

# **DESIGN OF MATHS CURRICULA**

## **AN EXTERNAL PERSPECTIVE**

G Venkatesh

# Three Points

- Syllabus structure
  - necessary, sufficient or neither?
- Continuous (formative) assessment
  - Feedback to learners
- Does it promote thinking
  - ... and self-reflection?

# Syllabus

A large, light blue circle is positioned on the left side of the slide. A blue speech bubble tail extends from the right side of the circle, pointing towards a larger, rounded blue speech bubble on the right. This larger bubble contains the text 'Syllabus designed to be a guideline for teachers'.

Syllabus designed to be a guideline for teachers

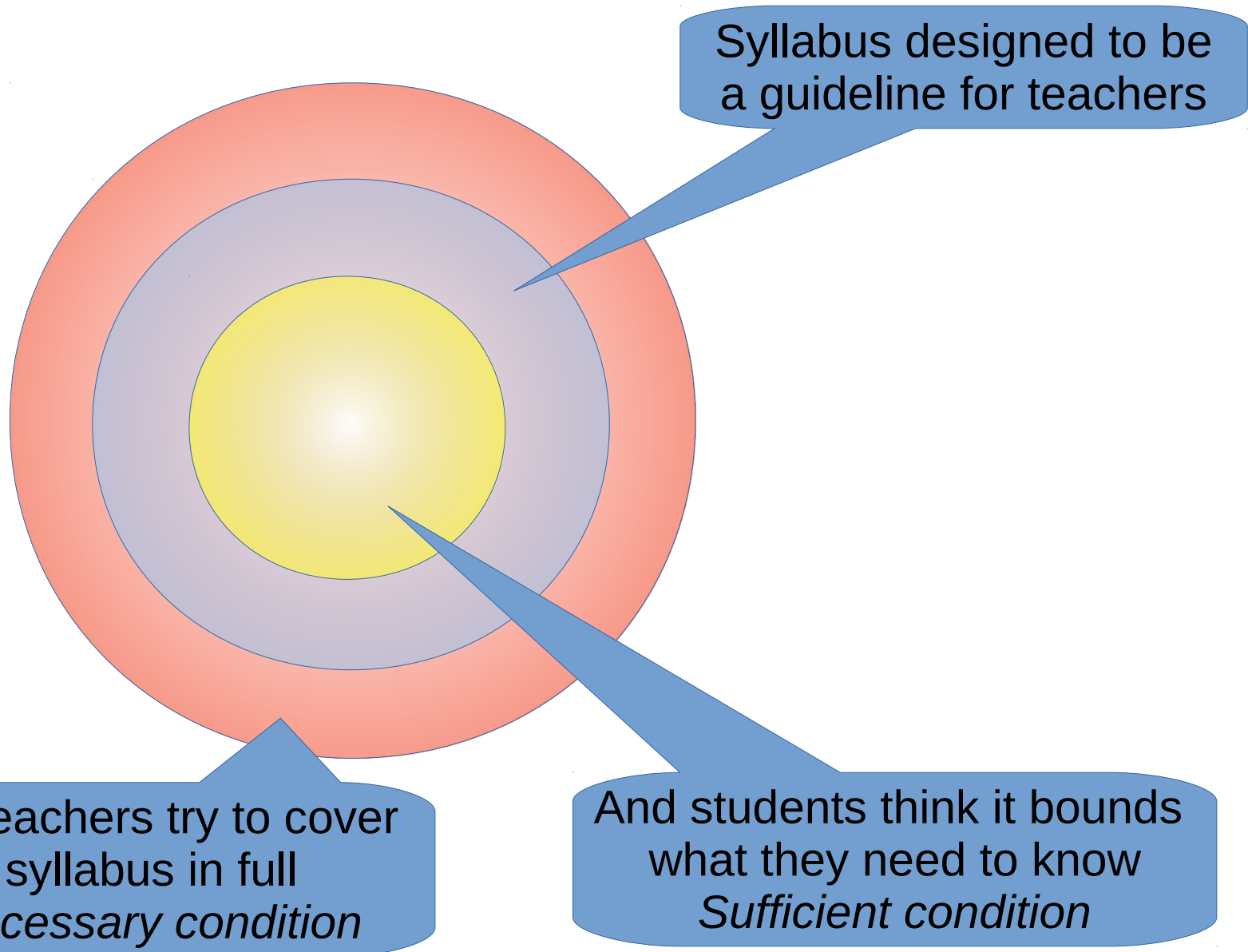
# Syllabus



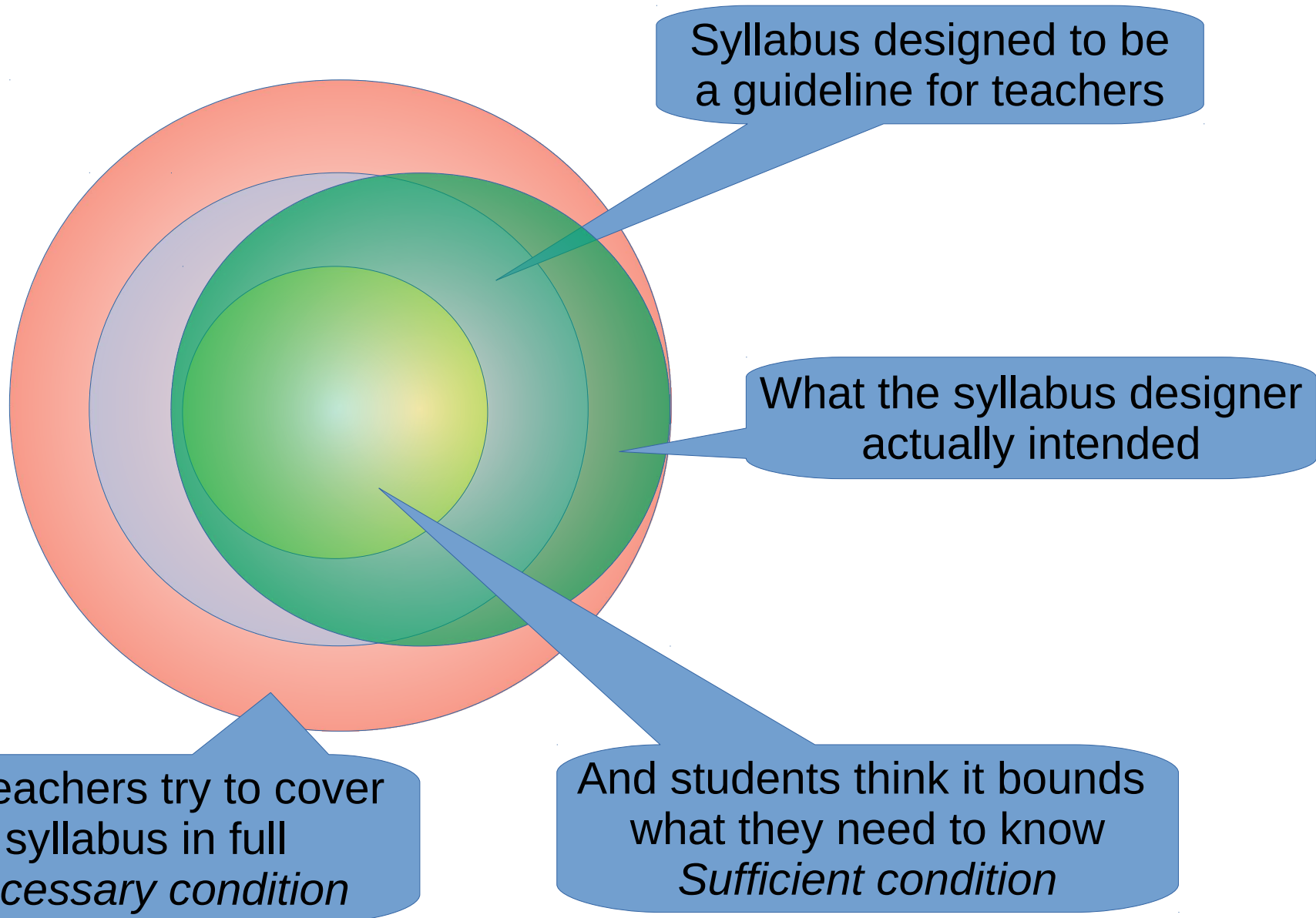
Syllabus designed to be  
a guideline for teachers

