



Edge Hill
University

Faculty of
Education



Intensive Training and Practice (ITAP)

Year 2 BA (Hons) Primary Education with QTS (Part-time)

Variation in Mathematics

Programme Leader: Elizabeth Dunn, dunne@edgehill.ac.uk
ITaP Lead: Lorraine Healy, Healyl@edgehill.ac.uk
Lead mentors: Sarah MacDonald, Macdonas@edgehill.ac.uk
Steven Hodson, Steven.Hodson@edgehill.ac.uk



What is Intensive Training and Practice ? (ITAP)

Intensive practice is a way of helping trainee teachers to get better that involves:

- Focussing on a **particular aspect of teaching** for a period of time.
- A co-ordinated set of activities **that link the theory and practice of teaching.**
- Multiple opportunities for a **trainee to practice and receive feedback.**

A five day intensive practice unit focussed on a particular aspect of teaching.

It will include centre based and school based support and a range of opportunities to practise and receive feedback.



Variation in Mathematics

- This ITaP has a focus on variation theory. Trainees have previously considered the use of the CPA approach within mathematics teaching and how representations and structures can be used to support teaching and learning. Variation is another of the 'Five Big Ideas' (NCETM) for effective mathematics teaching.
- Trainees will be using their knowledge of carefully sequenced, small steps in learning and applying this to ensure pupils have a deep conceptual understanding. An example of this could be to consider the properties of rectangles when exploring quadrilaterals, considering what changes and what stays the same when presented with a range of images. An example related to number could be carefully sequencing an approach to column addition.
- Trainees, in centre-based training, will gain an understanding of **presenting the concept in different ways using concrete resources, visual images and considering examples and non-examples**, as well as sequences of learning. During school-based training, trainees will have the opportunity to observe and put this approach into practice.



The **Five Big Ideas** that underpin teaching for mastery are all interconnected.

‘Variation involves looking at a concept through different representations, starting with one and then adding more to consider the concept from different perspectives.

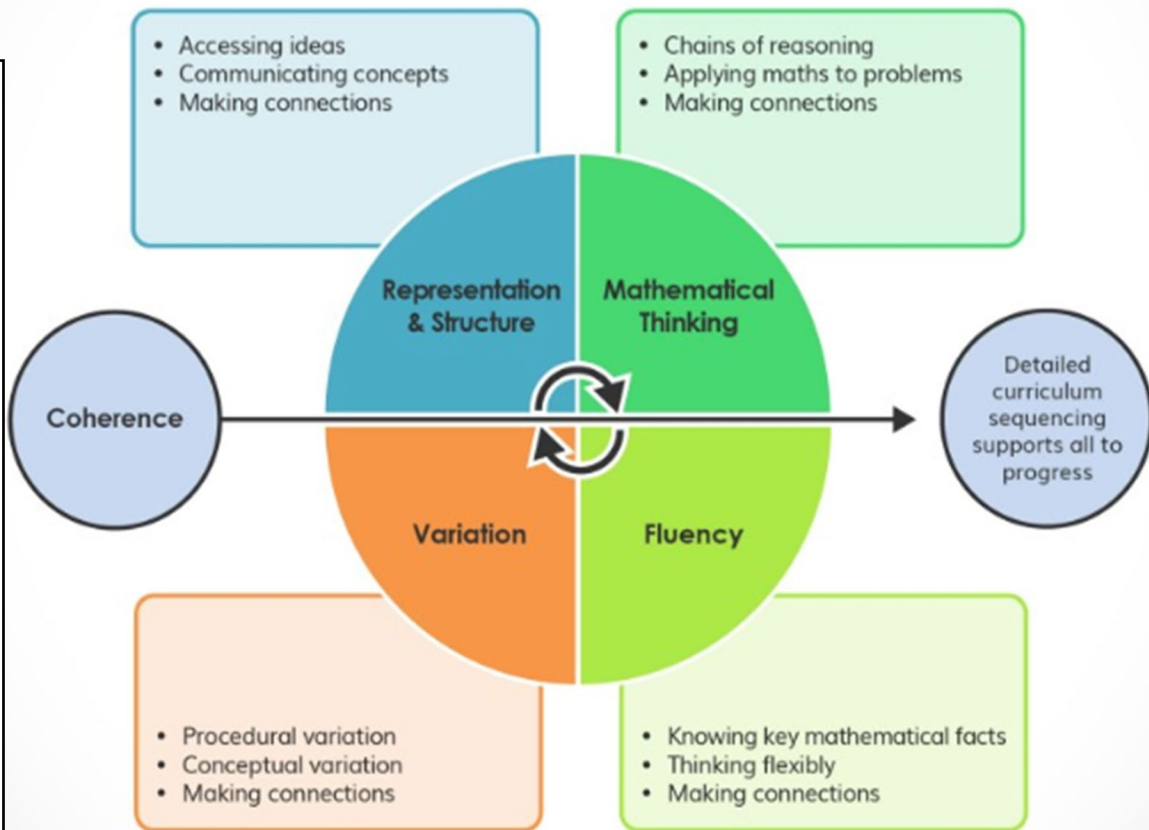
Concepts are presented coherently to engage pupils in mathematical thinking, to reason and make connections.

