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**Observatory for
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Levelling Up: Case Studies

The London Mathematical Society (LMS) commissioned the Observatory for Mathematical Education to write this case study to highlight the impact and benefit of the Levelling Up: Maths scheme to participants with different roles.



Queen Mary University of London, 2024

The academic team at Queen Mary found out about *Levelling Up: Maths* through a tweet by one of the participating universities. Talking to departments already delivering the programme was key to getting up and running, along with the support and enthusiasm of the London Mathematical Society. After receiving start-up funding from *Levelling Up: Maths* for the first year, the programme has since been funded internally by the School of Mathematics, who recognise the benefits within and beyond the school.

Located in East London, Queen Mary is known for having a diverse study body. Through *Levelling Up: Maths*, school students from minority groups are able to see themselves represented among university mathematics students. A key benefit for participants is it challenges their stereotypical image of a mathematician, for example, mistakenly thinking that to be a mathematician you have to be a genius, or that all mathematicians have poor social skills. Instead, they find that mathematicians are very normal people.

A level Mathematics students are often undecided about their future and have lots of questions about what it's like to study maths at university. The *Levelling Up: Maths* tutors are able to talk about their own experience of the degree. Participants also get to experience a way of doing maths that might be different from how they've been taught in school, by solving problems collaboratively and working through mistakes. Queen Mary has found it valuable to run an in-person launch event, where tutors and students can meet for the first time and break the ice. The subsequent tutoring sessions are all online, meaning that students from across East and West London are able to take part.

"I believe that the message that the tutors have been very good in delivering is that it is normal in mathematics to make mistakes. You make a mistake and then you learn from your mistake, and this is also the message I give to my students."



For the tutors, taking part in *Levelling Up: Maths* has improved their teaching skills, particularly the ability to recognise when students are struggling and adapt their explanations accordingly. Tutors really appreciate that lesson materials are already provided for them, although as they grow in confidence they often start creating their own additional resources to meet the needs of their students. Since the current tutors at Queen Mary are mathematics PhD students who also deliver tutorials for undergraduates, their increased confidence has a positive effect on their teaching within Queen Mary's School of Mathematics as well. Tutors have also had unique opportunities to expand their own networks through meeting and presenting alongside mathematicians from the London Mathematical Society.

A common question from other universities is about the amount of work involved. At Queen Mary the importance of having a good team was emphasised, working across marketing and communications, EDI and widening participation, and academic teams, as well as making sure to recruit excellent, reliable tutors. Taking part in *Levelling Up: Maths* has improved relationships with local schools and led to other widening participation events, such as invitations from schools to deliver talks on diversity in mathematics.

"My honest answer is that if you get your team of people that you can trust and you involve professional services as well, then actually it is doable."

Jordan, Queen Mary University of London

Jordan is a third year PhD student in Mathematics at Queen Mary University and has been tutoring on *Levelling Up: Maths* since the programme started in February 2023. The experience of tutoring A level students who are interested and enthusiastic about maths has confirmed his desire to continue in academia and hopefully become a lecturer in the future.

Before signing up for the *Levelling Up: Maths* programme, Jordan already had experience tutoring GCSE and A level students, as well as running tutorials for undergraduate students at Queen Mary. He stressed that no tutoring experience is needed, since the tutor guides provided by *Levelling Up: Maths* include information about what students are expected to know already, and how to deliver the content. Even with his experience, Jordan finds the *Levelling Up: Maths* materials very helpful in suggesting different ways to break down problems, and he has been able to apply some of these ideas in his teaching of undergraduates, for example when teaching calculus. Tutoring on the programme has given him opportunities to develop his teaching skills, such as knowing how to give hints without giving away the answer. He has also used a format similar to the *Levelling Up: Maths* sessions when presenting his own maths research to an



audience, using a graphics tablet to write in the gaps on pre-prepared materials as an active part of the presentation, rather than simply talking to slides.

For Jordan, an important aspect of the programme is challenging stereotypes of maths and mathematicians. By interacting with university maths students in an informal setting, participants get to see younger people from different backgrounds doing maths. In addition, they gain a much better idea of what maths is like at university by experiencing the kind of teaching that happens in university tutorials or seminars.

"The nature of the session really isn't like an A level class or any class in maths that they've had before, and it's kind of an eye opener to what a seminar at university is like. And in that sense, they're getting exposure to what the real world of maths is."

Taking part in *Levelling Up: Maths* helps students who are on the fence about what to study at university. For example, one participant who was deciding whether to apply for engineering or maths as a degree subject chose maths once he realised how much he enjoyed the *Levelling Up: Maths* sessions. For participants from schools in more deprived areas, like parts of London local to Queen Mary, the schools may not be able to provide support for applying to maths at university. Two students that Jordan taught were enabled to take the STEP paper for entrance to university maths because of the support they received on the *Levelling Up: Maths* programme, which introduced them to solving STEP-type problems. In fact, the ambitious material provided by *Levelling Up: Maths* really does challenge students and provide a good foundation for them to not only access harder maths but also to think flexibly and link ideas. It would therefore be surprising if it didn't benefit all the participants in terms of their attainment by making A level Mathematics and Further Mathematics seem more trivial in comparison.

"I wish that Levelling Up would be in more places and more departments. I think that it has a real power to change the attainment problem which the country is seeing."
