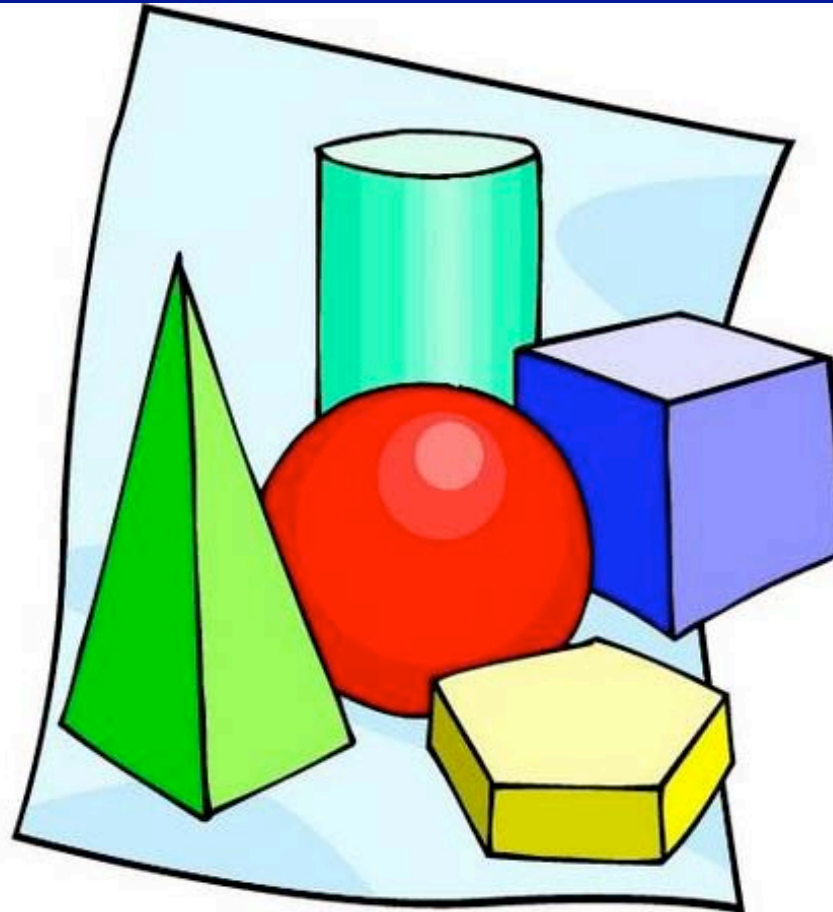


# Making Mathematics Accessible to English Learners

John Carr & Cathy Carroll

[jcarr@wested.org](mailto:jcarr@wested.org)

[ccarroll@wested.org](mailto:ccarroll@wested.org)



# Welcome and Housekeeping

---

- Discussion/Interactive Format
  - Quick Polling (yes/no & multiple choice)
  - Type messages into text chat area
  - Reflection & Open Responses
  - Break for responding to chat questions/comments
  - Those on just the teleconference with the slideshow can email questions to: [eventquestion@wested.org](mailto:eventquestion@wested.org)

# Overview of the Webinar

---

- Introduction to guidebook
- Inquiry-based learning
- Scaffolding
- Strategies to support language development
- Applying to the classroom

# Poll: Who is on the webinar?

---

- School, District, or State administrator
- Teacher (classroom or resource)
- Mathematics teacher leader/ Professional developer
- EL coordinator
- Curriculum coordinator
- Higher education staff
- Other (type into the chat area)

# Quick Yes/ No Poll

---

Which State are you joining us from

Hit YES for CA, Hit NO if other State and type into chat

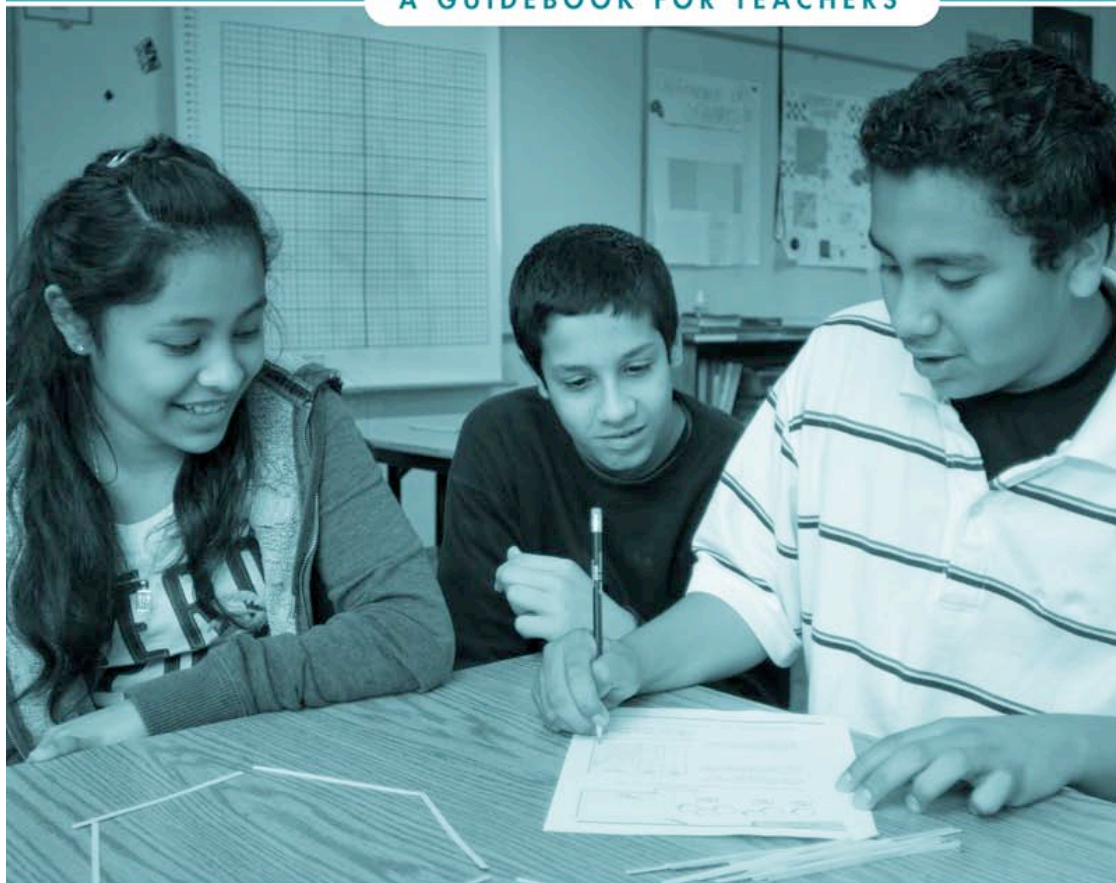
I have attended previous SchoolsMovingUp  
webinars on ELL & Math.



