Assessment in Statistics:
A two-edged sword

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Introduction

- A two edged-sword - can damage as well as do good work
- Does the way we assess maintain and improve standards or does it lower them
- Promoting Statistical Illiteracy as well as literacy

Two Examples

- Response of a Secretary of State to their TIMSS results
- *We must teach to the test better*

- An example from testing the English National Curriculum
- Objective 5/4c. Use the mean and the range of a set of data

The Two Buses

- I can either catch bus 1 or bus 2 on my way home from school. This is how long I had to wait for bus 1 on my last 5 journeys:
10 min 8 min 5 min 9 min 8 min

  This is how long I had to wait for bus 2 on my last 5 journeys:
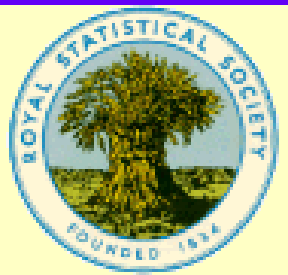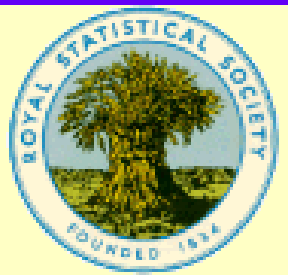16 min 1 min 2 min 15 min 1 min

Continued

- The mean waiting time for bus 1 is 8 min and for bus 2 is 7 min. The range for bus 1 is 5 min and for bus 2 is 15 min

- Use the mean and the range to choose which is the best bus to catch.

Assessment

- Drives learning and teaching
- WYTIWYG
- We live in a society unhealthily preoccupied with assessment

Types of Assessment

- Illustrated by why the assessment is being done: e.g.
- The student to know what (s)he does & does not know
- The teacher to know what the student knows
- The teacher to be able to judge effectiveness of teaching
- The institution to give a grade
- Society to assess the effectiveness of the teacher or institution. This gets confounded with raising and maintaining standards, accountability, targets
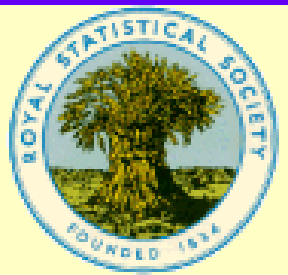
Purposes of assessment (i)

- Many purposes; formative, summative etc. but fundamentally
- To ensure that students have learned and can apply
- But 'learned' at what level
- And the nature of 'apply'
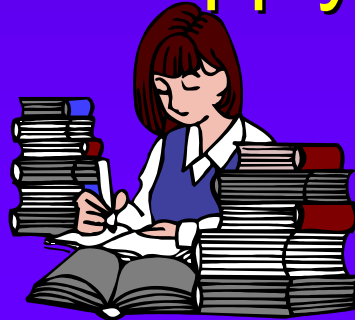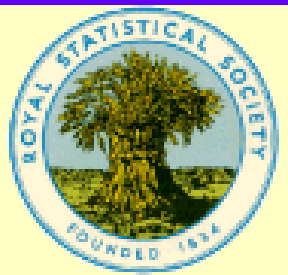
Purposes of assessment (ii)

- Formative: … appropriate next steps
- Diagnostic: … remedial help
- Summative … overall achievement
- Evaluative … assess work of
  school/institution

Summary of purposes

- Formative and diagnostic is to improve student learning - collaborative
- Summative is to give a grade or a mark - judgmental
- Evaluative is to grade an institution - a distorting pressure
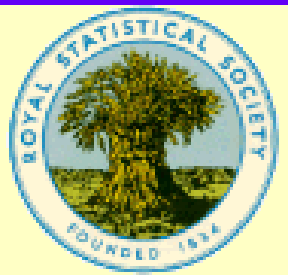
Good Formative Assessment

- Is embedded in the teaching & learning
- Shares learning goals with students
- Helps students know & recognise standards
- Provides feedback to aid improvement
- Is committed to every student improving
- Involves students in self-assessment
- Involves students & staff in continual review of progress
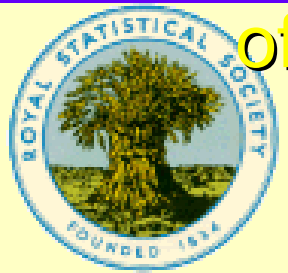
Marking & feedback

