Design of maths curricula

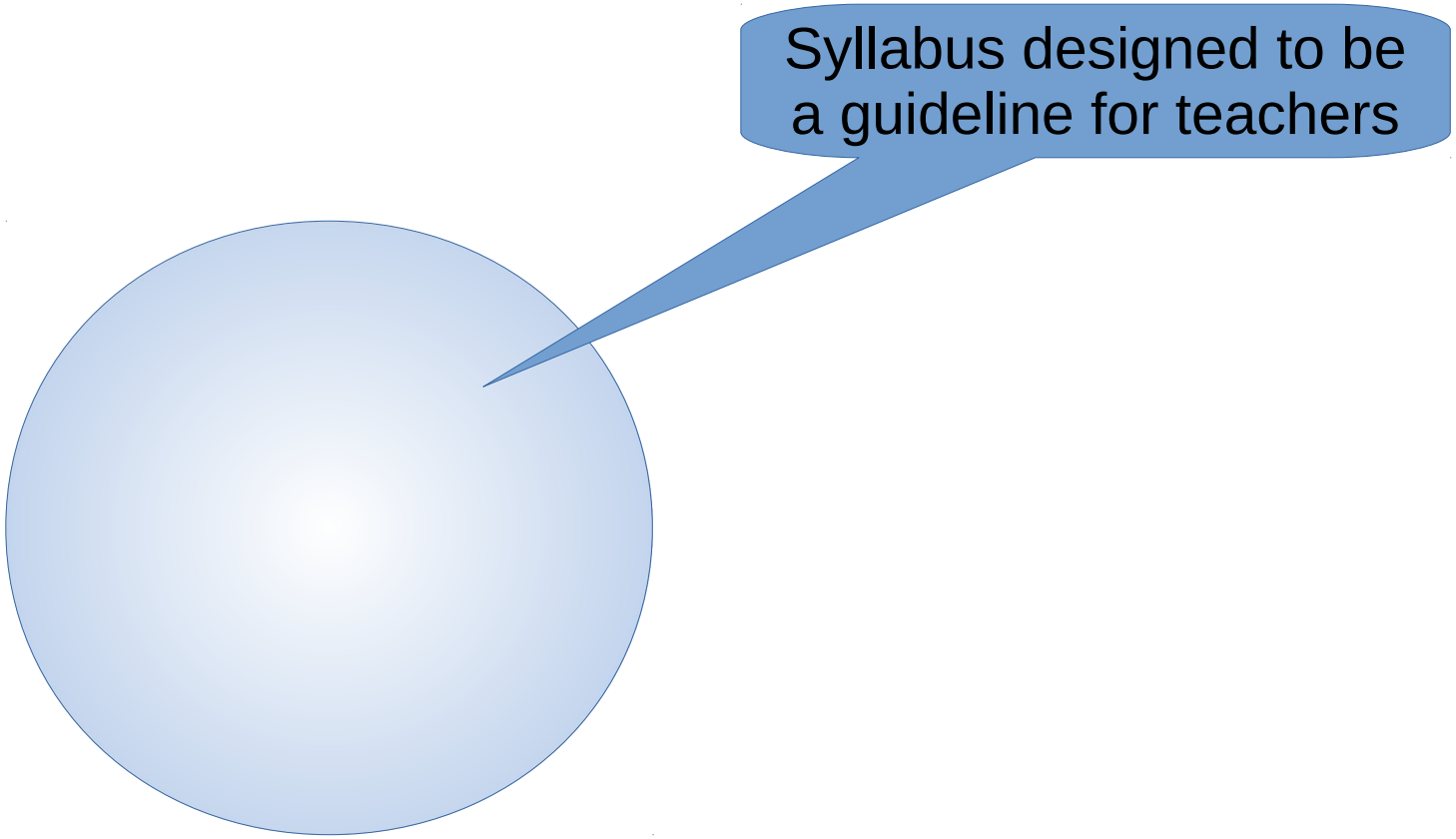
An external perspective

G Venkatesh

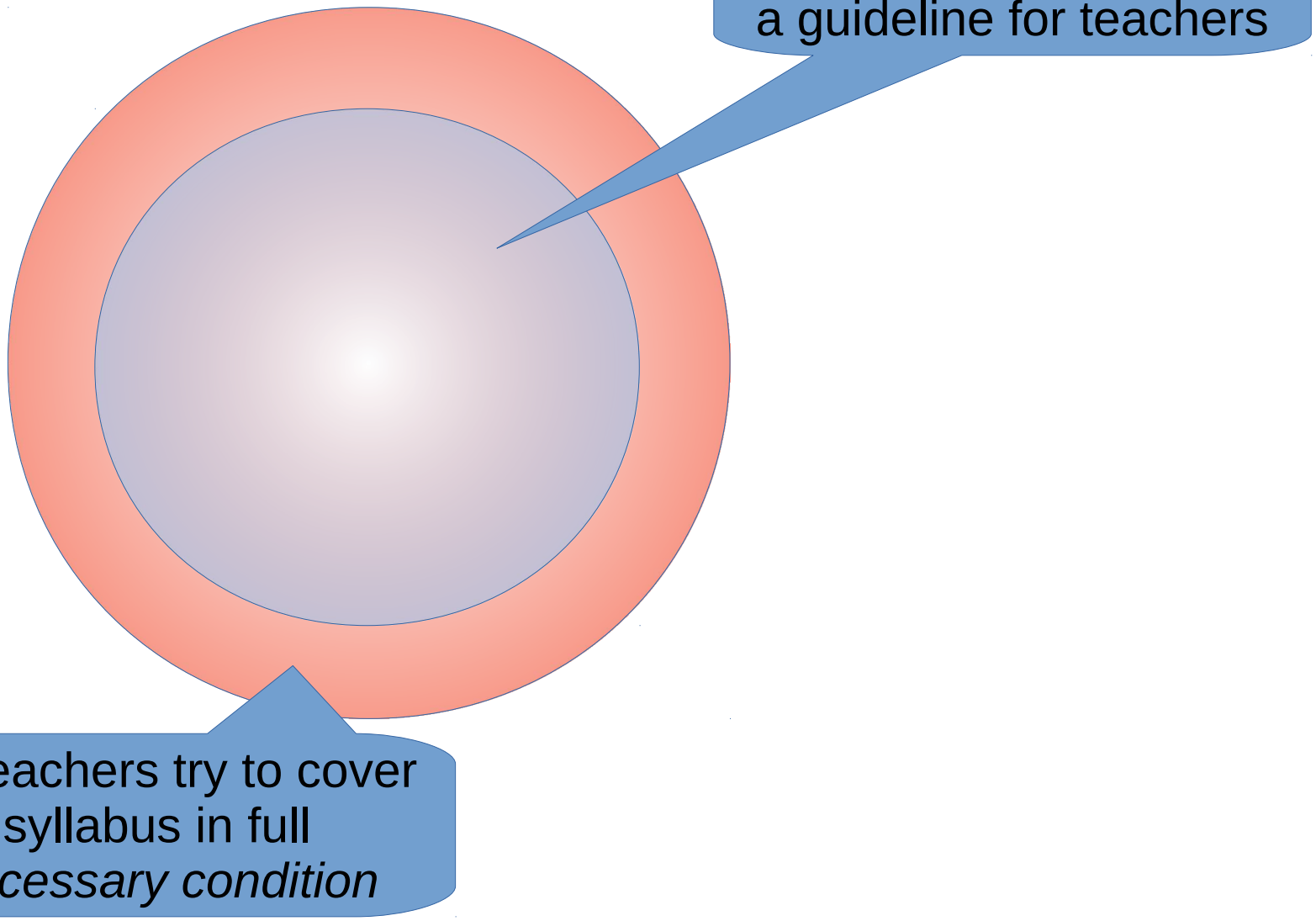
Three Points

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