Choosing calculations that pupils are already fluent in reduces overload and learning is made accessible to all pupils.’

NCETM 2024

Teaching for Mastery

Five Big Ideas



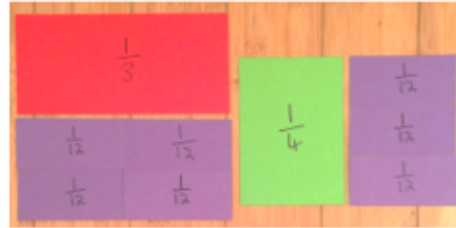


Progression in Visual Representations in Fractions, Decimals and Percentages

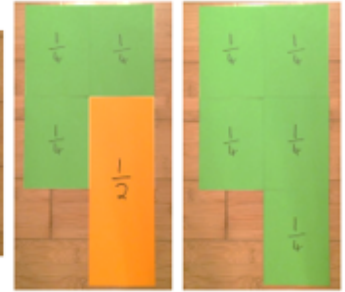
Year 5

Compare and order fractions, find equivalent fractions, add and subtract fractions.

Fraction cards used to compare, show equivalence and model calculations.



Example: $\frac{1}{4} + \frac{1}{2}$



Find decimal equivalents for quarters, fifths and tenths, relating to division

Dividing length of a metre ruler into two/four/five equal parts.



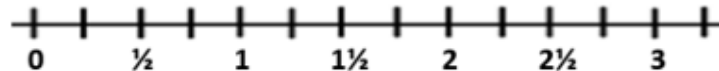
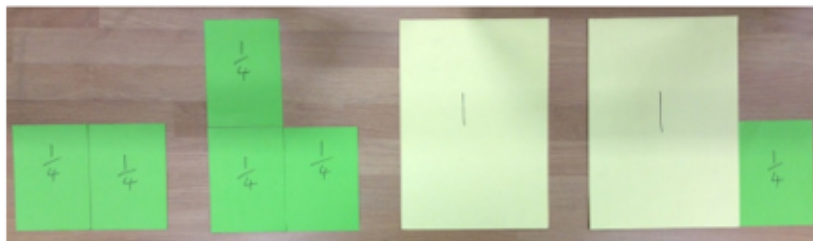


Progression in Visual Representations in Fractions, Decimals and Percentages

Year 2

Use halves and quarters as counting numbers, going over 1

Modelled with fraction cards and on a number line.



Year 3

Simple unit/non-unit fractions represented in a range of ways; different fractions compared including equivalence

Identify fraction of shaded shape; position fractions on a number line; use fraction cards to show equivalence and compare fractions.

True or false?



$\frac{1}{2}$

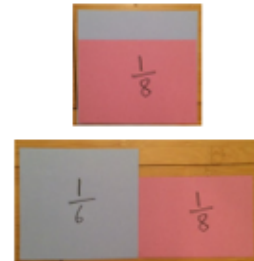
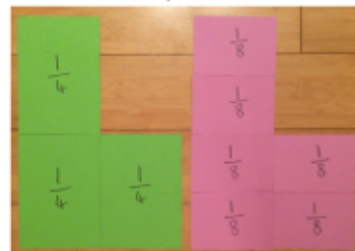
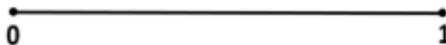


