Designing Effective Professional Learning That Makes a Difference in Student Learning

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Quality Teachers

"Quality teachers have a greater influence on pupil achievement than any other school-based factor. How the nation educates teachers will largely determine the degree to which the United States can participate and succeed in the emerging knowledge economy."

Daniel Fallon, Program Director

Carnegie Corporation of New York, Higher Education





Professional Learning for Teachers





- ...is part of a larger, long-range strategy to improve math instruction and student outcomes
- ...is built on a foundation of leadership support
- ...addresses the instructional needs of every teacher
- ...is sustained through differentiated, targeted, on-going professional learning
- ...is based on extensive in-classroom research incorporating the most innovative strategies and "best practices" from our award winning authors



Guiding Principles





Robust Content Knowledge





Robust Content Knowledge

Which student is using a method that would work for any two whole numbers?

Student A	Student B	Student C
35 ×25	35 x25	35 ×25
125	175	25
+75	+700	1 50
875	875	1 00
		+600
		875





Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.

4.NBT.5 –Multiply a whole number of up to four digits by a one-digit number, and multiply two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.





Robust Content Knowledge

25 25 25	Student A	Student B	Student C
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	35 <u>×25</u> 125 +75 875	35 <u>x25</u> 175 <u>+700</u> 875	$ \begin{array}{r} 35 \\ \times 25 \\ 25 \\ 150 \\ 100 \\ +600 \\ 875 \end{array} $

















Guiding Principles



Understanding How Students Learn







How Students Learn

Think of a time when you learned something.

> What conditions were present that gave you access to the learning?





Conditions for Learning

- A need to know
- Time to learn
- Hands on experience
- Permission to make mistakes and learn from them
- A supportive teacher/supportive environment





For Learning to Occur

Physical Experience

Social Interaction

Maturity





Two Aspects of Learning Mathematics

Making Sense

Learning Social Conventions

The source of learning is internal.

The source of learning is external.





b + e = g





b + e = g





Two Aspects of Learning Mathematics

Making Sense

Learning Social Conventions

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Guiding Principles



Effective Instructional Strategies







Standards for Mathematical Practice

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.





Which is a better choice, $\frac{3}{5}$ or $\frac{7}{8}$ for the location A on the number line?







During the Video

- What is the role of the teacher in this discussion?
 What skills has this teacher developed?
- What is the role of the students in this discussion?
 What skills have the students developed?











Reflect on the Video

- What is the role of the teacher in this discussion?
 What skills has this teacher developed?
- What is the role of the students in this discussion?
 What skills have the students developed?





Effective Instructional Strategies

- Choosing and using rigorous tasks with fidelity
- Engaging all students in productive discourse
- Asking quality questions instead of giving answers
- Establishing a classroom culture that supports reasoning, sense-making, and constructive struggle







Insight Into Individual Learners Through Formative Assessment





Formative Assessment

"...encompassing all those activities undertaken by teachers, and/or students, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged."

Black and Wiliam, 1998a, p.7





Assessing Through Questioning

- What do you know about this problem?
- What is the relationship of this to that?
- What do you predict will happen?
- Is the solution reasonable, considering the context? How do you know?
- What is a real-life situation where this could be used?





Math Reasoning Inventory

12.6 x 10





Student A







Student B







Formative Assessment



Effective Instructional Strategies

Understanding How Students Learn





Guiding Principles



The National Staff Development Council found that efforts to improve student achievement can succeed only by building the capacity of teachers to improve their instructional practice and the capacity of school systems to promote teacher learning.

(Chung Wei, Darling-Hammond, et al. 2009).





Math Solutions Professional Learning





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