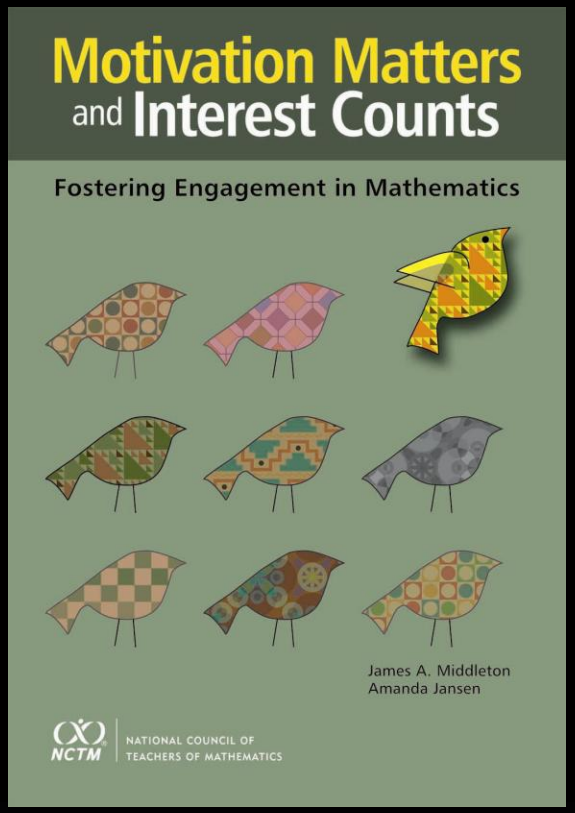
NCTM Annual Meeting. Philadelphia, PA. April 27, 2012.



MOTIVATION MATTERS AND INTEREST COUNTS

Who are we?

- Jim Middleton
- Amanda Jansen

Today's talk

- What is motivation?
- How can we motivate and engage more of our students to learn mathematics?

What is motivation?

Think about when you have a student, a group of students or a classroom of students who are motivated and engaged to learn mathematics.

What does this look like? What are the students doing?

What are your goals for your students' dispositions, motivation, and engagement?

[think-pair-share]

A question of values

If you desire…	You must foster…	Or else you will get…
Craft	Technical skill	Mediocrity
Fluency	Literacy	Illiteracy
Challenge	Perseverance	Easy way out
Usefulness	Hard work	Just get by

