



# **An Overview of Mathematics Assessment with a Focus on Formative Assessment of ELLs/Latino Students**

*Organized and redesigned as an on-line short course package*

*by Angela Thompson<sup>1</sup>*

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<sup>1</sup>The original course was introduced by Ed Silver (Day 1) and presented and authored by Rick Kitchen, Laura Burr, and Berenice Castellon. CEMELA is the Center for the Education of Mathematics for Latino/as. <http://math.arizona.edu/~cemela/english/>



**Course Description:** This module addresses the role of formative assessment as an integrated and dynamic instrument of the learning process. The purpose of this short course is: to acquaint participants with several theories on formative assessment, the use of formative assessment for five different subconstructs using fractions, and to consider important questions about the use and value of formative assessment by examining several fraction problems and real data transcripts.

The module includes a bibliography that contains course readings as well as a list of suggested further readings, electronic files of the course readings, questions to prompt class discussions, in-class activities, hand outs, and power point presentations to aid the instructor.

The suggested time frame for the module is a one-hour introduction followed by four two-to-three-hour classes. Complete lesson plans along with the materials needed for each lesson (i.e. readings, questions, activities, transcripts, handouts, and power point slides) are included. However, the video used in the original presentation is protected and can not be shared.



**Objectives:**

1. Participants will review and consider a framework for mathematics tasks and its relationship to formative assessment.
2. Participants will review rational number concepts as they relate to word problems involving fractions, percents, and decimals.
3. Participants will analyze and discuss real formative assessment data for ELLs and consider the implications for pedagogical practice.
4. Participants will consider important research questions and the theoretical basis for formative assessment as a part of mathematics teaching for ELLs.



**Day 1: COURSE OVERVIEW: *An Overview of Mathematical Assessment with a particular focus on the formative assessment of ELLs/Latino students. A framework for mathematics tasks will be presented along with its relationship to formative assessment.***

Activities: Display the slides as shown in the attachment, allowing time for within-group discussion as well as whole-class discussion of the questions listed below. The questions will appear on the slides. Keep these questions in mind throughout the course. At the end of the course, re-address these questions to determine if any new ideas have emerged.

[CEMELA Assessment SCP Day 1.pdf](#)

### Readings

In preparation for the tomorrow's activities, please read:

- Kitchen, R.S. & Wilson, L.D. (2004). Lessons learned from students about assessment and instruction. *Teaching Children Mathematics*, 10(8), 394-399. Reston, VA: NCTM.
- Kulm, G., Wilson, L.D., & Kitchen, R.S. (2005). Alignment of content and effectiveness of mathematics assessment items. *Educational Assessment Journal*, 10(4), 333-356. Mahwah, NJ: Lawrence Erlbaum Associates.
- Stein, M.K. & Smith, M.S. (1998). Mathematical tasks as a framework for reflection: From research to practice. *Mathematics Teaching in the Middle School*, 3(4), 268-275. Reston, VA: NCTM.

### Questions

1. What comes to mind when you hear the word “assessing”?
2. What information about student learning should the teacher collect?
3. How should this information be collected?
4. How can a teacher reconcile different sources of information?
5. What are some misconceptions mathematics students may have, and what are some strategies to redirect their thinking towards discovering more productive/successful conceptions?



## **Day 2: The formative Assessment of ELLs of Rational Number Concepts**

### Lesson Plan

1. Warm up
2. Presentation/discussion on the five fraction subconstructs
3. Make a poster
4. Introduction to formative assessment/discussion

### Power Points/Handouts

1. Warm up handout: contains five math problems
2. Presentation of the five fraction subconstructs/Formative Assessment

### Readings

- Charalambous, C., & Pitta-Pantazi, D. (2007, March). Drawing on a theoretical model to study students' understandings of fractions. *Educational Studies in Mathematics*, 64(3), 293-316.
- Shepard, L.A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4-14.

### Questions

1. What strategies hold great promise to document and assess the learning of Hispanic students of fractions?
2. Critical question: What role could formative assessment play in the teaching and learning of fractions for understanding?
3. What experiences have you had with formative assessment, as a teacher, a student, or a parent?
4. What role could formative assessment play in the teaching and learning of fractions for understanding?