But teachers try to cover  
syllabus in full  
*Necessary condition*

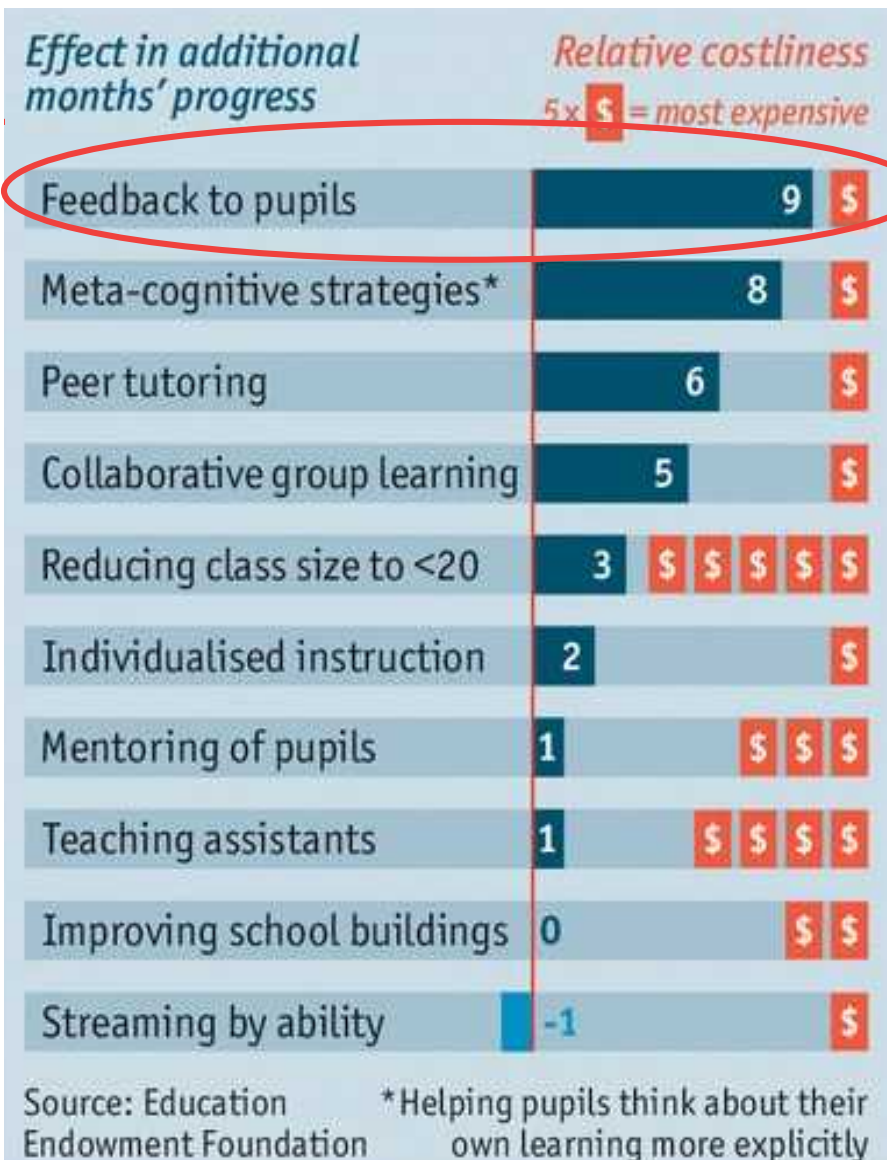
# Syllabus



# Syllabus intent aligned with assessment

