The Learning Line

Formative assessment:

Identifying gaps in learning

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Outline

- What exactly is assessment?
- Why formative assessment needs to be a priority
- What formative assessment is and isn't
- Strategies and techniques
  - Sharing learning intentions
  - Eliciting evidence
  - Feedback
  - Students as learning resources for one another
  - Students as owners of their learning

What exactly is assessment?

Assessment

- Assessment is a procedure for drawing inferences
  - We give students things to do
  - We look at what they do
  - We draw conclusions
- The conclusions can be about
  - status
    - current level of achievement
    - potential

    Summative
  - teaching
    - checking for understanding
    - next steps

    Formative

The key requirement: validity

- Evolution of the idea of validity
  - A property of a test
  - A property of students' scores on a test
  - A property of inferences drawn from test results
- "One validates not a test but *an interpretation of data arising from a specified procedure*" (Cronbach, 1971, emphasis in original)
  - No such thing as a valid assessment
  - No such thing as *a* formative assessment

How does assessment improve learning?

Announced?	Given?	Scored?	Used?	
▯				Assessment for motivation
	▯			Retrieval practice
		▯		Instructional correctives
			▯	Formative assessment

Why formative assessment needs to be a priority

Why formative assessment?

- A principle and an uncomfortable fact about the world
  - The principle:
    - "If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him [or her] accordingly" (Ausubel, 1968 p. vi)
  - The uncomfortable fact:
    - Students do not learn what we teach.
  - What is learning?
    - Learning is a change in long-term memory (Kirschner et al., 2006)
    - The fact that someone can do something now does not mean they will be able to do it in six weeks, **but**
    - If they cannot do something now, it is highly unlikely they will be able to do it in six weeks

Building Plan “B” into Plan “A”

Formative Assessment: A contested term

	Long-cycle	Medium-cycle	Short-cycle
Span	Across terms, teaching units	Within and between teaching units	Within and between lessons
Length	Four weeks to one year	One to four weeks	Minute-by-minute and day-by-day
Impact	Monitoring, curriculum alignment	Student-involved assessment	Engagement, responsiveness

Engagement and responsiveness

Balancing chemical equations

$$\square\ Hg(OH)_2 + \square\ H_3PO_4 \rightarrow \square\ Hg_3(PO_4)_2 + \square\ H_2O$$

Unpacking Formative Assessment

	Where the learner is going	Where the learner is now	How to get the learner there
Teacher	Clarifying, sharing, and understanding learning intentions and success criteria	Eliciting evidence of learning	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Student		Activating students as owners of their own learning	

Unpacking Formative Assessment

	Where the learner is going	Where the learner is now	How to get the learner there
Teacher	Before you can begin	Responsive teaching	
Peer	The learner's role		
Student			

Strategies and practical techniques for classroom formative assessment

Clarifying, sharing and understanding learning intentions

Teaching as an intentional activity

- Learning intentions are descriptions of the *learning* that is intended as a result of completing tasks specified by the teacher.
- Success criteria are descriptions of the desired *performance* on those tasks ("I'll be happy if…")

	Purpose	Mostly useful to
Learning intentions	Planning teaching	Teachers
Success criteria	Evaluating teaching	Teachers and pupils

Teaching as an intentional activity

- Success criteria
  - As limitations on what is expected
  - As practice in applying in different contexts
  - As explanations to students of what is meant
  - As scaffolding students' responses

Share learning intentions

- Share learning intentions and success criteria when appropriate (not necessarily at the beginning)
- Start with examples rather than rubrics
- Over time, reduce use of student-friendly language
- Use planning and writing frames *judiciously*
- Ask students to assess the work of anonymous others
- Ask students to design their own test questions.

Eliciting evidence of learning

Eliciting evidence

- Key idea: questioning should
  - cause thinking
  - provide data that informs teaching
- Improving teacher questions
  - generating questions with colleagues
- Improving teacher questioning
  - low-order vs. high-order not closed vs. open
  - appropriate wait-time
  - ‘No hands up’ (except to ask a question)
  - Universal response systems

Eliciting evidence: Diagnostic questions

Questioning in science: Discussion

Ice-cubes are added to a glass of water. What happens to the level of the water as the ice-cubes melt?

