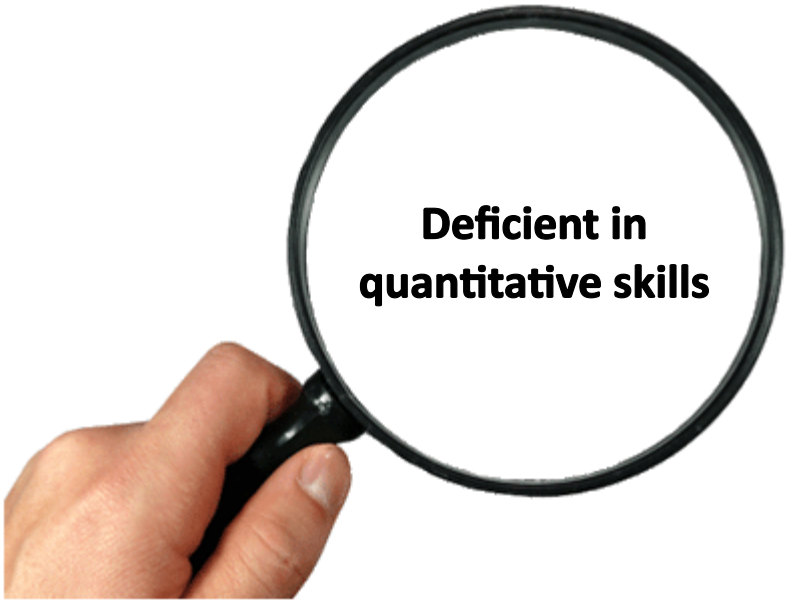

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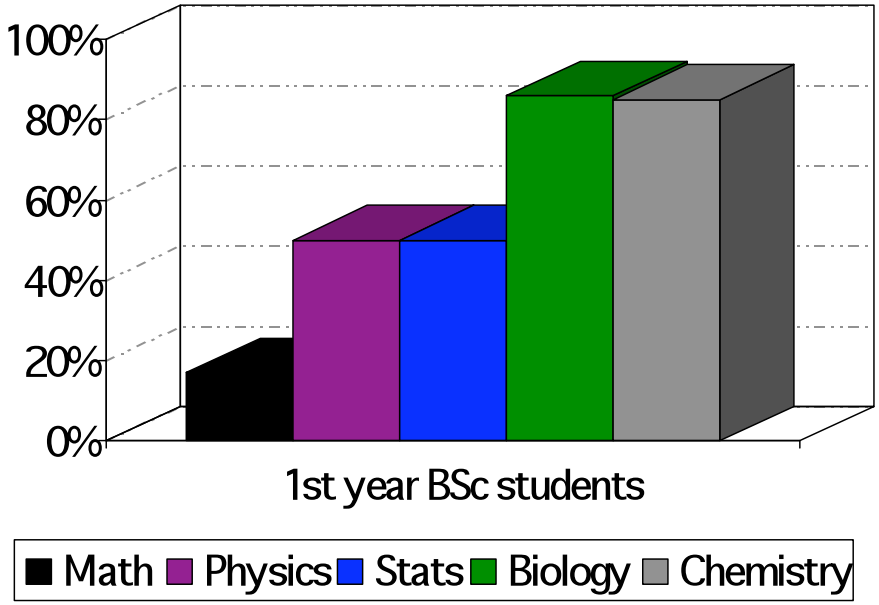

"It (BSc) has not really contributed a lot to the development of my quantitative skills. The mathematical knowledge I entered with wasn't built upon (which I suppose is normal seeing as it is a science degree)."

2008 BSc Graduate, majoring in Biomedical Science

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Quantitative skills are not very important in the bachelor of science. There are computer programs that can do everything for you.

BSc 2008 Graduate,

major: Physiology

Source: Science Skills Inventory

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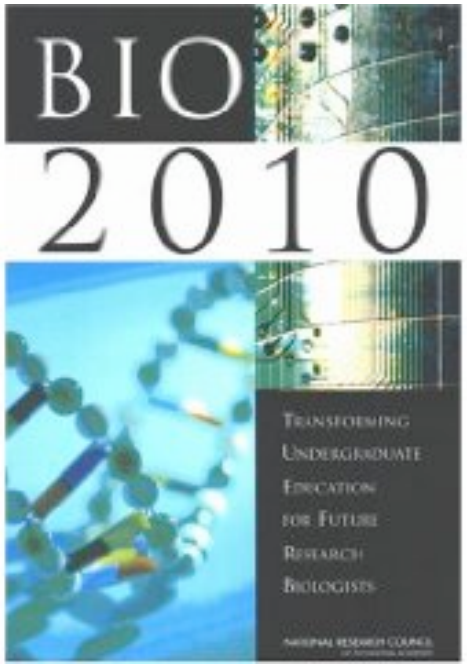
(Quantitative skills are important) because students must be able to inteprete (sic) experimental data obtained...this enable students to think critically about what the results are conveying.