Grades 6-12

# Making **MATHEMATICS** Accessible to English Learners

A GUIDEBOOK FOR TEACHERS



John Carr • Catherine Carroll • Sarah Cremer  
Mardi Gale • Rachel Lagunoff • Ursula Sexton

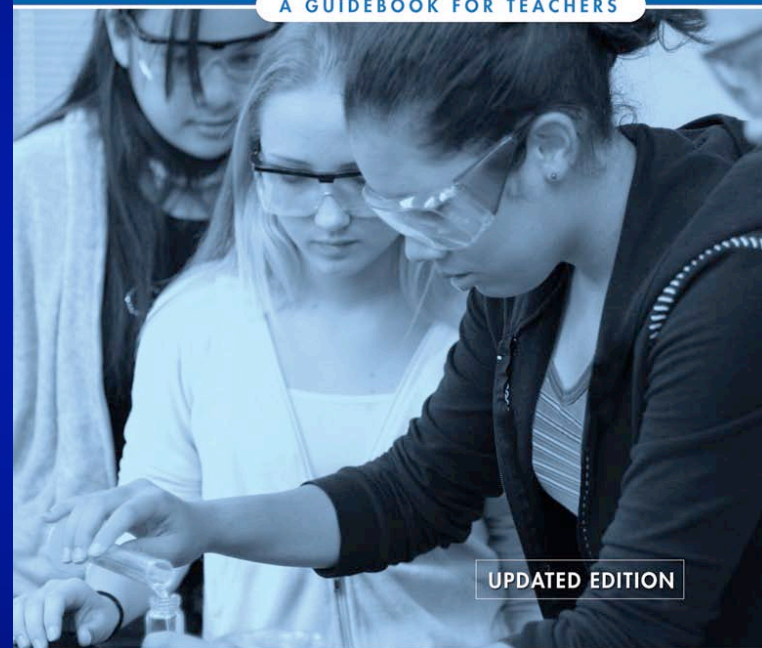
# Based on...



Grades 6-12

# Making **SCIENCE** Accessible to English Learners

A GUIDEBOOK FOR TEACHERS



UPDATED EDITION

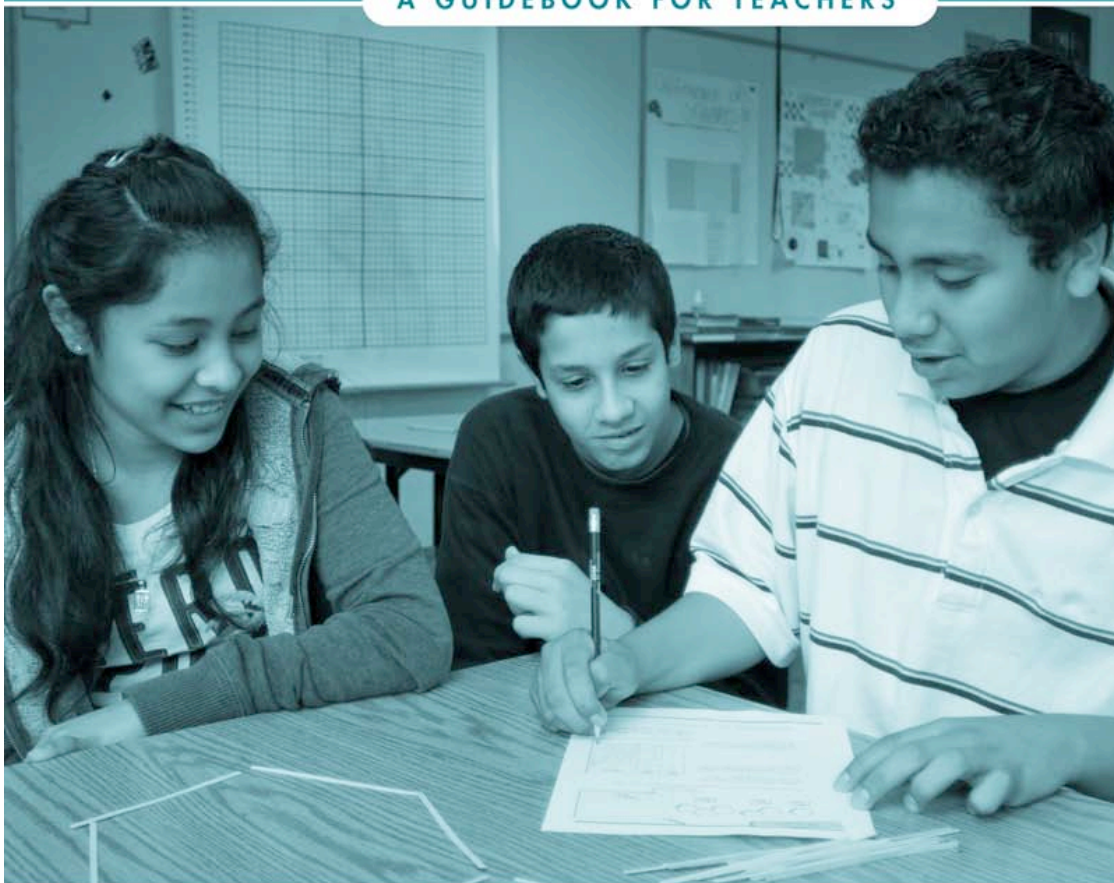
John Carr • Ursula Sexton • Rachel Lagunoff