A. The level of the water drops
B. The level of the water stays the same
C. The level of the water increases
D. You need more information to be sure

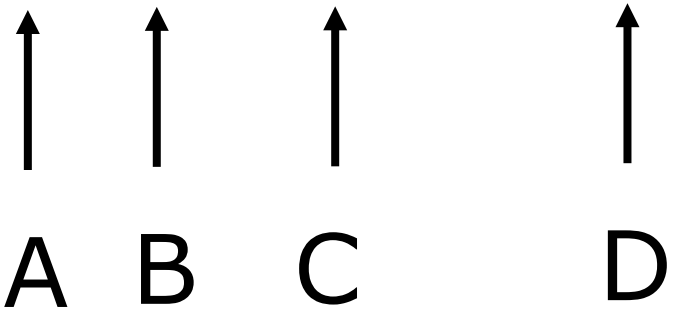
Principles of diagnostic questioning

1. A response from every student

A response from every student…

Where is the verb in this sentence?

The dog ran across the road



A response from every student…

Principles of diagnostic questioning

1. A response from every student
   - ABCD cards, mini-white boards, exit passes

Principles of diagnostic questioning

1. A response from every student
   - ABCD cards, mini-white boards, exit passes
2. Quick checks on understanding, not extended discussions
3. Decision-driven data-collection
4. The right response means the right thinking
   - Distractor-driven multiple-choice questions

Distractor-driven questions: science

Version 1

Which of these are living?

A. Rock
B. Cat
C. Table
D. Bird

Version 2

Which of these are living?

A. Grass
B. Bus
C. Computer
D. Tree

Distractor-driven questions: maths

Version 1

There are two flights per day from Newtown to Oldtown. The first flight leaves Newtown each day at 9:20am and arrives in Oldtown at 10:55am. The second flight from Newtown leaves at 2:15pm. At what time does the second flight arrive in Oldtown? Show your work.

Version 2

There are two flights per day from Newtown to Oldtown. The first flight leaves Newtown each day at 9:05am and arrives in Oldtown at 10:55am. The second flight from Newtown leaves at 2:15pm. At what time does the second flight arrive in Oldtown? Show your work.

Distractor-driven questions: English

Which of these is correct?

A. Its on its way.
B. It’s on its way.
C. Its on it’s way.
D. It’s on it’s way.

Questioning in science: Diagnosis

Janet was asked to do an experiment to find how long it takes for some sugar to dissolve in water. What advice would you give Janet to tell her how many repeated measurements to take?

A. Two or three measurements are always enough
B. She should take 5 measurements
C. If she is accurate she only needs to measure once
D. She should go on taking measurements until she knows how much they vary
E. She should go on taking measurements until she gets two or more the same

Osborne (2011)

Distractor-driven questions: English

Which of these is the best thesis statement?

A. The typical TV show has 9 violent incidents
B. The essay I am going to write is about violence on TV
C. There is a lot of violence on TV
D. The amount of violence on TV should be reduced
E. Some programs are more violent than others
F. Violence is included in programs to boost ratings
G. Violence on TV is interesting
H. I don’t like the violence on TV

Distractor-driven questions: Spanish

Which of the following is the correct translation for “I give the book to him”?

A. Yo lo doy el libro.
B. Yo doy le el libro.
C. Yo le doy el libro.
D. Yo doy lo el libro.
E. Yo doy el libro le.
F. Yo doy el libro lo.

Principles of diagnostic questioning

1. A response from every student
   - ABCD cards, mini-white boards, exit passes
2. Quick checks on understanding, not extended discussions
3. Decision-driven data-collection
4. The right response means the right thinking
   - Distractor-driven multiple-choice questions
   - Multiple correct responses

Multiple correct responses: Maths

What is the area of the semi-circle?

