Transition to higher level mathematics study for disabled students

Anticipating and resolving barriers

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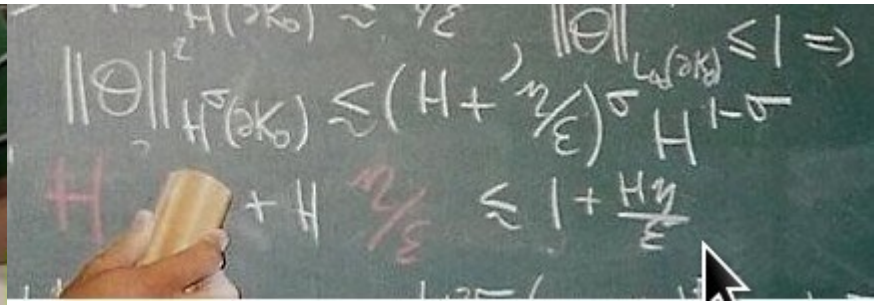


Outline

- Why look at transition to HE mathematics specifically for disabled students?
  - Context of work on access to mathematical subjects for disabled students in the UK
- A one-day intensive collaboration
  - Framework and commentary
  - Key recommendations
- Anticipating and resolving barriers
- Next steps

Access to mathematics *is* different

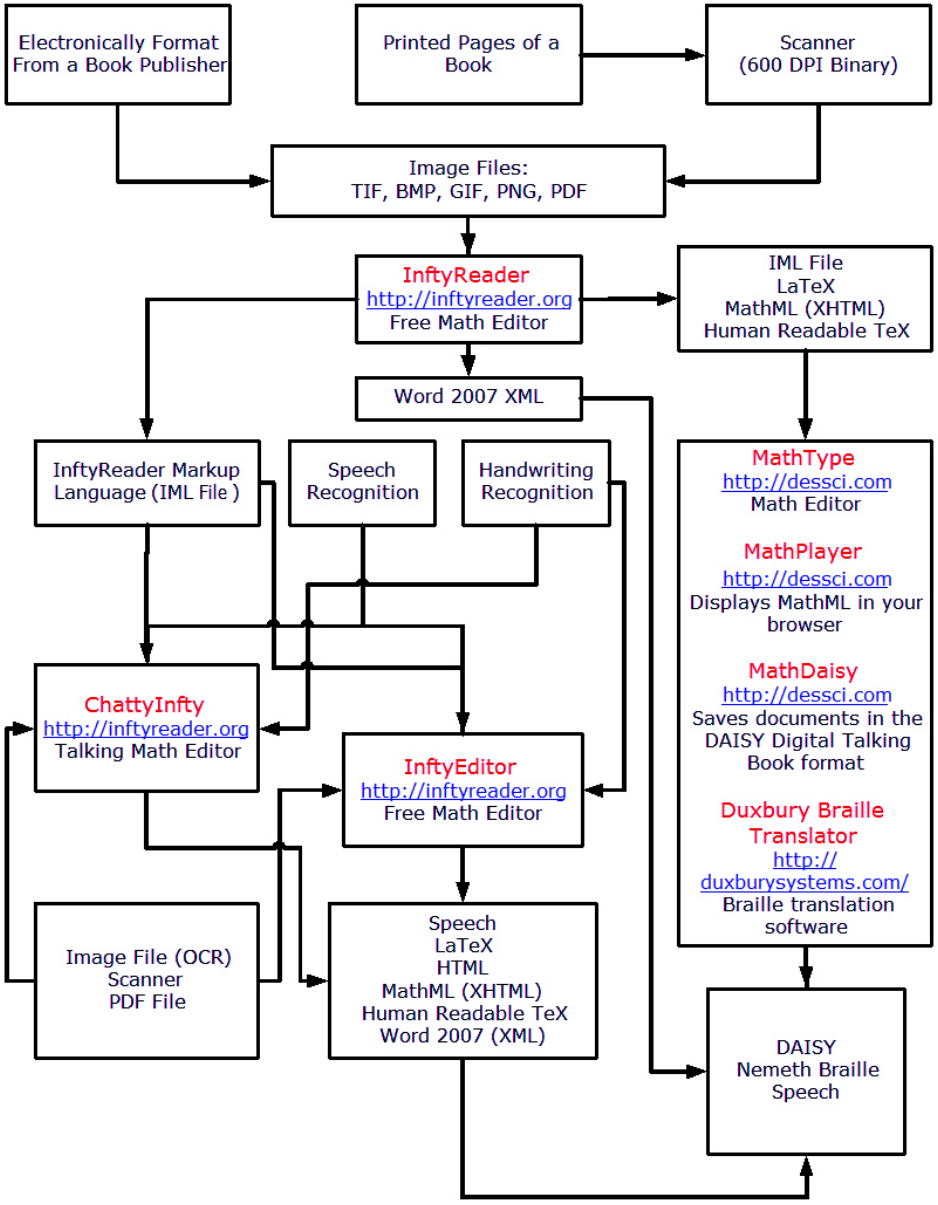
Equality and Human Rights Commission (2011):