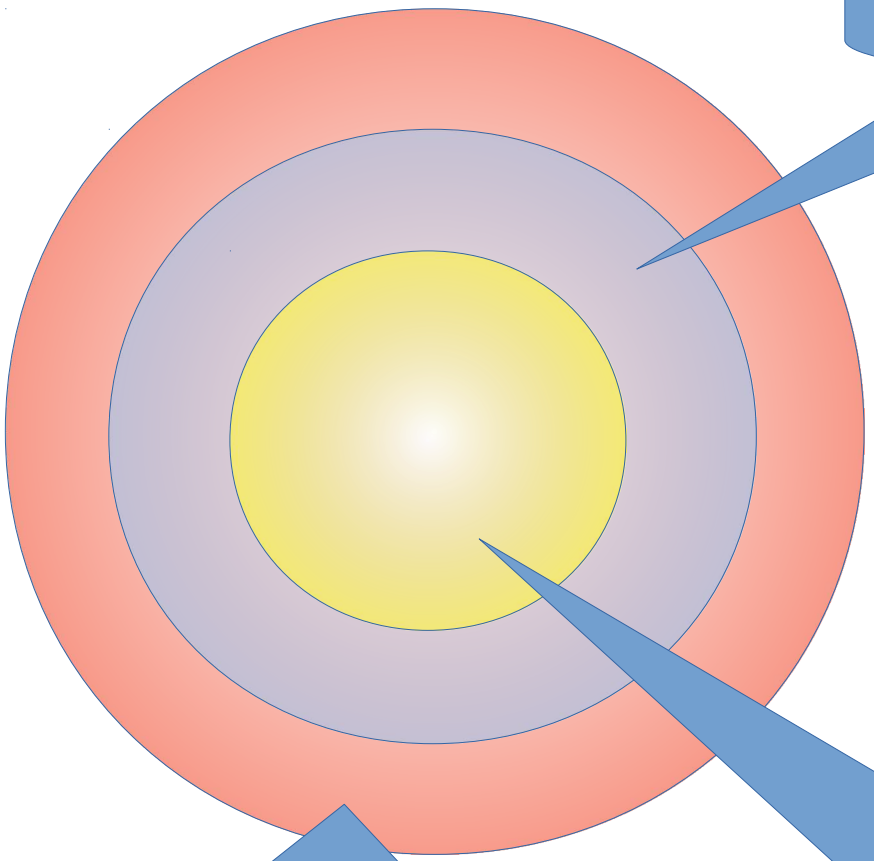
Syllabus



Syllabus


Syllabus designed to be a guideline for teachers
But teachers try to cover syllabus in full
Necessary condition

