# MENTOR DEVELOPMENT: Understanding the ITE Partnership Curriculum

## Mathematics

Subject rationale

We believe that education plays a key role in promoting social justice and reducing social inequalities, and that well qualified and highly skilled teachers make a difference to the lives and futures of the learners they teach.

This practical programme educates BSTs about life in the Mathematics classroom. They gain the knowledge and understanding necessary to reflect on their practice in order to improve their teaching and children's learning.

Pupils' learning is at the heart of the programme and we will focus on teaching methods which allow students to explore mathematics, developing as independent learners and mathematical thinkers. The university training supports and complements BST’s work in schools.

BSTs develop their knowledge to become both effective and reflective Mathematics teachers. They gain skills to plan and teach your subject effectively, helping all students to unlock their potential.

## **Sequencing the subject for each phase**

The timings of actual outcomes for each BST will vary according to their own background and how they develop through the course. The following expectations represent the general outcomes from the coverage of the core curriculum components and the connected Mathematics curriculum sessions for that phase:

Phase 1 – To have begun to recognise the difference between mathematical knowledge per se, and pedagogical mathematical knowledge useful for teaching. To have started to unpack their own mathematical understandings, in certain topics, to make them more useful to them in the teaching of mathematics. To show an understanding of the need to make mathematics accessible and interesting to learners. To start to develop ways to assess prior knowledge in order to support learners new mathematics learning. To start thinking about how to adapt teaching to the needs of different learners.

Phase 2 – To have developed and become adept at implementing at least one lesson structure, leading to learning in their classrooms. To be able to adapt teaching so that all learners make some progress, with support from classroom teachers. To start to engage with parents and carers and other staff (e.g. tutors, heads of year, SENCo) for the benefit of learners. To be able to plan learning journeys for their pupils in a coherent way, using spaced retrieval practice to help learners retain information and make links between various parts of mathematics. To be aware of and have a range of strategies to deal with mathematics anxiety in the classroom, and teach in a way to encourage the development of mathematical resilience. To have an understanding that mistakes can come from many sources, but that identifying and addressing earlier misconceptions can often hold the key to helping learners understanding.

Phase 3 – To have adapted to their second placement and to have expanded their repertoire of teaching strategies to be able to reach a wider range of pupils and to start to think about how to maximise their use of lesson time for learning. To have an awareness of the power of multiple representations in mathematics and how they can help learners become flexible in their use of mathematics, as well as engendering understanding in a more diverse group of pupils. To understand and be practiced in the use of variation theory in mathematics in order to grow the awareness of mathematical structure in their learners.

Phase 4 – To be able to engage a wide variety of learners in mathematics content at both KS3 and KS4. To know how to use various representations of mathematical concepts to build understanding in your learners. To know how to chunk mathematical content to ensure learners are not cognitively overloaded. To be able to use variation in question design in order to reveal mathematical structure as well as practice algorithmic skills. To be able to encourage learners as mathematical thinkers, valuing their reasoning skills and avoiding focus on speed, in order to avoid instilling mathematics anxiety, as traditional mathematics teaching has done.

### How mentors can support BSTs in school

* ​​​​​​​​​​​​​Help BSTs to develop strategies to engage learners in mathematics, either by modelling, suggesting observation of other teachers, or developing the BSTs own ideas.
* Reinforce the message that real mathematics learning is about developing habits of mathematical behaviour in the learners, rather than only “covering content”.
* When covering new content, to ensure that BSTs have, and are developing more, strategies to assess pupil understanding, including starting points.
* Help BSTs to develop the ability to adapt their teaching to the needs of their learners, taking emotional responses to mathematics into account.
* Explore with the BST how to balance substantive and disciplinary knowledge in mathematics learning within a lesson.
* Discuss and analyse how the big ideas in mathematics are revisited by using a range of examples to teach key concepts, modelling how they balance exposition, repetition, practice of critical skills and knowledge.
* Help BSTs with planning both content delivery and high quality assessment for learning opportunities.
* Enabling BSTs to develop independence in all aspects of their practice, including planning, exploring pedagogical mathematical knowledge, and reflective teacher behaviours in the classroom.