- Decrease the use of extrinsic awards
- Provide more oral feedback rather than relying on marking/written feedback
- Help students develop skills in reviewing their own work & that of peers
- Be clear whether to get pupils to correct their own work based on purpose served

- *From:* Good Assessment Practice in Mathematics. HMI 1477. Office for Standards in Education

Bloom's Taxonomy

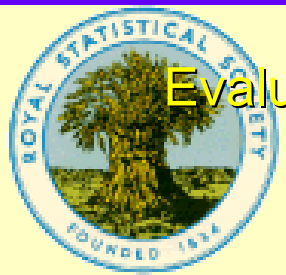| Form of learning	Verbs
Knowledge	Define. State. List. Recognise Show. Label. Name. Identify
Comprehension	Explain. Clarify. Discuss. Review. Describe. Recognise Interpret. Relate.
Application	Demonstrate. Use. Calculate Estimate. Fit. Implement. Apply
Analysis	Investigate. Solve. Interpret Explore. Analyse. Explain. Compare. Contrast.
Synthesis	Design. Formulate. Model. Improve. Adapt. Develop. Construct. Devise. Combine.
Evaluation	Assess. Criticise. Contrast. Review. Distinguish. Decide.

Methods of assessment

Form of learning	Verbs	Methods
Knowledge	Define. State. List. Recognise Show. Label. Name. Identify	quiz part exam question
Comprehension	Explain. Clarify. Discuss. Review. Describe. Recognise	Multi choice, assignment exam
Application	Demonstrate. Use. Calculate Estimate. Fit. Implement.	Coursework. Apply specific techniques to particular problem
Analysis	Investigate. Solve. Interpret Explore. Analyse. Explain. Compare. Contrast.	Analyse a data set Oral presentation. Case studies Analyse computer output
Synthesis	Design. Formulate. Model. Improve. Adapt. Develop. Construct. Devise. Combine.	Design and carry out an investigation. Prepare a report & Present. Essay. Open ended questions.
Evaluation	Assess. Criticise. Contrast. Review. Distinguish.	Critically assess others' projects Defend own presentation

# Summative & Evaluative Assessment Distort

- An example from UK Health Service
- The false logic. If X knows this they will be able to do Y; they can do Y therefore they know X
- Summative and evaluative assessment encourage defence mechanisms and breed fear
- Formative assessment requires trust, no judgement and openness
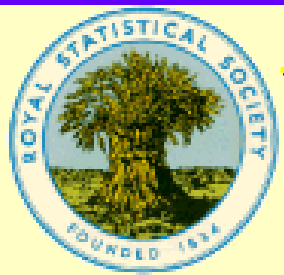
How psychology students see assessment (Newstead 2003)

- It is to grade people
- Developing an argument is low priority; amount & accuracy of information covered is important
- Assessment neither motivates students nor promotes learning.
- Even highly motivated students resort to a shallow approach - this is adaptive if the student is to take a variety of different assessments in a short time period
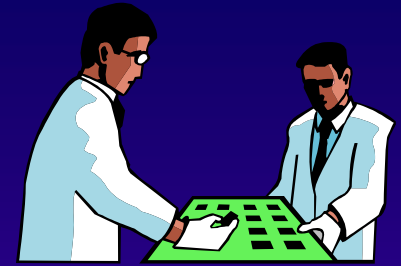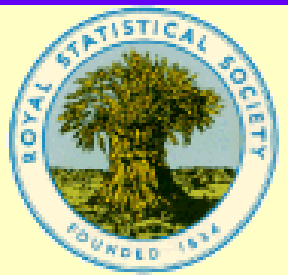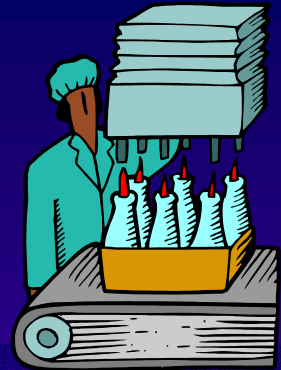- No correlation between learning approach & final degree
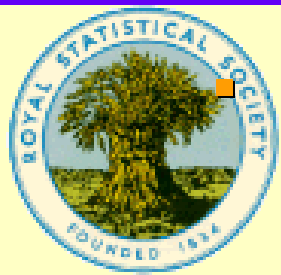
A Quote

