

Sum-things Don't Add Up

Tackling the Numerical Skills Deficit

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Aug 2004: great exam news!



- A-level pass rates rose for the 22nd year in a row
- %age of entries achieving grades A-E rose from ~68% (1982) to **95.9%** (England), **96.5%** (Wales) & **97.4%** (NI)
- **22.1%** (England), **23.5%** (Wales) & **30.0%** (NI) of entries achieved grade A (in 1984 **9.3%** achieved grade A)
- %age of NI entries achieving grades A*-C at GCSE has risen to **69.4%** with **22.8%** awarded grades A or A*

[Joint Council for Qualifications]

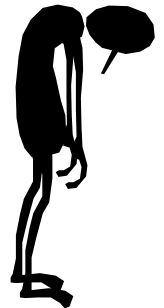


Reflecting rising standards within our UK education system?

On the other hand



- 'A-level standards hit new low' (*The Sunday Times*, 26/4/98)
- 'Nearly a third fail "too hard" AS-level maths' (*TES*, 24/8/01)
- 'Pass marks "cut to boost GCSE grades"' (*The Daily Telegraph*, 24/8/01)
- '15% is pass at maths GCSE' (*The Sunday Times*, 24/8/03)
- 'Maths in crisis' (*The Daily Mail*, 10/1/03)
- 'A-levels will be a success when more pupils fail' (*The Sunday Times*, 17/8/03)
- 'B-grade maths students are so bad, they may as well guess the answers' (*THES*, 27/8/04)



Employers join in



- ‘The GCSE [has become] the exam “no one can fail”, and A-levels are less demanding and discriminatory than they used to be.’ (Report by the Institute of Directors, 2002)
- ‘Easy exams make pupils unfit for jobs, say bosses.’ (*The Observer*, 21/7/02)
- ‘Employers lose faith in maths GCSE’ (*TES*, 10/1/03)



HE attempts to adapt



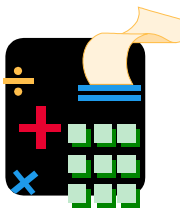
- ‘Trainee teachers are ordered to sit numeracy test’ (*The Independent*, 21/1/00)
- ‘Freshers’ maths skills tested’ (*THES*, 27/9/02)
- ‘First-years need remedial help’ (*THES*, 8/2/02)
- ‘Universities send students for basic maths lessons’ (*TES*, 18/4/03)
- ‘Two-thirds of all science and engineering departments now provide remedial classes in maths’ (*The Sunday Times*, 24/8/03)



Numerate individuals



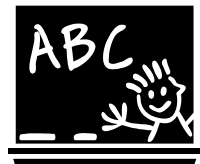
- Recognise why numbers are important & possess a sense of the size of numbers (e.g. 1mm is 1/1000th of a metre)
- Understand the ‘language’ of basic mathematics
- Know by heart number facts (e.g. multiplication tables)
- Are able to calculate accurately & efficiently, both mentally and on paper
- Recognise when it is appropriate to use a calculator & use one efficiently
- Possess strategies to check whether their answers are reasonable



Numerate individuals



- Are able to manipulate numbers & equations
- Are able to solve numerical problems in a variety of contexts without seeking advice or help from others
- Feel confident in their ability to do basic arithmetic & algebra
- Are able to suggest units for measuring & make sensible estimates of measurements
- Are able to explain & make predictions from the numbers in graphs, diagrams, charts & tables