Grades 6-12

# Making **MATHEMATICS** Accessible to English Learners

A GUIDEBOOK FOR TEACHERS



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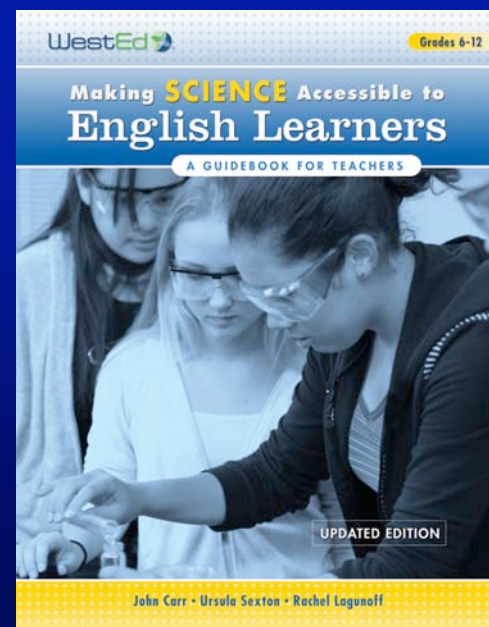
## Cathy Carroll

## John Carr

[ccarroll@wested.org](mailto:ccarroll@wested.org)

[jcarr@wested.org](mailto:jcarr@wested.org)

Senior Research Associates



# Guiding Theme

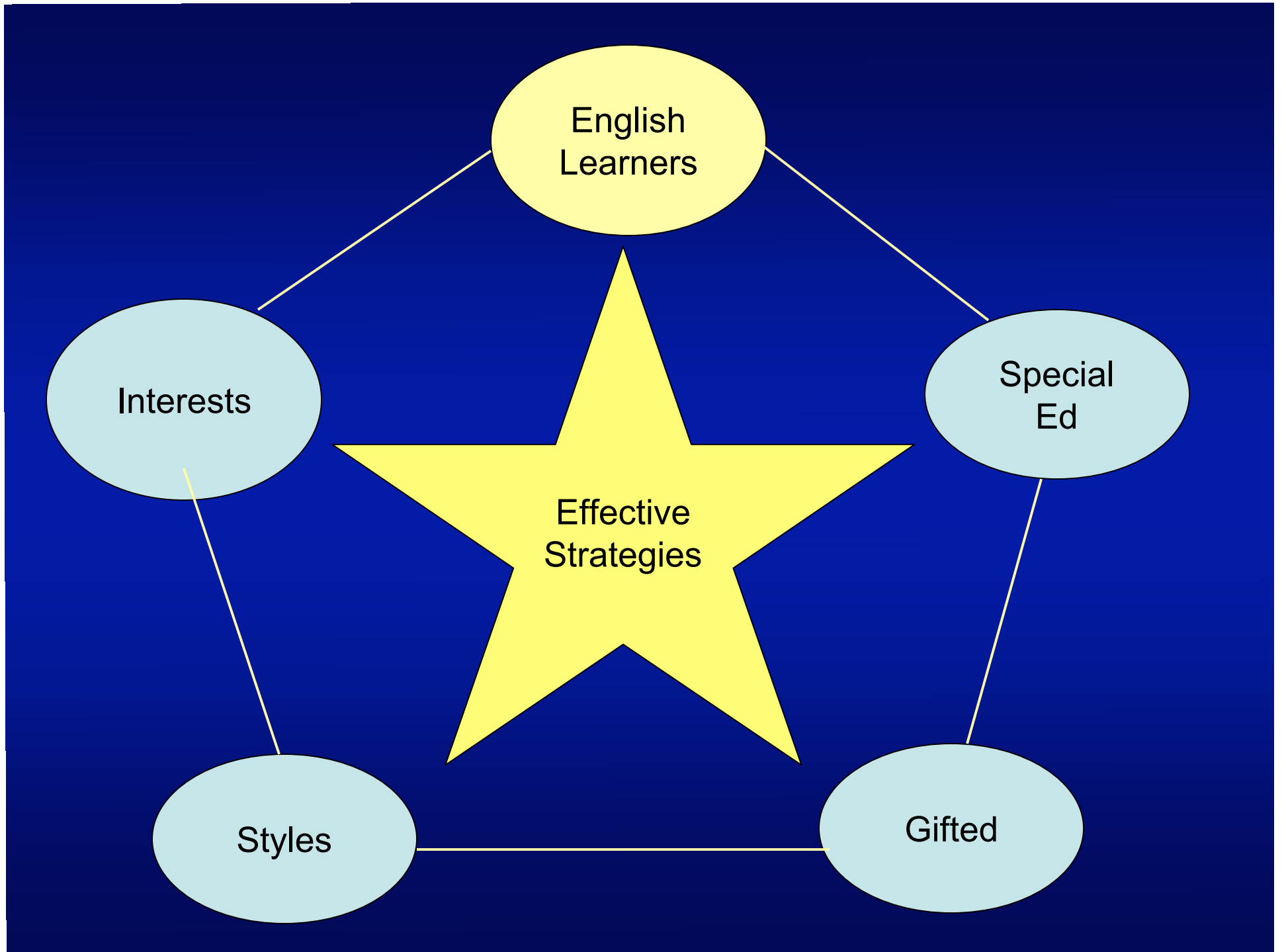
A large part of learning mathematics is learning the language of mathematics and using mathematics terminology meaningfully within academic conversations and written work

