Building Lessons for All Students

Gallery Workshop for Grades 6 – 12

NCTM Regional Meeting and Exhibition
Baltimore, Maryland
October 2010

Edward C. Nolan

Our Motivation

Why did we become teachers?

What is the best way to teach?

What is the best way to learn?

Is there only one way?

Lessons Evolve

We start with a basic lesson or activity and then add/revise as we find new ideas, reflect on what worked and what did not, and try to find ways to better connect with our students and their knowledge.

What Does it Mean to Teach ALL Students?

Have high expectations for all

Provide worthwhile opportunities for all

Accommodate differences

Support needs

Checkpoint 1

1. What is a Professional Learning Community (PLC)?

2. Are PLC's important? Why?

3. How can PLC's be used to aid in lesson development?

4. How well do you understand the operation of a PLC?

1 2 3 4

My Two Goals

PLC Foci

Student Learning

Collaboration

Focused and Measureable Goals

Results

Before criticizing someone, walk a mile in their shoes . . .

that way, if they get upset, they will be a mile away and barefoot.

When you improve a little each day, eventually big things occur . . . Not tomorrow, not the next day, but eventually a big gain is made. Don't look for the big, quick improvement. Seek the small improvement one day at a time. That's the only way it happens - and when it happens, it lasts.

- John Wooden

“Learning” is more important than “teaching”

Where are your students?

How do you know?

Checkpoint 2

What is differentiation?

How well do you understand differentiation?

1 2 3 4

Find a partner who has a different understanding level from yourself and share some examples of differentiation.

Differentiated Lessons

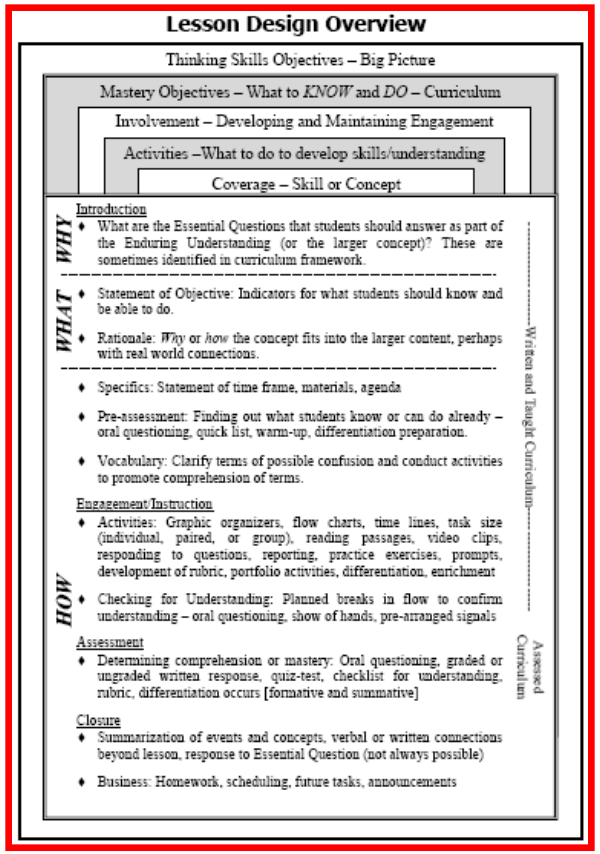
Think about learning profiles and/or interests

What's the task?

How can I modify the task to incorporate specific learning profiles?

How can I modify the task to incorporate specific interests?

Lesson Design



Lesson Design Overview

Thinking Skills Objectives – Big Picture

Mastery Objectives – What to *KNOW* and *DO* – Curriculum

Involvement – Developing and Maintaining Engagement

Activities –What to do to develop skills/understanding

Coverage – Skill or Concept

WHY

Introduction

- What are the Essential Questions that students should answer as part of the Enduring Understanding (or the larger concept)? These are sometimes identified in curriculum framework.