$\frac{1}{3}$



$\frac{1}{2}$

Estimate the position of $\frac{1}{3}$, $\frac{1}{5}$ and $\frac{7}{10}$



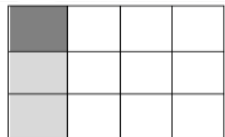
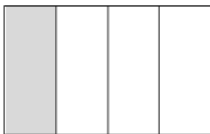


Year 6

Multiply and divide unit fractions and simple non-unit fractions

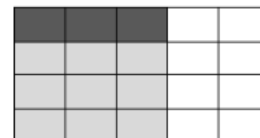
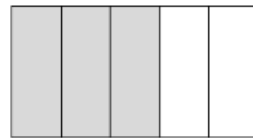
Area model diagrams to model a fraction being divided or multiplied by a fraction (modelled in two steps).

$$\frac{1}{4} \times \frac{1}{3}$$



$$= \frac{1}{12}$$

$$\frac{3}{5} \div 4$$

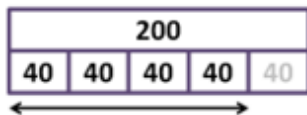
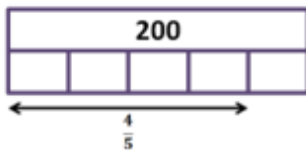


$$= \frac{3}{20}$$

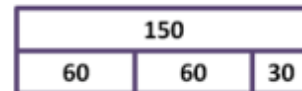
Calculate percentages and fractions of quantities

Bar model visualises finding fraction/percentage of quantity and finding the whole given a percentage/fraction. Shown step-by-step.

$$\frac{4}{5} \times 200$$



40% of a number is 60. What's the number?





Progression in Variation Examples

True or False

Conceptual and Non Conceptual Variation



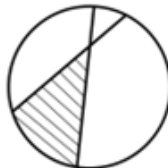
$$\frac{1}{2} \quad \checkmark$$



$$\frac{1}{2} \quad \times$$



$$\frac{1}{3} \quad \times$$



$$\frac{1}{4} \quad \times$$

Why, explain?

Procedural Variation

National Centre
for Excellence in the

$2 \times 3 =$

$6 \times 7 =$

$9 \times 8 =$

$2 \times 30 =$

$6 \times 70 =$

$9 \times 80 =$

$2 \times 300 =$

$6 \times 700 =$

$9 \times 800 =$

$20 \times 3 =$

$60 \times 7 =$

$90 \times 8 =$

$200 \times 3 =$

$600 \times 7 =$

$900 \times 8 =$

The child is carrying out the procedural operation of multiplication, but through connected calculations has the opportunity to think about key concepts involving multiplication and place value

This leads to intelligent practice

Adaptive Teaching

Learn that:

LT1 Pupils are likely to learn at different rates and to require different levels and types of support from teachers to succeed.

Learn how to:

Provide opportunity for all pupils to experience success, by:

LHT 5 Observing how expert colleagues adapt lessons, whilst maintaining high expectations for all, so that all pupils have the opportunity to meet expectations and deconstructing this approach.

LHT6 Discussing and analysing with expert colleagues how to balance input of new content so that pupils master important concepts.

And - following expert input - by taking opportunities to practise, receive feedback and improve at:

LHT9 Making use of well-designed resources (e.g. textbooks). • Planning to connect new content with pupils' existing knowledge or providing additional pre-teaching if pupils lack critical knowledge

LHT11 Building in additional practice or removing unnecessary expositions.

LHT12 Reframing questions to provide greater scaffolding or greater stretch.

How pupils learn

Learn that:

LT6 - Where prior knowledge is weak, pupils are more likely to develop misconceptions, particularly if new ideas are introduced too quickly.

Learn how to:

LHT 10 following expert input - by taking opportunities to practise, receive feedback and improve at: • Balancing exposition, repetition, practice and retrieval of critical knowledge and skills.

Subject and curriculum

Learn that:

LT 3 - Ensuring pupils master foundational concepts and knowledge before moving on is likely to build pupils' confidence and help them succeed.

Learn how to:

following expert input - by taking opportunities to practise, receive feedback and improve at:

LHT4 - Providing opportunity for all pupils to learn and master essential concepts, knowledge, skills and principles of the subject.

LHT5 - Working with expert colleagues to accumulate and refine a collection of powerful analogies, illustrations, examples, explanations and demonstrations.