A. $\frac{\pi \times 20}{2}$ B. $\frac{\pi \times 20 \times 20}{2}$ C. 50π D. $\frac{\pi \times 10 \times 10}{2}$ E. $\frac{\pi}{2}\left(\frac{20}{2}\right)^2$

Distractor driven & multiple-correct responses

Identify the adverbs in these sentences:

1. The boy ran across the street quickly.
   (A) (B) (C) (D) (E)

2. Jayne usually crossed the street in a leisurely fashion.
   (A) (B) (C) (D) (E)

3. Fred ran the race well but unsuccessfully.
   (A) (B) (C) (D) (E)

Hinge questions

- A hinge question is based on the important concept in a lesson that is critical for students to understand before you move on in the lesson.
- The question should fall about midway during the lesson.
- Every student must respond to the question within two minutes.
- You must be able to collect and interpret the responses from all students in 30 seconds

Providing feedback that moves learners forward

Effects of feedback

- Kluger & DeNisi (1996) review of 3000 research reports
- Excluding those:
  - without adequate controls
  - with poor design
  - with fewer than 10 participants
  - where performance was not measured
  - without details of effect sizes
- left 131 reports, 607 effect sizes, involving 12652 individuals
- On average, feedback increases achievement
  - Effect sizes highly variable
  - 38% (231 out of 607) of effect sizes were negative

Why getting feedback right is hard

Response type	Feedback indicates performance…	
	falls short of goal	exceeds goal
Change behavior	**Increase effort**	Exert less effort
Change goal	Reduce aspiration	**Increase aspiration**
Abandon goal	Decide goal is too hard	Decide goal is too easy
Reject feedback	Feedback is ignored	Feedback is ignored

Kluger and DeNisi (1996); Wiliam (2011)

General principles for feedback

- The purpose of feedback is to improve the student, not the work
- The only thing that matters with feedback is what students do with it
- If your feedback is getting you more of what you want, it's good feedback
- Feedback should be more work for the recipient than the donor

Practical techniques for feedback

- Key idea: feedback should:
  - Cause thinking
  - Provide guidance on how to improve
- Four-quarters marking
  - Individual feedback
  - Whole-class feedback
  - Peer assessment
  - Self assessment
- Comment-only marking
- Focused marking
- Explicit reference to mark-schemes/rubrics
- Not giving complete solutions

Making feedback into detective work (1)

Feedback as information	Feedback as detective work
You've done a really great job of ordering the first 3 objects in order of smallest to largest. The final two are the wrong way around. Shall we try again with these different objects?'	"You're nearly there, but two of these are the wrong way round. Can you see which ones they are?"
Great use of capital letters. Make sure you are forming your letters correctly and using full stops in all your work	Great use of capital letters. Look back at your work and draw a line under five words that you think could be written better.
When reading maps, remember the order of North, East, South, West. This will be really useful across all of our map work.	Can you think of a way that would help you remember the order for North, East, South West?
You've named lots of carnivores, but not many herbivores. Check back over your work to see if you have included all of the herbivores we've learned about.	You've named lots of carnivores. Check back over your work to see if you have included all the other kinds of animals we've learned about.

Making feedback into detective work (2)

Feedback as information	Feedback as detective work
You need to add more factual details to support your argument in your 3rd paragraph	One of these paragraphs could do with adding more factual details to support your argument. Can you figure out which one, and supply the missing details?
Ensure that you use BIDMAS throughout your calculations.	In three of these calculations, you haven't used BIDMAS correctly. See if you can find them and fix them
When writing in German, remember to use the correct grammatical gender: 'der', 'die' or 'das'.	In the second paragraph, you have used the incorrect grammatical gender for "the" (der/die/das) in three places. Please find them and fix them.
Throughout your answers you need to use specialist terminology, and use it appropriately; ensure that you are monitoring this as you write, and revisit responses where you require more.	There are at least five places in these answers where it would be much better to use specialist terminology. I've highlighted two of them. Please redraft using the appropriate language in the other three.