WHAT

- Statement of Objective: Indicators for what students should know and be able to do.
- Rationale: *Why* or *how* the concept fits into the larger content, perhaps with real world connections.

Written and Taught Curriculum

- Specifics: Statement of time frame, materials, agenda
- Pre-assessment: Finding out what students know or can do already – oral questioning, quick list, warm-up, differentiation preparation.
- Vocabulary: Clarify terms of possible confusion and conduct activities to promote comprehension of terms.

HOW

Engagement/Instruction

- Activities: Graphic organizers, flow charts, time lines, task size (individual, paired, or group), reading passages, video clips, responding to questions, reporting, practice exercises, prompts, development of rubric, portfolio activities, differentiation, enrichment
- Checking for Understanding: Planned breaks in flow to confirm understanding – oral questioning, show of hands, pre-arranged signals

Assessment

- Determining comprehension or mastery: Oral questioning, graded or ungraded written response, quiz-test, checklist for understanding, rubric, differentiation occurs [formative and summative]

Assessed Curriculum

Closure

- Summarization of events and concepts, verbal or written connections beyond lesson, response to Essential Question (not always possible)
- Business: Homework, scheduling, future tasks, announcements

Objective of the Lesson/ The Big Picture

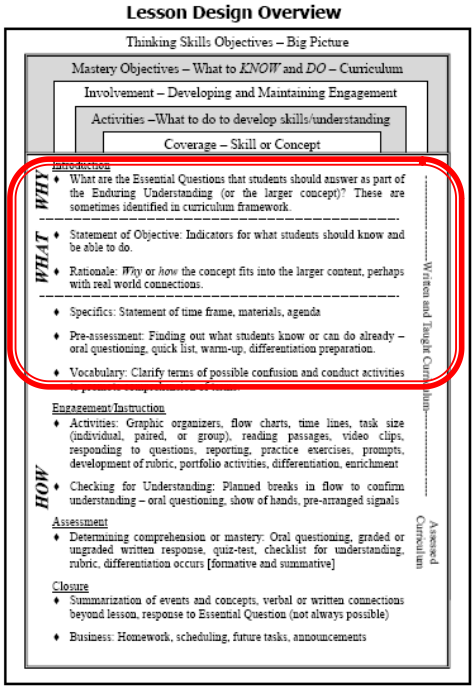
Mastery Objective

Involvement/ Developing Engagement

Lesson/Activities

Did the Students Get It?

Lesson Design



Objective of the Lesson/ The Big Picture

What questions should students be able to answer at the end of the lesson?

What is the Big Picture (larger concept)?

These are often identified in the curriculum

Lesson Sample: Understanding Mean

Thinking Question:

What is the “Big Picture” when we talk about mean?

Lesson Design

Mastery Objective

State the Objective – What should students know and be able to do?

The "**Why**" or "How" of the concept and placed in both a Real World and "Big Picture" context

Lesson Sample: Understanding Mean

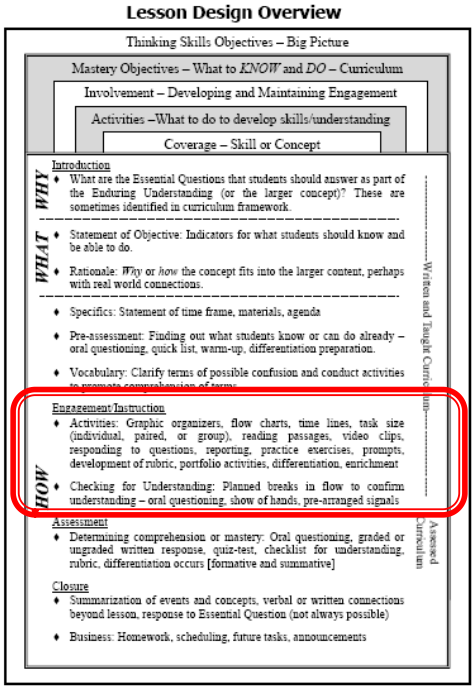
- What should students know and be able to do to demonstrate understanding about *mean*?