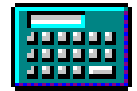


Numerical skills in context



1. Powers of ten

- Essential when enumerating micro-organisms



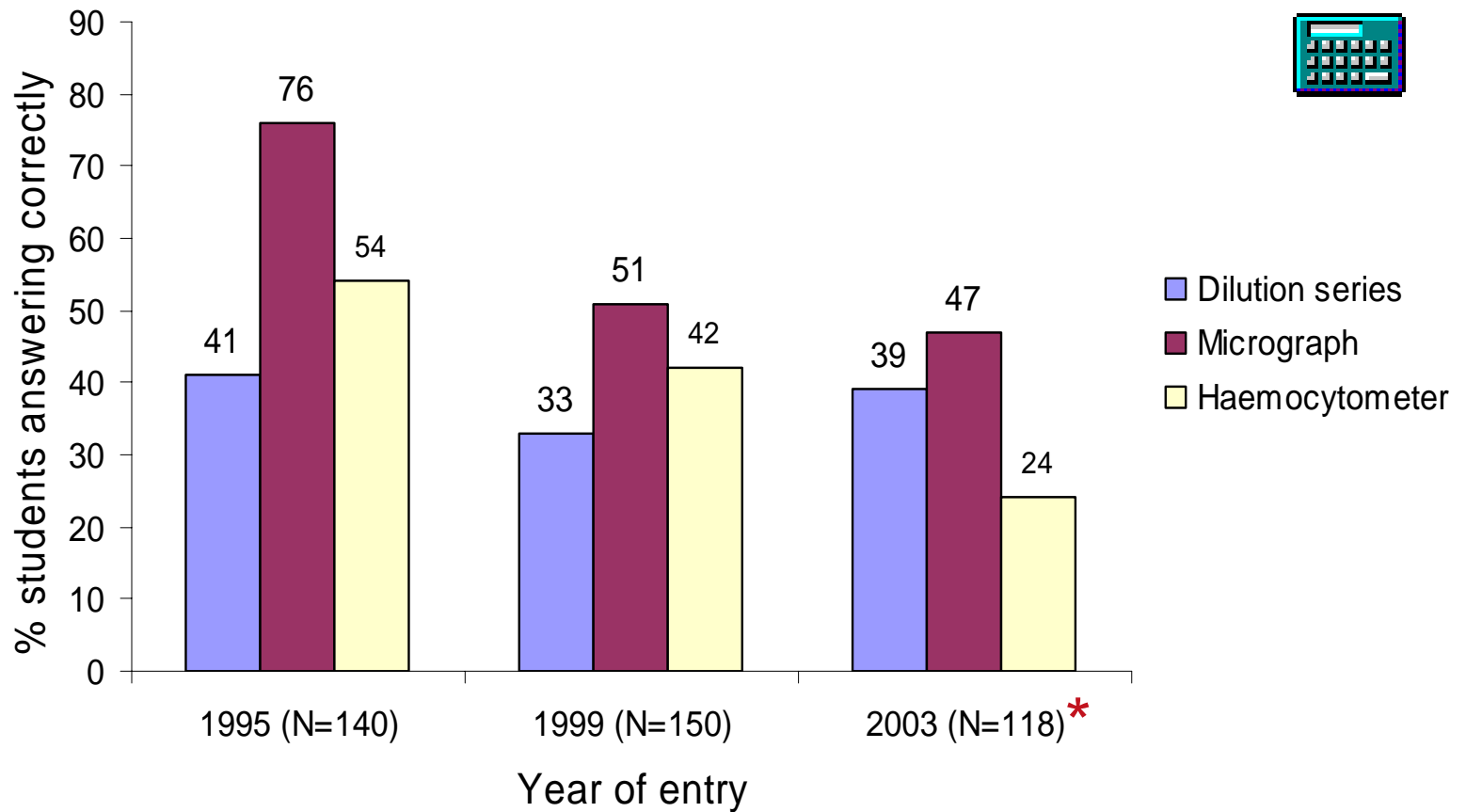
2. Units of length & concept of magnification

- Determining the real size of a microscopic structure when presented with a micrograph & its magnification