LHT6 - Using resources and materials aligned with the school curriculum (e.g. textbooks or shared resources designed by expert colleagues that carefully sequence content).

LHT7 - Being aware of common misconceptions and discussing with expert colleagues how to help pupils master important concepts.



On completion of the ITaP, trainees should:

- Have a greater understanding of **how variation is successfully implemented**, within the classroom, to ensure pupils have a deeper understanding of taught concepts.
- Know how **to plan a sequence of variations to provide practise in different contexts** to deepen mathematical understanding, recognising what stays the same and what has been changed.
- Have a greater understanding of the progression of maths skills being taught and what prior learning is needed before introducing a new concept.



ITaP Model Structure

INTRODUCE

Learning about the theory of teaching and learning

ANALYSE

Using representations to analyse expert teaching

PREPARE

Using approximations to practise and get feedback

ENACT

Receiving support to apply learning in the classroom

ASSESS

Tracking trainees' growing knowledge and skills

Framework informed by Grossman, P. (2018) (ed) .Teaching Core Practices in Teacher Education



Model Structure Intensive Training and Practice (ITAP)

- ITaPs are a blend of centre- and school-based activities to:
- **Introduce:** support trainees' learning about the theory of teaching and learning around a given aspect of pivotal practice
- **Analyse:** support trainees to analyse and deconstruct expert teaching
- **Prepare:** provide opportunities for trainees to use approximations practice and to get multiple opportunities for expert feedback
- **Enact:** support trainees to apply their learning in the classroom in different scenarios and contexts
- **Assess:** monitor trainees' knowledge and skills

Pre ITaP training	In Year 1, trainees will have had sessions on the CPA approach and be familiar with this. They will have also completed their introductory professional practice.			
Wednesday 22nd/ Thursday 23rd May	WB 3rd June	WB 10th June	WB 17th June	WB 24th June & 2nd July*
DAY 1 Centre-based	DAY 2 School-based	DAY 3 School-based	DAY 4 School-based	DAY 5 School-based/Centre-based
INTRODUCE/ ANALYSE	PREPARE/ ENACT	ENACT	ENACT	ASSESS
Learning about the theory of teaching and learning. Using representations to analyse expert teaching.	Using approximations to practice and get feedback.	Receiving support to apply learning in the classroom.	Receiving support to apply learning in the classroom.	Tracking trainees' growing knowledge and skills.
Seminar (2 hours) Variation seminar – PED2033 Maths tutor	Observing expert teaching in KS1 – Focus on variation. How variation is used to develop conceptual and/or procedural understanding	Team teaching – KS1 Opportunities for rehearsal and subject specific feedback.	Observing expert teaching – KS2 – focus on variation.	Team teaching – KS2 Opportunities for rehearsal and subject specific feedback.
Reading (1 hour) A reading given from one of the above key texts.	Expert KS1 teacher	Reflection with mentor or another expert colleague	How variation is used to develop conceptual and/or procedural understanding	Reflection with mentor or another expert colleague



		Discuss outcome of lesson with above colleagues in supporting the understanding of variation in KS1.	Expert KS2 teacher	Discuss outcome of lesson with above colleagues in supporting the understanding of variation in KS2.
<p>Preparation - Questions and areas of focus related to variation in mathematics lessons.</p> <p>Work with peers to devise questions and possible areas. Discuss these with maths tutor in preparation for school.</p>	<p>Co-planning and research</p> <p>Trainees to work alongside the KS1 teacher to plan for the following week.</p> <p>Discuss these with the Lead mentor</p>	<p>Reading (1 hour)</p> <p>A reading given from one of the above key texts.</p>	<p>Co-planning and research</p> <p>Trainees to work alongside the KS2 teacher to plan for the following week.</p> <p>Discuss these with the Lead mentor</p>	<p>Portfolio</p> <p>Overall reflection and target setting (*Centre-based 2nd July)</p> <p>Discussions with peers and maths tutor.</p>



Introduce/Analyse Day One

Wednesday 23rd May

Learning about the theory of teaching and learning.
Using representations to analyse expert teaching.

Centre-based learning	Seminar and discussion on variation by Primary Assistant Maths Hub Lead and Y6 teacher, Sharon Thornhill.
	Observation of film clips, deconstruction of good practice.



School-Based

3.10.06

10.03.06

17.03.06

Observing expert teaching in KS1 and KS2 over the three weeks – Focus on variation.