### Indicative open access reading

1. DfE (2014) National Curriculum; Program of Study for Mathematics: <https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study>
2. OfStEd (2021) Research review series: mathematics: <https://www.gov.uk/government/publications/research-review-series-mathematics/research-review-series-mathematics>
3. Jo Boaler (2016) How you can be good at math and other surprising facts about learning, TEDx Stanford Talk: <https://www.youcubed.org/resources/jos-tedx-talk/>
4. Hewitt, D. (1999) 'Arbitrary and necessary part 1: A way of viewing the mathematics curriculum', For the Learning of Mathematics, 19(3), pp. 2-9. <https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/18847/3/hewitt1.pdf>
5. NRICH (2018) What is a Mathematically rich task? <https://nrich.maths.org/6299>.

**Being a Mathematics Mentor in the ITE Partnership: O*ur Curriculum***

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| **Curriculum Component** | **University Mathematics Session** | **A brief summary of what BSTs have learned** |
| **Professional behaviours** | **Introduction to the Secondary Mathematics PGCE** | BSTs have reflected on their personal vision and values for mathematics education, and on how their values in mathematics impact their pedagogical approaches. They have developed reflection and target setting skills and explored tools for subject knowledge development. |
| **Subject, pedagogical and curriculum Knowledge** | **Mathematics Education and the National Curriculum for Mathematics** | BSTs have gained an understanding of the development of the national curriculum for mathematics up to its present form.  They have reviewed the development of mathematics education and understand the place of formal assessment in England. |
| **Developing subject pedagogy** | This session includes a focus on anticipating common misconceptions, and making good use of expositions, by discussing and analysing with expert colleagues how to use concrete representation of abstract ideas (e.g. making use of analogies,  metaphors, examples and non-examples). |
| **How pupils learn** | **Situated Learning and Peer Microteach** | BSTs learn that teachers approach lessons in a variety of ways in order to develop innovative approaches to pupils’ learning, and how to take risks when planning and delivering lessons in order to engage fully and creatively with the learning process. They have learned how to demonstrate conscious methods to encourage pupils’ intellectual curiosity, recognising the importance of modelling work in the classroom. |
| **Communicating in mathematics** | BSTs have gained and understand of the importance of speaking, listening and diverse communications skills in the mathematics classroom including a strong focus on questioning the use of specialist IT, e.g. Geogebra |
| **Planning for learning** | **Planning a sequence of learning in mathematics** | BSTs have reflected on what progress in mathematics looks like in a single lesson, a series of lessons and a longer period of time. They have engaged in lesson planning and delivery both with their peers and in groups in one-off school experiences. BSTs have considered different models of teaching including direct instruction, structured problem solving and teaching for mastery. |
| **Adaptive Teaching** | **Adaptive teaching in Mathematics** | Key pedagogies related to adaptive teaching, inclusion and differentiation have been explored, including strategies to support the spectrum of learners. Strategies explored include: scaffolding, use of manipulative and representations, stretch and challenge, questioning and modelling. |
| **Assessment of Pupils** | **Assessment in Mathematics** | BSTs are familiar with the difference between formative and summative assessment in mathematics and when these may be more or less appropriate.  BSTs have practiced assessing Key Stage 3 and GCSE responses using mark schemes across exam boards. BSTs are also familiar with Growth Mindset theory and how to apply this to student feedback. |
| **Managing Pupils’ Behaviour** | **Positive classroom management in mathematics** | BSTs are familiar with positive classroom management and a range of behaviour management systems. We have discussed ways they can engage and motivate learners in mathematics. |
| **Pupils physical and mental health** | **Developing mathematical resilience** | BSTs have been made aware of the prevalence of mathematics anxiety and the impact this can have in the classroom. We have explore ways to develop mathematical resilience to combat this. |