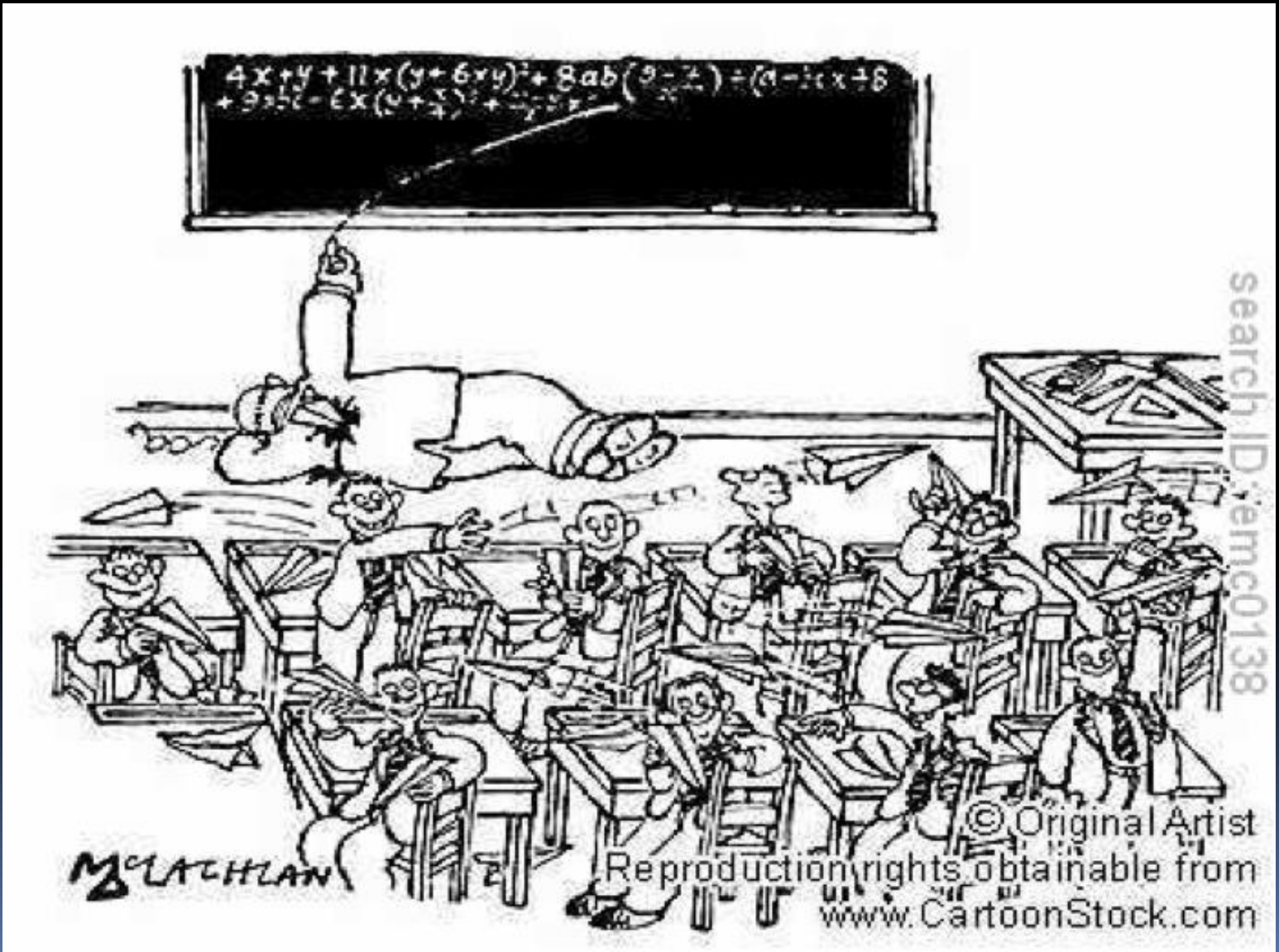
Our goal

- To help you develop, in students, an attitude towards mathematics that includes:
  - Confidence
  - Skill
  - Appreciation
  - Stick-to-it-ive-ness
  - Pro-social affiliation
  - Enjoyment???