Syllabus

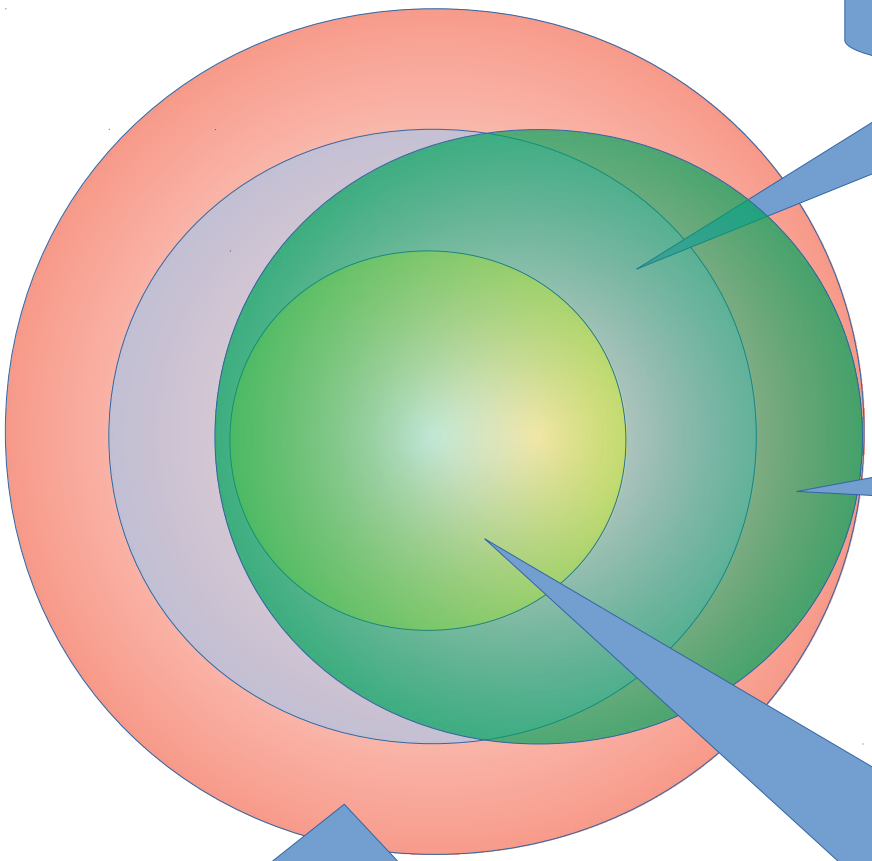


Syllabus designed to be a guideline for teachers

But teachers try to cover syllabus in full
Necessary condition

And students think it bounds what they need to know
Sufficient condition

Syllabus intent aligned with assessment



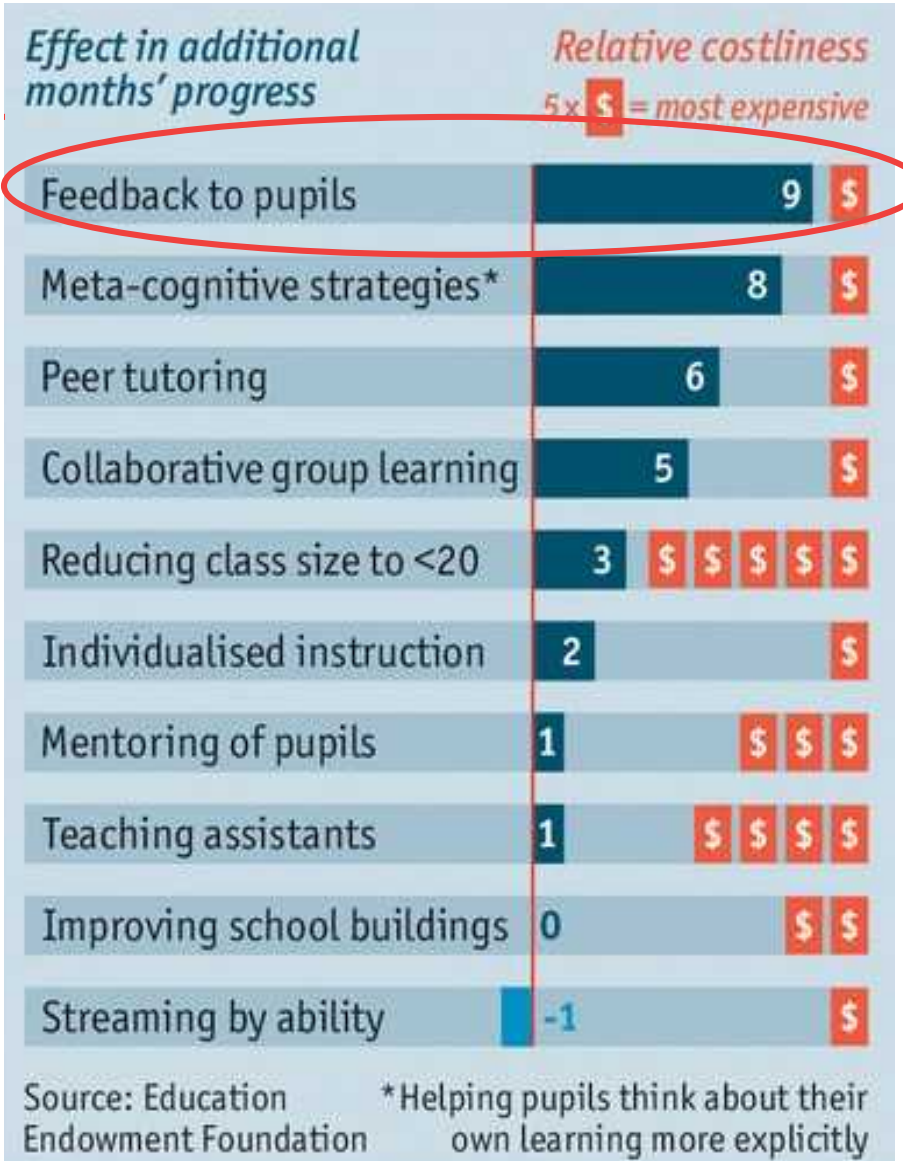
Syllabus designed to be a guideline for teachers

What the syllabus designer actually intended

But teachers try to cover syllabus in full
Necessary condition

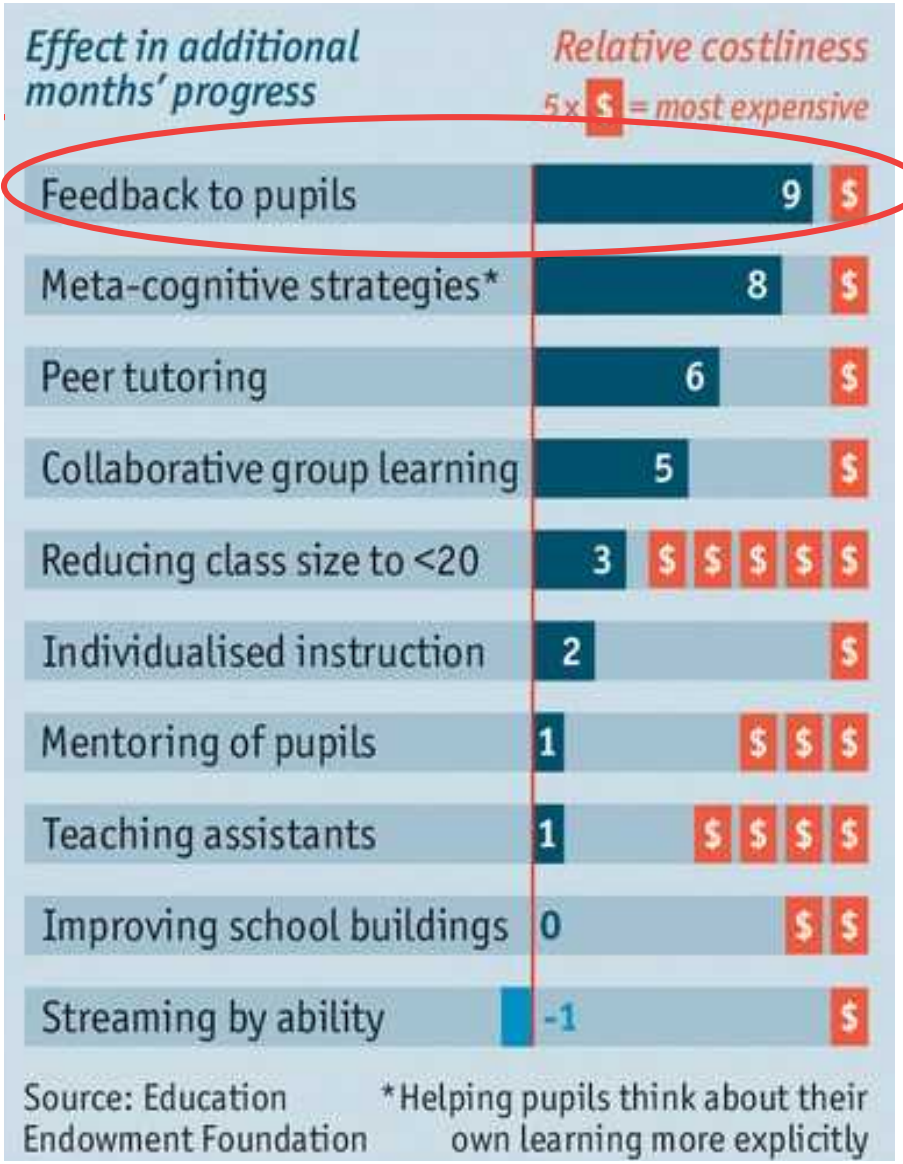
And students think it bounds what they need to know
Sufficient condition