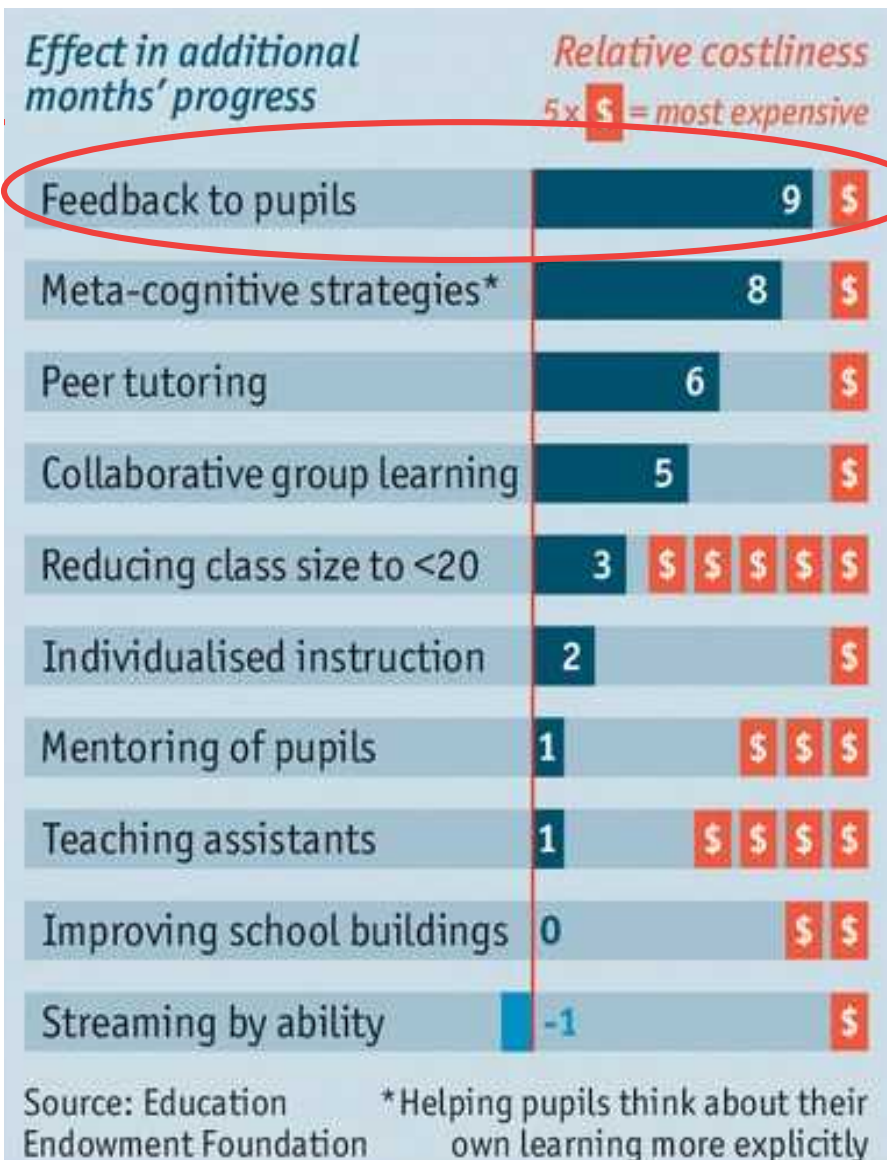


# Learner Feedback: high impact



Source: Economist

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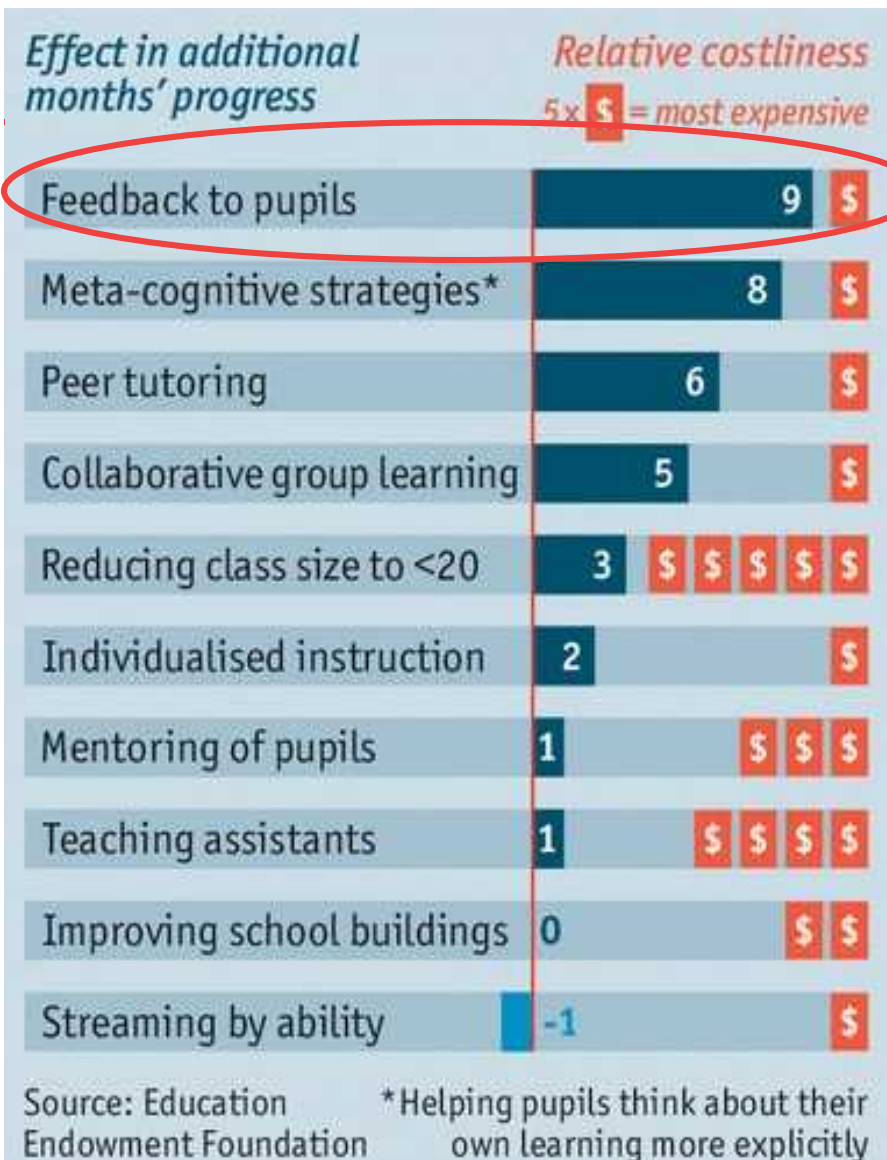


