



Curriculum, Evaluation and Management Centre

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"ARE STANDARDS IN MATHEMATICS DECLINING"
(NOTES FOR THE BRITISH ASSOCIATION DEBATE)

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"ARE STANDARDS IN MATHEMATICS DECLINING?"

*Notes for the British Association debate
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Why do standards matter?

- Examination results provide information for employers, admissions officers and others. These persons need to know what grades signify both in terms of the content studied and the aptitudes of the person considered for employment. If standards change then employers and university admissions officers and others all need to be accurately informed about the changes.
- Motivation- for teachers and students. Clear syllabuses and external assessment provide a framework in which teachers and students collaborate to reach standards.
- Fairness in the allocation of the nation's resources for university places. If these are allocated for simple points-scores, for example, when the chance of getting high grades is higher in some subjects than others, this could be unfair to candidates, and unproductive educationally.
- Preparation for the next stage - - so that the university can teach university work not A-levels.

How are standards set ?

- There used to be a recommended distribution of A-level grades, in which the modal grade was a fail (for 30 percent of candidates in each subject). This was widely perceived as a failure to certify genuine achievement and also worked against candidates in subjects enrolling able students. The rule has been relaxed and this has led to some welcome adjustments. Pass rates are no guarantee of standards when intakes are changing.
- Examination Boards combine judgements of experienced examiners with statistical information.

How are standards monitored?

- The Examination Boards have processes involving cross-moderation, tight marking schedules and statistical monitoring of markers, but processes cannot guarantee outcomes. Further monitoring is needed - - as well as expert advice on syllabus content.
- OFSTED has not been noticeably informative about standards. As is its wont, it employs unreliable and un-validated methods.

How should standards be monitored?

- There was an Assessment of Performance Unit (APU) which did the job properly, using representative samples and items repeated over several years and which were consistently marked. The APU collected the necessary quantitative and qualitative evidence and took account of the complex problem of ever- changing syllabuses. It disappeared without trace into SEAC and nothing has taken its place.

What evidence regarding standards in A-level mathematics is available?

- We have some statistical evidence from the ALIS project. The grades awarded can be compared with data from various "reference tests". This procedure established the differential difficulties (or severe grading) of Maths. Science and Foreign Languages at A-level (SCAA report on Candidates' Performance in Mathematics and Science, Fitz-Gibbon and Vincent, 1994) and can be used to look at changes across the years. **There is clear evidence that candidates with the same basic skills are now getting higher grades in mathematics A-level than similar candidates obtained several years ago.** There has been a steady drift to higher grades. (Figure 1). The *interpretation* of these differences has to be tentative. Candidates may be getting higher grades now either because grades are easier to get or because the candidates are better taught or working harder. However, if the latter explanations applied we would expect to see satisfaction in those who subsequently teach the students. In contrast, there is considerable concern expressed by numerous bodies. This suggests that standards have fallen rather than that the higher grades signal higher achievement. However, interpretations must be cautious, the internationally high standards represented by A-levels must not be forgotten and the need for the regular collection of special monitoring data, as was done by the APU, must be stressed.

What might be causing alterations in standards?

The suggestions which follow are speculations. Furthermore some factors may have mixed effects - - improving standards or worsening them, or both at once depending on the

situation. Education is highly complex which is why constant monitoring and feedback systems are necessary.

- The National Training Targets which roughly require the average student who used to get a CSE grade 4 to perform at a level equivalent to the top of a grammar school. Universal acceptance of this political idea simply illustrates the lack of any sense of quantification among politicians and their advisers. What the educational system needs is realistic benchmarks, not arbitrary targets. Since it is unlikely the targets could be met without standards being lowered, perhaps that explains some of the lowering of standards.
- The need for universities, old and new, to fill places. Some universities that are perplexed by particularly low standards among students may be failing to recruit the more able students for various reasons - - location, perception of the courses, employment prospects in the region etc.
- The pressure on Examination Boards to retain customers. No Examination Board wants to offer a "difficult" A-level syllabus.
- Modular courses are very popular and may increase motivation and yield higher grades. But do the students know the work as well when they go on to university? Modular courses need to be evaluated.
- Stressed teachers may not work with students as well as formerly. They are burdened with ever increasing paper-work, threats from OFSTED, and job insecurity. On the other hand fear and threats may be motivating. Not only do we not know but there appears to be no attempt to find out if the end justifies the (very expensive) means.
- The lack of other job opportunities may lead to the retention and recruitment of a stable teaching force, which could work for or against standards. We do not know. Nor do we know how the financial pressures to hire young, inexpensive teachers impacts on the effectiveness of teaching..
- Bleak employment prospects for graduates - - for some this could stimulate hard work, for others it could be discouraging, especially if combined with debts.
- The perception that high salaries are won in business, management and finance, not science, engineering and mathematics. This could lead to some able students being attracted away from Maths-Sci. subjects
- Lack of standards in university degree courses - - - some students will work to the extent necessary and no more (they have other interests to pursue.) If students can get on courses with low grades and get degrees for easy work, some will. Universities should participate in national, blind marking of randomly selected scripts to see how standards compare from one university to the next.