Motivation

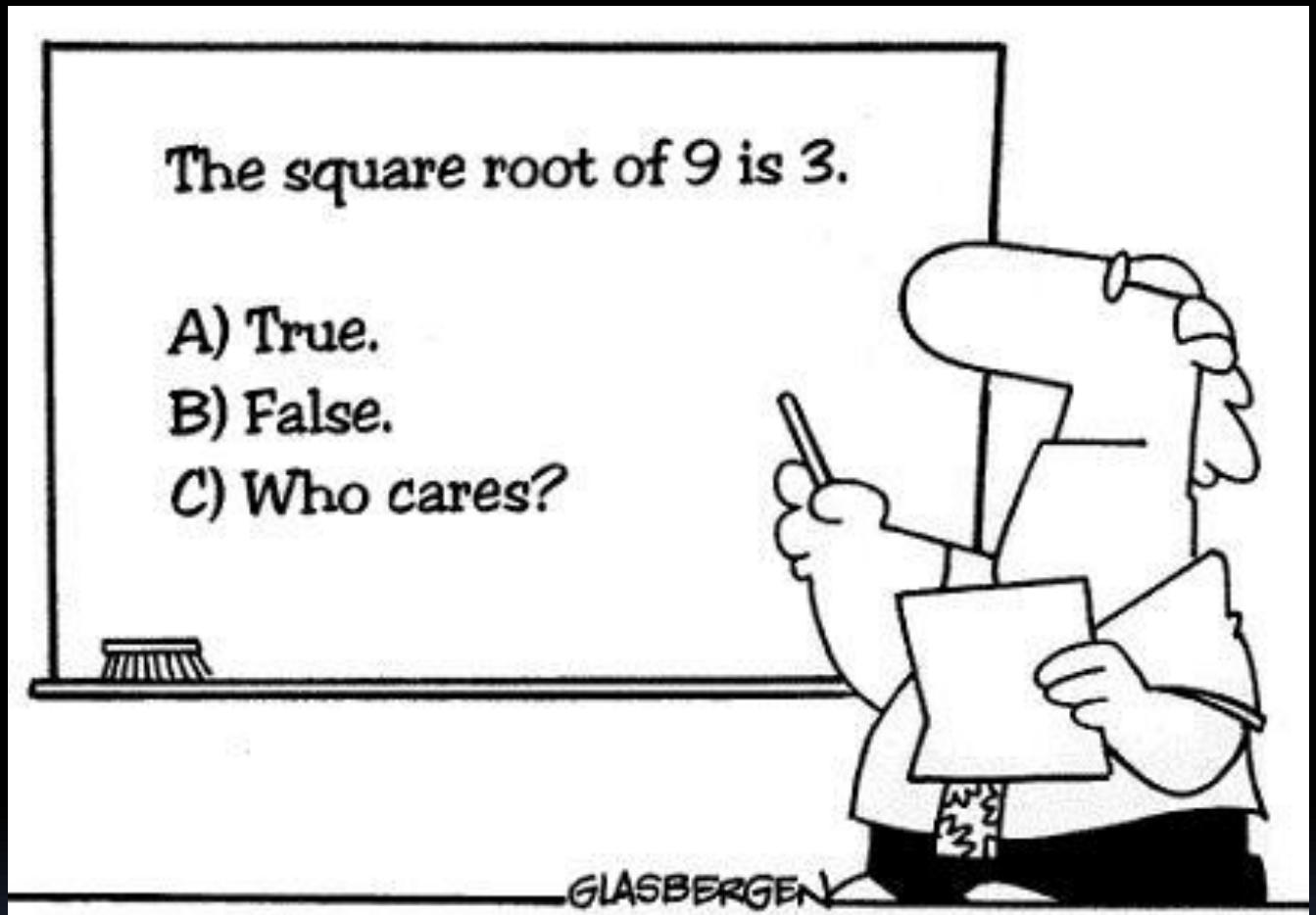
- Why we do what we do
  - Drive
  - Incentive
  - Coercion
  - Choices

All Students are Motivated?



Typical patterns of motivation

- In mathematics, children become more alike with respect to motivation and achievement over time, not more diverse.
- Students tend to grow *more* disillusioned
- *Less* likely to continue on in higher levels of mathematics
- Show diminishing returns on achievement



Many students actually look forward to Mr. Atwadder's math tests.

