Maths within Chemistry, in a Pandemic: An exploration of Durham Level 1 Chemistry students’ experiences of the mathematical concepts of the course, and the instructors of the same course’s assumptions of the students, in the context of the national school closures and exam cancellations announced in March 2020.

Max J.I. Kirk* (they/them), Professor J. M. Robson (she/her) and Dr H. C. Cramm (she/her)

Department of Chemistry

Background

The importance of maths within chemistry is considerable, with a correlation between maths aptitude and understanding of chemistry. Additionally, the outbreak of Covid-19 caused all schools in the UK to close in March, until September 2020, leading to a period where formal education was disrupted to some extent for all pupils and students. This links to research on learning loss over summer holidays, which indicates a loss of confidence and understanding, particularly around mathematical concepts. This is in contrast to the impact of the first lockdown on first year undergraduate students’ experiences of studying the maths within the Mathematical and Experimental Tools Required in Chemistry module (METRiC) in 2020/21.

Research Questions

1. What access to learning provision did Durham Level 1 Chemistry undergraduate’s have between March-June 2020?
2. What assumptions did METRiC maths course instructors make about METRiC students in October, in the context of the 2020 school closures and cancelled exams? Where did these assumptions come from?
3. What are Durham Level 1 Chemistry students’ experiences of the mathematical concepts within the module, in the context of school closures and cancelled exams in 2020?

Methodology and Methods

The research project employed an exploratory design methodology, which aims to generate conclusions a posteriori: the hypothesis emerges from the data collection. This allowed for a useful flexibility within the project, as well as providing effective groundwork for future studies. Table 1 displays each method utilised within the project, as well as the response rates and analysis techniques.

Table 1: The different research methods, response rates and analysis techniques utilised within the project

<table>
<thead>
<tr>
<th>Method</th>
<th>Population</th>
<th>Engagement</th>
<th>Data type Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-structured interviews</td>
<td>4 instructors</td>
<td>100%</td>
<td>Qualitative, Thematic Analysis</td>
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<tr>
<td>Self-constructed questionnaires</td>
<td>156 students (58 M, 68 F)</td>
<td>42.6%</td>
<td>Quantitative, Statistical Analysis (univariate and bivariate)</td>
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<tr>
<td>Online survey</td>
<td>72 students (35 M, 37 F)</td>
<td>100%</td>
<td>Qualitative, Thematic Analysis</td>
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The response rate is satisfactory, given possible ‘research fatigue’ within the cohort and N is sufficient for statistical analysis. The sample shows a slightly gender bias, with a smaller proportion of men, but this is a common outcome in social research.

Most respondents reported having been in their final year of schooling during 2019/2020 (n=63).
- There is a significant positive correlation between a respondent having attended a private school and completion of their theory content, though not for practical content. This could worsen existing social mobility gaps.
- A similar positive relationship between being a man and completing the theory content was found, which also indicates a potential widening of gender inequality within education generally, and exams, March 2020.

We can see a variety of themes of the impact of school closures and exam cancellations on student respondents’ experiences of the METRiC module (Figure 6). These themes demonstrate the multifaceted nature of the respondents’ experiences in the first lockdown and their impact on METRiC.
- Many participants have struggled to catch up on missed work or get back into formal education, resulting in respondents feeling behind and having to spend more time and effort (than pre-Covid cohorts) to keep up with METRiC courses.
- A few also cited an impact of a lack of confidence, as well as feelings similar to imposter syndrome, which is a common challenge for university students.
- Other respondents have felt more comfortable, having had more time to do extra preparation before beginning university.

Conclusions

The key finding from this research is that the extent of student respondents’ resource provision varied considerably for different students. Very few respondents received live lessons, examined study output, and practical feedback from teachers, the latter can positively influence student learning outcomes. However, it did have the capacity to develop their individual study techniques, which are essential for university studies, especially remote learning.

Figure 6: Charts to summarise the themes from qualitative analysis of the free-text questionnaire responses about the impact of school closures (n=61) and exam cancellations (n=63) on their experience of METRiC

References