What should be done about standards?

1. The Assessment of Performance Unit should be resuscitated in some form, and should be charged with (and funded for) the *regular* monitoring of standards nationally. The standards should relate to progression through the system, national needs and international comparisons. It should take account of a wide range of clients: business, industry and professional associations such as the Engineering Council, the Institute of Physics and the associations for mathematics and science education.
2. All examinations should be monitored for statistical relationships such as those provided in the studies of Examination Boards, subject difficulties and GNVQs arising out of the A-Level Information System (ALIS).. The information should be made available nationally every year.
3. Work should start on checks on degree standards in those subjects where there is agreement on some parts of a common syllabus (mathematics, science and foreign languages, engineering, computing etc.) The alternative to blind (and therefore unbiased) quantitative and qualitative evaluation of university degree courses will be expensive and un-validated "inspection", called "quality assessment".
4. In our concern for *academic* standards we must not forget to assess the "Value Added" by schools in the *social* outcomes of schooling which may be equally important for a thriving and effective society.

Acronyms:

OFSTED Office of Standards in Education

SCAA School Curriculum and Assessment Authority

SEAC Schools examination and assessment Council (no longer in existence)

APU Assessment of Performance Unit

NOTE: A paper giving the background to the data in the figures, and other analyses to support the conclusions, will be available at the debate.

Figure 1 a. Showing that the students enrolled in A-level mathematics courses have shown, over recent years, a slight decrease in measured skills in comprehension and simple mathematics (the International Test of Developed abilities, ITDA)