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Formative Assessments



# Learner Feedback: high impact



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Formative Assessments

CCE → ?

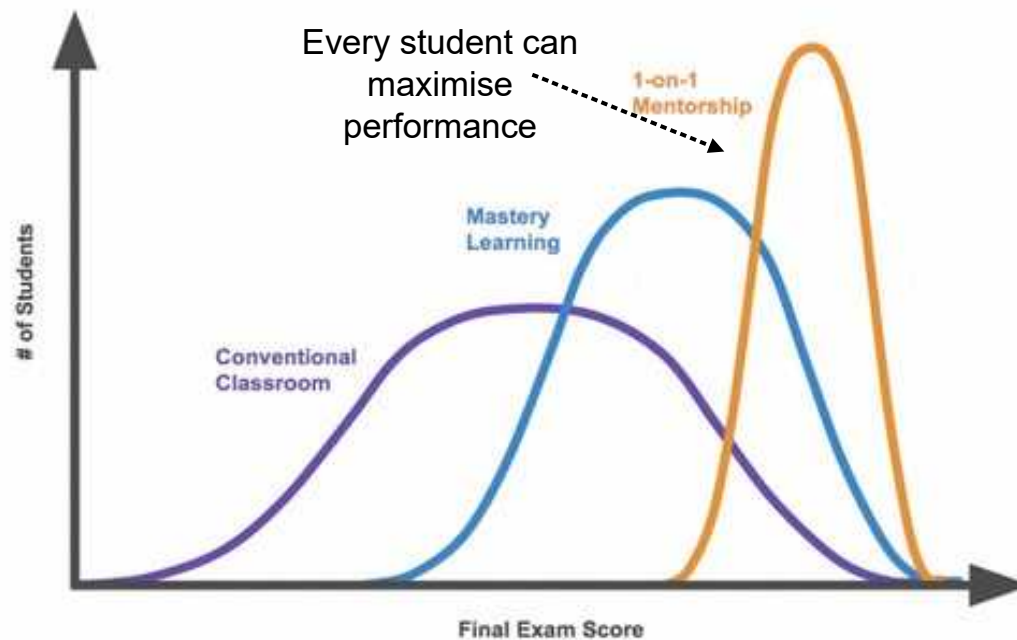
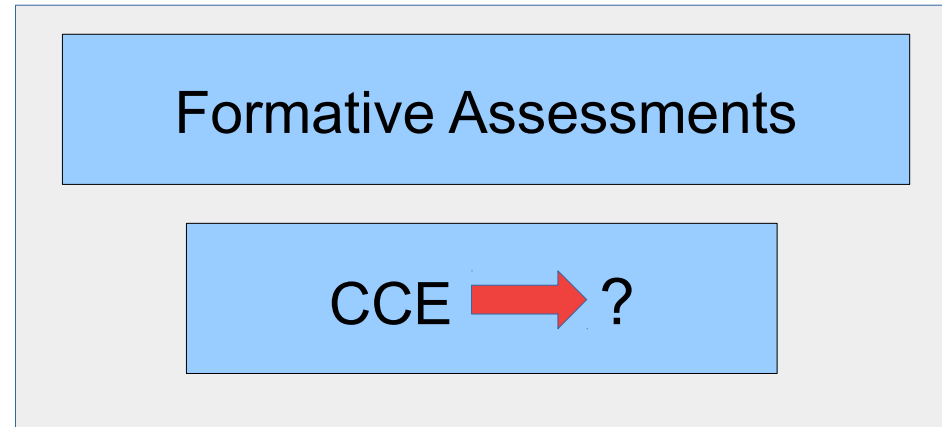
# Curricula should support CCE and personalisation

Effect in additional months' progress	Relative costliness
Feedback to pupils	9 \$
Meta-cognitive strategies*	8 \$
Peer tutoring	6 \$
Collaborative group learning	5 \$
Reducing class size to <20	3 \$ \$ \$ \$ \$ \$
Individualised instruction	2 \$
Mentoring of pupils	1 \$ \$ \$
Teaching assistants	1 \$ \$ \$ \$
Improving school buildings	0 \$ \$
Streaming by ability	-1 \$

5x \$ = most expensive

Source: Education Endowment Foundation  
\* Helping pupils think about their own learning more explicitly

Source: Economist



# Is there space for thinking and reflection?

Is  $x^2 > y^2$  for all real numbers  $x, y$  with  $x > y$  ?

Works for  $x = 2, y = 1$



Works for  $x = 0.8, y = 0.5$

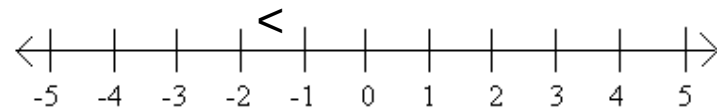
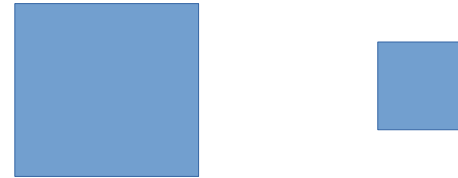
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What if  $x = -1, y = -2$  ?