How variation is used to develop conceptual and/or procedural understanding

Observation of variation within mathematics

	Key Stage 1	Key Stage 2
How was variation evidenced in the teacher's planning of the lesson?		
How were the learning episodes, activities and exercises sequenced to support children in making connections and observing what stays the same and what changes?		
What manipulatives and representations were utilised? Consider how they supported the learning and compare their effectiveness.		
Did you see the use of examples and non-examples? What questions did the teacher ask to develop pupils' understanding of the mathematical structures?		
What did you notice about the sequencing of questions e.g. in independent activities? How did this support a deeper understanding of the concept?		



Prepare/Enact School Based Experiences outlined

WB 3/6/24	WB 10/6/24	WB 17/6/24	WB 24/06/24
<p>Observing expert teaching in KS1 –</p> <p>Focus on variation. Observe how variation is used to develop conceptual and/or procedural understanding</p> <p>Expert KS1 teacher Analyse how variation was evident in</p> <p>Co-planning and research - Trainees to work alongside the KS1 teacher to plan for the following week.</p>	<p>Team teaching – KS1 Opportunities for rehearsal and subject specific feedback.</p> <p>Reflection with mentor or another expert colleague - Discuss outcome of lesson with above colleagues in supporting the understanding of variation in KS1.</p>	<p>Observing expert teaching – KS2 –</p> <p>Focus on Variation Analyse how a CPA Observe how variation is used to develop conceptual and/or procedural understanding</p> <p>Expert KS2 teacher Analyse how variation was evident in</p> <p>Co-planning and research - Trainees to work alongside the KS2 teacher to plan for the following week.</p>	<p>Team teaching – KS2 Opportunities for rehearsal and subject specific feedback</p> <p>Reflection with mentor or another expert colleague - Discuss outcome of lesson with above colleagues in supporting the understanding of variation in KS2</p>



24/6/24
Centre-Based

Reflection with mentor or another expert colleague
Discuss outcome of lesson with above colleagues in supporting the understanding of variation in KS2.

7/07/24
Centre-Based

Overall reflection and target setting.
Discussions with peers and maths tutor



Edge Hill
University

Faculty of
Education

Reflections Centre-based



Edge Hill
University | Faculty of
Education

Reflections (Centre-based)

Give an example of when variation was used effectively to impact on pupils' conceptual or procedural understanding.

Give an example of how you used variation in your teaching. What impact did it have? Would you change anything in the future?



Quality Assurance – Lead Mentor

- During the ITaP school-based days, one of the Lead Mentors will visit a selection of settings to meet with trainees and mentors to quality assure to delivery of the ITaP experience.
- The Lead Mentor will contact schools and trainees directly to arrange these visits.
- Visits are non-judgemental and the focus is to look for ways to improve the ITaP experience for both our trainees and partnership schools.



- **NCETM The 5 big ideas in teaching for mastery** [Five Big Ideas in Teaching for Mastery | NCETM](#)
- **OFSTED Co-ordinating Mathematical success DFE 2023** [Coordinating mathematical success: the mathematics subject report - GOV.UK \(www.gov.uk\)](#)
- ASKEW, M. 2011. *Transforming Primary Mathematics*, Routledge.
- DAVIDSON, A. 2019. Ingredients for planning student-centred learning in mathematics. *Australian Primary Mathematics Classroom*, 24(3), pp. 8–14. Available at: <https://search.ebscohost.com.edgehill.idm.oclc.org/login.aspx?direct=true&db=ehh&AN=138323622&site=ehost-live&scope=site> (Accessed: 27 March 2023)
- EDUCATION ENDOWMENT FOUNDATION. 2021. Improving mathematics in the Early Years and Key Stage 1. Available from: <https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/early-maths>
- EDUCATION ENDOWMENT FOUNDATION. 2022. Improving mathematics in Key Stage 2 and 3. Available from: <https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/maths-ks-2-3>
- GALLAGHER, M. A., PARSONS, S. A. and VAUGHN, M., 2022. Adaptive teaching in mathematics: a review of the literature. *Educational Review*. 74 (2), pp. 298-320. Available from: <https://doi-org.edgehill.idm.oclc.org/10.1080/00131911.2020.1722065>.
- WATSON, A. and MASON, J. ,2006. Seeing an exercise as a single mathematical object: using variation to structure sense-making. *Mathematical Thinking and Learning*, 8(2), pp. 91–111



Variation in Mathematics

- According to NCETM, 'The benefit of using variation is enormous: you can improve the progress that children make and the quality of learning. Ensuring depth of understanding and making lessons accessible to all children means that more pupils make good progress and become confident mathematicians. Using variation relieves cognitive load, so children have space to make deep and lasting connection.'