## Activities

1. Warm-up: Work in groups to solve the five problems on the handout. As a challenge, ask all groups to come up with more than one way to solve each problem. Discuss as a whole class.
2. Start the power point presentation, describing in detail the five fraction subconstructs. At slide #15, stop the presentation.
3. Consider the four questions for today (listed above). Allow some group discussion, and then record ideas on posters. If the class size is large enough, assign one question to each of one or more groups. All participants may add to the poster(s) each day as new insights emerge from conversation and coursework.
4. Continue the powerpoint presentation with slide #15, an introduction of formative assessment. Stop at slide #22; the PPT slideshow will begin tomorrow with slide #23.
5. Have a class discussion about question #3: What experiences have you had with formative assessment, as a teacher, a student, or a parent?



### **Day 3: Introduction to a Formative Assessment Research Project of Rational Number Concepts with 6<sup>th</sup> Grade ELLs<sup>2</sup>**

#### Lesson Plan

1. Warm up
2. Presentation/discussion of research design by Kitchen, Burr, and Castellon
3. Work on data analysis with transcripts and research questions
4. Add to poster(s)

#### Power Point/Handouts

1. Warm up handout: “Bits and Pieces” Pre-Assessment
2. Presentation of CEMELA formative assessment research project
3. Packet of transcripts

#### Readings

- Clark, D., Roche, A., Mitchell, A. (2007). Year six fraction understanding: A part of the whole story. In J. Watson & Beswick, K. (Eds.), *Proceedings of the 30th Annual Conference of the Mathematics Education Group of Australasia*.

#### Questions

1. What strategies hold great promise to document and assess the achievement and learning of Hispanic/Latino students of fractions?
2. How can formative assessments of sixth grade ELLs be used as a means to develop and understand ELL’s “voice” in mathematics
3. What do sixth grade ELL students understand well and what are their mathematical “gaps”, particularly with regard to fractions?
4. What can we learn from mathematical assessments of ELL students’ understanding of fractions to inform classroom instruction?

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<sup>2</sup> It is possible to combine Day 3 and Day 4; however, the instructor will have to choose only a few transcripts and a few of the research questions. It is important to give groups ample opportunity to analyze transcripts in light of the research questions. Therefore, to avoid rushing through a thoughtful and reflective exercise, two days are recommended.



5. What classroom level assessment formats (both formal and informal) foster or inhibit the demonstration of mathematical knowledge and proficiency by Hispanic/Latino students?
6. What role does language play for sixth-grade ELLs learning fractions?

### Activities

1. Warm up: Work in groups to solve the five problems on the handout “Bits and Pieces” Pre-Assessment. As a challenge, ask all groups to come up with more than one way to solve each problem. Discuss as a whole class.
2. Show the powerpoint slides #23 through #28 as a way to introduce the data and research questions that will be analyzed on days 3 and 4. Keep slide #28 up as groups work to remind them of the analysis protocol.
3. The transcripts include a table of contents and corresponding research questions. Choose one transcript to analyze research questions 1 or 3. Choose two participants to read aloud the two roles of the dialogue. Participants may follow along with the correct math problem from the “Bits and Pieces” Pre-Assessment and the transcript. Then have groups work on analysis of the research question. Wrap up each transcript analysis with a whole-class discussion. When finished, choose another transcript and do the same, continuing as time permits.
4. Check in with groups near the end of class. Are there any new insights to add to the poster? Are there more research questions arising as a result of group discussions?



## **Day 4: Data analysis from a Formative Assessment Research Project with ELLs**

### Lesson Plan

1. Warm up
2. Continue work on data analysis with transcripts and research questions
3. Add to poster(s)

### Power Point/Handouts

1. Warm up handout: “Bits and Pieces” Post-Assessment
2. Packet of transcripts

### Readings

- Graue, M.E. (1993). Integrating theory and practice through instructional assessment. *Educational Assessment*, 1(4), 293-309.

### Questions

1. What strategies hold great promise to document and assess the achievement and learning of Hispanic/Latino students of fractions?
2. How can formative assessments of sixth grade ELLs be used as a means to develop and understand ELL’s “voice” in mathematics
3. What do sixth grade ELL students understand well and what are their mathematical “gaps”, particularly with regard to fractions?
4. What can we learn from mathematical assessments of ELL students’ understanding of fractions to inform classroom instruction?
5. What classroom level assessment formats (both formal and informal) foster or inhibit the demonstration of mathematical knowledge and proficiency by Hispanic/Latino students?
6. What role does language play for sixth-grade ELLs learning fractions?

### Activities

1. Warm up: Work in groups to solve the four problems on the handout “Bits and Pieces” Post-Assessment. As a challenge, ask all groups to come up with more than one way to solve each problem. Discuss as a whole class.