Students who are simultaneously learning the English language and mathematics benefit from extra support

# Scaffolds to Learn Content

- Keep content rigorous
- Use strategies that support English learners at different levels to have the opportunity to learn
- Temporary strategies



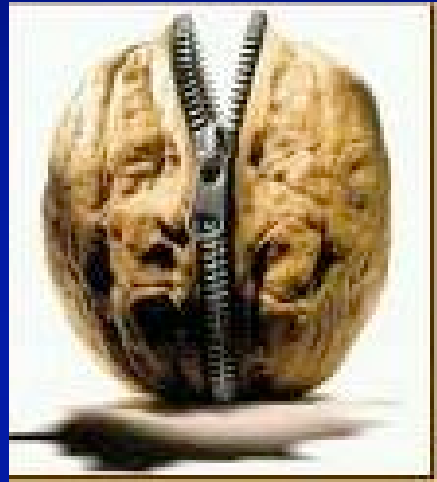


# Poll: How familiar are you with inquiry-based learning?

---

- I'm very familiar.(i.e., I currently use this approach)
- I'm some what familiar.
- I'm not yet familiar.

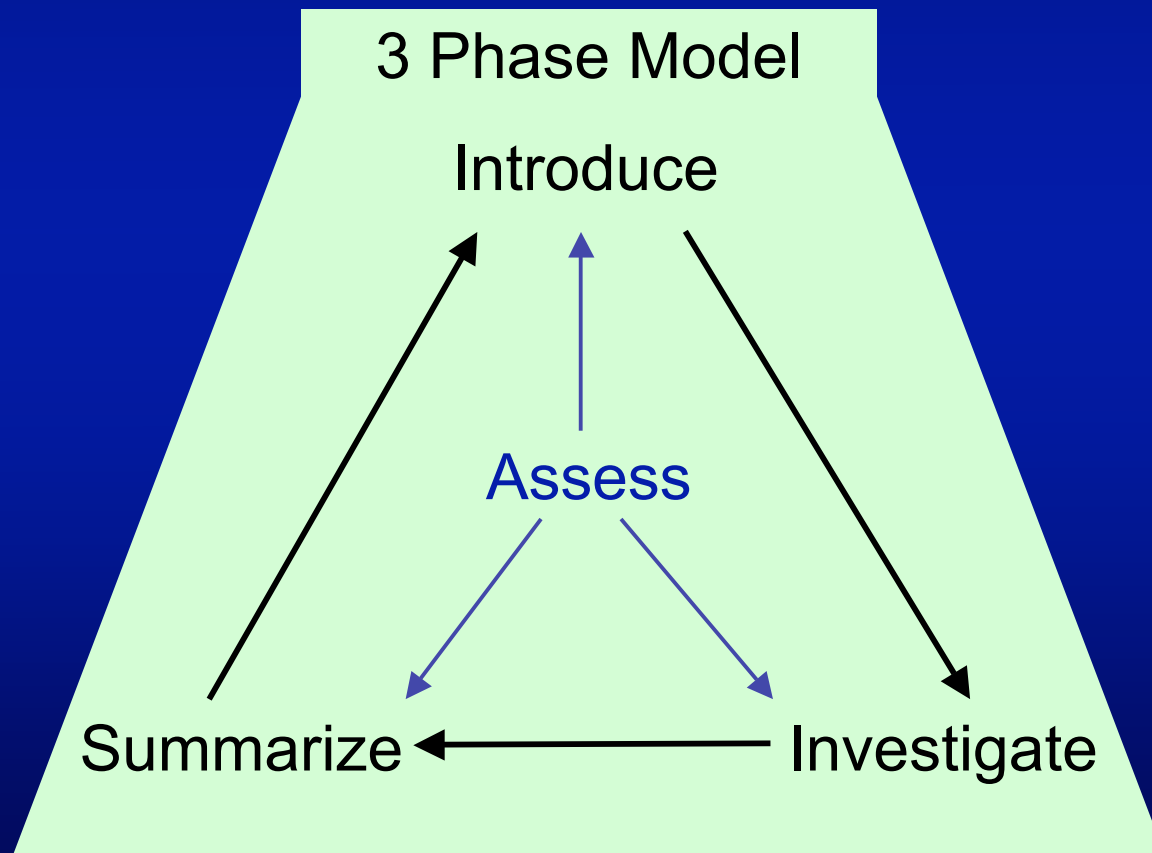
Guide learning through inquiry,



Talk with visuals for a brief period,  
Then listen to students talk in pairs,  
trios, & whole class

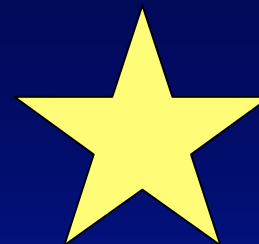
# Inquiry-based Learning

## Mathematics





## Introduce Phase

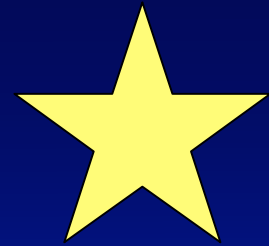


- Connect students' past & present learning experiences
- Focus students' thinking toward the mathematical goals of the lesson

- 
- *What do you remember/know about...?*
  - *How might you solve this problem?*
  - *What do you think would happen if...?*



## Investigate Phase

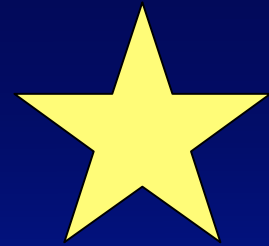


- Provide students with experiences within which mathematical concepts, processes, and skills are identified and developed
- 

- *How are you thinking about the question?*
- *What might you try next?*
- *How can you justify that?*



## Summarize Phase



- Make mathematical connections and extend students' conceptual understanding and skills
- 

- *How did you convince yourself?*
- *What might be another approach to this task?*
- *How does this task relate to what we did on...?*

# Poll: How familiar are you with the English Language Proficiency Standards /Levels in your State?

---

- I'm very familiar with them
- I'm some what familiar with them.
- I'm not familiar yet.