- What questions do we want students to be able to answer about mean?

Lesson Sample: Understanding Mean

- When do students first learn about mean?
- What is the usual context for their understanding?

Lesson Design



Involvement/Developing Engagement

Specifics: timing, materials, agenda

Pre-assessment

Vocabulary

Activities to promote comprehension

Discourse

Student engagement

Lesson Design

Lesson/Activities

Activities: Graphic organizer, individual task, paired work, or group activity, reading passages, responding to questions, practice exercises, activities

"Checking for Understanding": Planned breaks in flow to confirm understanding: questioning/pre-arranged signals

Lesson Design

Lesson/Activities Continued

Importance of student movement and interaction

Student choice within activities, projects, and homework

Anchor Activities – ongoing activities that students work on independently

Lesson Sample: Understanding Mean

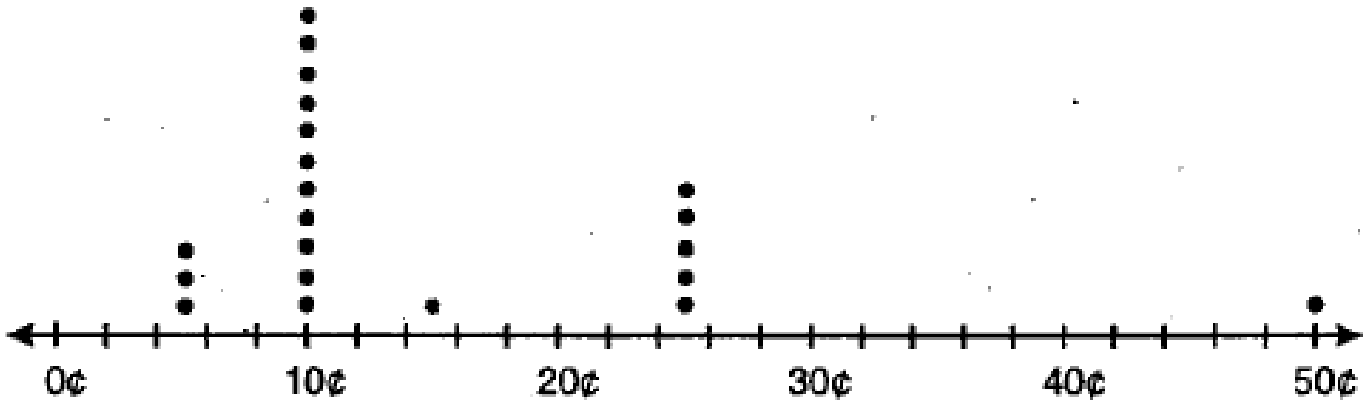
- What activities will help students meet our objectives?
  - **Women's Soccer Results**
  - **Meaning of Mean**

Ahead

Lesson Sample: Understanding Mean

- Extensions possible:
  - **A Balancing Act**
  - ***Media Clips* from September 2007**

Tori has twenty coins: three nickels, eleven dimes, five quarters, and one half-dollar. To find the average value of the twenty coins, we must determine the value of the coins, $3 \times 5¢ + 11 \times 10¢ + 5 \times 25¢ + 1 \times 50¢ = 300¢$, and then divide by the number of coins, 20. The average value of each coin is $300¢/20 = 15¢$. Since we are dealing with more than one of several of the coins, we must be careful in our number-line representation. The following number line is the correct model for this example.



"A Balancing Act," *Student Math Notes*, March 1997

Starting to Generalize:

2. Mathematics students should not be surprised when the median and the mean of a given data set are not equal. Assuming that *mean* refers to arithmetic mean, give an example of a data set of five different two-digit numbers for each of the following:
   (*a*) The median is less than the mean.
   (*b*) The median is equal to the mean.
   (*c*) The median is greater than the mean.

