The Maths Bridging Initiative:
An Institutional Transition Support Programme

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A COVID STORY
COVID & A-Level
what we knew...

The Full A-Level Maths Curriculum Was Not Delivered

No Formal Exams for Two Years

Curriculum Delivered Varied by School

102 Programmes at QUB Required A-Level Maths
The Maths Bridging Initiative

Scaffolding Maths Knowledge into HE
Not ‘Just’ Another Intervention

Diagnostic Testing

Resources

Intervention
## Designing the Diagnostic Tests

### Sourcing the Data for Bespoke Diagnostic Testing

How important is it for the students on your programme to have knowledge of the following A Level Pure Mathematics Algebra and Functions topics?

<table>
<thead>
<tr>
<th>Not Needed</th>
<th>Useful</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Laws of indices and surds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Solving quadratics, simultaneous equations and linear and quadratic inequalities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Enabling a Data Driven Approach

Executive Summary

Number of students who have completed: 34.
Average score: 70.17%
Histogram where the red line indicates the average.

CivilEngineering - Overall Performance

Number of Students

0 2 4 6 8 10 12

Percentage

0 10 20 30 40 50 60 70 80 90 100
Schools Receive Detailed Reports on A-Level Bottleneck Areas

<table>
<thead>
<tr>
<th>Topic</th>
<th>Student Score</th>
<th>Teacher Score</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3 Integration by parts</td>
<td>76.47</td>
<td>23.53</td>
<td>100</td>
</tr>
<tr>
<td>7.3 Integration by substitution</td>
<td>73.53</td>
<td>26.47</td>
<td>100</td>
</tr>
<tr>
<td><strong>7.3 Integration using partial fractions</strong></td>
<td><strong>32.35</strong></td>
<td><strong>67.65</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>10.2 Q1 Formulae for constant acceleration for motion</td>
<td>82.35</td>
<td>17.65</td>
<td>100</td>
</tr>
</tbody>
</table>
in a straight line
| 10.2 Q2 Formulae for constant acceleration for motion                | 91.18         | 8.82          | 100         |
in a straight line
| **10.4 Calculus in kinematics in two dimensions and motion in a straight line** | **8.82**      | **91.18**     | **100**     |
| 11.2 Resolve forces in two dimensions                                 | 73.53         | 26.47         | 100         |
| 11.5 Weight and motion in a straight line under gravity               | 73.53         | 26.47         | 100         |
| **11.8 Solve problems involving equilibrium of forces**              | **50.00**     | **50.00**     | **100**     |
on a particle, motion of a body on a rough surface
and limiting frictions and statics

Student Signposted To Resources Based on Diagnostic Results
Resources

6.1 Differentiation of Linear Functions, Exponentials, Logarithms and Trigonometric Functions

Differentiation of a formula yields a formula ('the derivative') for the gradient of its graph at a typical point. For many routine functions, this can be carried out almost mechanically (although the underlying reasons why it works may be quite subtle).

Further resources to support your knowledge
Teaching material for each topic is provided in different formats so you can choose those that suit your own learning style best

- 6.1 Differentiating log and exp functions.pdf
- 6.1 Differentiation by taking logs.pdf
- 6.1 Differentiation of sin and cos first principles.pdf
- interactive-maths.com - Differentiation (Interactive Resource)
- 3blue1brown.com - Differentiation (Text-based Resource)

Further Support
If you would like further support in this subject area you can also access confidential 1-1 or group tutoring (face-to-face or remote) during term time. Book your appointment via http://go.qub.ac.uk/eps-mash in the Maths & Stats Helpdesk (MASH). Available to all UG & PG students across the university.
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
<th>Description</th>
<th>Venue</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday 19th</td>
<td>1pm - 1.45pm</td>
<td>Lunch n Learn - Integration (1)</td>
<td>First year QUB students are welcome to come along to this event and learn more about integration as the reverse of differentiation: standard integrals and how to extend their use by “guess and check and modify”. Integration by substitution -- changing the variable (how and why). Lunch is provided so booking is essential.</td>
<td>Medical Biology Centre, South Lecture Theatre</td>
<td>More Info</td>
</tr>
<tr>
<td>October 2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Register</td>
</tr>
<tr>
<td>Wednesday 20th</td>
<td>1pm - 1.45pm</td>
<td>Lunch n Learn - Integration (2)</td>
<td>1st year QUB students can come along and discover more techniques and examples of integration, aiming to include integration by parts, further &quot;guessing and checking&quot;, definite integrals, areas, volumes etc. Lunch is provided so booking is essential.</td>
<td>Mathematics &amp; Physics Teaching Centre, Room OG/006</td>
<td>More Info</td>
</tr>
<tr>
<td>October 2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Register</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>This workshop, designed specifically to support 1st year UG students across QUB, will quickly review the derivatives of around a dozen standard functions, etc.</td>
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</tbody>
</table>
Data Driven Interventions

- Use Diagnostic Data
- Inform Core Teaching
- Proactive Student Engagement
- Discipline Specific Interventions
- Grow Learning Communities
- Identify Areas of Non-Engagement
Outcomes (2021/22)

Intervention

Diagnostic Testing

Resources

Intervention
Diagnostic Tests

1371 Eligible Students

458 Took a Test (33%)

12/20 Lunch n’ Learn Sessions based on diagnostic data.
Education Events

20 Lunch n’ Learn Sessions

8 Exam Bootcamps

15 Online and Person Workshops
Community Events

2 Guest Lectures & Quiz Nights in collaboration with Maths and Physics Student Society

3 Field Trips
“Thanks for supporting and helping our students”

“Thank you for including us and for the resources you are providing for our students”

“I really appreciated the effort by you and your team”

“Very helpful and informative”

"Friendly lecturer, good explanations"

"Very easy to follow explanations, definitely gained out of this"

98% of students would recommend Lunch n Learn sessions to others
Reflections on 2021-22

Data Driven Interventions were effective.

Poor engagement can be a problem.

GCSE Level Maths often more beneficial.

Scheme will run again in 2022/23
How did it go? (2022/23)
Opening Thoughts

Continued the Data Driven Approach
• Bespoke Diagnostic Tests
• School-Specific Events
• Development of Resources

Deepened Integration with QUB Curricula
• Greater focus on Schools actively requesting support
• Some areas built in class time for MBI activity.

Managed Reduced Funding
• Now internally funded
• From ~£120k to ~£18k
• Reduced social events
Diagnostic Tests

1222 Eligible Students

490 Took a Test (40%)

An increase of 7% year-on-year.
These areas provided dedicated time to undertake the diagnostic tests.
Education Events

15 Workshops Delivered  
*(down from 43 in 2021-22)*

570 Attended a Session

More students attended fewer events - better engagement.
“Great to see the very positive feedback from the students – excellent” (Physics)

All but 1 student who attended the workshop passed. (Nursing and Midwifery)

Students requested that the diagnostic tests be made available to all students (Maths)

98.5% of students would recommend Lunch n Learn sessions to others

"Brilliant. Really engaging and helpful"

"Friendly lecturer, good explanations"

“Helped me understand how to multiply and divide by decimal numbers”

Consistent with 2021-22
## The Bottom Line

| Diagnostic tests identify individual learner needs. | Programme teams can adjust curricula based on need. | Enables reflection and targeted study by students. |
| Fewer, but more bespoke activities can boost engagement. | Students may perceive greater value in targeted activities. | Staff more likely to encourage participation. |
| The Maths Bridging Initiative Works | Enhances student attainment by mitigating knowledge gaps, | Becoming an established institutional support structure. |
Thank you