# What does an English learner look like?

## Academic Language Skills

- 5 ELD levels (Beginning...Intermediate...Advanced)
- 8 skills
  - Listen with comprehension
  - Use academic vocabulary
  - Ask and answer questions
  - Explain main ideas
  - Use writing strategies
  - Write compositions
  - Write research reports
  - Communicate critical thinking

# Open Response: Reflection

---

- What do you see as a key issue or challenge in supporting mathematics for English Language Learners?

# Strategies to build academic vocabulary and discourse

# Poll: Which of these strategies do you use on a regular basis?

---

- Enhanced Word Wall
- Concept Organizer
  
- *Type into the chat why or why not*

# *Enhanced Word Wall*

## Finding the Average of a Set of Data

Word (Form)	Beginning Definition	Example
<b>Measure of central tendency</b>	<b>How to find the measure</b>	<b>Data set 5, 2, 8, 2, 3</b>
Mean (n.)	(Sum of values) / (number of values)	$(5 + 2 + 8 + 2 + 3)/5$ → mean is 4
Median (n.)	Arrange data in sequential order, and find the middle value in the sequence.	2, 2, 3, 5, 8 → median is 3
Mode (n.)	Find the value that occurs the most often.	2 occurs the most → mode is 2

## *Enhanced Word Wall*

**Graph (n.)** A picture of pairs of objects

**Axis (n.)** A (reference) line on a graph

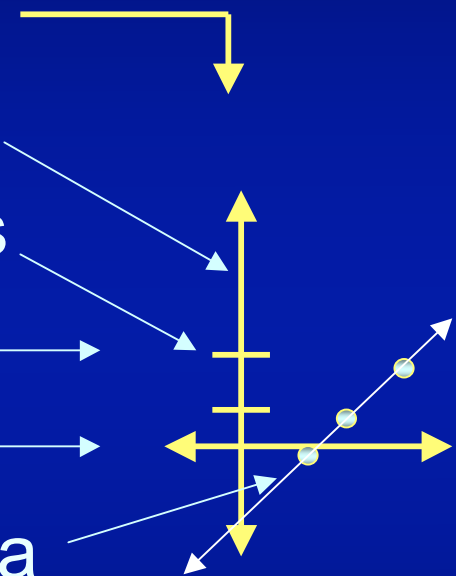
**Scale (n.)** Measurement marks on axis

**Vertical (adj.)** Up-and-down

**Horizontal (adj.)** Left-to-right

**Ordered pair equation (n.)** Location of a point on a graph

**Base charge per minute (adv.)** each minute, for one minute



# Frayer Concept Organizer

Definition

Characteristics

**Inequality**

Examples

Non-Examples

# Frayer Concept Organizer

## Definition

An inequality is a mathematical statement that describes the relationship between two unequal quantities using the symbols  $<$ ,  $>$ ,  $\leq$ , or  $\geq$ .

## Characteristics

.

## Inequality

## Examples

## Non-Examples

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## Characteristics

Relates two unequal expressions.  
The value of one expression is greater than or less than the other.

## Inequality

## Examples

## Non-Examples

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## Examples

20 oz.  $<$  25 oz.

