1. Introduction

It is now almost 20 years since the advent of Integrated Masters programmes in mathematics (referred to typically as MMath or MSci programmes). Essentially arising out of a report made by a working group supported by the London Mathematical Society [1], MMath programmes (as we shall refer to them here) were the sector’s response to the recommendation in that report that a choice of three or four year Honours degrees be offered in UK higher education institutions (four or five years in Scotland). The aim was, and still is, to provide appropriate training to those who wish to go on to a career as a professional mathematician, since more in-depth and advanced training is needed for such individuals beyond the sound education that a traditional BSc course provides.

At the University of Reading we have been offering MMath programmes since 1994. During this time we have had no progression requirements for students going from their penultimate year (henceforth referred to as Year 3) to their final year (Year 4). Recently, however, the University has been considering the issue of progression requirements for Integrated Masters programmes. Realising that it was by no means clear to us just what the consensus was in other mathematics departments across the UK, we set out to survey them. The results of this survey, which demonstrate wide variability, are summarised below. Also summarised is an analysis of our own data for recent MMath students, to provide an insight into the possible effects of implementing different progression hurdles at Year 3. Our intention in this paper is to provide an opportunity for reflection on the current situation regarding MMath progression.

2. Data collection from other Universities

An online survey was set up in SurveyMonkey™ (www.surveymonkey.com) in order to establish the existence of Year 3 to Year 4 progression requirements for Integrated Masters programmes in Mathematics. All Heads of Departments of Mathematics were emailed via the HoDoMS mailing list and asked to complete the survey. The survey was short, with just four questions asking for University, whether there was a rule (Yes/No), what this rule was, and whether there were plans to implement one if one did not exist (Yes/No).

This request resulted in 19 responses (where responses were not fully addressing the question, further information was obtained by consulting online programme specifications). Subsequently a list of all Universities appearing to offer MMath-type programmes on the UCAS website (www.ucas.com) was compiled – there were 39 of
these. The 20 Departments/Schools that had not responded were then emailed individually and asked to complete the survey. Of these, 15 either completed the survey online or emailed us their responses. A further one Department was found to have its progression requirements published online, meaning that responses and information from a total of 35 out of 39 Departments across the UK (90%) who offer relevant courses were considered.

“There is a surprisingly large amount of variation within the sector in terms of MMath Part 3 progression requirements. We feel that it is perhaps time to reconsider MMath progression in some detail, with the aim of reaching some consensus and reducing some of this variability.”

3. Results

3.1 Survey responses

Of the 35 Departments from whom information was obtained, eight (23%) seem to have no progression requirement for students going from Year 3 to Year 4. However, of these eight, three stated that they were considering implementing one in the near future. Many Departments specify progression in terms of an overall average to date (in effect, what the student would leave with if they were on the three-year degree), with some specifying requirements for just the third year. Table 1 shows a simplified summary of these requirements (making no distinction between overall average and Year 3 average).

There is clearly some variability in the progression requirements across the UK, with either a simple passing rule, or averages of 55% or 60% (in Year 3 or across years), being common.

3.2 Retrospective application of progression requirements

At Reading we have not had a Year 3 progression requirement, and have had only a 50% Year 2 requirement, which puts us in a good position to analyse the profiles of a wide range of past MMath students with respect to different hurdles. By applying various Year 3 progression requirements to their Year 3 level profile (incorporating Year 2 and Year 3 module marks) we are able to gain some insight into the likely effect of implementing different hurdles in the future.

Profiles of marks were obtained for students graduating from Reading with an MMath degree in the period 2005/6 – 2009/0. There were 42 such students, including primarily those studying just Mathematics, but also a small number studying either Mathematics and Meteorology or Mathematics and Physics. No students failed an MMath programme in this period.

We considered three progression hurdles: obtaining a Year 3 average of 50%, obtaining a Year 3 average of 60%, and

<table>
<thead>
<tr>
<th>None</th>
<th>Pass Year 3*</th>
<th>50%</th>
<th>55%</th>
<th>60% (2i)</th>
<th>Approx 1st</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count (%)</td>
<td>8 (22.9%)</td>
<td>8 (22.9%)</td>
<td>1 (2.9%)</td>
<td>8 (22.9%)</td>
<td>9 (25.7%)</td>
</tr>
<tr>
<td>*This includes more complex rules such as passing a certain number of credits either in Year 3 or overall.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 – Summary of Year 3 to Year 4 MMath progression requirements in the UK

<table>
<thead>
<tr>
<th>Final MMath classification</th>
<th>Failed to get 50% at Year 3 on first attempt</th>
<th>Failed to get 60% at Year 3 on first attempt</th>
<th>Failed to get 60%/2i weighted over Years 2 and 3 on first attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2i</td>
<td>4 (30.77%)</td>
<td>8 (44.44%)</td>
<td>6 (37.5%)</td>
</tr>
<tr>
<td>2ii</td>
<td>7 (53.85%)</td>
<td>8 (44.44%)</td>
<td>8 (50%)</td>
</tr>
<tr>
<td>3</td>
<td>2 (15.38%)</td>
<td>2 (11.11%)</td>
<td>2 (12.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 2 – Final classifications of students who would have failed to progress to MMath Year 4 at first attempt

