MATHEMATICAL EDUCATION

The New School Syllabi: How New?

Michael Brennan

When second level schools reopened in September 1987, Mathematics teachers faced the task of interpreting and teaching the three new Junior Cycle Maths Syllabi (hereafter the A-Course, B-Course and C-Course) drawn up by the Dept. of Education's Syllabus Committee over the years 1982-84. To help the teachers along, the publishing houses produced 6 or 7 competing textbooks and the Curriculum and Examinations Board attempted to produce a set of sample papers. These papers have not been published. One feature of them—the exclusion of multiple-choice questions—has probably been lost in the political turmoil of the CEB era.

Background

Pressure for revising the old syllabi (which had stood since 1973) came from three sources external to the Department:

1. from teachers who felt that the old Intermediate Certificate Higher course was too long, that Geometry was offputting, that the Lower course was too hard, the below-40% student success rate too high, and that a substantial percentage of Lower Course pupils were not being catered for by the syallabus;
2. from third level Mathematicians who felt that the Intermediate and Leaving Certificate syllabi were not producing students with a good grasp of the basics, And that the Geometry, in particular, was unsatisfactory;
3. from a certain number of industrial/commercial interests who were calling for "relevance" in the syllabi. Pilot schemes in alternative syllabi had taken place. (In the event, these had no noticeable influence on the revision).

The Revision

At the outset the Department of Education, adopting an earlier proposal from the IMTA, announced that there would be 3 Junior Cycle Syllabi to cater for a wide spread of ability. Until the exams are taken in 1990 nobody can say what percentages of pupils will follow each course to the bitter end but a reasonable estimate would be A: 30%, B: 50%and C: 20% at most. The A– and B–courses are modifications of the Higher and Lower Intermediate Certificate courses respectively, and the C–course is a new course for the very weak student.

Educational cutbacks will, however, limit options, especially in smaller schools. Also, parents and pupils may be unwilling to accept that the C–Course is where their best chances lie. Numbers following the C–Course may be falsely low. That would be a pity. There is enthusiasm in the IMTA for the C–Course which, it is felt, is custom-built, not merely a cut-down model of the older syllabi.

The new A– and B– courses by contrast are in the main exactly that —cut-down versions of previous Higher and Lower syllabi. The revision of the syllabi was carried out by reading through the topics listed in the Rialacha agus Clár and deciding which ones stayed in and which did not! In a small number of places new material was added. Did this result in a shortened A–Course, one of the objectives of the revision? Yes, but it is arguable whether or not it was shortened enough. The main reduction took place in Geometry: the number of proofs was cut from 29 to 19. But Statistics has been substantially lengthened.

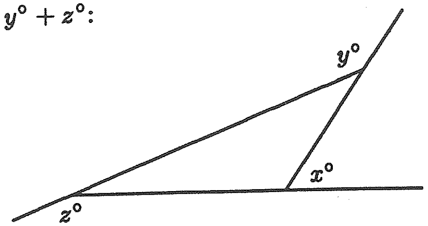
In the B–Course more time will be given to numerical work with financial bills of all kinds, with train timetables and distance charts. Here the number of Theorems has gone from 15 to 11 but the number of proofs (including construction proofs) from 18 to nil!

On the C–Course, Geometry stops at constructing triangles and Algebra at $3x + 4 = 19$ although powers are included. But all the traditional topics are touched on except trigonometry.

Proofproof

Maths has abeen proofproofed for the majority of pupils by these changes—unless one considers the solutions to questions such as the following as proofs:

(1) Evaluate $x° + y° + z°$:



(2) Show that the triangle with vertices $a(1,2)$, $b(5,2)$, $c(3,1)$ is isoscele
(Distance Formula supplied).

These appeared on one draft of a B–Course sample paper.

It is right that we should mark the departure of Geometry proofs by recall ing why Geometry has become so unpopular with teachers and pupils alike The non-intuitive nature of the old Geometry lies at the heart of it. Equipol lence, which students meet soon after finding their way along the corridors o their post-Primary school, combined with seemingly irrelevant proofs abou the image of a line under a central symmetry ... , together with the inabilit of teachers to think up unseen problems which were assailable by isometries did to death the cause of Geometry proofs, or indeed of any proofs, for up t 70% of our pupils, between 1973 and 1987.

In the new A–Course the treatment of Geometry reverts to a Hall and Stevens type, with congruence of triangles prominent. Proofs using isometrie will be accepted but equipollence and definitions of isometries as sets of cou ples are gone. Three extra theorems and "Equipollent couples" (undefined! appear in the B–syllabus, not for any good pedagogical reasons, I think. Th overall impression is of a war-torn Geometry course straddling two syllabi the A and B, unsure of who its ancestors are. There must surely be anothe revision in the years ahead to set it on simpler, more clear-cut lines.

