Mastery tests to cope with mixed backgrounds in an introductory statistics course

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Arnold Statistics in New Zealand schools

- One of largest 7th form subjects
- Modern syllabus emphasising data
- But many students don’t do 7th form stats

Massey University

- No formal prerequisites
- Distance students with varied backgrounds
- Internal students with varied majors
Statistics courses

- **100-level courses**
  - Statistics for Business
  - Introductory Statistics
  - Introductory Biostatistics
  - Principles of Statistics

- **Core for...**
  - BBS
  - BSc
Problems

161.120 Introductory Statistics

- Need to cover all topics from basics
  - Weak students with no stats background

- Easy to bore top students
  - Some will be our majoring students

- Mixture of new and old material each week
New approach

- **First 5 weeks**
  - Overlap with 7th form
  - Assessed by mastery tests
  - Told that good students don’t need to come to lectures

- **Last 7 weeks**
  - Some earlier topics extended
  - Topics not taught at school
  - New material for everyone

Internal only in 2011
Resources

- **Moodle site**
  - Study guide
  - Nothing on paper
- Customised CAST e-book
- Paperback textbook

Start CAST
Mastery tests

- Three tests with 10 questions each

- Questions
  - Each is a Java applet
  - Many aspects randomised
  - Different questions each attempt
  - Repetition only helps if concepts mastered

- Practice on same questions as exercises

CAST exercises
Mastery tests

- Hosted on custom Moodle site
  - Implemented as question-type plug-in

- Max of 10 attempts

- 12 hours between attempts

- Immediate feedback

Start Moodle 2.1
Number of attempts

![Bar chart showing the number of attempts for Test 1, Test 2, and Test 3. The chart displays the percentage of attempts for each test across different numbers of attempts.]
Marks for individual attempts
Maximum mark

Test 1

Test 2

Test 3
Mastery vs Final exam
Conclusion

- Students liked mastery tests
  - No pressure
  - Could improve mark
  - Early engagement
  - No effect on lecture attendance

- Results were good
  - Many persevered until they mastered concepts
But...

- Cheating?

- Final pass rate was no better

- Could only assess specific concepts
  - Very fine-grained questions
    - (... but no worse than most multi-choice tests)

- Projects in 2nd half of course
CAST
- Introductory & advance e-books
- About 1,000 dynamic diagrams (applets)
- Exercises

Tests
- Moodle question-type plug-in
- About 100 questions

http://castAdmin2.massey.ac.nz/download/cast_moodle_plugin.zip