Learner Feedback: high impact



Source: Economist

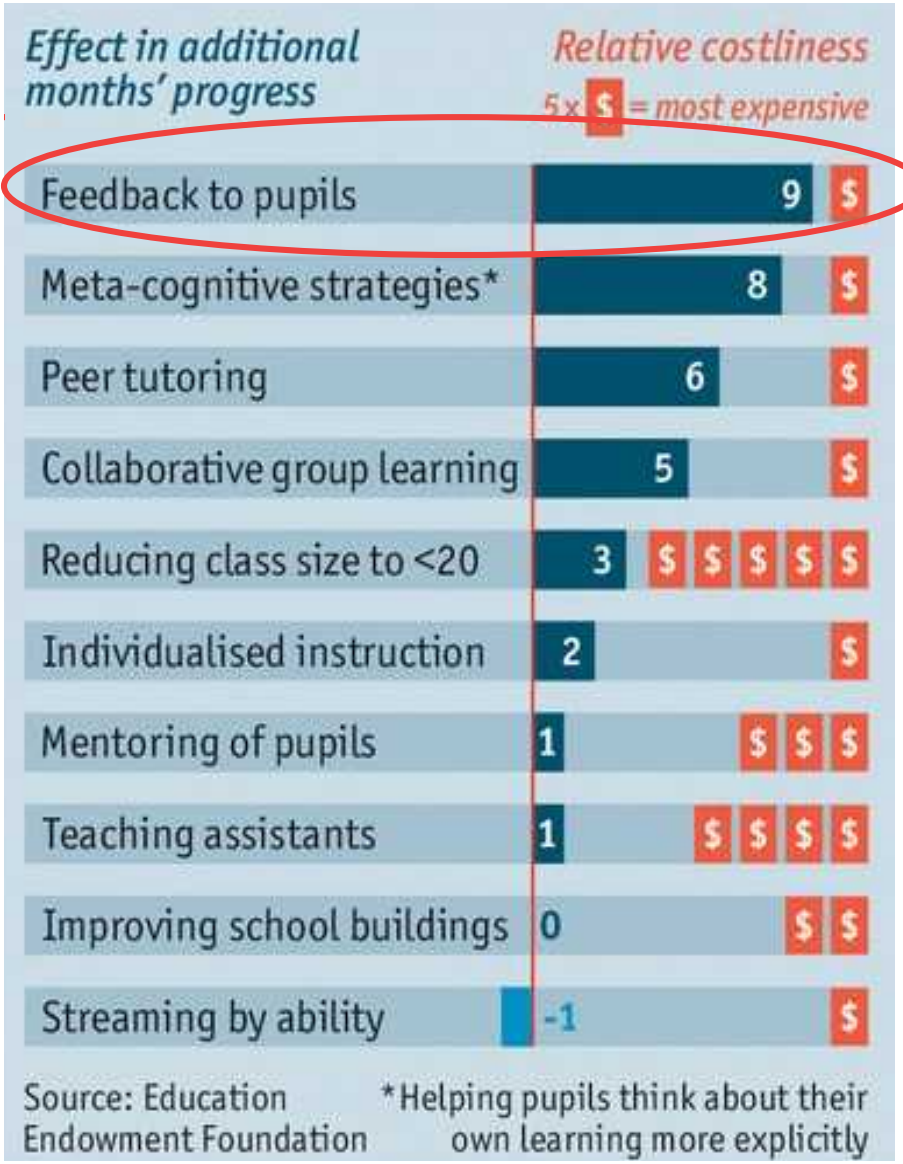
Learner Feedback: high impact



Source: Economist

Formative Assessments

Learner Feedback: high impact

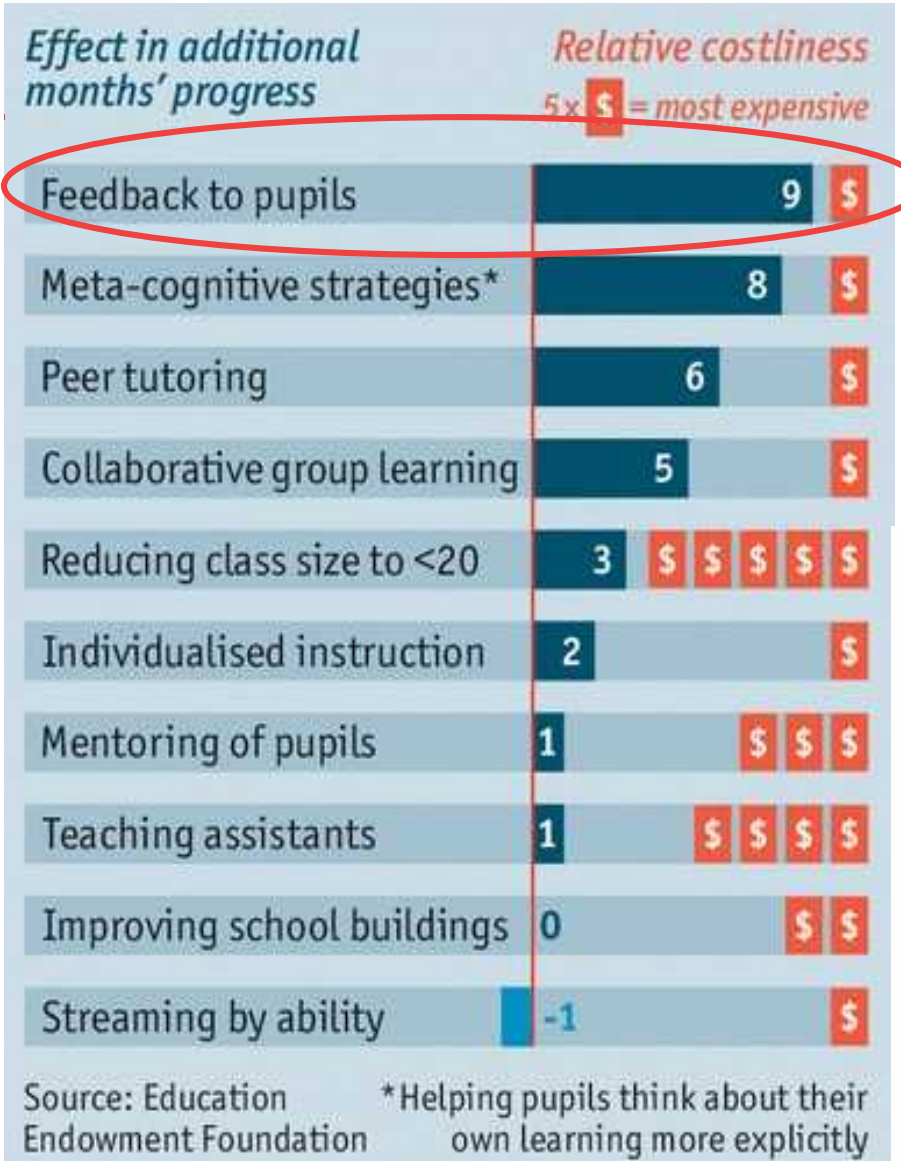


Source: Economist

Formative Assessments

CCE → ?