A common anticipatory adjustment of providing resources in advance in electronic formats.

Quality Assurance Agency for Higher Education (2007):

Traditional board-based lectures continue to have substantial merit.

- Equations in common electronic formats are not accessible via assistive technology; books cannot be easily accessed
- Students may not have an effective mechanism to produce mathematical text
- Support workers may not have a mathematical background
- Working in formats such as Braille, audio and via voice input can be challenging
- Not all mathematical software works with assistive technology
- Skills and strategies do not necessarily carry over the transition e.g. use of Braille, ad hoc shorthand
- Generic, ineffective responses lower aspirations, impact on WP and public image

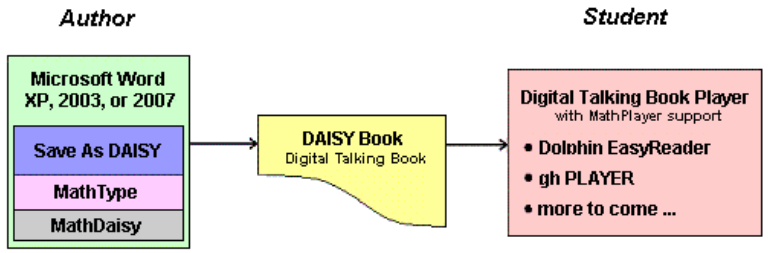


InftyReader Group 2011, *Resource List for Accessing Math and Science* accessed Sept 2013, http://www.inftyreader.org/?p=92

*And **complex**...*

Design Science 2013, *Which Assistive Technology Products Have Math Support? Reader tools,* accessed Sept 2013, http://www.dessci.com/en/solutions/access/atsupport.htm