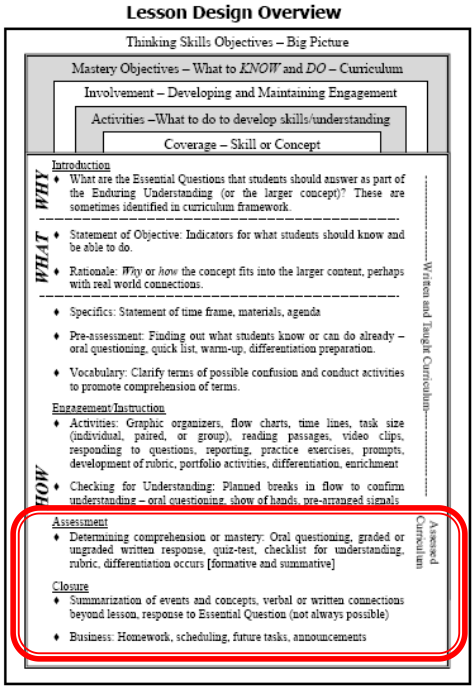
Math Phobia Media Clips, *MT*, September 2007

Extending the Generalization

3. In order to illustrate the difference between median and mean, it is sometimes said that when Bill Gates walks into a room, everyone in the room becomes a millionaire on average, but their median net worth does not change. Assume Bill Gates is a billionaire.
   (*a*) Construct an example to show how each of five people in a room could become a millionaire on average when Bill Gates walks into a room. Assume that *average* refers to arithmetic mean.
   (*b*) Explain how the median net worth of a group of five people in a room could remain unchanged when Bill Gates walks into the room.

Math Phobia Media Clips, *MT*, September 2007

Lesson Design



Did the Students Get It?

Determining comprehension or mastery: questioning or exit card or quiz or test

Formative and **Summative**

Summary of the lesson

Response to initial question of the lesson

Checkpoint 3

How do we know if students are learning?

- What evidence can we collect?
- How do we interpret the evidence?
- What do we do with the evidence?
- What should students be doing?

Using Ongoing Assessment

Pre-assessment

Assessment during instruction

Post-assessment

Lesson Sample: Understanding Mean

What type of questions should we ask to know if students have learned the objective?

Questioning

There are many ways to organize types of questions:

- Levels of intellectual behavior (recall, describe, apply, formulate, judge) [Bloom]
- Types of student activity (engage, refocus, clarify) [Bright and Joyner]
- Algebraic Habits of Mind (doing-undoing, building rules, abstracting) [Driscoll]
- Managing, clarifying, orienting, prompting mathematical reflection, eliciting algebraic thinking [Driscoll]

Mathematics should be about reasoning, not procedures

Questions I Seldom Ask, by David R. Johnson

How many of you understand that?

Everybody see that?

You want me to go over that again?

Did I go too fast for you?

This is a right triangle, isn't it?