Six Principles for Understanding Academic Motivation

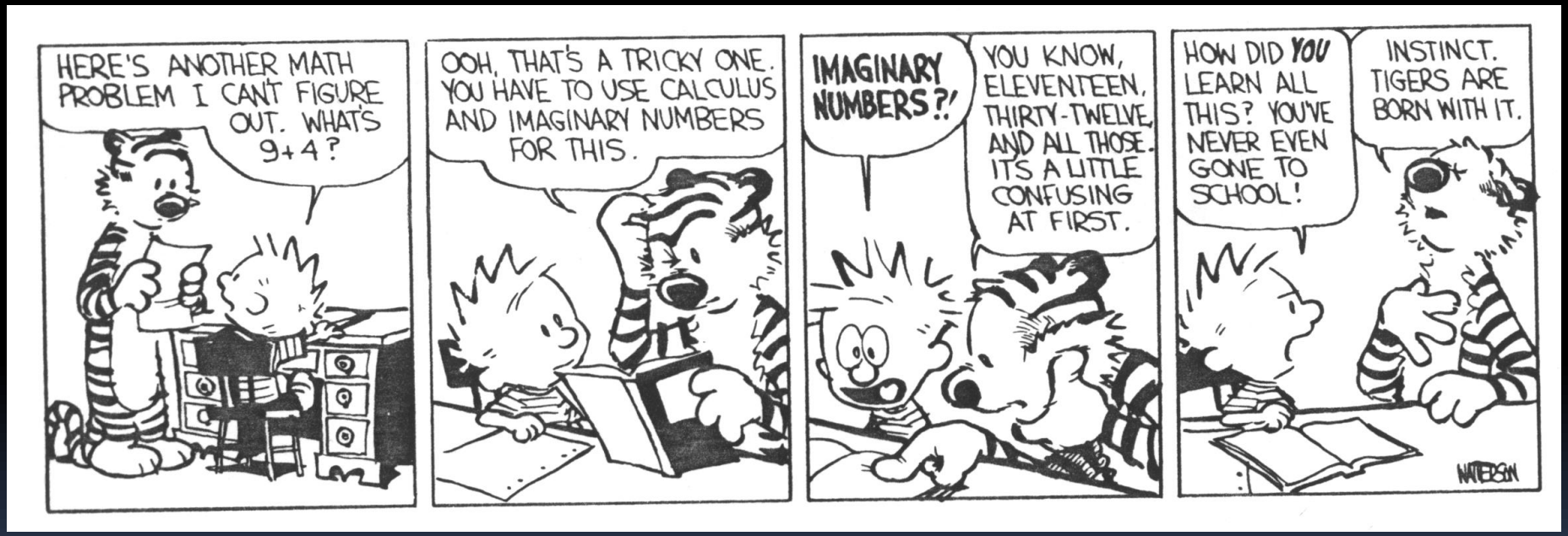
1. **Motivations are learned.**
2. **Motivation is adaptive**
3. **Motivation is "in the moment."**
4. **Motivation creates long-term attitudes.**
5. **Motivation is social.**
6. **Success Matters.**

1. Motivations are learned

- When we learn "algebra" we also learn why algebra is(n't) worthwhile, why it is(n't) useful, why it is(n't) understandable
- Societal attitudes shape our very language, and they shape who gets to play and how they get to play
- Traditional pedagogy in mathematics emphasizes just getting it done as opposed to learning.

So…

- “Mathematics” is a special case


HERE'S ANOTHER MATH PROBLEM I CAN'T FIGURE OUT. WHAT'S 9+4?
OOH, THAT'S A TRICKY ONE. YOU HAVE TO USE CALCULUS AND IMAGINARY NUMBERS FOR THIS.
IMAGINARY NUMBERS?!
YOU KNOW, ELEVENTEEN, THIRTY-TWELVE, AND ALL THOSE. ITS A LITTLE CONFUSING AT FIRST.
HOW DID YOU LEARN ALL THIS? YOU'VE NEVER EVEN GONE TO SCHOOL!
INSTINCT. TIGERS ARE BORN WITH IT.
WATTERSON

2. Motivation is adaptive

- Orients us towards productive pursuits
- Orients us away from nonproductive pursuits
- Aids in recall of important knowledge and skills
- Aids in developing plans and strategies
- Monitors behavior during tasks to maintain optimal performance

3. Motivation is “in the Moment”

- Task Relevance
- Task Challenge, etc.
- Social setting and social goals
- Goals of the Learner
- Self Efficacy Beliefs of the Learner

- The learner only has THIS moment
- What are you going to do to create THIS moment?