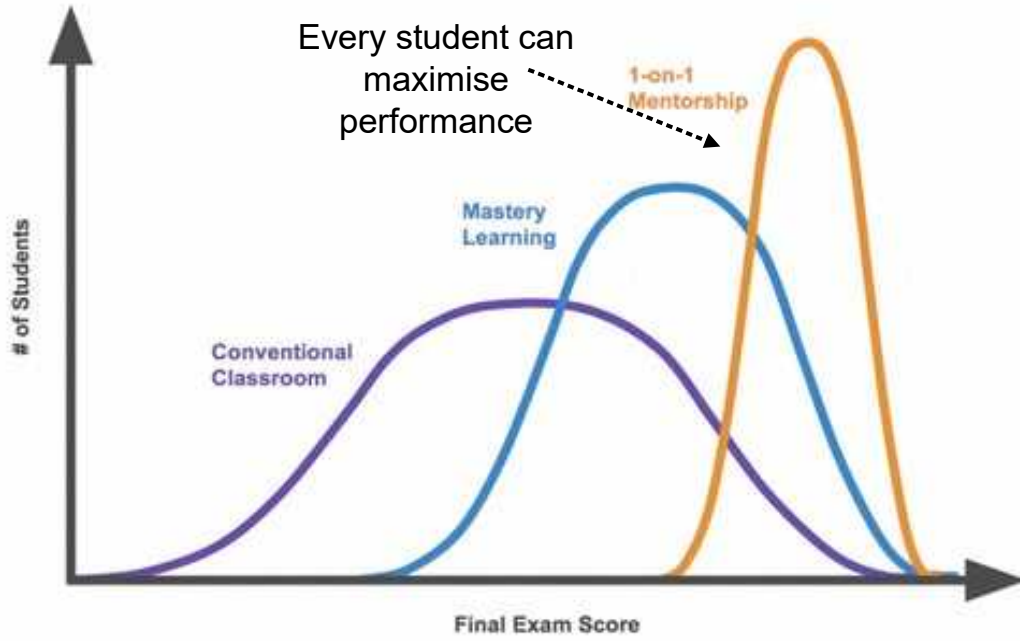
Curricula should support CCE and personalisation



Source: Economist

Formative Assessments

CCE → ?

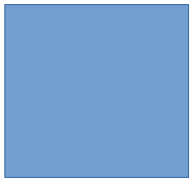


Is there space for thinking and reflection?

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



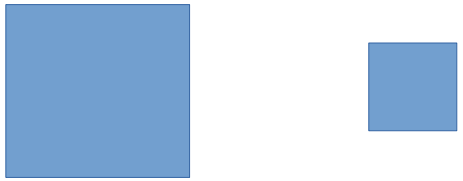
Is there space for thinking and reflection?

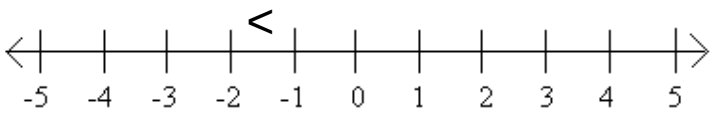
Is $x^2 > y^2$ for all real numbers x,y with x > y ?

Works for x = 2, y = 1

Works for x = 0.8, y = 0.5

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





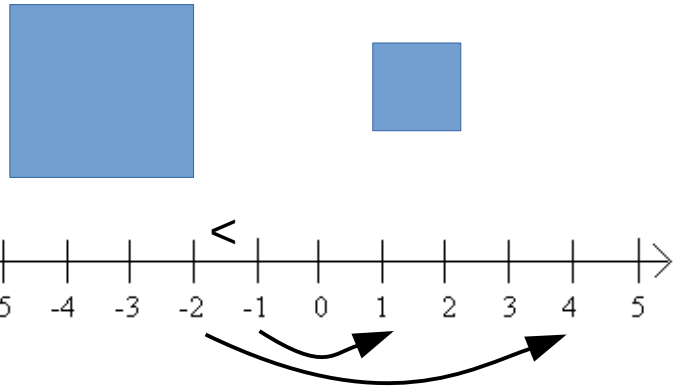
Is there space for thinking and reflection?

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

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



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

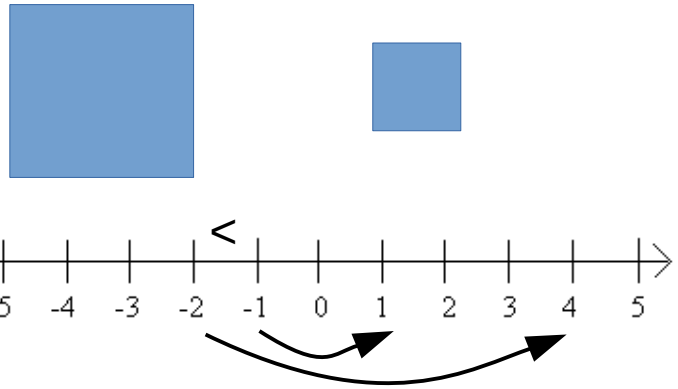
Is there space for thinking and reflection?

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

Works for $x = 2, y = 1$

Works for $x = 0.8, y = 0.5$

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



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?

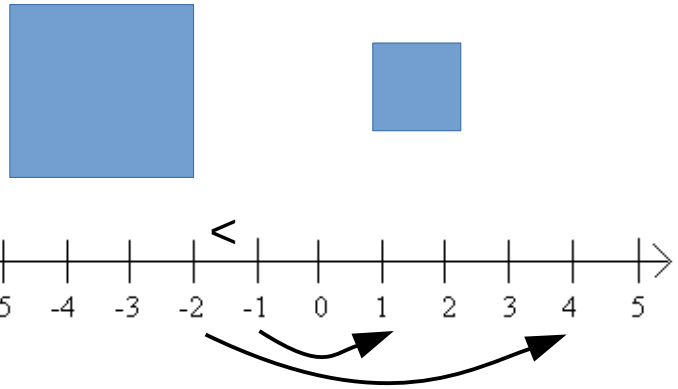
Is there space for thinking and reflection?

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

Works for $x = 2, y = 1$

Works for $x = 0.8, y = 0.5$

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



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?

What if $x = 0.8$?