3. Units of volume & capacity

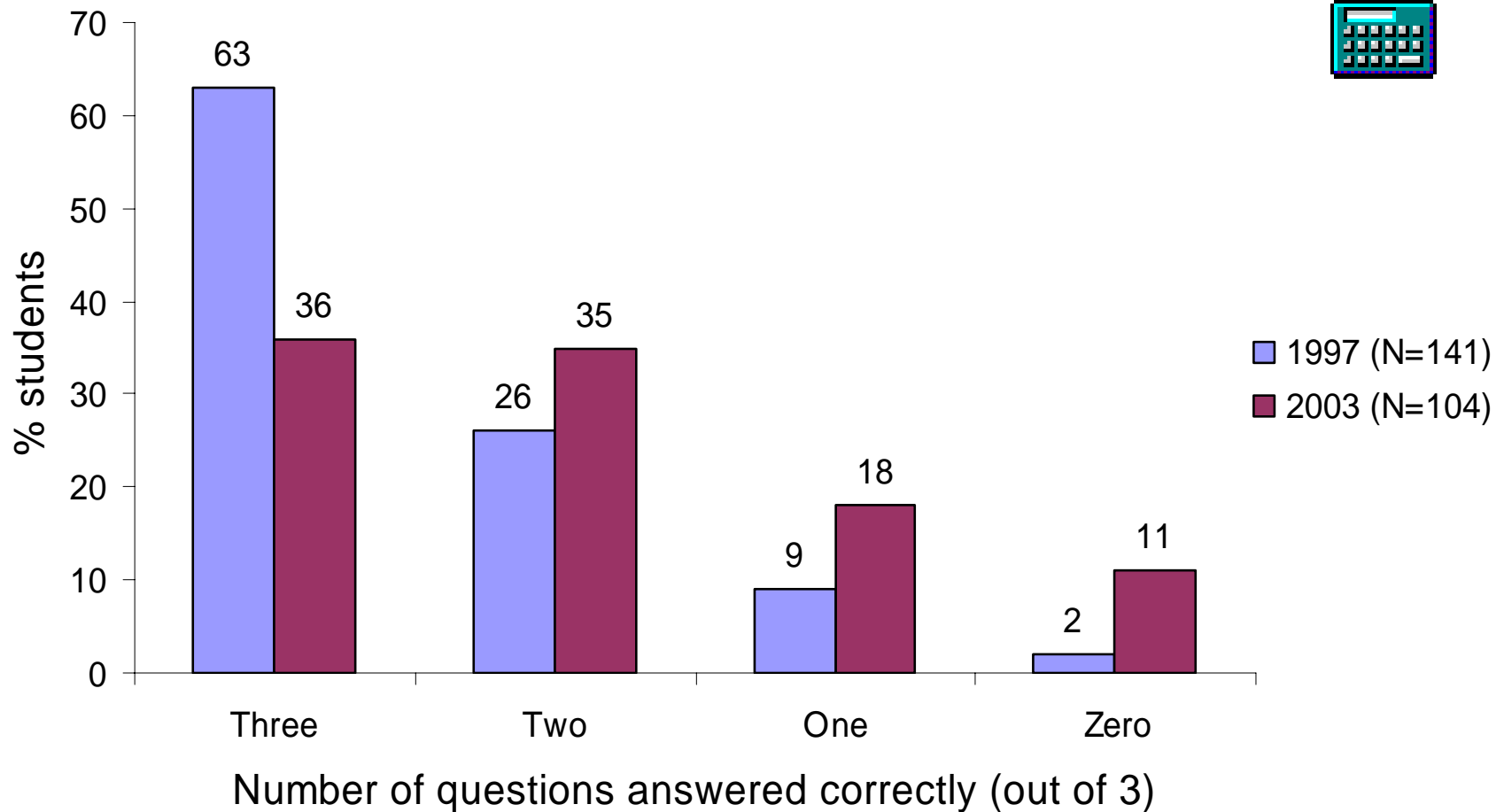
- Calculating the volume (in cm^3) of a haemocytometer chamber when given its dimensions in mm
- Determining the no. of cells per ml when given the mean no. of cells in a fraction of a ml (i.e. in a haemocytometer chamber)

Results: 1st test (wk 5)