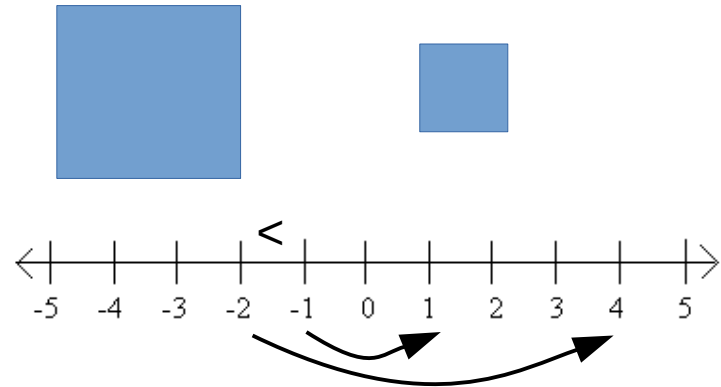
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*If double negatives are hard to understand in English,  
why would it be any easier in Maths?*

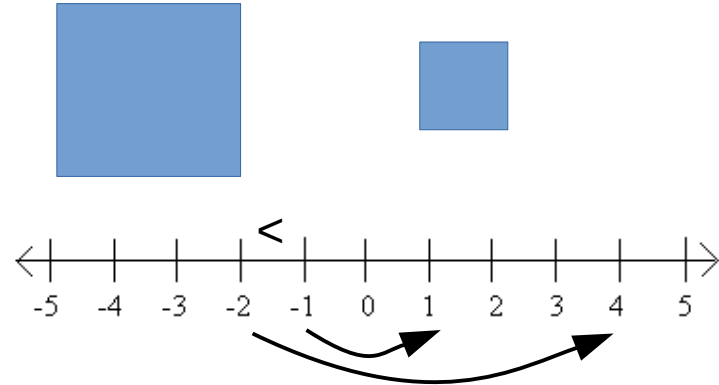
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Is  $x^2 \geq x$  for all real numbers  $x$  ?

Works for  $x = 2$

Works for  $x = -1$

*But can we really compare  $x^2$  and  $x$ ?*

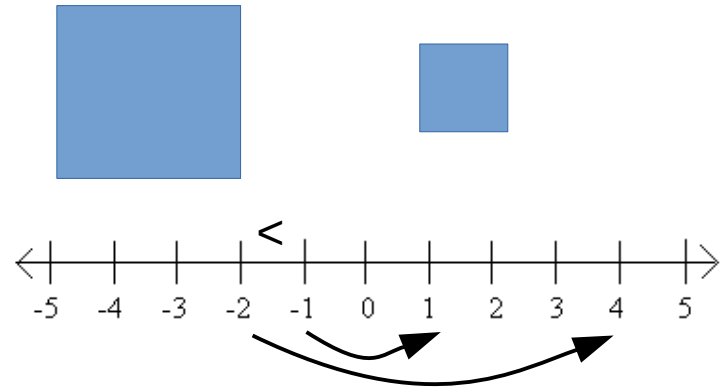
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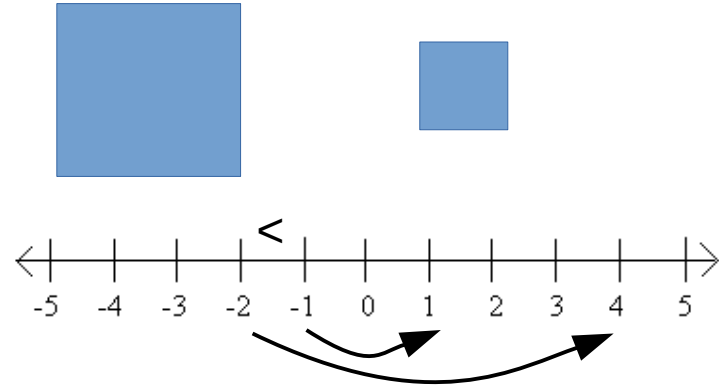
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*Thinking starts with a question whose answer is non-intuitive*