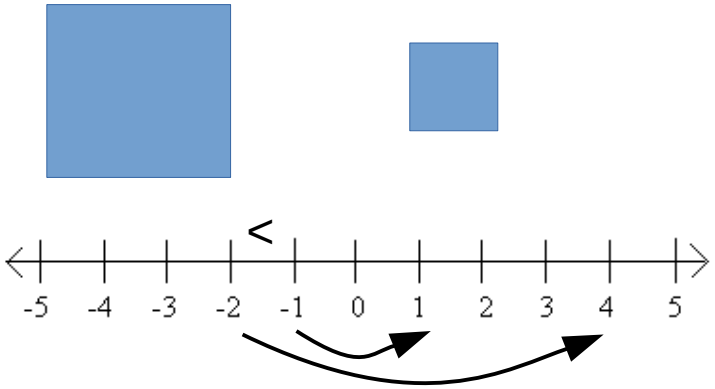
Is there space for thinking and reflection?

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

Works for $x = 2, y = 1$

Works for $x = 0.8, y = 0.5$

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



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?

What if $x = 0.8$?

Thinking starts with a question whose answer is non-intuitive

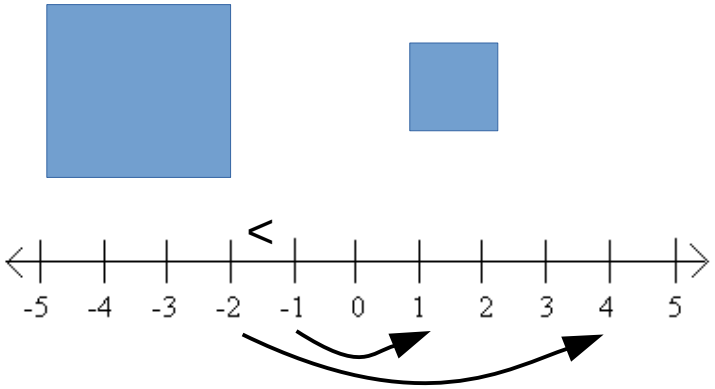
Is there space for thinking and reflection?

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

Works for $x = 2, y = 1$

Works for $x = 0.8, y = 0.5$

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



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

Works for $x = 2$

Works for $x = -1$

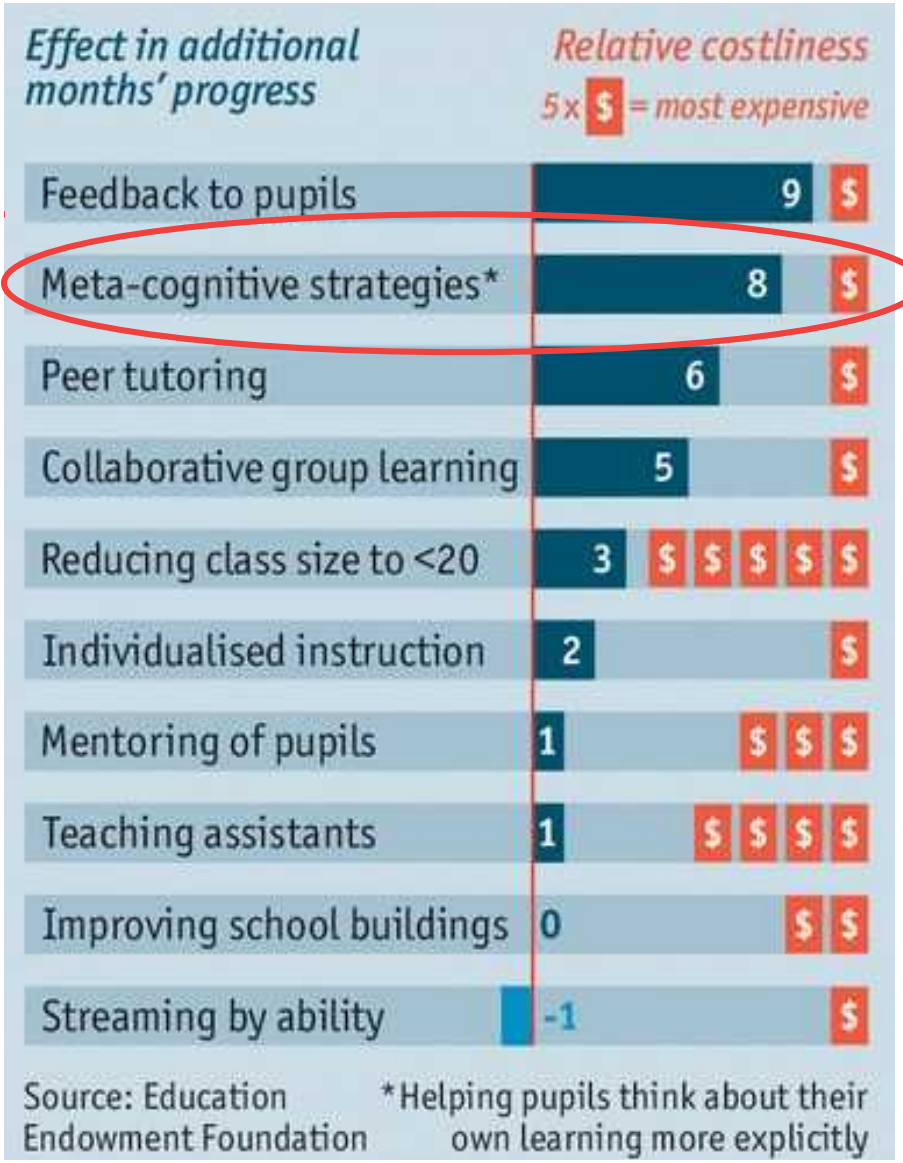
But can we really compare x^2 and x?

What if $x = 0.8$?