Intrinsic Motivation

- Engagement "for its own sake"
  - Leads to increased effort in the face of failure
  - Develops Positive attributions of success
  - Develops Positive self-efficacy
  - Develops Learning Goals
  - Results in Increased achievement
- A cycle of productive behaviors and attitude

Extrinsic Motivation

- Performance of a task to receive a reward or escape a punishment
  - Requires careful examination of what the minimal reward is;
  - Task-oriented, not pursuit-oriented
    - Remember the problems of "Performance Goals versus "Learning Goals"
  - About 70% success is optimal

- Leads to a cycle of diminishing returns

Which is Better???

- Intrinsic Motivation is better than engagement for a reward;
  - Challenge and Control
  - Interest
  - Individual Preferences are difficult to manage

4. Motivation Creates Long-Term Attitudes

- Long-term goals
- Interests and other values
- Expectancies
  - Self [(in)competence, abilities, predilections)
  - Mathematics (what counts, who counts)

5. Motivation is Social

- Needs for Relatedness
  - Can enhance or interfere with mathematics learning.
  - Affiliation
  - Fear of Disapproval
  - To Demonstrate Competence and Obtain Approval and Affirmation
- Need for Social Concern
- Need to Build Shared Meaning
  - Connect with math & connect with others

6. Success Matters

- What makes people smart in mathematics?