2. Continue working with the transcripts as done on Day 3: Choose one transcript to analyze research questions 2, 4, or 6. You may dis (Question #5 is omitted from in-class analysis as it requires video not available to participants.) Choose two participants to read aloud the two roles of the dialogue. Participants may follow along with the correct math problem from the “Bits and Pieces” Pre-Assessment and the transcript. Then have groups work on analysis of the research question. Wrap up each transcript with a whole-class discussion. When finished, choose another transcript and do the same, continuing as time permits.
3. Check in with groups near the end of class. Are there any new insights to add to the poster? Are there more research questions arising as a result of group discussions?



## **Day 5: More Data Analysis and Final Discussion of the Formative Assessment Research Project with ELLs**

### Lesson Plan

1. Revisit questions posed on Day 1.
2. Re-address poster(s)
3. Connections between course readings and course activities
4. Next steps

### Power Point/Handouts

Handout stating the questions to be discussed during today's activities

### Questions

1. What questions do you still have about formative assessment?
2. What are the political aspects of preparing teachers to assess in the socio-constructivist paradigm at a time of intense teacher "deskilling" through curricular scripting and test prep?
3. What role should formative assessment have when high-stakes, large-scale assessments are receiving so much attention?
4. What research questions do you have about the formative assessment of ELLs in the mathematics classroom?
5. What should be done in teacher education to prepare prospective teachers to be able to align formative assessment practices with the new socio-constructivist paradigm?

### Activities

1. If time permits and participants are interested, analyze a few more of the transcripts as done on days 3 and 4. (25 minutes). You may show slide #29 to display today's agenda.
2. Using the handout for Day 5, revisit the questions posed on Day 1: Are there new questions to add to this list? Has any participant or group changed



their responses to these questions as a result of work done in this course?  
Record responses.

3. Re-address the poster with reactions to the question: What strategies hold great promise to document and assess the learning of Hispanic students of fractions? As a class, try to revise or condense the material on the poster(s) into succinct points of interest.
4. Connecting research and practice: Assign each group one of the course readings. Groups will prepare a small (5 minute) presentation outlining the connections between the research article and the work done by all participants in the current coursework.
5. Looking to the future. Have groups discuss the five questions for today's lesson. You could also assign 1 or more questions to each group. After some time to reflect and discuss, conduct a whole-class discussion to help determine if participants' needs and interests have been met.
6. Conclude with the "Final Ruminations", slides 30-32 of the slide show.



## **Bibliography**

### **Part I: Recommended Course Readings**

- Charalambous, C., & Pitta-Pantazi, D. (2007, March). Drawing on a theoretical model to study students' understandings of fractions. *Educational Studies in Mathematics*, 64(3), 293-316.
- Clark, D., Roche, A., Mitchell, A. (2007). Year six fraction understanding: A part of the whole story. In J. Watson & Beswick, K. (Eds.), *Proceedings of the 30th Annual Conference of the Mathematics Education Group of Australasia*.
- Graue, M.E. (1993). Integrating theory and practice through instructional assessment. *Educational Assessment*, 1(4), 293-309.
- Kitchen, R.S. & Wilson, L.D. (2004). Lessons learned from students about assessment and instruction. *Teaching Children Mathematics*, 10(8), 394-399. Reston, VA: NCTM.
- Kulm, G., Wilson, L.D., & Kitchen, R.S. (2005). Alignment of content and effectiveness of mathematics assessment items. *Educational Assessment Journal*, 10(4), 333-356. Mahwah, NJ: Lawrence Erlbaum Associates.
- Shepard, L.A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4-14.
- Stein, M.K. & Smith, M.S. (1998). Mathematical tasks as a framework for reflection: From research to practice. *Mathematics Teaching in the Middle School*, 3(4), 268-275. Reston, VA: NCTM.

### **Part II: For Further Reading**

[ReferencesAssessment.doc](#)



### **Appendix: List of attachments**

1. CEMELA SCP Day 1 (PDF)
2. Readings for Day 1 (3 PDFs)
3. Handout for Day 2 (PPT)
4. Readings for Day 2 ( 2 PDFs)
5. Presentation for Days 2-5 (PPT)
6. Assessment Transcripts Days 3-5 (DOC)
7. Bits and Pieces Pretest Day 3 (DOC)
8. Reading for Day 3 (PDF)
9. Bits and Pieces Post-test Day 4 (DOC)
10. Reading for Day 4 (PDF)
11. Handout for Day 5 (DOC)
12. For further reading (DOC)