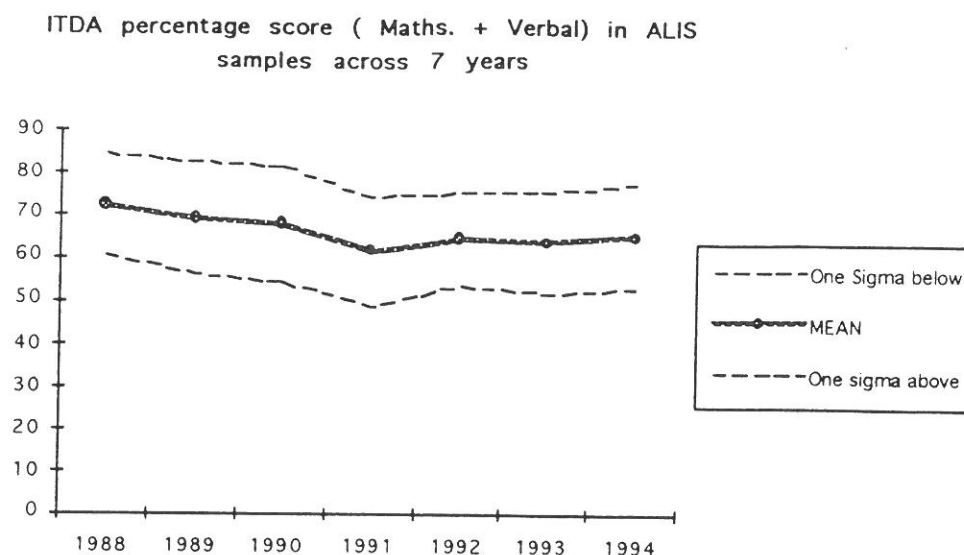
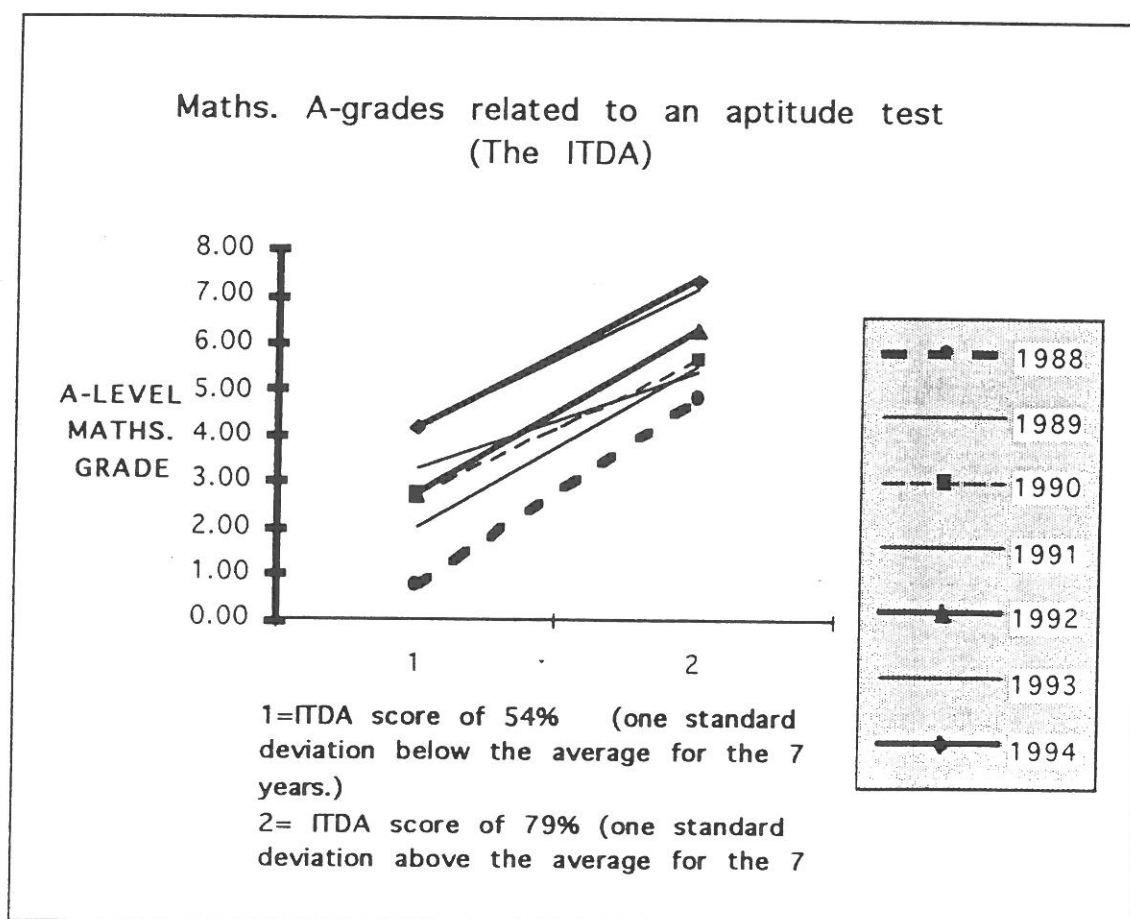


Figure 1b. Showing that for the same level of measured skills (in comprehension and simple mathematics as assessed by the International Test of Developed abilities) higher grades are achieved in recent years than earlier years. i.e. the same kinds of students seem to now obtain higher grades. High grades, therefore, may not now signal the same levels of aptitudes that they represented some years ago.





Andrew Barkley

complete with textbooks and a sample bag of mushroom compost

"grand plan" is to work for a firm for 15 years, build up reputation and some knowledge, then leave to set up on his own. He is not worried about which area of business it should be.

"It does not really matter what you are selling. As long as you sound enthusiastic, concerned and seem to have the situation under control, you will be all right," he says.

Throwing himself in at the deep end was the best and quickest, if hardest, way to learn. "But I did it, and I think I swam pretty well. Actually now, I can hardly believe how easy it was."

at colleges throughout the UK. The RSA also runs more than 200 courses in subjects from administration and customer services to arts and entertainment. The General National Vocational Qualifications are designed for the school-leaving age group and can be taken at foundation, intermediate or advanced level in health and social care, engineering, hospitality and catering, and science, and many other subjects. To equip yourself with skills demanded by the modern office, which are useful for temporary work or essay writing later, the RSA also offers its own computer literacy and typing writing courses.