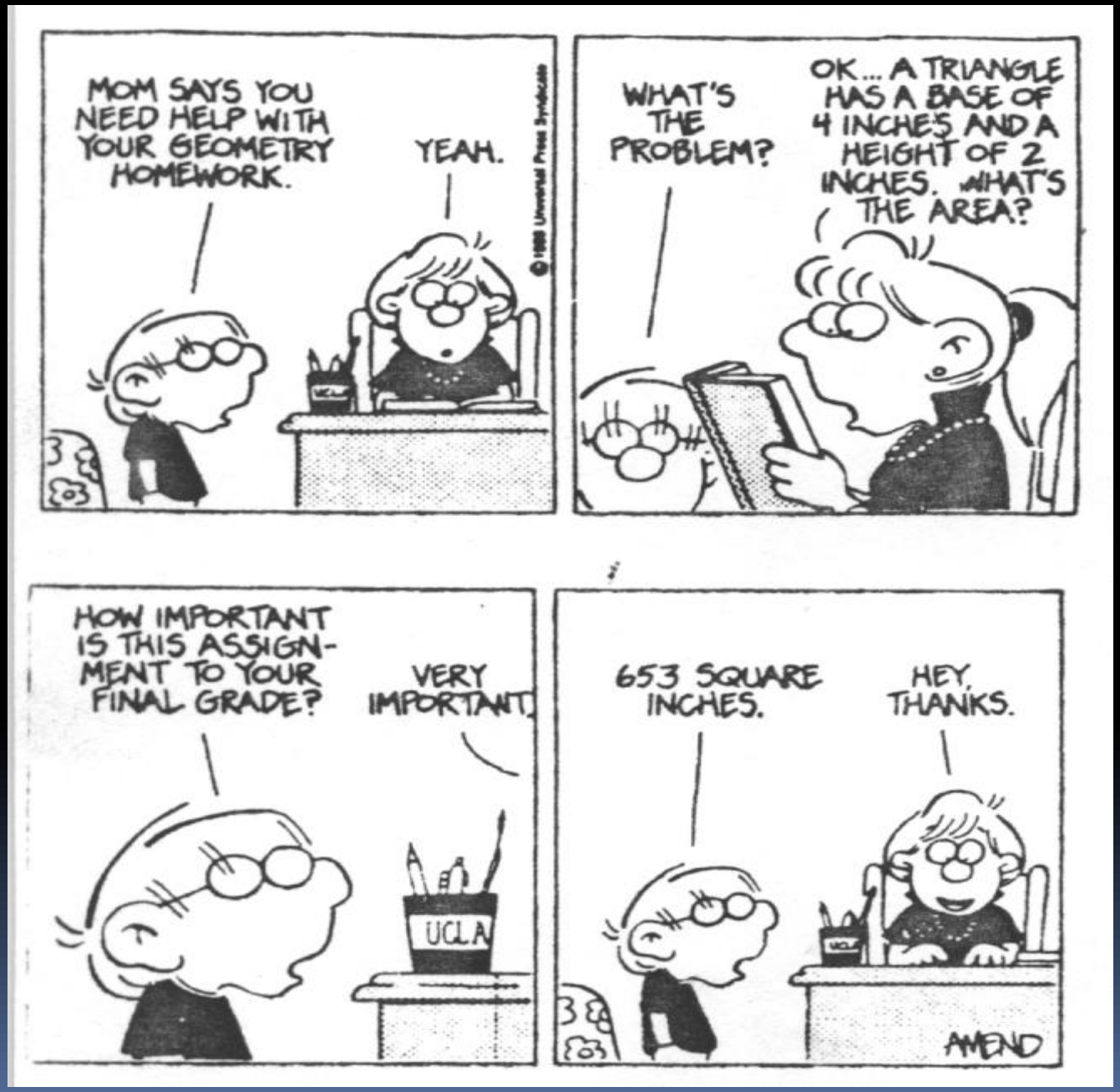
6. Success Matters

- Develop a belief that intelligence is malleable versus a belief that intelligence is fixed
  - "I can do it…"
  - "…but it will take hard work"
    - Positive self efficacy
    - Ability to regulate effort