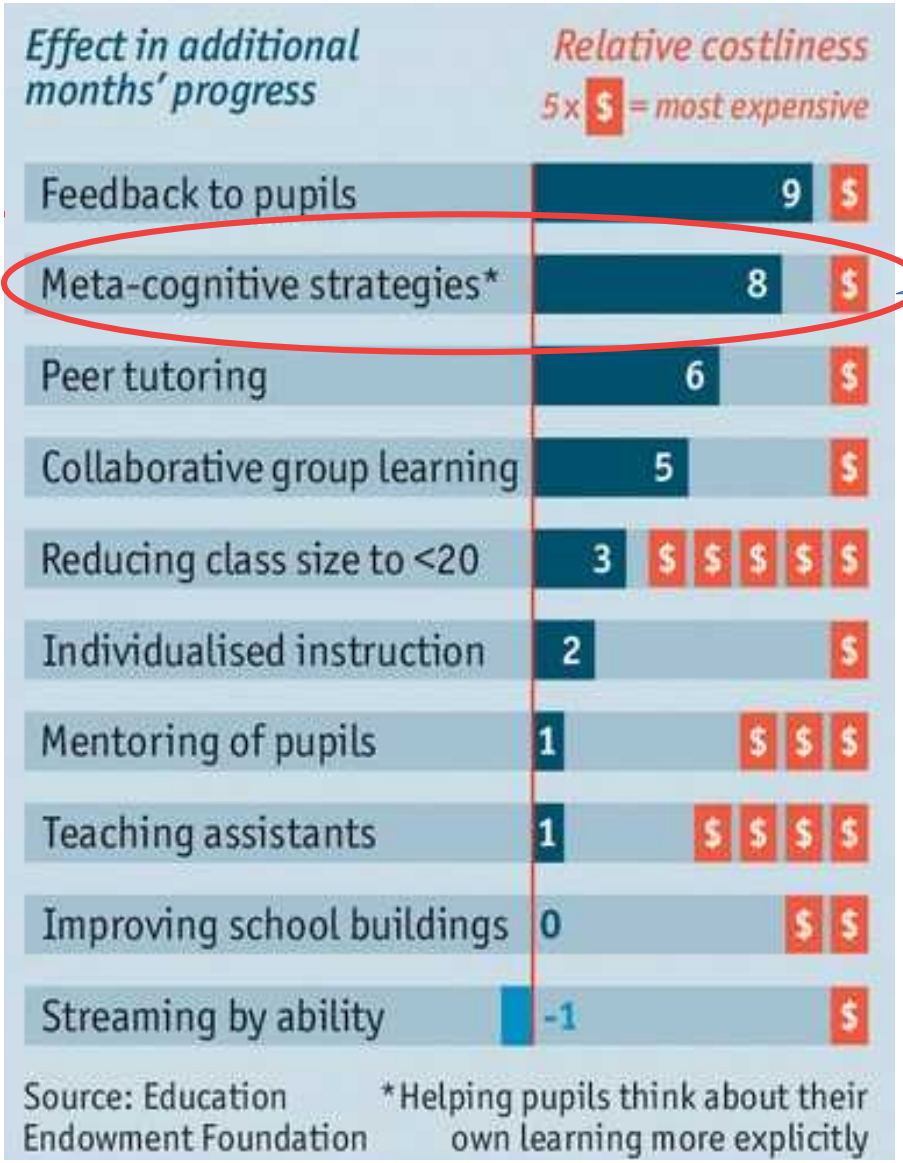
Thinking starts with a question whose answer is non-intuitive

Twisted questions are good … provided they counter intuition

Is there space for thinking and reflection?

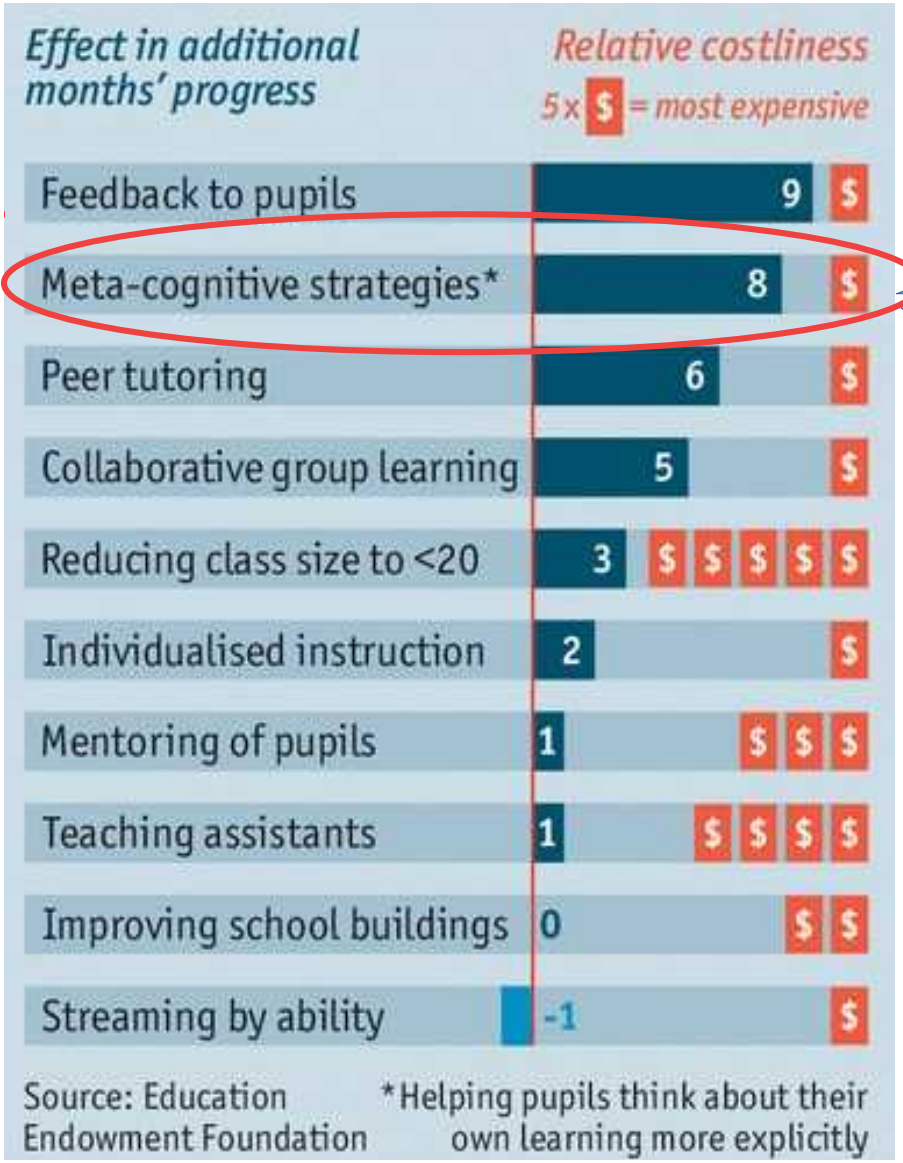


Is there space for thinking and reflection?



