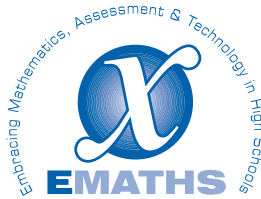


## Technology: The Bridge to Mathematics for ALL Students



1

## The Teaching Principle

Effective teaching requires understanding what ALL students know and need to learn and challenging and supporting them to learn it well. (NCTM, 2009)

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2

## Students learn if

- they are actively involved in choosing and evaluating strategies, considering assumptions, and receiving feedback.
- they encounter contrasting cases- notice new features and identify important ones.

National Research Council, 1999

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3

## Managing Discussions

“...when teachers learn to see and hear students’ work during a lesson and to use that information to shape their instruction, instruction becomes clearer, more focused, and more effective.” (NRC, 2001, p.350)

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4

## Implications for teaching:

- Recognize that many students are learning for the moment not for understanding and retention.
- Take advantage of technology that can allow students into math in new ways.
- Focus on the questions, plan for them, and use them to create classrooms where the focus is on developing understanding of the math

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## Utilize Technology

“Technology is an essential tool for learning Mathematics in the 21<sup>st</sup> Century, ...”

NCTM May/June 2008

6

## Technology is often used

### ■ For Performance:

- To carry out difficult computations or manipulation
- To make the graph or find the equation of a line
  - After the content has been taught
  - Review, consolidate concepts

### ■ NOT as a Tool for Learning

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7

## Technology can

- explicitly engage teachers in exploration, inquiry, and conjecture with their students around specific mathematical concepts.
- create new opportunities for students to reason and make sense out of the mathematics world

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8

## Ways technology materials have gone astray

- Emphasis on mastering the technology - mathematics is of secondary importance
  - Demonstration of concept - students are spectators
  - Revisiting a topic in a simple way - students' role is verification
- Replicating activities from the point of view of current instructional materials, underutilizing the technology's potential
- Fragmented ideas - obtaining a formula as an objective  
(adapted from Belfort & Guimaraes, 2004)

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## A Possible Solution

- Use technology to provide different learning experiences that allow students to interact with the mathematics in new ways.
- Structure lessons that take account of well documented trouble spots.
- Ask questions that reveal student thinking - questions that promote reasoning and sense making.

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10

## References

- Belfort, E. & Guimaraes, C. (2004). Teachers' practices and dynamic geometry. In Hoines, M. & Fuglestad, A. (Eds.), *Proceedings of the 28<sup>th</sup> Conference of the International Group for the Psychology of Mathematics Education*. (2, pp. 503-510).
- Burrill, G. & Dick, T. (2008). What state assessments tell us about student achievement in algebra. Paper presented at NCTM 2008 Research Pre-session
- Florida Department of Education (2006). FCAT Mathematics Released Items, Grade 9.
- Maine Department of Education. Maine Educational Assessment (MEA) Released Items 2004, 2005. Mathematics Augmentation Sample Items.
- Michigan Department of Education. (2003). MMLA Lesson Study Project. Burrill, G., Ferry, D., & Verhey R. (Eds). Lansing, MI
- Michigan Department of Education. (2007). Released items mathematics grades 7, 8 fall. [www.michigan.gov/mde/0,1607,7-140-22709\\_31168\\_31355-95470--,00.html](http://www.michigan.gov/mde/0,1607,7-140-22709_31168_31355-95470--,00.html)
- National Assessment for Educational Progress (2005). Released Item. National Center for Educational Statistics. (2005).

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- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston VA: The Council
- National Research Council (2001). *Adding It Up*. Kilpatrick, J., Swafford, J., & Findell, B. (Eds.) Washington DC: National Academy Press. Also available on the web at [www.nap.edu](http://www.nap.edu).
- New Hampshire Department of Education. (2006). End of Grade 10 Common Items Released Items
- Ohio Department of Education. (2006). Released end of course tests algebra & geometry, Ohio Graduation Test. Spring. Columbus OH.
- Ohio Department of Education. (2006). Ohio graduation tests item analysis. March. Columbus OH.
- Schwartz, & Branford, J. (2000) A time for telling. *Cognition and Instruction*.
- Stigler, J. & Hiebert, J. (2004). Improving Mathematics Teaching, *Improving Achievement in Math and Science*, 61(5), p. 12 – 17

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12

- Texas Education Agency (2004). TAKS Texas assessment of knowledge and skills. Spring. Exit level mathematics, pp. 37-74. Austin TX.
- Texas Education Agency (2004). TAKS. Texas assessment of knowledge and skills item analysis summary report, all students. Spring. Austin TX.

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13