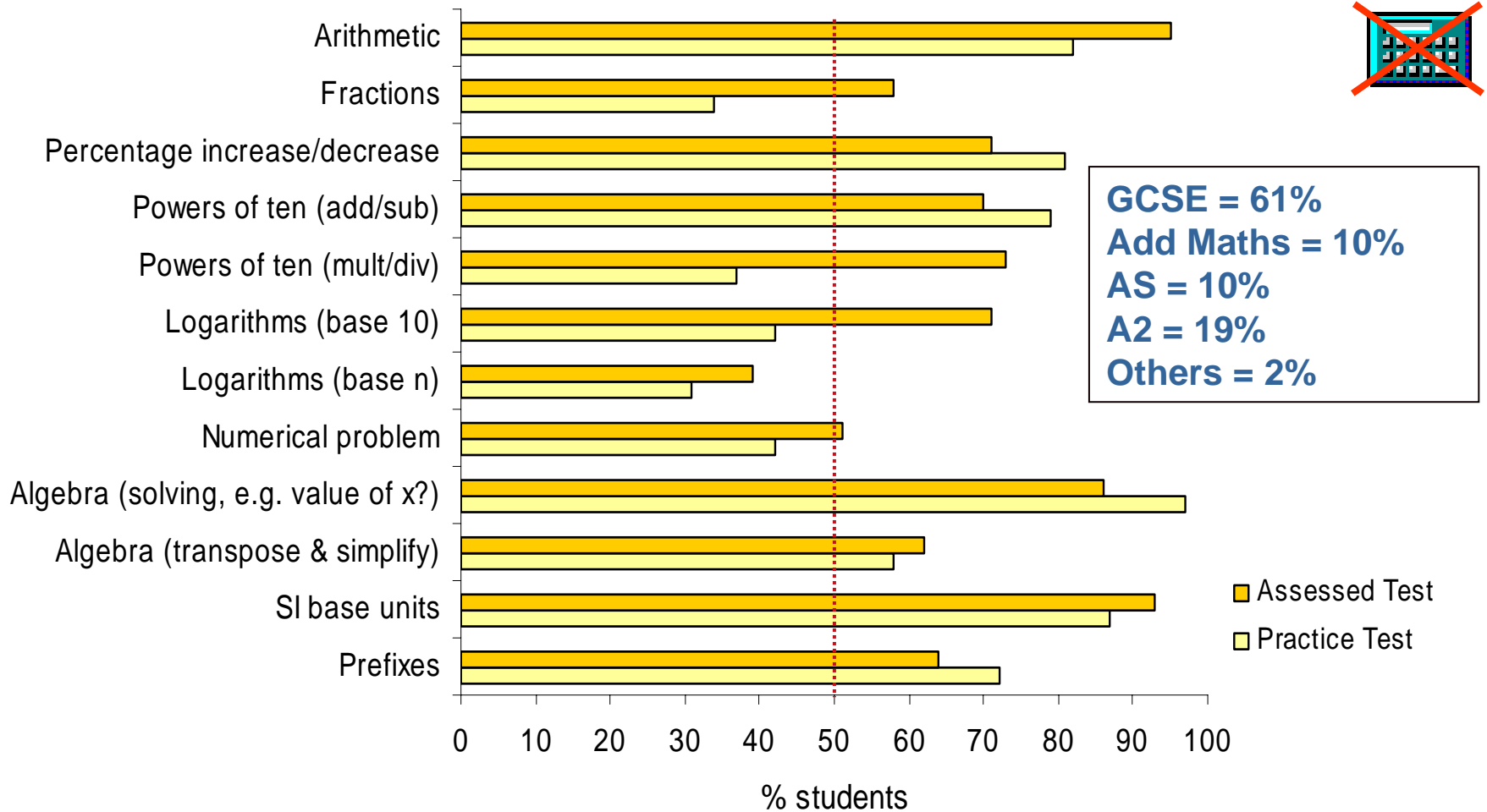


* Following introduction of *'Skills in Biosciences'* module in 2001/2002

Results: re-sit test (wk 11)



Diagnostic test: 2003 results



Emerging issues



- Lack of confidence & irrational fear of anything numerical
- Failure to recognise importance of numerical skills – in academic & broader contexts
- Reliance on calculators for simplest procedures & absolute faith in answers the calculator returns
- Inability to manipulate numbers or equations, to convert between units of measurement & interpret data presented in graphs, charts & tables.

Strategies adopted



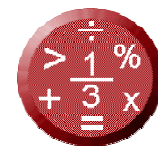
- Pre-university summer courses
- Foundation modules within academic disciplines
- Dedicated centres or drop-in surgeries
 - BP Mathematics Centre at Coventry University
- Streaming – based on results of diagnostic tests
- Tutor-led small group tutorial / workshop sessions
- Peer tutoring
- Access to self-help & independent learning resources
 - CBL materials & self-instructional guides

Mathcentre & Mathtutor



- **Mathcentre** (www.mathcentre.ac.uk)
- **Mathtutor** – series of DVDs
 - Educational Broadcasting Services (EBS) Trust, Universities of Leeds, Loughborough & Coventry
 - Funding from HEFCE (FDTL4) & Gatsby Foundation
 - Supporting students post-GCSE to 1st-year undergraduate (principally in Engineering and Mathematics)
 - Includes:
 - Diagnostic tests
 - Video tutorials & printable texts
 - Interactive exercises & animations

Mathtutor for Biosciences?

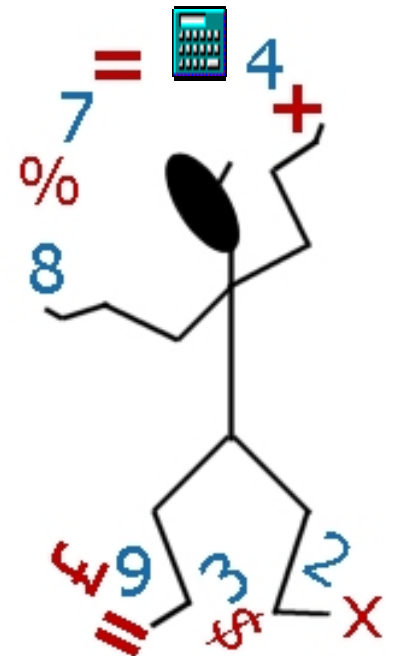


- Similar resource (style, NOT content) for Biosciences?
- Biosciences would need to define the content
- Jim Stevenson (EBS Trust) – preparing proposal to put to the Biomaths discussion group & LTSN
 - Place mathematics in a range of bioscience contexts
 - Different examples for different disciplines within the biosciences
- VT, JS & Tom Roper (Mathematics Education, University of Leeds) – meeting in Preston in September 2004

Interested?



- Join the Biomaths discussion list at www.jiscmail.ac.uk/lists/biomaths-ed.html - we look forward to your contributions
- Contact:
 - LTSN Bioscience
 - Vicki Tariq (vtariq@uclan.ac.uk)



References



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