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

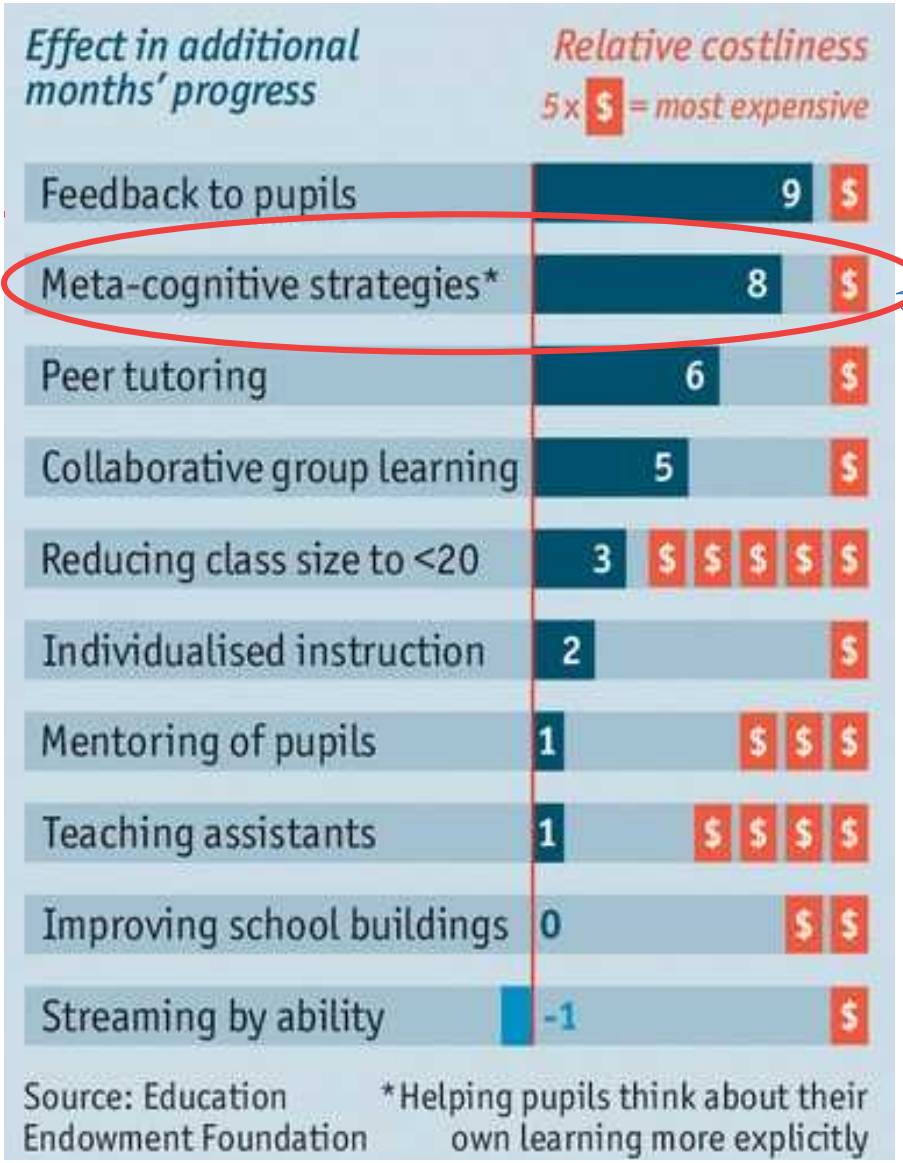
Is there space for thinking and reflection?



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

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

Is there space for thinking and reflection?

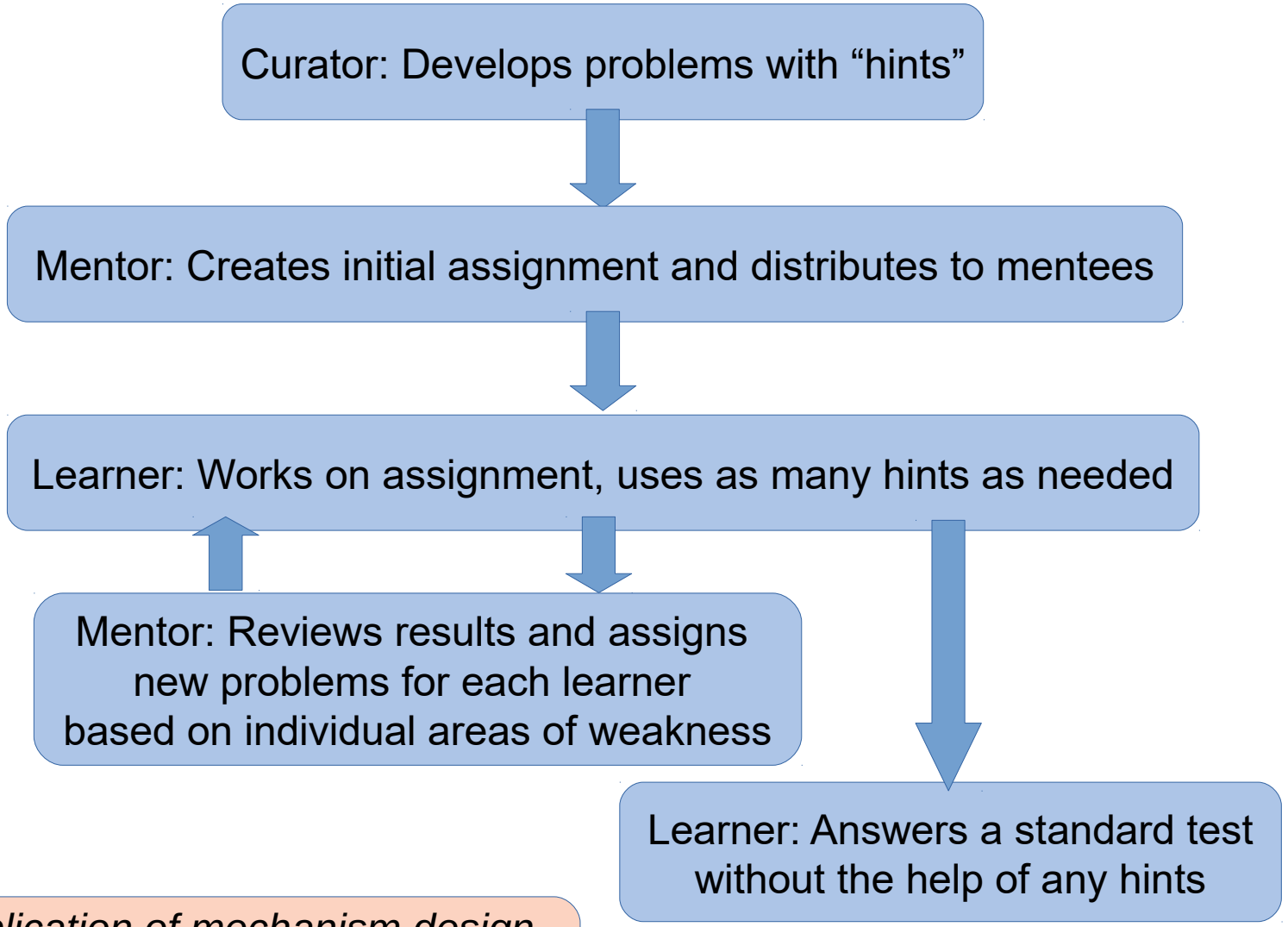


Record meta data about the learning process: Easier in Maths – problem solving is *procedural*

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

Content needs to be curated properly to support this

Mylspot personalised learning



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

www.mylspot.com

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

gv@ee.iitm.ac.in
gv@mylspot.com