

# Technology *enabled* mathematical science education

Bridging Research and Practice

Emma Cliffe

# Defining the problem

- ▶ Enabling access
  - ▶ Defining the problem
  - ▶ From research to practice
  - ▶ Change
- ▶ What next?
  - ▶ Dissemination and core challenges

# We want...

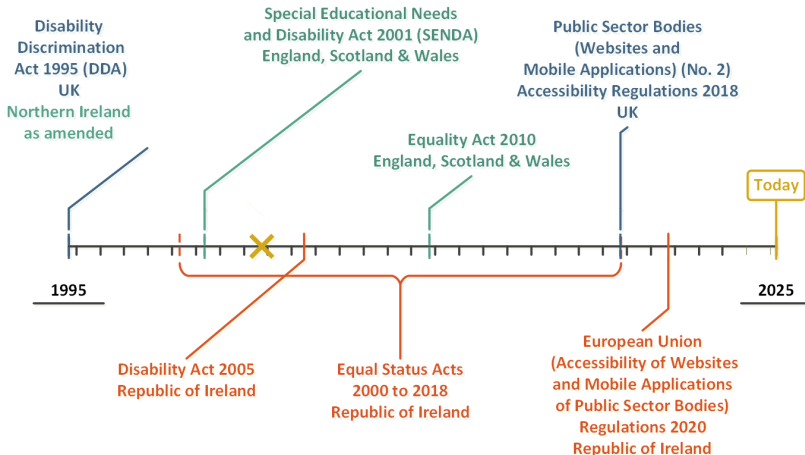
... to enable access to mathematical content by:

- ▶ People using assistive technology
- ▶ People reading on small screen devices, e-book readers...
- ▶ People searching, copying and pasting
- ▶ People verifying reproducibility of results
- ▶ Software parsing, transforming, generating and manipulating input and output
- ▶ AIs consuming and generating mathematical content...?

But...