$2 > x$

$x + 5 > x + 2$

## Non-Examples

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## Non-Examples

5 is equal to  $4 + 1$

$5 = 4 + 1$

$X = 197$

$3x$

Break to review chat

---

# Scaffolding Content



Scaffolding  
Strategies

**Visuals**

Cues

**Think Aloud**

**KWL+**

**Think-Pair-Share**

**Summarizing**

Reciprocal Teaching

# Which of these strategies do you use on a regular basis?

---

**Visuals**

**Think Aloud**

**KWL+**

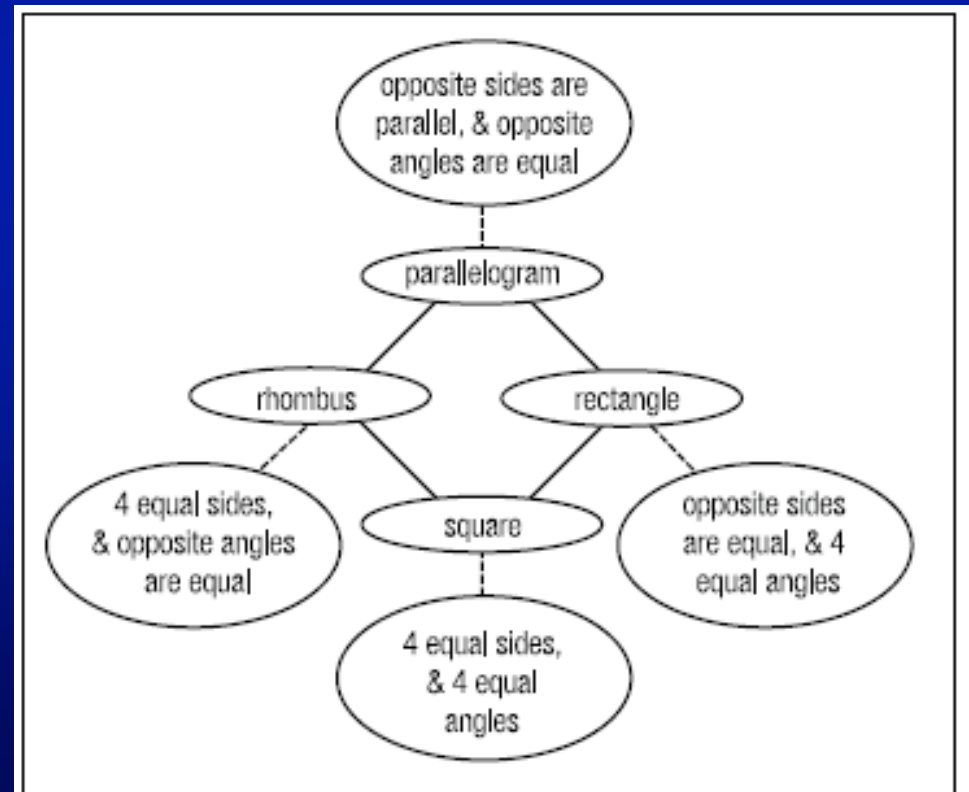
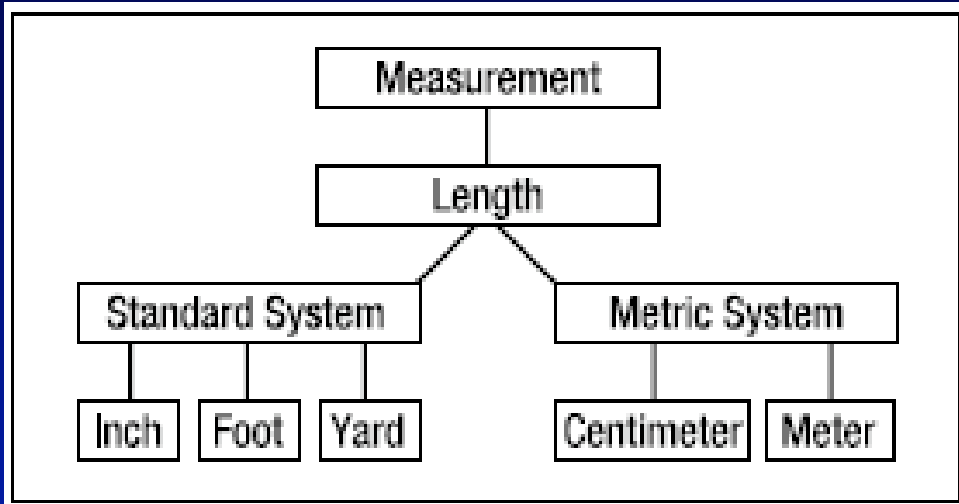
**Think-Pair-Share**