<table>
<thead>
<tr>
<th>Year 3 “BSc” vs MMath classification</th>
<th>Failed to get 50% at Year 3 on first attempt</th>
<th>Failed to get 60% at Year 3 on first attempt</th>
<th>Failed to get 60%/2i weighted over Years 2 and 3 on first attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved</td>
<td>7 (53.85%)</td>
<td>9 (50%)</td>
<td>9 (56.25%)</td>
</tr>
<tr>
<td>Same</td>
<td>6 (46.15%)</td>
<td>9 (50%)</td>
<td>7 (43.75%)</td>
</tr>
<tr>
<td>Dropped</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 3 – Changes in classifications at end of Year 3 to end of Year 4 for students who would have failed to progress to MMath Year 4 at first attempt
obtaining a weighted average over Years 2 and 3 of 60% or
attaining a 2i to date according to the University’s rules for
classification of BSc degrees in that year (Year 2 is weighted
one third and Year 3 two thirds for the BSc). No attention
was given to the number of modules that had been passed.

Table 2 shows the number of students who would have
failed to exceed the simple progression hurdle indicated,
and the percentage of all such ‘not qualified at first attempt’
students who then went on to achieve the different
classifications at the end of their MMath by virtue of there
being no such hurdle in place.

For each rule about one third of students who would have
failed at the first attempt then went on to achieve an Upper
Second Class MMath degree, and about 90% went on to
achieve a Second Class MMath degree of some level (Upper
or Lower).

We further analysed the data by seeing whether students
improved their final (MMath) classification from that which
would be calculated at the end of Year 3 if they left with
a BSc instead. Table 3 shows these results, again in terms
of counts and percentages for those ‘not qualified’ under
certain progression hurdles.

No student who would have been ‘not qualified at first
attempt’ dropped a classification after completing their
Integrated Masters year, and around 50% of such students
actually improved. This demonstrates that these students
benefited from this additional year, and such a hurdle may
have been detrimental to their learning and ultimate career
prospects, if they had not been permitted to continue and
had left with a BSc at that point.

Of course, a caveat to the results displayed in Tables 2 and
3 is that because no such progression requirement was in
place for these students, it is impossible to assess whether
their performance was lower than what it would have
been had they known they had such a hurdle to exceed.
It is also not possible to assess whether these students
would have passed at resit, and therefore still continued
to their final year of their MMath. However, the results are
nevertheless illuminating in revealing the large percentage
of those students who may have failed to progress at the
first attempt who went on to achieve good results in their
MMath, thus opening up opportunities to follow a career as
a professional mathematician that may not otherwise have
been afforded to them.

4. Conclusions

We conclude by highlighting the fact that there is a
surprisingly large amount of variation within the sector in
terms of MMath Part 3 progression requirements. We feel
that it is perhaps time to reconsider MMath progression in
some detail, with the aim of reaching some consensus and
reducing some of this variability.

To aid any future discussions, we would put forward
the following points to consider. The relevant QAA
Benchmarking statement does not specify the need for,
nor level of, hurdle for progression to the final (level 7)
year, stating only in its Annex “Because of the demanding
nature of the additional master’s level work that will be
encountered later, institutions are likely to think it suitable
to impose fairly strict conditions on transfers in terms of
the quality of work so far exhibited.” [2] However, whilst
MMath programmes clearly should be advanced and
command respect, we must not lose sight of the reason
for their existence, which is to provide the necessary in-
depth training for those wishing to continue their lives as
professional mathematicians. Indeed, this was underlined
by Neumann when first proposing such programmes
(“The aim is a system in which all students who enjoy
mathematics and who would benefit from studying it
at degree level can follow appropriate courses” [1]), and
is supported by the QAA Benchmarking statement “the
essential aim of an MMath programme is to provide an
opportunity for learners to proceed to a higher level of
study in MSOR” [2].

We would recommend that any student with a reasonable
chance of succeeding on the programme should be
afforded the opportunity to do so. Our experience is that
some students take longer to establish themselves as
credible mathematicians than others. The data we have
studied from Reading show that setting a Part 3 progression
hurdle too high is likely to remove this opportunity from
a reasonable number of students who are nevertheless
capable of clearly satisfying the learning outcomes of an
Integrated Masters programme, and obtaining a good
classification at the end of it. Striking the right balance
in terms of progression hurdles, to afford all promising
students the opportunity whilst redirecting those to the
BSc for whom the MMath is not suitable, is an interesting
challenge for us all.

Acknowledgements

We wish to thank those individuals in the mathematics
departments and Schools who responded to our survey.

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