BSc 2008 Graduate,

major: Biochemistry & Molecular cell biology

Source: Science Skills Inventory

Review Recommendations for the BSc



- Required 1st year statistics course
- Development of new 1st year course, aiming to demonstrate
  - The interdisciplinary nature of modern science
  - How mathematics underpins various scientific disciplines
  - The role of computational modelling in scientific research
- Capstone course for each major in the BSc

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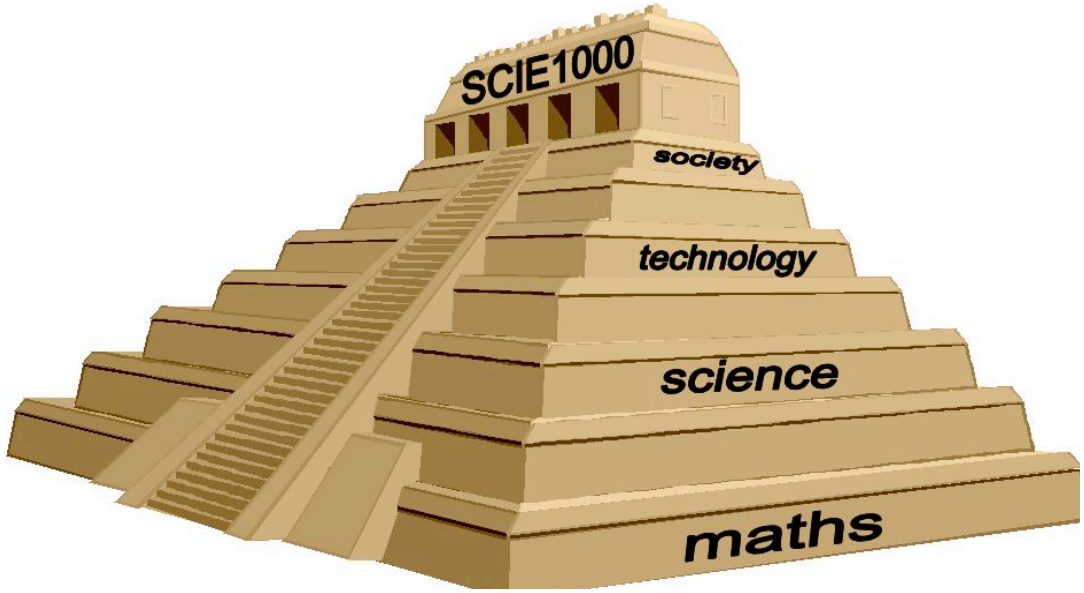
SCIE1000: Theory & Practice in Science



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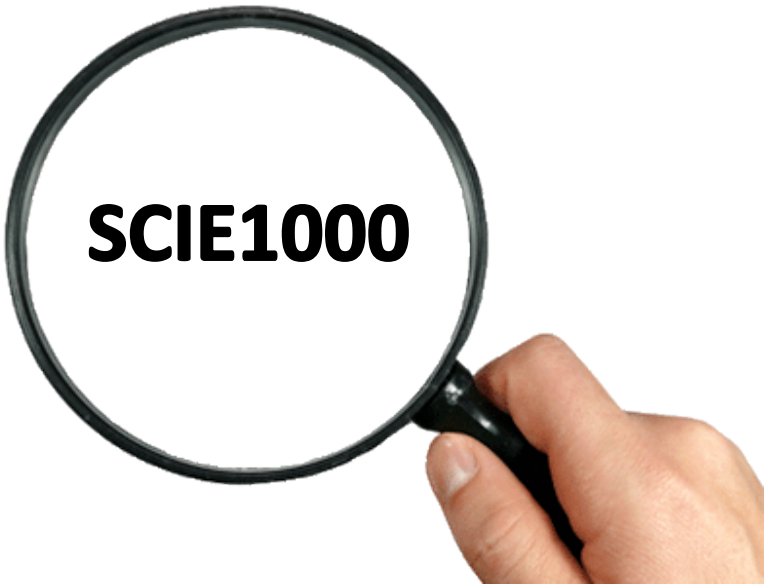
Aims of SCIE1000

1. introduce students to the interdisciplinary nature of modern science
2. instil an appreciation of the quantitative skills required for the practice of modern science, regardless of discipline
3. improve students' mathematical and computational skills in the context of scientific problems and issues
4. involve students in analysis of some "big picture" issues in science
5. engage students in the UQ "science community"

Evaluating SCIE1000



- Online attitude survey & short diagnostic (pre/post compare on attitudes)
- 3-2-1 student feedback activity (mid-semester)
- Online course evaluation (last week)
- On-going assignments with reflective questions
- Comprehensive final exam
- Focus groups (after course completed)
- On-going observations

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Student's description of SCIE1000

SCIE1000 is a course that uses maths and science in an every day sort of context so that you can…appreciate what you're learning in a science degree applies to the rest of the world…

Female (BSc High GPA group)