Mastering the art of using a

one of 50 countries is useful. tough. Candidates have to demonstrate physical and mental ability to get on with a staying power to win a schemes such as carrying fieldwork surveys in the Barrier Reef.

But there are no rules on how you spend planning, it is quite possible combination of everything holiday, complete a course, do some voluntary work, final piece of advice in the Year Guidebook says: rest it is supposed to be fun, endurance test.

Our A levels set the standard

Carol Fitz-Gibbon believes that constant monitoring should be built into the A-level system to prevent 'special inquiry' syndrome

Certainly grades are creeping upwards, year by year. Some years ago, the general pattern was that the highly selected and well-motivated students who took A levels were taught in small, expensive classes by carefully chosen teachers and then 30 per cent failed. The modal grade was a fail.

Most teachers felt that the high failure rate was usually inappropriate... students had learnt a great deal in two years of concentrated A-level work, and the system was failing to accredit this learning. Whereas 30 per cent of grades used to be failures, that figure now stands at about 17 per cent. Which is the more reasonable?

At the higher end of the scale, the proportion of top grades (As) has risen from 10 per cent to about 15 or 16 per cent. Is this reasonable? A difficult question.

We need to take into account the fact that the intake of students to A levels is now less selective. With the lack of jobs for school leavers, and with strong national encouragement

ment, students are staying in school beyond the age of 16 in far greater numbers. What are they to do? A levels are sometimes the only courses available and they often seem to provide the only well-recognised and highly regarded qualifications. Vocational courses such as those provided by the Business and Technical Education Council (BTEC) were steadily gaining some recognition, and are now joined by the Advanced General National Vocational Qualifications (Advanced GNVQs). These appear to be on a par with the easier A levels as far as a student's chance of success is concerned. But neither the pass rate nor the grades awarded can tell us if standards have changed. If high grades are being awarded for poorer work than previously, then standards have dropped. Whether or not this is the case requires careful collection of specially designed

data and a broad range of evidence. The Assessment of Performance Unit used to undertake this vitally important monitoring of national standards. It was able to show, for example, using nationally representative samples, that whereas students achieved less on mathematics items involving percentages over the years, they had improved in their handling of probability items. Presumably the curriculum emphasis had changed and with it the achievement levels.

Alas, the Assessment of Performance Unit was closed a few years ago. Now, when questions of standards arise, there is little evidence available. Quite rightly the School Curriculum and Assessment Authority is now calling for a detailed inquiry.

However, the occasional panic (the special inquiry) is no way to run a system. What is needed is to build into the

system the procedures needed for the kind of careful and ongoing monitoring that the APU was conducting. Some organisation, such as SCAA, should be provided with the funds necessary to reinstate this national monitoring. If standards are falling, or changing, this needs to be reported. It is not necessarily bad to recognise a wider range of achievements but many people, such as university entrance officers and employers, need to know how to interpret the grades.

One source of change in A-level grading appears to arise from the introduction of modular courses with different marking procedures. These courses are very popular, encourage students to work hard consistently, and urgently need to be monitored, evaluated, and compared with traditionally graded A levels.

One reason for grade inflation (if it exists) could be the

pressure to reach "national training targets". To meet these politically set, arbitrary targets, students would need to become mentally gifted if there were no change in standards or in teaching effectiveness. Since changes of the required magnitude have never been known to occur on a national basis, the only solution is to lower standards.

However, these little local difficulties should not lead us to lose sight of the outstanding role which our widely admired examination system has played. It provides fair, blind assessment for pupils, accountability for the public and clarity of purpose for teachers. It probably enhances teacher-pupil relationships by removing from teachers the onus of being both the coach and the umpire. Teachers accept the strong element of accountability inherent in the independent and external assessment of their students. Is any other

profession so accountable? Are the achievements of the system recognised?

Some of the results of the examination system have been remarkable. As far as is known from international studies, the A-level standards in the sciences and mathematics are "world class standards" which appear to be exceeded by only a couple of other nations. A-level teachers are teaching at a level which is usually found in universities in other countries. Indeed an A-level pass in a subject can earn a student two years' credits in that subject in top American universities. Surely one way forward is to try to create the same structure for a wider range of students and to create similarly high standards for technical and vocational courses? If it isn't broken, don't fix it... copy it.

● The author is professor of education and director of the Curriculum, Evaluation and Management Centre, Newcastle University. The CEM Centre runs the A-level Information System (ALIS) which has monitored A levels since 1983.



A-level relief at 10