

# Template for Developing Estimation Lessons

Grade Level \_\_\_\_\_

## Essential Question: How can I incorporate the development of estimation strategies/anchors into my lessons?

- The goal for both teachers and students is that they can explain what strategies they used, and when/why they need estimation. Prerequisite and ongoing skills for successful estimation implementation include number and computational sense. Part of each lesson should include questions that ask students number sense questions such as those found in the Number Sense section of the Mimosa Mathematics program, or Math Chats (available from Mimosa for grades 1 – 6). Another important component of each lesson is to always have students explain their thinking.

Questions need to be designed for multiple purposes. They set the stage, have students verbalize their thinking and probe their thinking. Questions that guide the effective development of lessons might include:

- How close is close enough?
- Do I need an exact answer?
- What is a *reasonable* estimate?
- When is the estimate the only logical answer?

Lessons should also include questions that develop computational sense such as:

- Should you add (subtract, multiply, divide, square, find the root, etc) in a particular situation? Why do you think so?
- Will you expect your answer to be smaller, larger? much smaller, much larger? Why?
- Do you expect your answer to be negative or positive?

### Step One: Develop Lessons That Incorporate Anchors/Estimation Strategies (Grades PreK-8)

1. The teacher needs to begin by questioning him/herself: In which lessons for this week's plans can I emphasis/incorporate a 5 - 10 minute focus or extension on an estimation strategy/concept. (see attached?) To begin, teachers will work to develop one strategy per month, and share results with grade level colleagues. The goal is for teachers to regularly integrate different estimation strategies into identified lessons.
2. The teacher needs to identify which estimation strategy will be taught/emphasized.

3. Identify the anchor to be taught from the 2-3 identified for each area (see attached), and their personal referent. A personal referent is a measurement that is personal to an individual, and that has been anchored to a standard unit of measure (e.g. a thumb tip is approximately 1 inch, 1 foot/notebook length, 1 yard/ length of your arm).
  
4. What does the teacher need to add to the lesson in order to effectively teach this anchor/concept? How will students develop the anchor? What is the range of reasonable responses? What are the steps in modeling the strategy?
  
5. What are some questions that the teacher needs to ask students to help clarify their thinking, help advance their reasoning, and identify possible sources of error? Questions need to be selected for initiating the activity and extending students' thinking after the activity.
  1. How did you get to your answer?
  2. What strategy did you use?
  3. What did you do first?
  4. Does the answer make sense? Why?
  5. What range do you think the answer will fall in?
  6. Of the strategies that we've heard, which do you think is the most efficient to use in this situation?
  7. What would happen if?...
  8. What are some ways to decide if our estimates are reasonable?
  9. Would you recommend your method to others? Why? Why not?
  10. How do you know....?
  11. How could you find out?
  12. What are some objects around the class that can best be measured in \_\_\_\_\_?
  13. What are some objects outside the class that can best be measured in \_\_\_\_\_?
  14. How do you know if your estimate was reasonable?
  15. Do you think your estimate will be too high or too low? How do you know that?
  
6. How will the teacher assess students' ability to apply the skill and justify their answers (e.g. will the answer be larger or smaller than estimated? Why?)

## **Develop Lessons That Incorporate Anchors/Estimation Strategies      Grade 9 - 12**

1. The teacher needs to begin by questioning him/herself: In which lessons for this week's plan can I emphasis/incorporate a 5- 10minute focus or extension on an estimation strategy.
2. What does the teacher need to add to the lesson in order to teach this anchor/concept? How will students develop the anchor? What is the range of reasonable responses? What are the steps in modeling the strategy?
3. What are some questions that the teacher needs to ask students to help clarify their thinking, help advance their reasoning, and identify possible sources of error?
  1. How did you get to your answer?
  2. What strategy did you use?
  3. What did you do first?
  4. Does the answer make sense? Why?
  5. What range do you think the answer will fall in?
  6. Of the strategies that we've heard, which do you think is the most efficient to use in this situation?
  7. What would happen if?...
  8. What are some ways to decide if our estimates are reasonable?
  9. Would you recommend your method to others? Why? Why not?
  10. How do you know....?
  11. How could you find out?
  12. What are some objects around the class that can best be measured in \_\_\_\_\_?
  13. What are some objects outside the class that can best be measured in \_\_\_\_\_?
  14. How do you know if your estimate was reasonable?
  15. Do you think your estimate will be too high or too low? How do you know that?
4. How will the teacher assess students' ability to apply the skill and justify their answers (e.g. will the answer be larger or smaller than estimated? Why?)

## DEFINITIONS

1. Referent: nonstandard units such as familiar objects or events that are used as reference points when estimating.
2. Anchor: numbers and pictures that serve as helpful reference points for working with larger numbers and visuals. They are easy to work with and to visualize and provide a conceptual foundation for making comparisons and doing mental computations with larger numbers.

# ESTIMATION TEMPLATE WORKSHEET

Name \_\_\_\_\_

Grade \_\_\_\_\_

1. Lesson Title \_\_\_\_\_

2. Source \_\_\_\_\_

3. Strategy focus

**Perceptual**

Compare an unknown quantity to a known quantity

Partition an unknown quantity into known quantities

Use mental computation

**Computational**

Front-end and adjusting

Clustering around an average

Rounding and adjusting

Compatible numbers

Special numbers

3. Anchor \_\_\_\_\_

4. Personal referent \_\_\_\_\_

5. Lesson additions/revisions:

6. Key Questions:

**Before:**

**During:**

**After:**

7. Assessment strategy