Source: focus group on 1st year BSc courses

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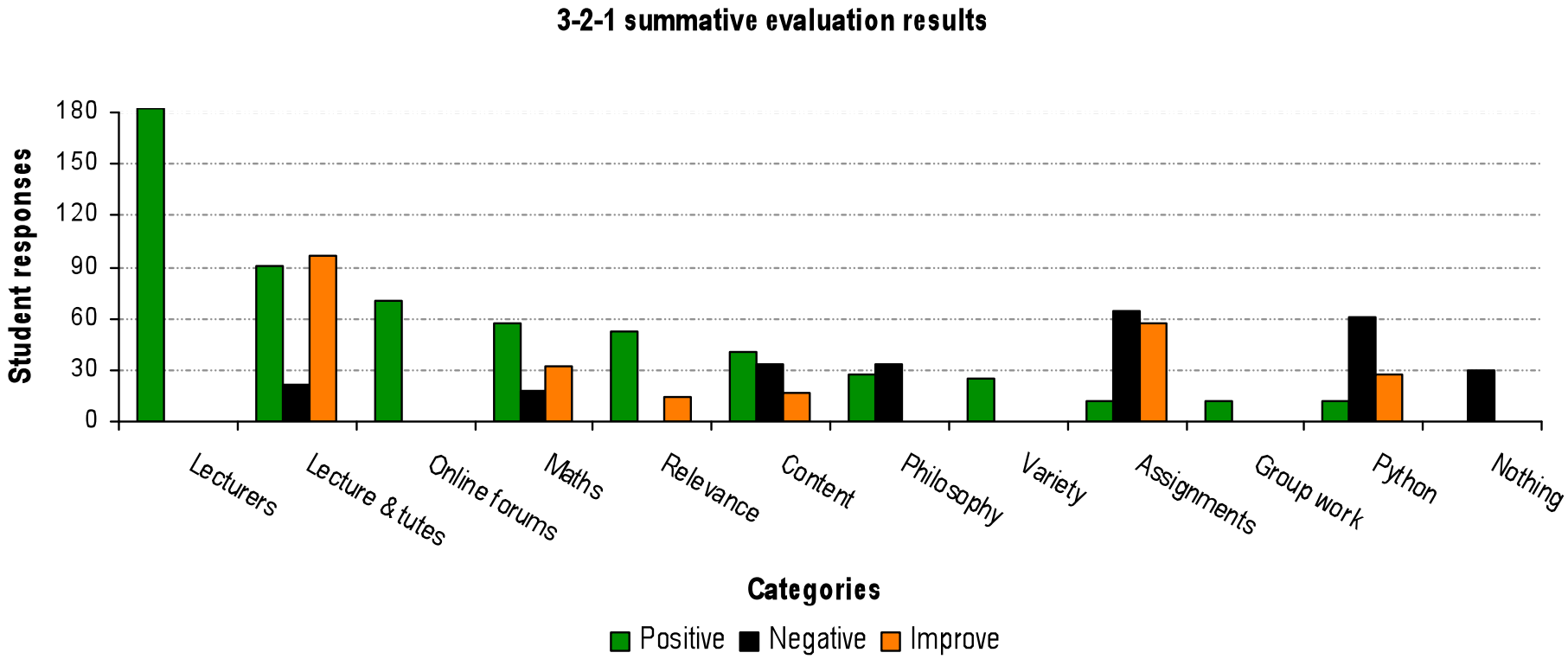
3-2-1 mid-semester feedback



Interdisciplinary nature of modern science

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Giving you like a basic knowledge in maths that you can use in a whole bunch of different scientific areas.

Anonymous SCIE1000 student

Source: online course evaluation survey

It is really confusing because you are studying physics, math, IT, philosophy and biology, and all in the same course.

Male (BSc high GPA group)

Source: BSc 1st year focus group

Improving math & computing skills in context of scientific problems

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It (SCIE1000) shows you that you actually need maths.

Female student

Source: SCIE1000 focus group

Analysis of big picture issues in science

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Like everything was actually related to real life, like every piece of magazine or everything that you read you're kind of like, you've got a feeling that you understand it based on the knowledge that you got from SCIE1000...

Male (BSc High GPA group)

Source: BSc 1st year focus group

Analysis of big picture issues in science

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I just don't feel like an idiot when I'm talking to anyone about world issues anymore, like I know what's going on now.

Female (BSc High GPA group)

Source: BSC 1st year focus group

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Challenges: Student (academic) Diversity

Yeah, there's a big range of people….So then they (students with lower entry scores) would have had to learn a lot more just to be able to get up to the same level as some of the other people taking the course.

Female student

Source: SCIE1000 focus group

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Challenges: Student (interest) Diversity

In the field I am going into there is no need for maths or computing! Why include maths/statistics in biomedical science?

Anonymous

Source: 3-2-1 student feedback activity

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Challenges: Student Opinions

SCIE1000 was good…at the time, I was like, 'I hate this subject…like it's stupid, blah, blah.' But as you go you realise that you do need to sort of appreciate where science fits into things....."

Female (BSc High GPA group)

Source: BSc 1st year focus group

Challenges: Embedding across curriculum, building into upper level course

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…Everybody will always remember SCIE1000 because it had those aspects which we will need in some other course somewhere in our lives, so that was a good thing

Female student

Source: SCIE1000 focus group

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QUESTIONS?