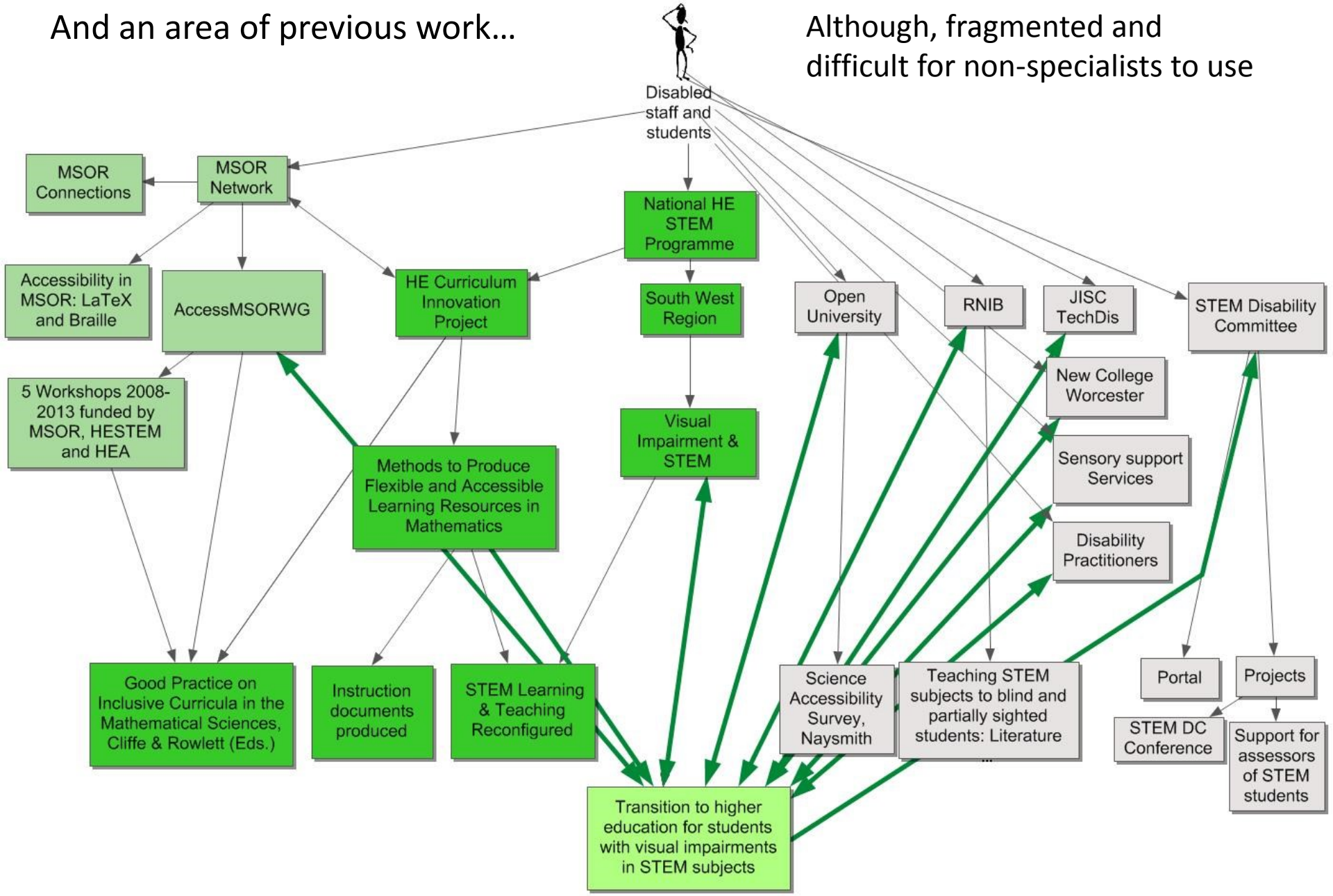
PRODUCT	VENDOR	Accessibility Partner	Basic Math Speech	Advanced Math Speech	Synchronized Math Highlighting	Refreshable Math Braille Support
Browsealoud	Texthelp	Yes	Yes	No	Yes	N/A
ClaroRead for PC	Claro	No	Yes	No	No	No
HAL	Dolphin	No	Yes	No	N/A	No
JAWS	Freedom Scientific	No	Yes	No	N/A	No
Kurzweil 1000	Kurzweil	Yes	Coming soon	No	N/A	No
Kurzweil 3000	Kurzweil	Yes	Yes	Yes	Yes	N/A
MAGic with speech	Freedom Scientific	No	Yes	No	No	N/A
NVDA	NVDA-project	N/A	Yes	No	No	No
Read&Write Gold	Texthelp	Yes	Yes	No	Yes	N/A
Supernova	Dolphin	No	Yes	No	No	No
System Access	Serotek	Yes	Yes	No	N/A	No
Window-Eyes	GW Micro	Yes	Yes	Yes	N/A	No
WYNN	Freedom Scientific	No	Yes	No	No	N/A
ZoomText Reader	Ai Squared	Yes	Yes	No	No	N/A



Design Science 2013, *MathDaisy,* accessed Sept 2013, http://www.dessci.com/en/products/mathdaisy/

And an area of previous work…

Although, fragmented and difficult for non-specialists to use



If you have been reliant on support at school, transition to the university might be a challenge

lack positive role models

Aspiration and professional support are very important

How do you know at what stage you need certain skills?

The main thing is to access the materials

I felt some universities didn't want me to apply…

Maths equations are complex to read

Publishers…

Diagrams…

Blackboards…

You have to be 'up and running' before the course starts

Introduction to LaTeX at A-levels might be sufficient

Accessibility issues…

"Lack of anticipation is a barrier, you need to prepare in advance"

Who is responsible for the information flow – university or school?

The difficulties of the subject make it difficult for the teacher to prepare the student

Current recommendations do not fully reflect students' needs

Not many people in the country know how to use the systems

If these developments are subject specific, how can disability specialists access this information?

Knowledge about the subject specific support?

What do we do about teaching visual concepts?

Will academic staff be willing to provide lecture materials in advance?