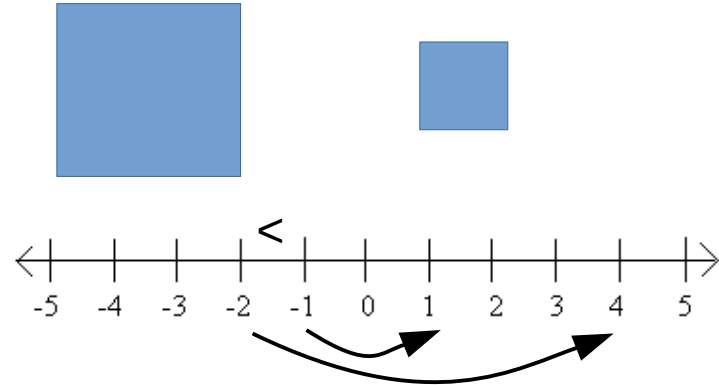
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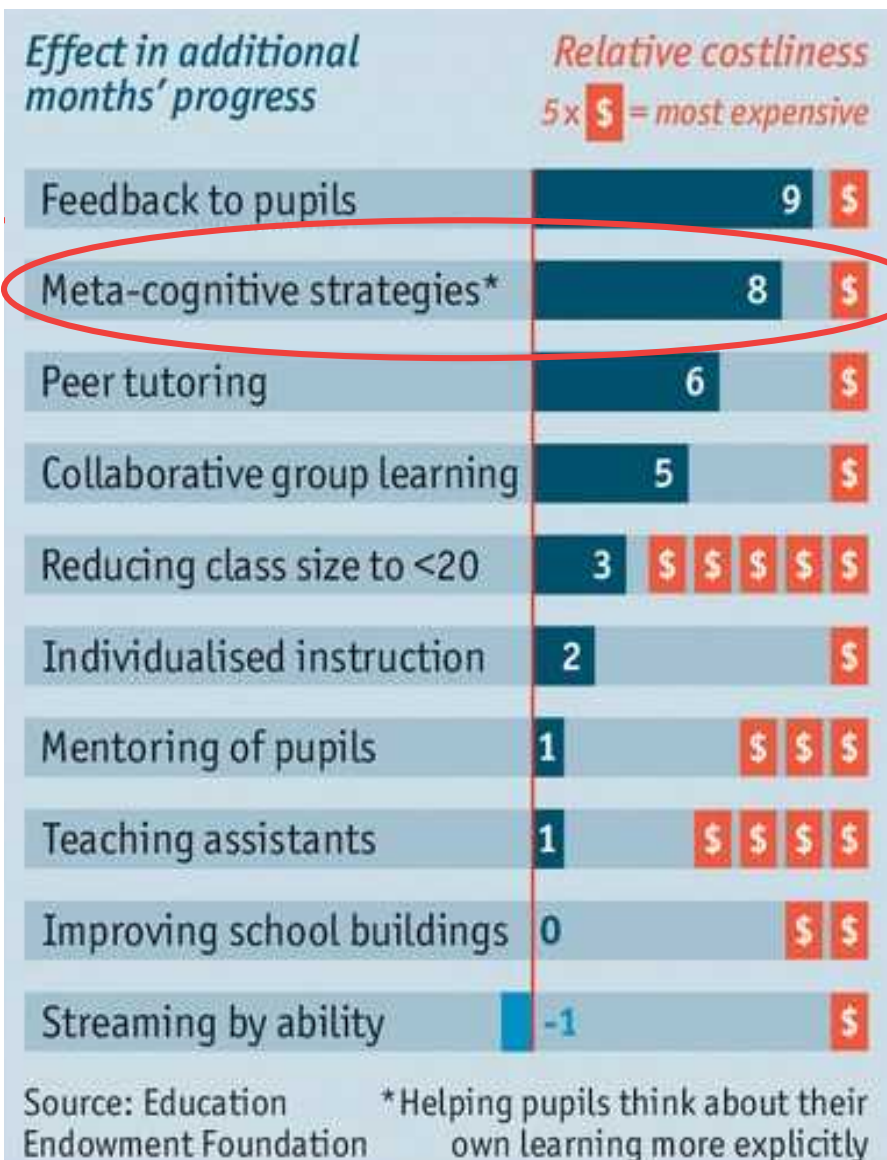
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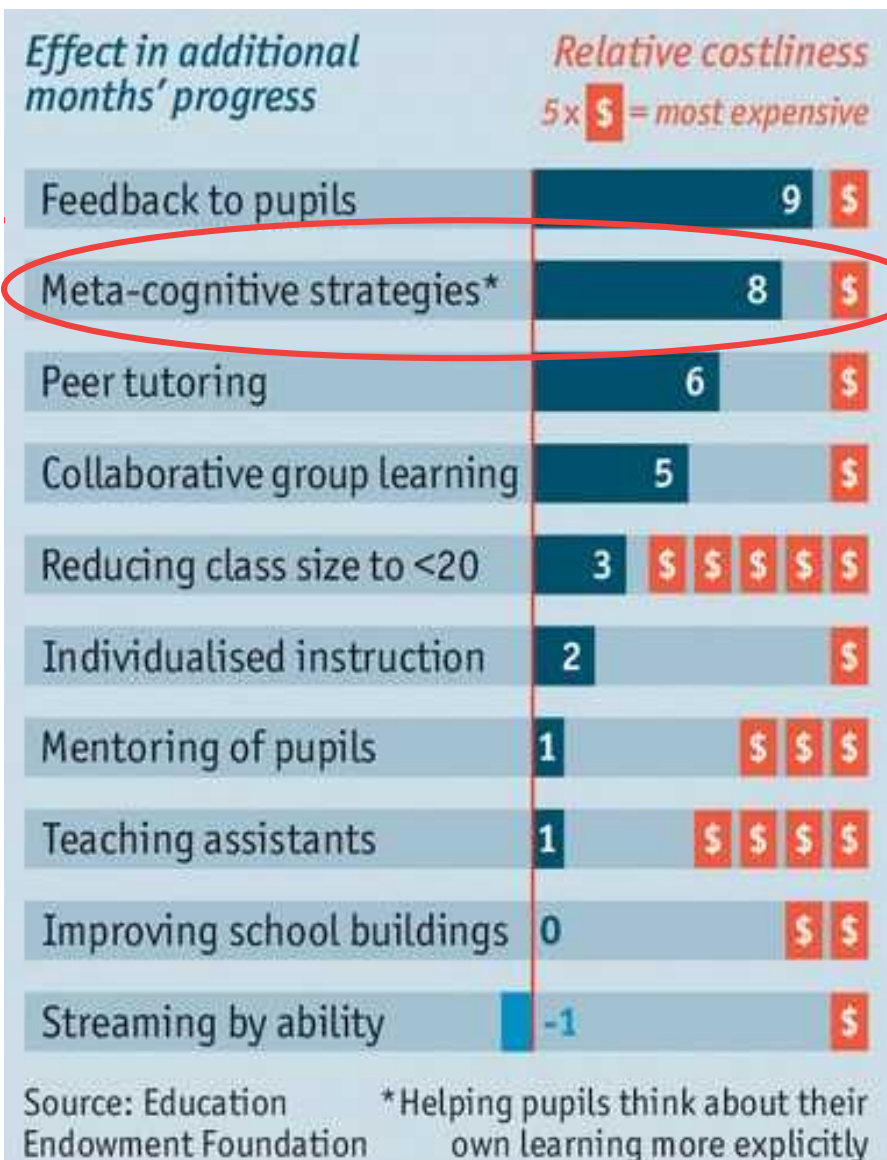
*Thinking starts with a question whose answer is non-intuitive*