- *We are in danger of preparing our students for a life of tests rather than the tests of life*

Improving Quality - apply Deming Approach

- Developed in Industry: see how it applies to education and assessment
- Quality improvement NOT quality control
- Quality is delighting the customer, not just meeting his/her requirements
- Work with the customer to decide on what customer considers quality and how it might be measured to show improvement (but the aim is quality, not the measure)
- Empower the person who is at the point of decision making
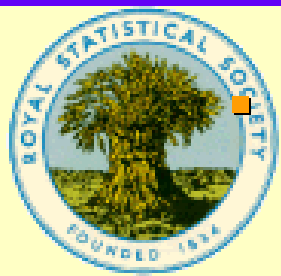
The 14 Points (see handout)

1. Constant purpose to improve;
2. adopt new philosophy of leadership;
3. stop using inspection to achieve quality, build in quality;
4. single trusted supplier;
5. improve constantly;
6. on job training;
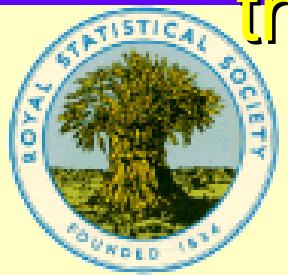7. leadership to help people do a better job;
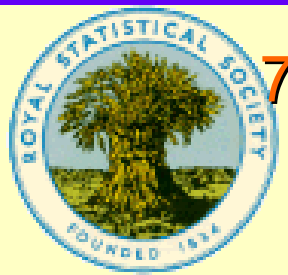
The 14 Points (contd)

8. drive out fear;
9. break down departmental barriers
10. eliminate slogans & targets;
11. eliminate quotas & management by numbers - substitute leadership;
12. remove barriers that stop pride in workmanship - incl. annual or merit rating;
13. institute programme of education & self-improvement:
14. transformation to quality is everybody's job.
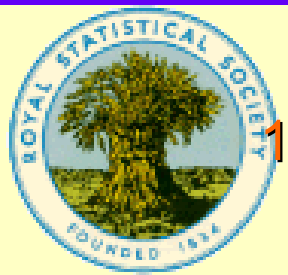
Apply to Education (1)

- Constantly and continually seek for improvement (1,5)
- Applies to students, teachers, administrators, governments
- In the context of quality as previously defined
- Consider who is the customer and who the supplier

Apply to Education (2)

- Leadership is to help people do a better job (7) take responsibility that leads to change (2)
- Again applies to all
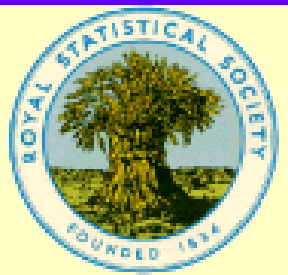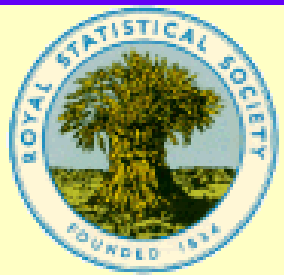
Apply to Education (3)

- Eliminate quotas, targets, numerical goals (11) and inspection for quality (3) build quality in from the beginning

- Develop pride in work & personal responsibility (12a) remove barriers such as inappropriate rewards (12b)
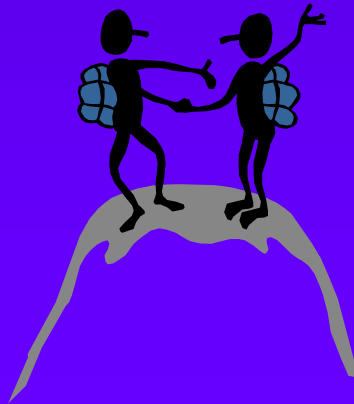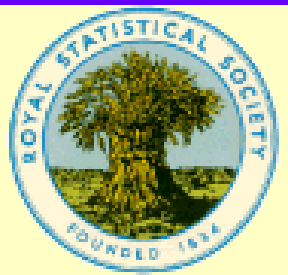
Apply to Education (4)

- Training on the job (6) education and self improvement (13)

- Note the delegation of responsibility to the receiver

- Drive out fear (8) slogans & exhortations (10) encourage cooperation (9) with all involved (14)

The End