    - Develop *Learning* Goals versus *Performance* Goals

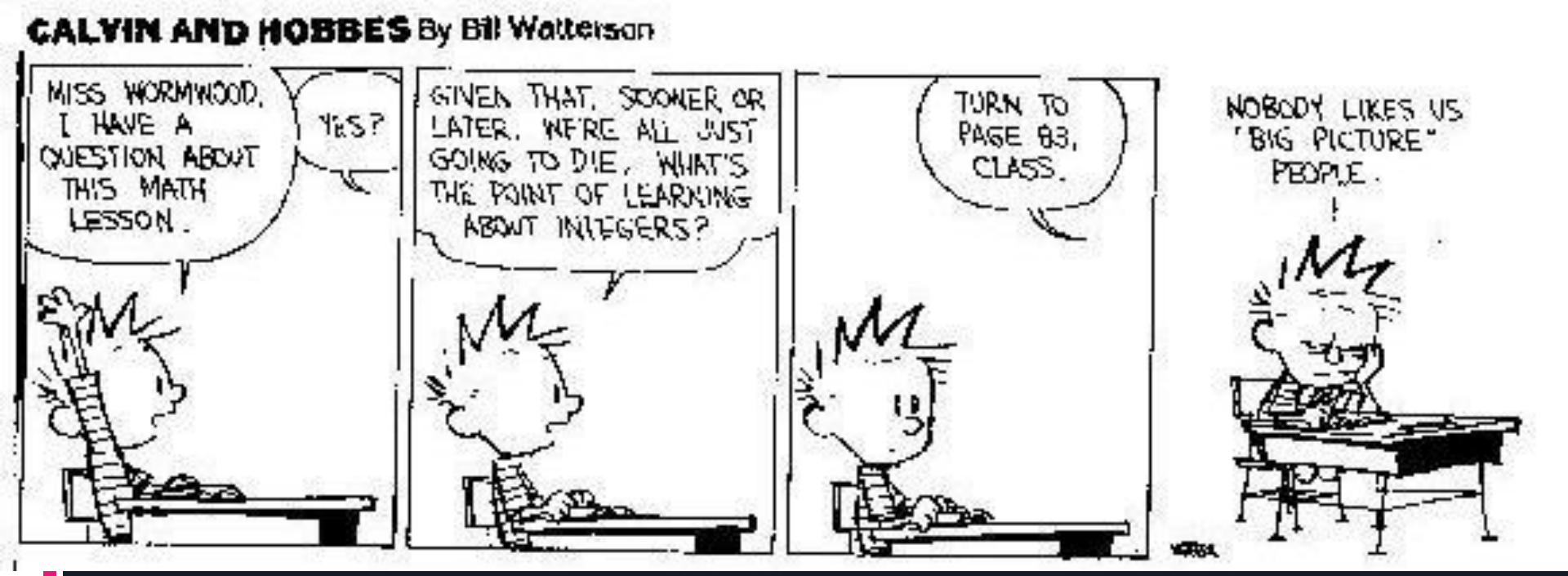
6. Success Matters

- Develop *Learning* Goals versus *Performance* Goals
  - **Learning Goals** focus on building competence, gaining knowledge, enjoyment of learning, and personal improvement
  - **Performance Goals** focus on validating ability in the eyes of others, while at the same time avoiding the perception that one is not able


MOM SAYS YOU NEED HELP WITH YOUR GEOMETRY HOMEWORK.
YEAH.
WHAT'S THE PROBLEM?
OK... A TRIANGLE HAS A BASE OF 4 INCHES AND A HEIGHT OF 2 INCHES. WHAT'S THE AREA?
HOW IMPORTANT IS THIS ASSIGNMENT TO YOUR FINAL GRADE?
VERY IMPORTANT.
UCLA
653 SQUARE INCHES.
HEY, THANKS.
AMEND

Instructional Principles: Promote Motivation and Engagement

1. **Use contexts judiciously**
2. **Scaffold to support challenge**
3. **Limit the use of rewards and other reinforcers**
4. **Exploit interests**
5. **Build relationships**


CALVIN AND HOBBES By Bill Watterson
MISS WORMWOOD, I HAVE A QUESTION ABOUT THIS MATH LESSON.
YES?
GIVEN THAT, SOONER OR LATER, WE'RE ALL JUST GOING TO DIE, WHAT'S THE POINT OF LEARNING ABOUT INTEGERS?
TURN TO PAGE 83, CLASS.
NOBODY LIKES US "BIG PICTURE" PEOPLE.

Utility provides several positive features to the curriculum

- Context which helps memory and sense-making;
- Information regarding the value of the mathematics;
  - To the student
  - To society

1. Strategies for Success: Use Contexts Judiciously

- How Real is "Real?" Whose contexts?
  - Teach the context
  - Locally relevant
  - Math is a context!

2. Scaffold to Support Challenge

- Scaffold for…
  - Developing mathematical understanding
  - Developing classroom community
  - Developing students' autonomy
- Value-added
  - Talking about talking
  - Choice of strategy

3. Strategies for Success: Limit the Use of Rewards

- Create criteria for success that are clear and tied to feedback regarding both *how* and *why* a student's work is successful or not.