*Twisted questions are good ... provided they counter intuition*

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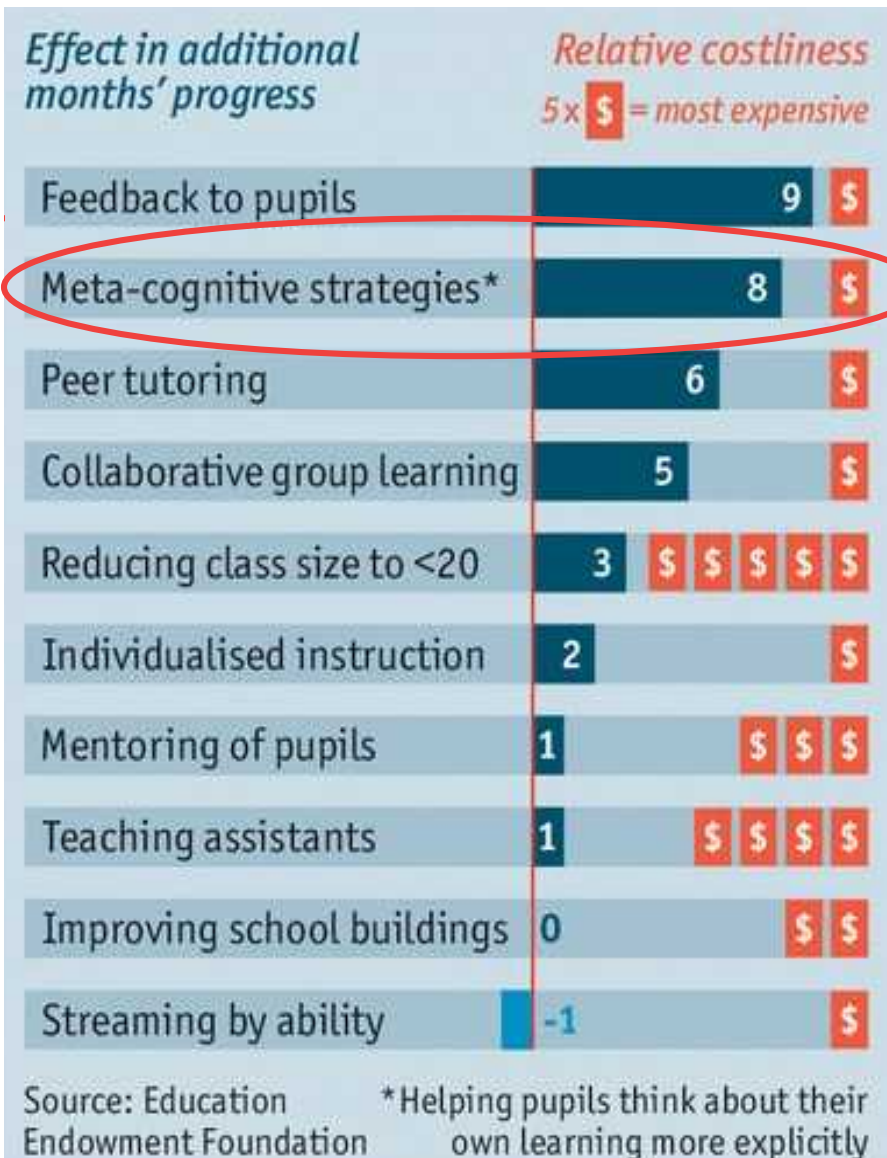


# Is there space for thinking and reflection?



Record meta data about the learning process:  
Easier in Maths – problem solving is *procedural*

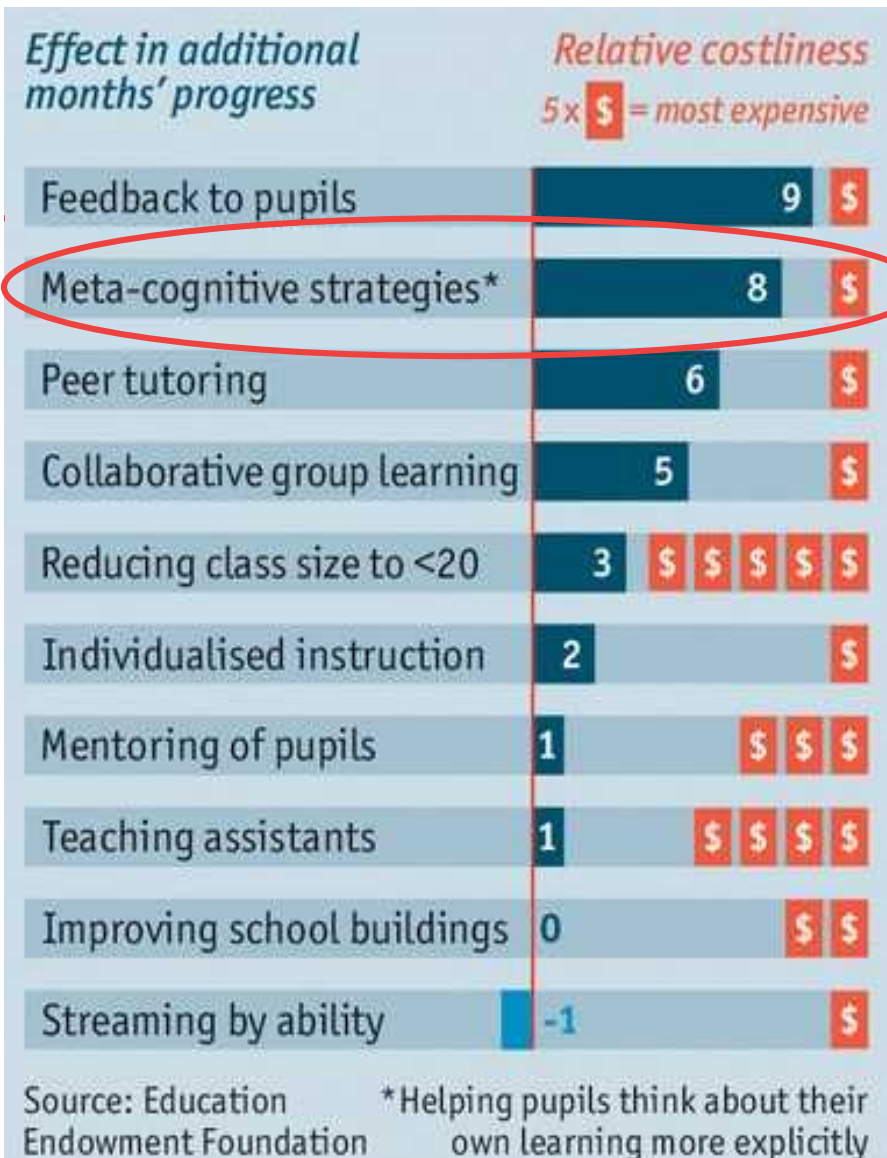
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Learners reflect on their learning performance individually and with the help of group partners