Where does the expertise lie?

Anticipation by whom?

Preparation by whom?

Any faulty assumptions?

One day collaboration

- Who? Students, lecturers, teachers, disability practitioners, sensory support services, RNIB, JISC TechDis
- What?
  - *Science Accessibility Survey*, Derek Naysmith
  - *Progressing to HE mathematics – sharing of experience,* Alastair Irving & Robin Williams
  - Workshop 1: Exploring barriers by sharing experience
  - Workshop 2: Drafting a framework to assist learners and their teachers to plan for higher education
- Why? To optimise the process of transition to higher education for learners with VI
  - Collaborative approach across sectors
- Where? University of Bath, HESTEM South West Region
- When? 21st September 2012

One day collaboration

- How?
  1. Workshop 1: group discussions loosely structured around five questions
     - Main barriers to study
     - Specialist skills required by students
     - Information requirements by students
     - Specialist knowledge required by staff
     - Main barriers to employment in STEM
  2. Workshop 2: groups asked to draft a framework for transition to HE STEM subjects
     - Day was recorded to ensure that full information was captured regardless of note-taking!
  3. Frameworks integrated
     - agreement on a broad classification of skills and on a gradual approach and the need for preparation – but not specifics
     - similar points were amalgamated
     - points made by only one group either kept or reported within a broader point

Thoughts on pre-application/entry

How far back […] Year 9?

Enable a student to think "Yes, I can do this!"

"Skills development aspect has to come from universities… universities need to specify the skills needed by a student [...] skills are subject specific"

We need to know what to put in place […] teachers are willing

Leaving learning the specialist skills to later does make it much harder when starting at university

Students need good descriptions of what a course involves

Pre-entry event…

Visit school…

It is about people, how much they are prepared to work with me […] how flexible they are

Pre-engagement […] over summer period

"Needs assessor should know what a course entails […] specialist subject areas and what skills would be required"

Thoughts on transition

Able to generate in depth questions about support needs in transition

Able to identify needs…

How to teach…?

STEM specific computer skills…

I used LaTeX, so you and the university can work together

Good notes in advance

Use e-materials

Getting peer support…

Use the classroom for discussions, consolidate and reflection

"Everyone does maths very differently […] finding a learning style that is sustainable requires effort and self-discipline"

Advice

Specialist knowledge…

Training…

Collaborate…

Central resources…

Share good practice…

Learn from students…

Dialogue…

Where are the funds?

Actual!	Student's actions	Skills development	Teaching & learning	Support
Pre-app	Students have higher information needs and may need very specific and detailed information, advice and development. They need to plan proactively and start all planning earlier than other students. They need to form dialogues and collaborations with a wide range of people from STEM, disability support and services. Students will need support to do this at first.	Specialist and subject skills are best developed gradually, likely starting in a school environment during A-level and continuing through pre-entry and transition.	Experience and knowledge in specialist areas needed. Communication and collaboration between/within institutions key. Failure to act proactively leads to significant barriers.	Schools need resources and information to prepare learners.
Pre-entry				DSA and support set up needs careful guidance through dialogue.
Transition				Specialist support/ information around transition might be required.
Later years		Students should by now have acquired a rich STEM and specialist skill set.	Staff should be aware how to ensure access – approaches are agreed, embedded and reviewed etc. Approach to placement and employability will need work.	Support needs may lessen but placement needs consideration.
Career planning				Access to work needs careful guidance. Specialist advice required.

Summary key recommendations

1. The various **methods of accessing and producing accessible STEM content** and of locating expertise in this area **should be documented in a centralised resource**. This information should be **appropriate to different roles** and levels and associated training resources may be required.
2. **Access to role models** including graduates and students with VI currently studying STEM subjects **should be facilitated**.
3. Learners for whom it is appropriate should have the opportunity to learn Braille and the Braille mathematics code up to GCSE level.
4. Self-advocacy, self-determination and communication skills and the skills required to locate and use information to make choices need to be actively promoted during earlier experiences of STEM study.
5. Students should be encouraged to be flexible and taught to take multiple approaches when working in STEM subjects, starting during sixth form.
6. **Institutions should audit STEM courses** to quantify the skills and technologies which are required at each level. This **information should be used by needs assessors** to enable a sound DSA assessment process.