Activating students as learning resources for one another

Cooperative learning: a research success story

- Two essential components
  - Group goals:
    - so students are working as a group, not just in a group
  - Individual accountability:
    - the best learning efforts of every member of the group must be necessary for the group to succeed, and
    - the performance of each group member must be clearly visible and quantifiable to the other group members

Slavin, Hurley and Chamberlain (2003)

Help students be learning resources

- Students assessing peers' work:
  - "Pre-flight checklist"
  - "Two stars and a wish"
  - Choose-swap-choose

Choose-swap-choose

- Conditions
  - Students make multiple attempts at the same task
  - There is a relatively permanent record of the attempt
  - There is a degree of subjectivity in the assessment
- Examples (primary)
  - Writing a letter of the alphabet
  - Forward roll
  - Playing a musical phrase
  - Dance move
  - Reciting a short poem expressively
- Examples (secondary)
  - Calligraphy
  - Welding
  - Mitre-joints in a picture frame
  - Ruler and compass constructions
  - Persuasive writing pieces in a portfolio

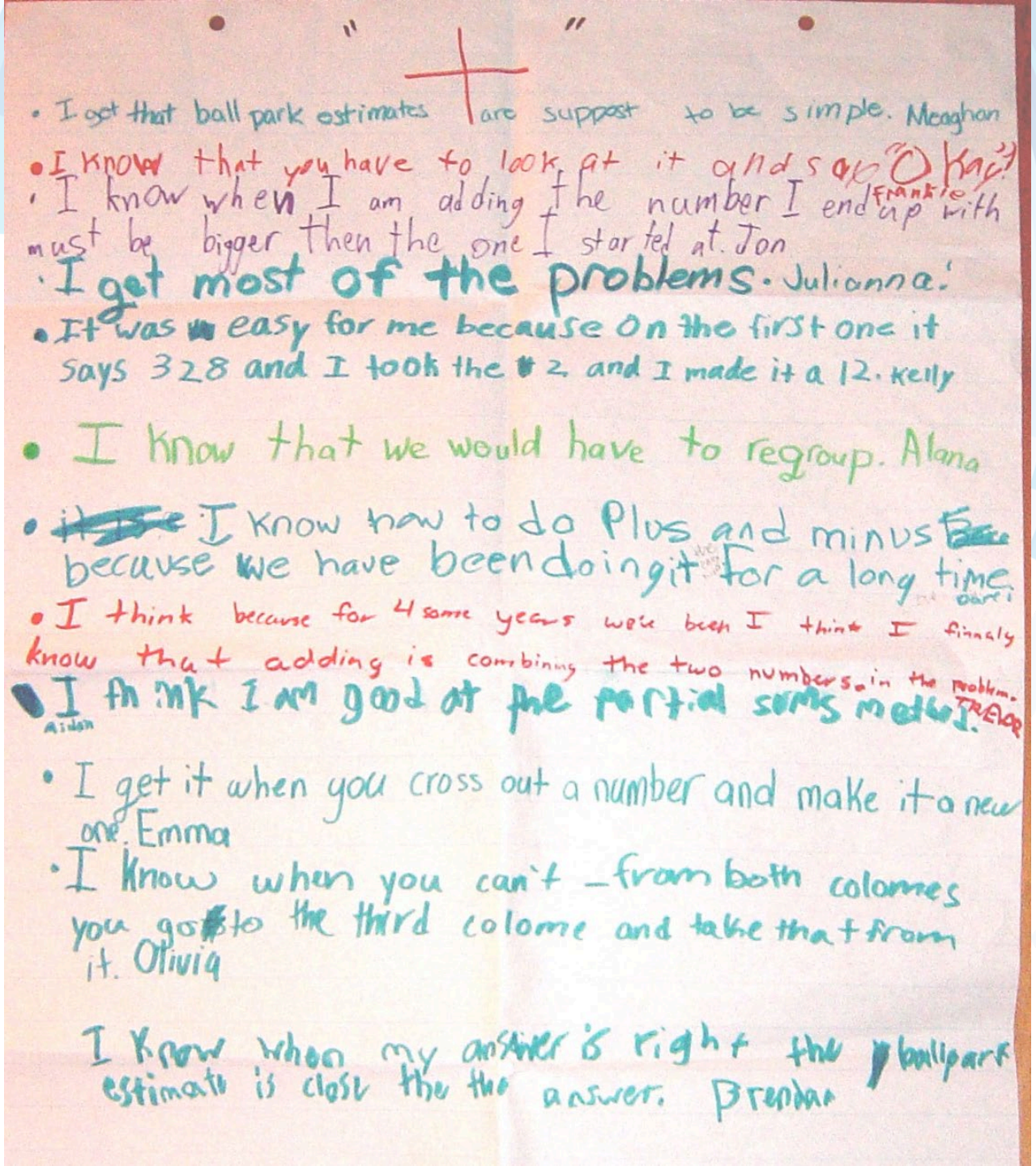
Help students be learning resources

- Students assessing peers' work:
  - "Pre-flight checklist"
  - "Two stars and a wish"
  - Choose-swap-choose
- Ladder of feedback (Perkins, 2003)
  - Clarify->Value->Concerns->Suggest
- Peer assessment as stepping-stone to self-assessment
  - Anonymous peers->actual peers->self-assessment
- Group questions
- Students' end-of-lesson review
- Best composite response