**Summarizing**

- Type into the chat why or why not

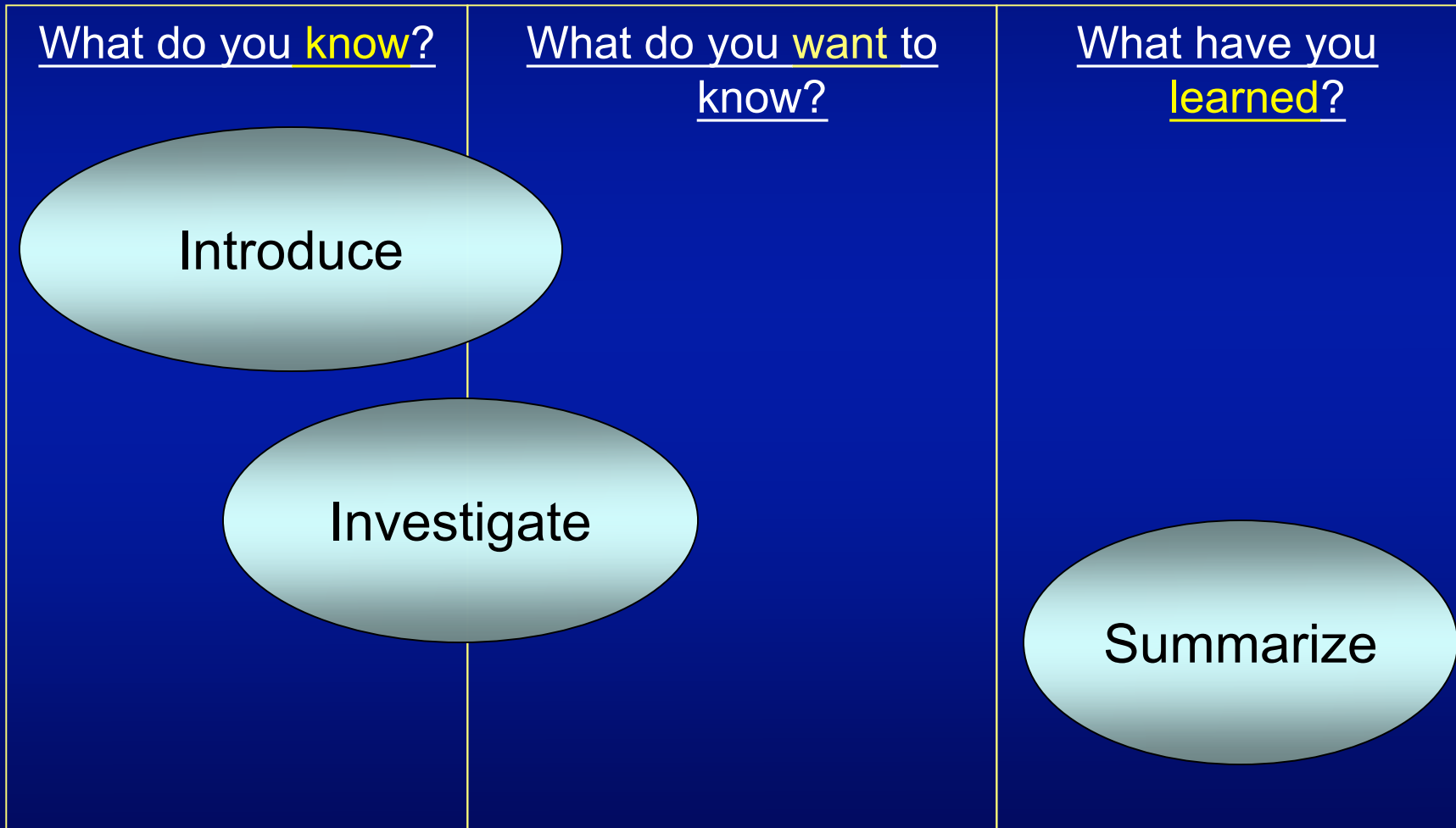
# Graphic Organizers

Show relationships between concepts



# KWL+ Chart

Think-Pair-Share



# Open Response

---

- Do you have any questions on the information just covered?

# Applying the Strategies in the Classroom

Graphing equations can also help us answer questions about the future and make predictions.

Joe's cell phone company has a base charge of 20 cents per call and then, a charge of 10 cents per minute of calling time. So for a 1-minute call he would pay 20¢ plus 1(10¢) or 30 cents. For a 3-minute call he would pay 20¢ plus 3(10¢) or 50 cents.

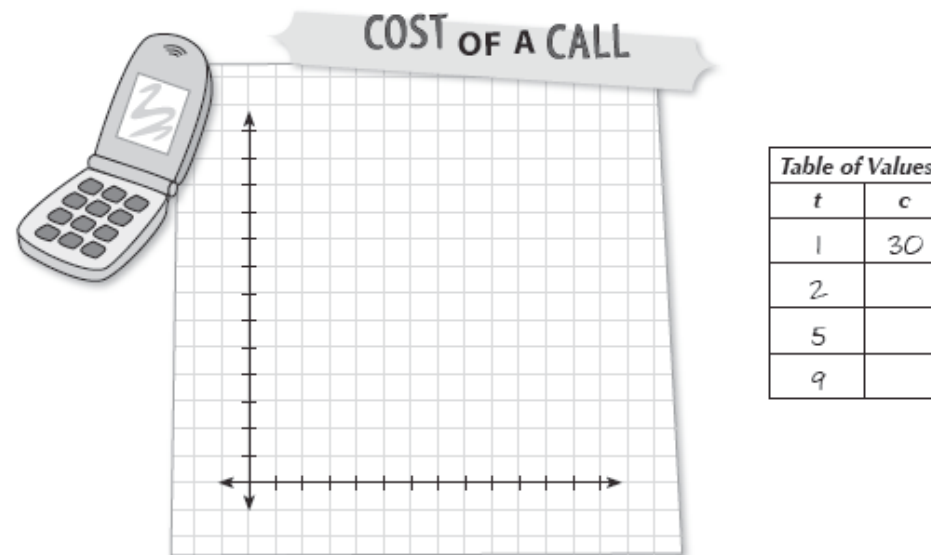
Joe wants to predict the charges for calls of different lengths and decides to make a graph.

$$20¢ + 1(10¢) = 30¢$$

↑ base charge     ↑ 1 minute charge     ↑ total cost

Using "t" as the time of the call in minutes and "c" as the total cost of the call in cents,

- Label the horizontal axis "Time of call in minutes".
- Label the vertical axis "Cost of the call in cents".
- Label the scale for each axis. (Hint: To label the c-axis, skip count by 10s.)
- Fill in the table for calls of 1 minute, 2 minutes, 5 minutes, and 9 minutes.
- Graph the ordered pairs in the table.



1. What is the ordered pair of the point on the line that represents a 12 minute call?
2. What would be the cost of a 12 minute call? \_\_\_\_\_
3. The equation that shows the cost of any call is  $c =$  \_\_\_\_\_.

# Introduce Phase

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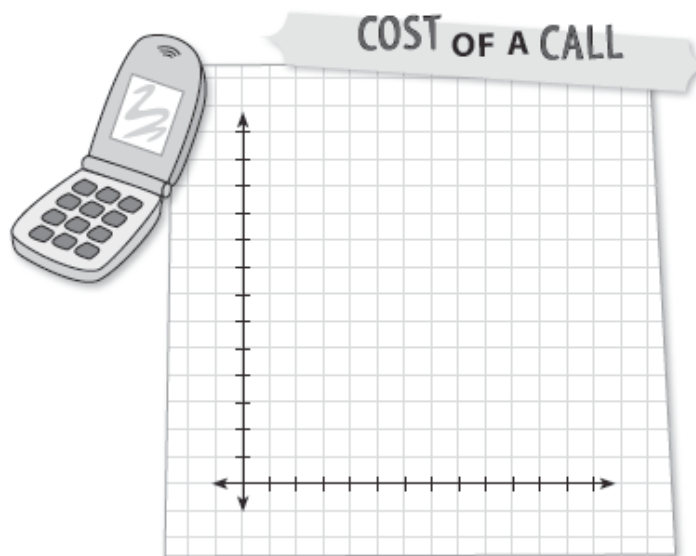
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5	
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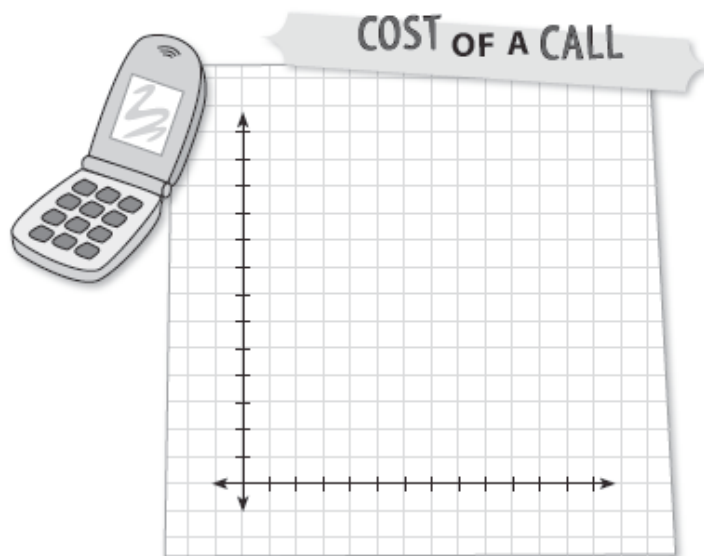
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## Investigate Phase