7. **Academic departments** should be encouraged to **form a pre-entry working** partnership with applicants and their school or college. **Students should be 'up and running' before they reach university** in their chosen methods of working with STEM content. **Needs assessors should be involved** in this partnership to ensure a sound DSA assessment process.
8. Institutions should ensure that they **proactively hold all lecture notes** in STEM subjects **in formats which can be used to create suitable alternative formats**.
9. A **national database of mathematically fluent support staf**f able, for instance, to **advise** on the production of LaTeX resources should be compiled.
10. There is an on-going necessity for **improvements to technology**. The STEM **community should communicate** clearly the need for such tools and investment from the public sector may be required.
11. Publishers and providers of STEM materials (e.g. books and journals) should store the source format e.g. LaTeX and make this available on request. Institutions should consider how the **education sector may put pressure on publishers** to provide STEM content in accessible formats.
12. HE professionals should be aware of issues around progression and transition to higher education for students with VI and **proactively communicate with schools** regarding these. Positive information should be exchanged by **collaboratively developing and delivering aspiration raising activities**, workshops and summer schools for students with VI, their parents and teachers.

Anticipating and resolving barriers

- Form on-going collaborations and dialogue with other professionals
- Acquire technical and practical information
- Audit courses
  - Skills and tasks: What do students need to be able to do? How could they achieve this?
  - Teaching: Are notes in formats which can be converted/accessed? How? Is the technology available? Who is responsible for what? Can staff access development and guidance?
  - Books: Are accessible versions available? Is the publisher responsive? Is there local expertise to convert formats if necessary?
  - Software: Is accessibility part of the procurement policy for mathematical software?
  - Support: Required mathematical skills of support workers? How to ensure quality?
- Share information from audit
  - Internally: Disability advisors, support workers etc.
  - Externally: Applicants, their Advisors, all Needs Assessment centres
- Act on information from audit
  - Hold resources on effective, accessible methods to undertake tasks and achieve skills including reading, doing and writing up mathematics and working with diagrams
  - Hold an agreed minimum of notes in formats which can be converted to accessible formats
  - Work with procurement, the library and alternative formats services
  - Work with disability services to source, recruit, train support workers as required
- Continue to locate sources of information and maintain expertise
- Form pre-entry working partnerships to ensure *all involved* are *'up and running'*
- Communicate positively to raise aspirations

But… must all this be local?

Distance contexts: formal project work, wholesale change

- Open University (Cooper 2008, Naysmith 2011)
- Portland Community College (2013)

Reactive → Proactive: approaches evolved

- University of Bath (Cliffe et al. 2009-2013)
- More realistic but far less effective
- Each department re-starts this journey

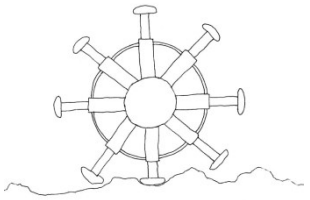

Alfred E. D'Harlingue
1917

Next step?

Stop re-inventing the wheel: high cost, low effectiveness!

A central resource that:

- Fully documents practical and technical methods
- Ensures such information is appropriate to the full variety of roles
- Assists collaboration and dialogue
- Assists in access to role models
- Assists in locating specialist advice and services
- Puts pressure on publishers to deliver accessible content
- Clearly communicates to software houses that STEM communities require tools and methods to facilitate access to STEM content



Thanks – any questions?

http://www.hestem-sw.org.uk/project?id=14&pp=709

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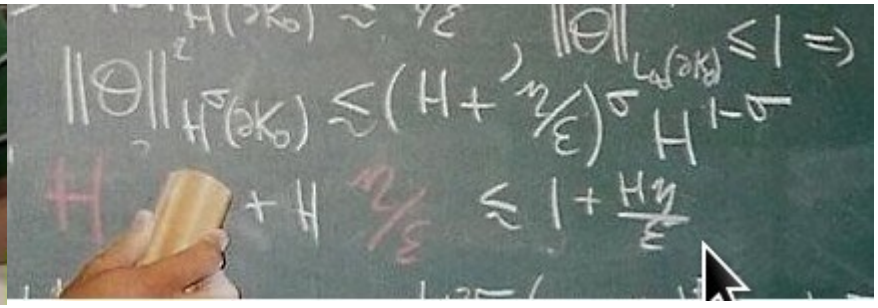

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