Activating students as owners of their own learning

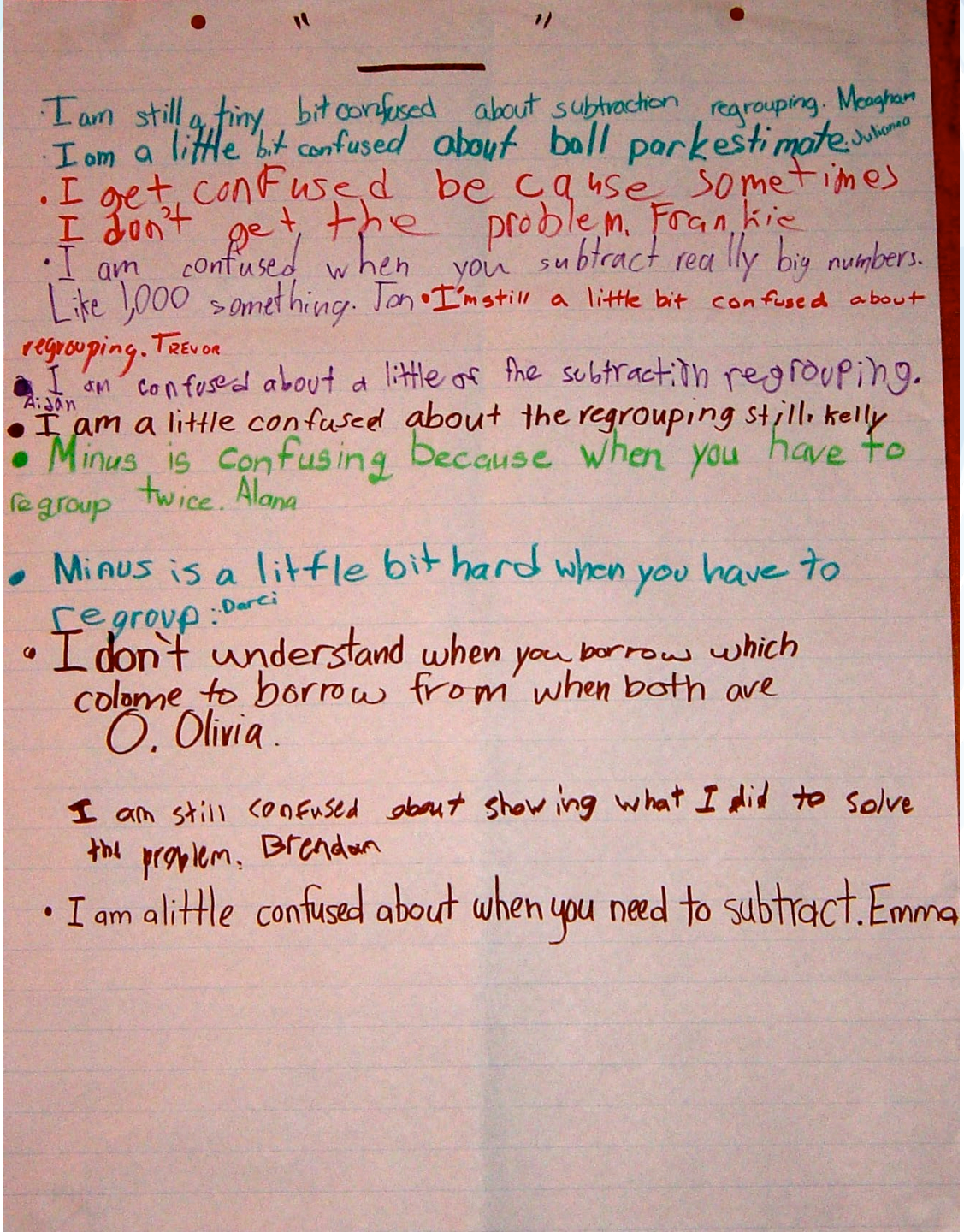
Help students own their own learning

- Students assessing their own work:
  - With rubrics
  - With exemplars
- Self-assessment of understanding:
  - Learning portfolio
  - Traffic lights
  - Red/green discs
  - Coloured cups
  - Plus/minus/interesting



- I get that ball park estimates are suppost to be simple. Meaghan
- I know that you have to look at it and say "Okay" I know when I am adding the number I end up with must be bigger then the one I started at. Jon Frankie
- I get most of the problems. Julianna.
- It was easy for me because on the first one it says 328 and I took the # 2 and I made it a 12. Kelly
- I know that we would have to regroup. Alana
- ~~it is~~ I know how to do Plus and minus ~~because~~ because we have been doing it for a long time. Dani
- I think because for 4 some years we've been I think I finnaly know that adding is combining the two numbers in the problem. TREVOR
- I think I am good at the partial sums method. Aiden
- I get it when you cross out a number and make it a new one. Emma
- I know when you can't - from both colomes you go to the third colome and take that from it. Olivia

I know when my answer is right the ballpark estimate is close the the answer. Brendan



I am still a tiny bit confused about subtraction regrouping. Meaghan
I am a little bit confused about ball park estimate. Julianna
I get confused because sometimes I don't get the problem. Frankie
I am confused when you subtract really big numbers. Like 1,000 something. Jon
I'm still a little bit confused about regrouping. Trevor
I am confused about a little of the subtraction regrouping. Aidan
I am a little confused about the regrouping still. Kelly
Minus is confusing because when you have to regroup twice. Alana
Minus is a litfle bit hard when you have to regroup: Darci
I don't understand when you borrow which colome to borrow from when both ave O. Olivia.
I am still confused about showing what I did to solve the problem. Brendan
I am a little confused about when you need to subtract. Emma

interesting

Carrying the number over to the next number Julianna

It's interesting how some people go to the nearest hundred, while others go to the nearest ten. Meaghan

It's intereting how some have to re group twice. Alana

It is interesting sometimes how you have to regroup ~~[illegible]~~ Darci

- It's pretty interesting about how you have to really work hard. Frankie
  - ~~I am~~ I am interested in borrowing because I didn't just get it yet. I want to really get to know it. Jon
  - I find it weird that you could just keep going from colome to colome when you need to borrow. Olivia
- On the ball park estimate it is ~~pretty good~~ easy but some times confusing. Kelly
- I really think that regrouping is pretty amazing.
- It is cool how addition and subtraction regrouping is just moving nombers and you could get it right easily.