Dr Debbie Morgan, the NCETM's Director for Primary, explains why variation is one of the most powerful ideas in the teaching of maths.

What is variation?

Dr Debbie Morgan

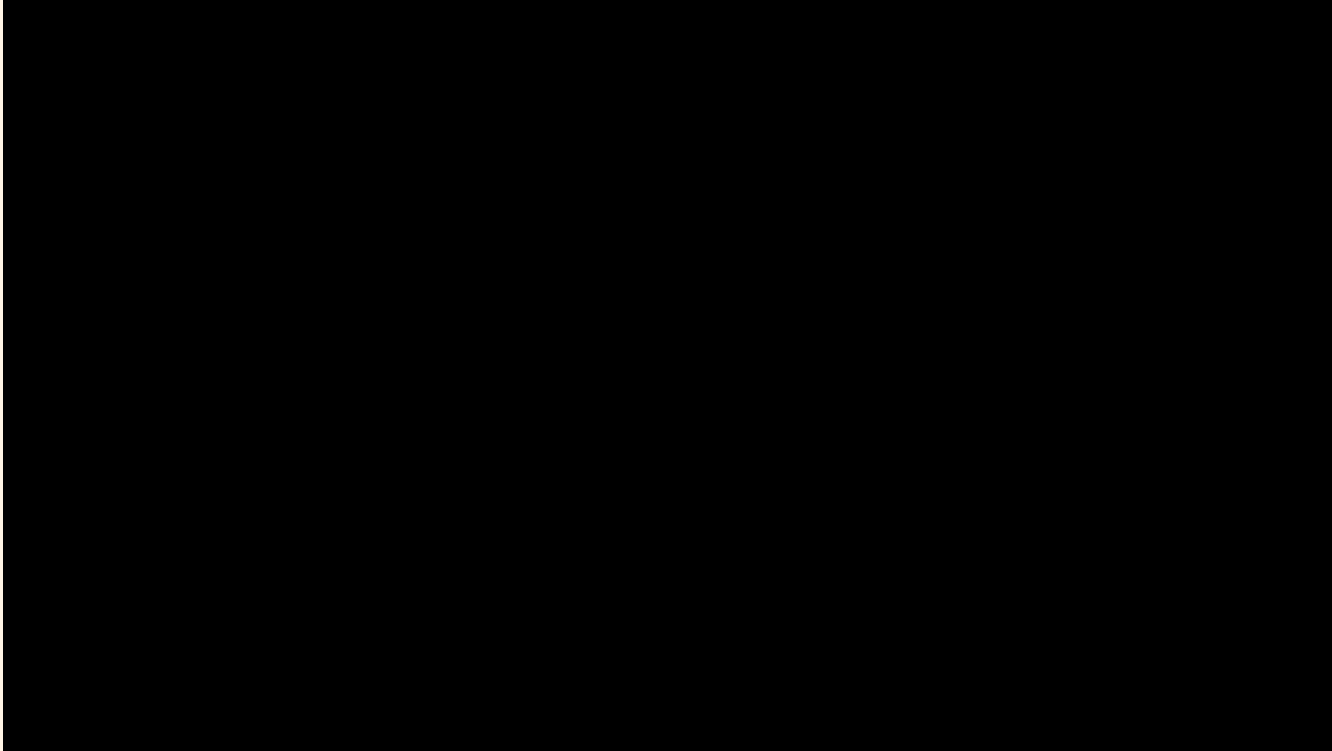




Edge Hill
University

Faculty of
Education

Debbie Morgan, the NCETM's Director for Primary





Edge Hill
University

Faculty of
Education

A hand in a dark suit sleeve holds a white megaphone with a blue handle. A white speech bubble with a blue border extends from the megaphone, containing the text "THANK YOU!" in large, bold, blue capital letters. The background is a solid blue color.

**THANK
YOU!**