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

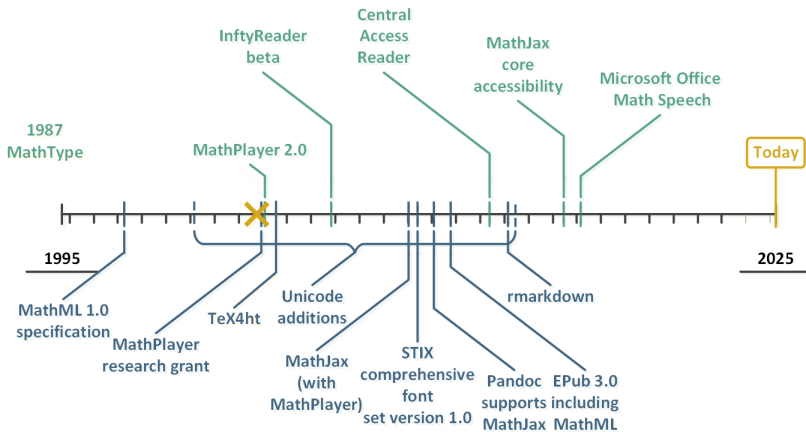
# Legal



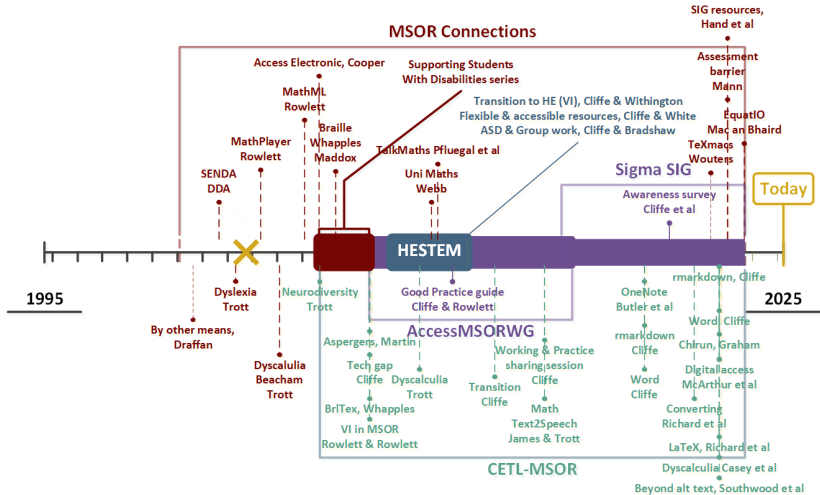
# From research to practice

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# Technical

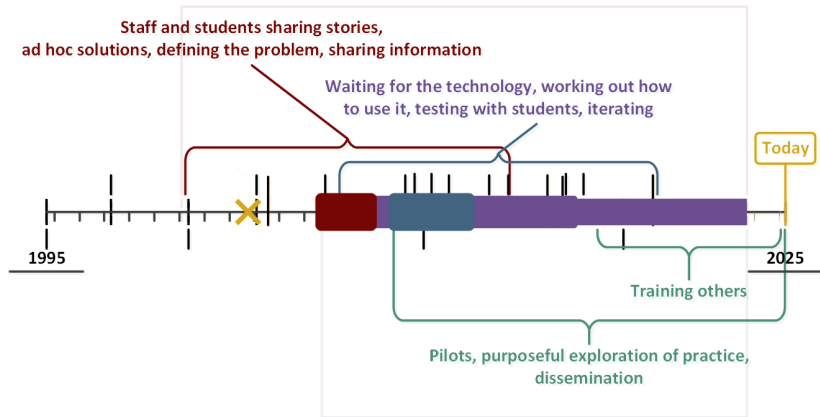


## Practitioners






# Phases



# Change

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# CLT & Lecturers

 **Learning and Teaching**

[Home](#) [Teaching & Assessment](#) [Professional Development](#) [Learning Technology](#)

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## Sub Categories

No categories

## Need Support?

Can't find the answer you're looking for?

[Contact a CLT team](#)



## Mathematics Accessibility

This page provides a list of resources and recommendations

- [Introduction to Accessible Technical Content](#)
- [How to create accessible figures and diagrams](#)
- [Accessible Maths with Microsoft Equation Editor](#)
- [Writing accessible documents using bookdown](#)
- [Moodle guidance for accessible maths](#)

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Lecture notes (pdf)



Last updated on Feb 3rd.



Lecture notes (html)



## Week 3: Feb 17



Problem Sheet 3



Problem Sheet 3 (html)



Problem Sheet 3 Solutions



Problem Sheet 3 Solutions (html)



Problem class recording

# MASH & Everyone!

## Maths support

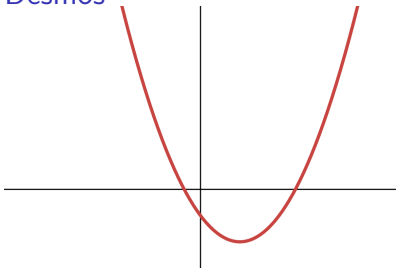
### On this page

- Directing students to us
- Maths teaching support
- Individual student referrals

## MathJax

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## Desmos



Interactive accessible version of the quadratic graph

# What next?

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## Getting started...

- ▶ RMarkdown, Bookdown and possibly ClavertonDown
- ▶ Quarto
- ▶ Chirun
- ▶ LWarp
- ▶ PreTeXt
- ▶ Word
- ▶ Desmos and Geogebra
- ▶ BrailleR

# Dissemination

We are still doing this, now others are too. . . Can you:

- ▶ Have a go yourself and tell others?
- ▶ Join JISC Accessibility Community Maths Working Group
- ▶ Consider and communicate regarding the implications for mathematical pedagogy?
- ▶ Consider and communicate regarding the implications for open and reproducible science?
- ▶ Build functionality into software and packages you create so that users automatically produce accessible output?

# Diagrams

- ▶ It is possible to use Desmos, some functionality of Geogebra and the BrailleR package to help make accessible diagrams
- ▶ This is nowhere near sufficient or flexible enough to represent the variety of diagrams we produce in e.g. TikZ
- ▶ These formats are not easily consumed and manipulated by other software or AIs



# Meaning

- ▶ We are no longer losing syntactic structure
- ▶ We are still losing enough of the semantics *known to the author* that things we want to do are affected
  - ▶ Sometimes the author encodes these in their LaTeX
  - ▶ Not always though...
- ▶ Consider

$$|\{(a, b) \mid a \in A, b \in B\}|$$

# Questions and discussion

Thank you for your time! Papers for discussion:

- ▶ Authoring Web-accessible Mathematical Diagrams.
- ▶ Author Intent: Eliminating Ambiguity in MathML., Pre-print

Slides: <https://ehcliffe.github.io/TEMSE2025/>

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