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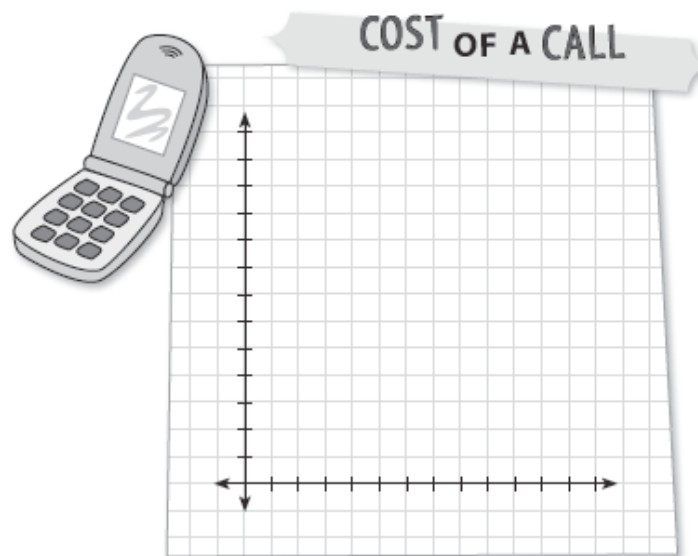
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## Investigate Phase

## Summarize Phase

## Introduce Phase

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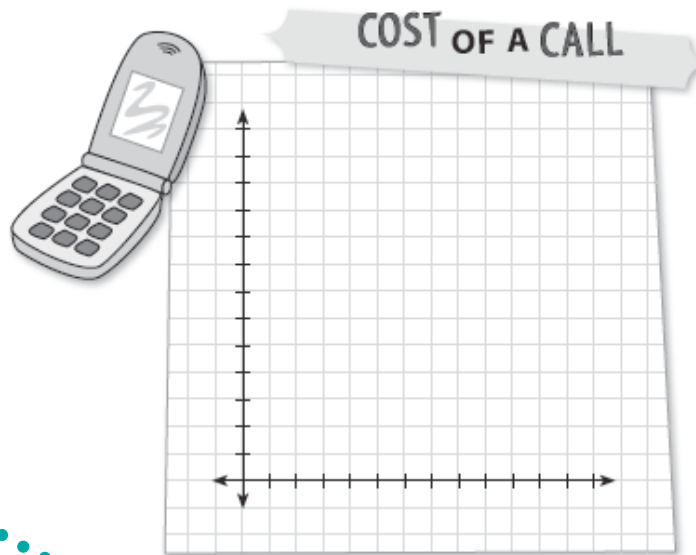
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## Investigate Phase

## Summarize Phase

# Open Response

---

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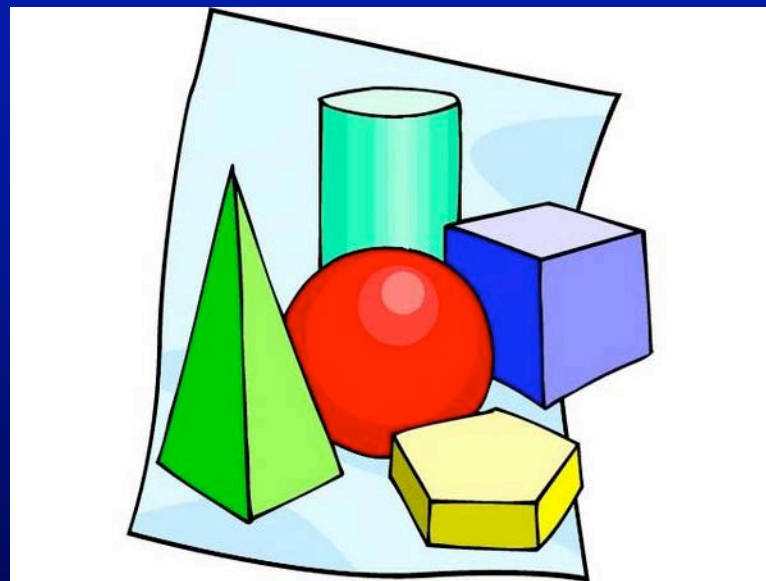
# Next Steps

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- Consider what you and your team might do with the information you've received today--how can you share with others?
- Use the guidebook in a “book club” format within a PLC or math department
- Provide PD for teachers--either in house or availing WestEd's service

For more information about services related to  
*Making Mathematics Accessible to English  
Learners*

Cathy Carroll  
[ccarroll@wested.org](mailto:ccarroll@wested.org)



# Next Steps

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- Archive
- <http://www.schoolsmovingup.net/webinars/ellmath2>
- Feedback:
- <http://www.surveymonkey.com/s/BX7V7SD>