+/–/interesting: responses for “+”

- I got that ball-park estimates are supposed to be simple
- I know that you have to look at it and say “OK”
- I know that when I am adding the number I end up with must be bigger than the one I started at
- I get most of the problems
- It was easy for me because on the first one it says 328 so I took the 2 and made it a 12
- I know that we would have to regroup
- I know how to do plus and minus because we have been doing it for a long time
- I get it when you cross out a number and make it a new one
- I know that when you can’t – from both colomes you go to the third colome and take that from it
- I know that when my answer is right the ball park estimate is close to it

+/–/interesting: responses for “–”

- I am still a tiny bit confused about subtraction regrouping
- I am a little bit confused about ball park estimates
- I get confused because sometimes I don’t get the problem
- I am confused when you subtract really big numbers like 1,000 something
- I’m still a little bit confused about regrouping
- Minus is confusing when you have to regroup twice
- Minus is a little bit hard when you have to regroup
- I don’t understand when you borrow which colome you borrow from when both are 0
- I am a little confused about when you need to subtract
- I am still confused about showing what I did to solve the problem

+/–/interesting: responses for “interesting”

- Carrying the number over to the next number
- It’s interesting how some people go to the nearest hundred while some go to the nearest ten
- It’s interesting how some have to regroup twice
- It’s pretty interesting about how you have to work really hard
- I am interested in borrowing because I didn’t just get it yet. I want to really get to know it
- I find it weird that you could just keep going from colome to colome when you need to borrow
- On the ball park estimate it is easy but sometimes hard
- I really think that regrouping is pretty amazing
- It is cool how addition and subtraction regrouping is just moving numbers and you could get it right easily

Help students own their own learning

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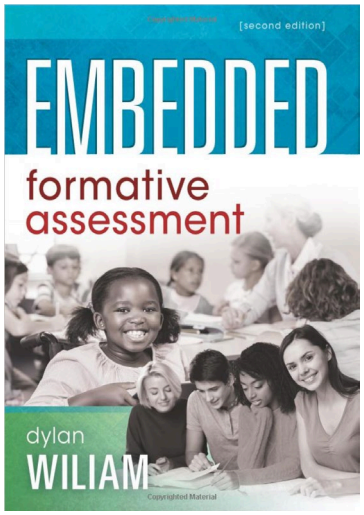
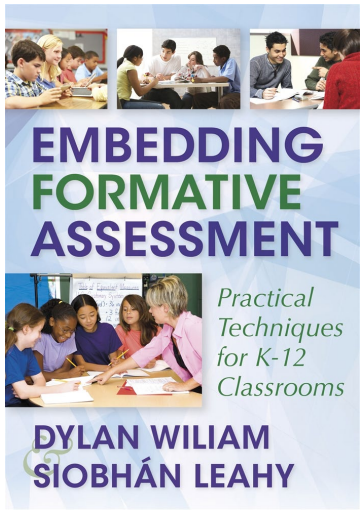
  - Traffic lights
  - Red/green discs
  - Coloured cups
  - Plus/minus/interesting
  - Practice testing

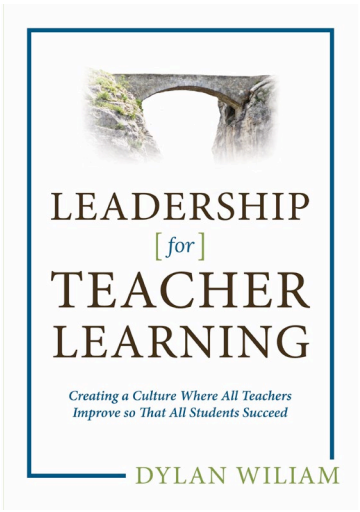
Self-assessment in the early years

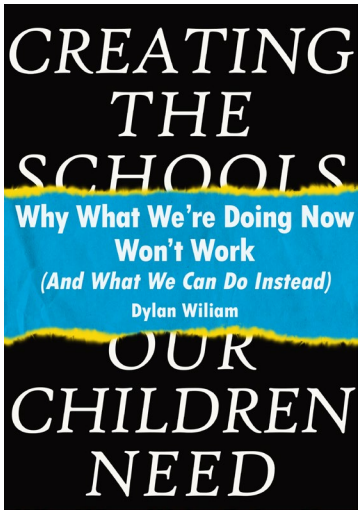
Technique review

To find out more…









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