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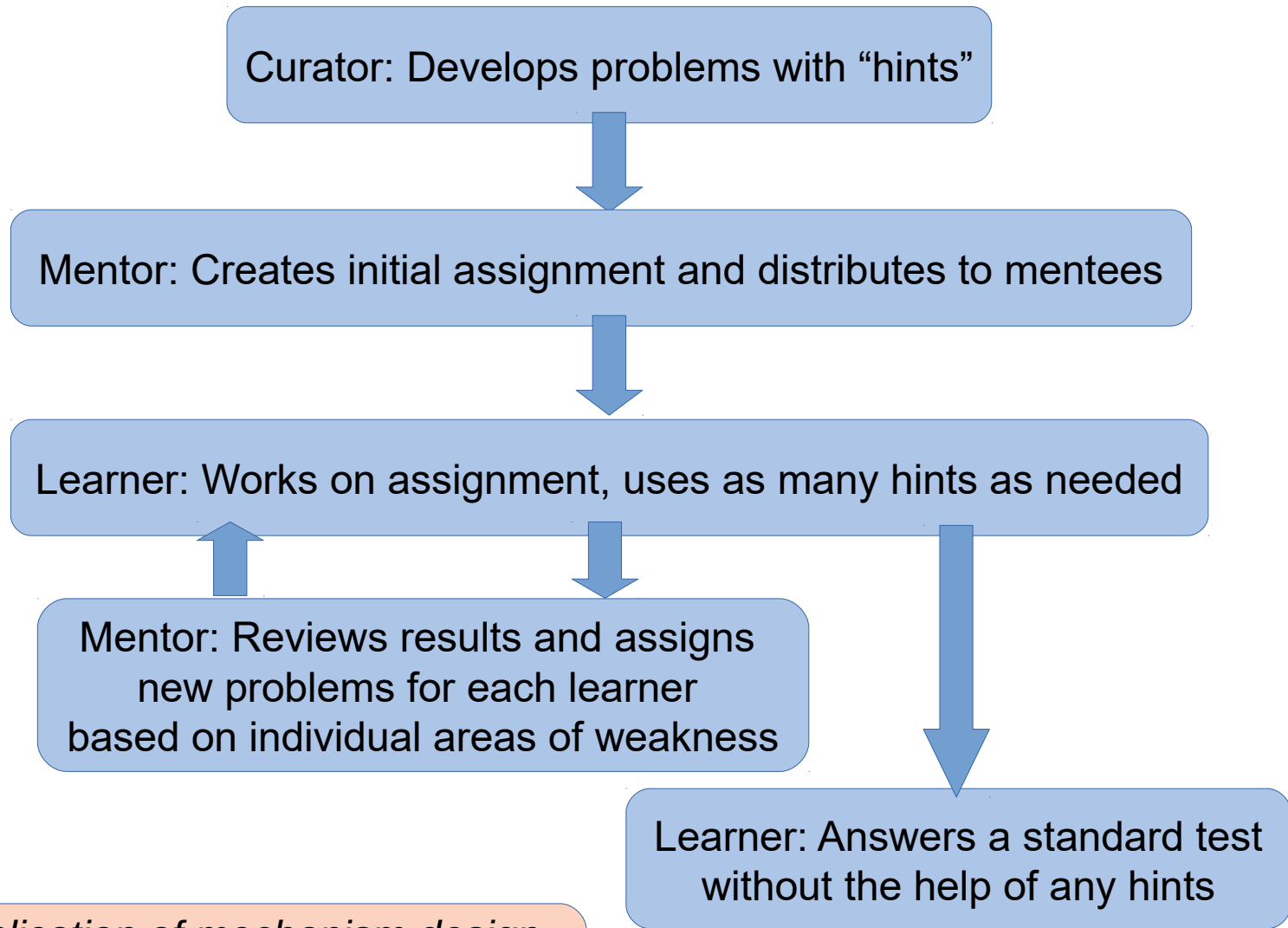
Record meta data about the learning process:  
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Learners reflect on their learning performance individually and with the help of group partners

*Content needs to be curated properly to support this*



# MyIspot personalised learning



*An application of mechanism design from game theory to incentivise learners to willingly reveal learning gaps*

# Three Points

- Syllabus structure
  - necessary, sufficient or neither?
  - *Clear communication. Provide options*
- Continuous (formative) assessment
  - Feedback to learners
  - *Support teachers with instruments and technology*
- Does it promote thinking
  - ... and self-reflection?
  - *Specially curated content to allow capturing of learning meta data*

Thank You

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