- If you DO use rewards,
  - they must not become expected

4. Strategies for Success: Exploit Interests

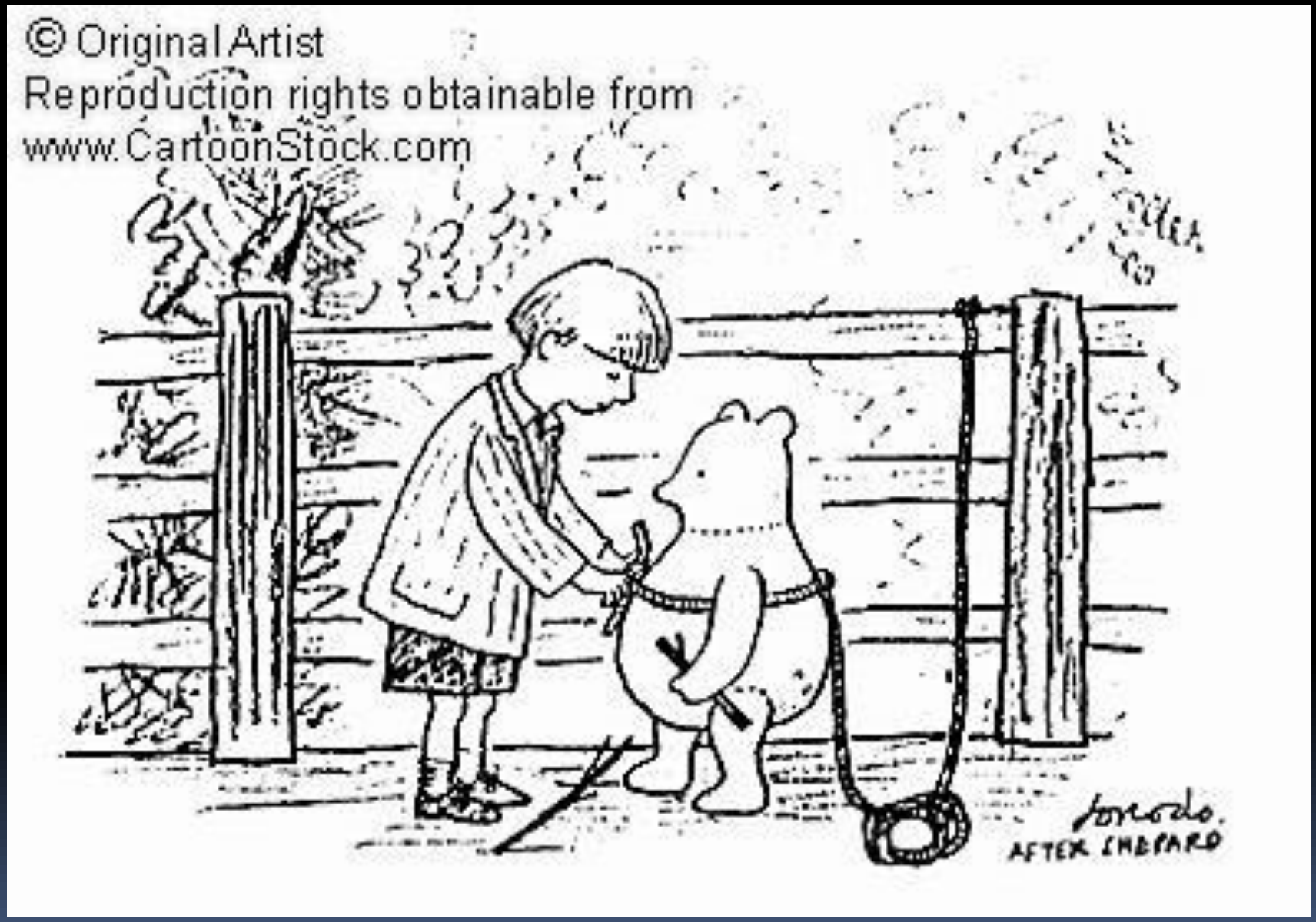
- Catch & Hold Students' Interests
  - Personal relevance
  - Sense of surprise
  - Not too difficult, not too easy
  - Model being interested!

4. Strategies for Success: Exploit Interests

- Change the language of success to emphasize effort
  - This task is challenging
  - We need to work hard to be successful
- Have the students set personal goals for learning

5. Strategies for Success: Build Relationships

- **Humans, in general, work better together**.
  - Treat knowledge as improvable
    - Evaluate based on growth
  - Interdependent classroom community
    - Make student thinking visible (preserve it & improve upon it)
    - Talk about talking
  - Transfer responsibility to students!


© Original Artist
Reproduction rights obtainable from
www.CartoonStock.com
AFTER SHEPARD

Tell Us a Story

- You are the experts of your own classroom!
- What instructional strategies have you used to motivate and engage learners AND support their understanding of mathematics?

Continue the conversation…

- Our Motivation Blog!
  - http://www.nctm.org/motivationmatters
- Book signing!
  - 2 – 3 p.m. today
  - NCTM bookstore
- Contact us
  - jansen@udel.edu
  - jimbo@asu.edu