As for the B and C courses it's a pity that some formal exercise in provin has not replaced the Geometry — such as proving that Superman is bette than Spiderman. Anything.

Quantity or Quality?

From a third level person's viewpoint, quantity in second level syllabi is spoil ing quality in the student. It will happen again with these syllabi: there ar

still too many topics blurring out the essentials. The trouble is, no syllabus committee is going to reduce the Junior Cycle syllabi to the seminal exercises of manipulating an arithmetic quotient, solving an algebraic equation, converting units, carrying through a 3-line proof (if A then B; but A; hence B) and postpone or forget altogether sets, relations, graphs, timetables, percentages, interest, trigonometry, statistics and geometry. Practicing a minimal set of skills like the first four mentioned would bore a large class and probably a teacher. Yet current syllabi preoccupation with a large number of detailed topics is hindering the teacher's purpose: that of nurturing mathematical skills in every pupil.

In Brief Then ...

Apart from hacking at the Geometry and throwing in an Iarnród Éireann timetable and an ogive there is little that is new in the new A and B syllabi. The emergence of the C–Course is a great achievement—unless that old dog cutback debilitates it at birth. The disappearance of proofs for the majority should be seen as an interesting experiment (to be kept under review?). As for relevance, "Relevance!" is an ephemeral cry made about syllabi. It comes and goes like a sí-ghaoithe and will come in due course to meet the new syllabi. The truth is, what industry needs, as what third level needs, is people with thinking skills. Mathematics classes are good vehicles for producing these skills — if the classes were not so crowded, the teachers not so harried and the syllabi not so full.

And by 1990 ...

By 1990 three new Leaving Certificate Syllabi must be ready to meet the pioneering class of '87.

When a ministerial order suspended the Department of Education Senior Cycle Syllabus Committee in 1986 (to make way for the CEB) the Committee had completed work on new Leaving Cert B and C syllabi. If this Committee's work is not discarded, work only needs to be done on the A syllabus (which leaves very little in the current revisions for third level people to influence [1]). For the record, the Junior Cycle Syllabus Committee consisted of 3 teachers' representatives, 3 school management representatives and 2–3 department inspectors. There was a third level representative on the Senior Cycle Committee.

There are questions still to be answered: What course should those first year pupils follow who started in September 1987 and who would normally have done the Group Certificate in 1990? Will calculators be allowed in time? And will the next Junior Cycle review be even more democratic than the last one? But we can at least raise our hats to the first syllabus in Irish schools which will have a certificate at three levels

References

[1] D.J. Hurley and M. Stynes, *Basic Mathematical Skills of UCC Students*, IMS Bulletin 17 (1986), 68–75.

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The Theory of Blunders!

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We all come across mathematical blunders of all types and sizes when correcting scripts, answering questions, during discussions or when checking homework. Very often, these blunders can be corrected with no recurrence by convincing the students of the error of their ways e.g. a frequent error which occurs in different guises is $\frac{1}{a}+\frac{1}{b}=\frac{1}{a+b}$, so ask them to work out $\frac{1}{3}+\frac{1}{5}$ and $\frac{1}{3+5}$.

What happens on many occasions is that the student fails to stop and think that perhaps something he or she has been doing all his or her mathematical life, and getting away with it, may be incorrect, and in fact *utterly* false. A student at one time came up to me having failed the exam totally convinced he should have passed. I looked up his script and discovered that everywhere he should have integrated he differentiated and everywhere he should have differentiated he integrated, and nearly all done correctly! He flew through the exam at the next attempt. Why hadn't I spotted this during the year? (I have a reason, closely approaching an excuse!)

We don't expect such blunders from a student in our small honours classes, but they still occur and we can be on the lookout by marking some work before the official examination. We haven't anywhere approaching the resources to sort out these problems in our large pass classes. Unfortunately very often the first time we see some of our students' work is at the end of the year and then it is too late. What we need to do is take in work regularly, go through it ourselves and return the work *individually* pointing out errors and asking that problems, similar to those where the errors occurred, be attempted and handed in again for checking. Of course this is impossible with the very large numbers we have to cater for e.g. this year I have some classes of approximately 180, 130 and 100 students and to give this kind of attention to even one of these would take up all of my time, with no lectures anywhere else.

Is there a solution? One solution, not necessarily unique, would be to double the staff numbers in our Mathematics Departments, but of course this is impractical without even considering our present economic climate. (I have presented a solution so as a Mathematician need I go any further?) From my own experience of teaching small classes here and abroad I am totally