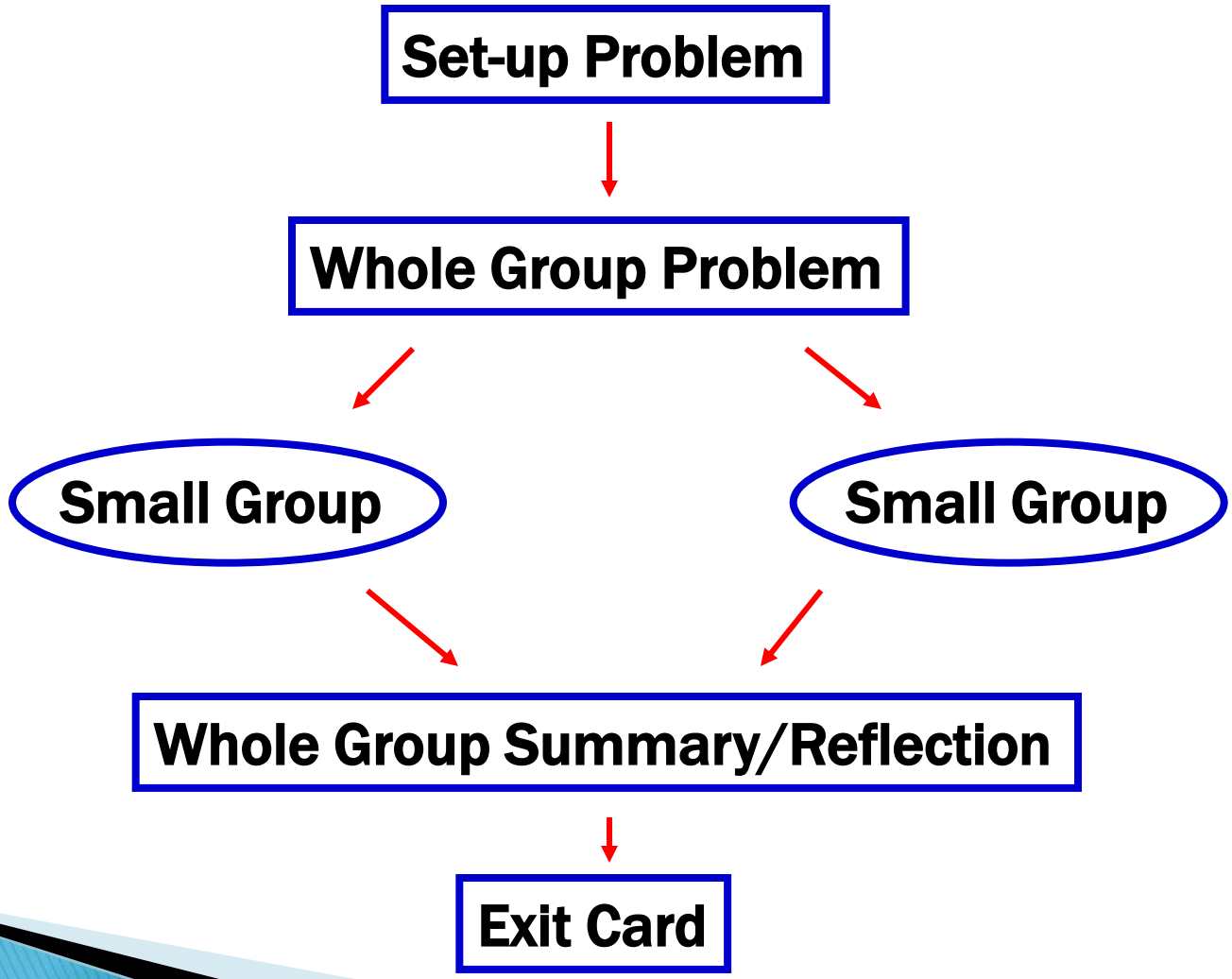
Right?

Do you have any questions?

Broad strategies for using assessment to support learning

- Clarifying and sharing learning intentions and criteria for success
- Engineering effective classroom discussions, questions, and learning tasks
- Providing feedback that moves learners forward
- Activating students as owners of their own learning
- Activating students as instructional resources for one another

One Possible Lesson Design



Climate for High Achievement for All Students

Building Relationships

Group and Cooperative Learning

Confidence and Risk Taking

Learning from Mistakes

Care and Perseverance

Quick and Detailed Feedback

Effort and Effective Strategies

Empowering Students

The old adage is true, you can lead a horse to water, but you can't make him drink.
However, it is the teacher's job to make him thirsty.

Glenda Lappan

Checkpoint 4

So what is important in lesson design?

REFLECTION

Communicate clear, specific expectations.

Be direct.

Model enthusiasm.

Be positive.

REFLECTION

Move among the students.

Have high expectations.

Respect your students.

Encourage persistence.

Use humor.

Remember, the Romans did not build a world empire by just talking . . .

OK, they did it by killing all who opposed them, but you get the idea. ☺

Building Lessons for All Students

Edward C. Nolan
ed@nolanmath.com