

California State University, Sacramento
College of Education Department of Teacher Education
Syllabus EDTE 314 rmj@sportsmath.com Folsom Cordova Cohort
Mathematics in the Diverse K-8 Classroom Fall 2006

Dr. Rita M. Johnson Office 321 A Eureka; Office hrs.: Mon. 3:15-4.; & half hour after class & by appt.
Class web site: www.csus.edu/indiv/j/johnsonr Home Office 481-4398

GENERAL COURSE GOALS: The NCTM (National Council of Teachers of Mathematics) states, "A major goal of mathematics is to help children develop the belief that they have the power to do mathematics. This autonomy develops and grows as children gain confidence and learn that mathematics is not simply memorizing rules and procedures but that mathematics makes sense, is logical, and is enjoyable." Knowing mathematics involves doing mathematics. The goal of this course is to provide opportunities for preservice teachers to develop knowledge, skills and dispositions that will enable them to pass along an enjoyment and confidence in mathematics to their elementary students.

Expected Outcomes:

1. Candidates will be able to demonstrate understanding and the ability to teach to the state-adopted academic content standards reflecting the current California Mathematics Framework.
2. Candidates will be able to recognize and teach logical connections across major concepts and principles in the state adopted content standards for students in Mathematics.
3. Candidates will be able to understand and effectively use materials, methods, and strategies for all students (i.e. ELD, special needs, gifted), providing them access to the core curriculum and beyond.
4. Candidates will be able to help students solve real-world problems using mathematical reasoning and concrete, verbal, symbolic, and graphic representations.
5. Candidates will be introduced to and create a mathematical teaching/learning environment that uses a variety of teaching strategies which address access, equity and the importance of the student's family and cultural backgrounds and experiences in relation to mathematics education in California.
6. Candidates will be able to select and integrate the appropriate technological resources for their relevance, effectiveness, alignment with mathematics content standards, and value added to all student learning.
7. Candidates will be able to build self-confidence so that they can become successful math teachers who develop a philosophy of mathematics education linked to on-going professional development
8. Candidates will be able to acquire a set of mathematics activities and resources to work with students of diverse abilities.
9. Candidates will become familiar with the concepts of lesson pacing, level of student involvement, checking for understanding, mastery versus performance learning, and general classroom management of mathematics instruction.
10. Candidates will demonstrate the ability to select, administer, and interpret informal and formal assessment tool(s) to assess student's understanding of mathematics, including appropriate measures for initial, progress monitoring, and summative assessment of English learners for math content knowledge in the core curriculum.
11. Candidates will be able to understand and effectively use systematic instructional strategies designed to make grade-appropriate or advanced math curriculum content comprehensible to English learners.

Course Requirements:

1. The student will attend all class sessions and participate seriously and spontaneously in class discussions and microteaching labs. **Absences (excused or not) may result in a lowered course grade. (Promptness is expected. Tardiness will result in a lowered grade.) Two and one-half missed classes (7.5 hours of classtime) may result in an incomplete grade for the course. Alternate assignments (paper, tutoring etc.) may be assigned to students who have been absent.**
2. The student will prepare a detailed, labeled binder of mathematics teaching philosophies, activities, strategies, projects, games etc. which will serve as a mathematics teaching resource.

Required Texts: *available in the CSUS student bookstore

1. Required: SECOND EDITION- *Teaching Mathematics to All Children: Designing and Adapting Instruction to Meet the Needs of Diverse Learners, 2/e*; Author : Tucker, Benny; ISBN : 0-13-027021-0*
2. Required: *Inclusion: 450 Strategies for Success*; Hammeken, Peggy; ISBN: 1-890455-25-3
3. Recommended: *2000 California Mathematics Framework* by the California Department of Education* (also on-line) <http://www.cde.ca.gov/re/pn/fd/documents/mathematics-frame.pdf>
3. Required: *Student Packet* by Dr. Johnson

Class Times:

1. Special Ed EDS 123A/B: Monday 4 -6:50 On campus, Eureka 313E
2. Folsom Cordova Friday 8-12 Off campus Ranch Cordova

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Fall 2006 Calendar

Week No.	Date Friday	Topics	Due this week:	Lab Time: <i>microteaching and</i>
1	9/9	Introduction: Grouping/Patterns/Logic/Counting/Problem Solving		getting started
2	9/15	Place Value; Whole number: Add. and Subtraction; <i>We will also organize your binder in class.</i>	Bring LARGE binder, course packet & 20 dividers	video/teaching/discussion
3	9/22	Whole number: Multiplication (primes/factors)		video/discussion
4	9/29	Whole number : Division		discussion
5	10/6	Fractions: definition, order & equivalentents (GCF/LCM)	Possible Field Experience	
6	10/13	Fractions: addition and subtraction	Assignment 1 Student Assess.	Discussion of assignment
7	10/20	Fraction: multiplication and division		Discussion
8	10/27	Decimals and Percents	Class, then Midterm.	
9	11/3	Integers/Assessment		video/teaching/discussion
10	11/17	Measurement; Circles; Area and Perimeter	Possible Field Experience	
11	12/1	Geometry: Toothpicks, Shapes, & Volume, Algebra	Assignment 2 Sig. Assign.	<i>Begin sig. assign. presentations</i>
12	12/8	Statistics, Probability, Graphing (** final may be this day, then no class on 12/15)	Binders due	<i>Continue sig. assign. presentations</i>
13	12/15	Individual Written Final (** may be at the end of class on 12/8)		

Assignment/Grading

100 points *

- 1. Student Assessment: 8 pts.
- 2. Signature Assignment: Teaching and Evaluating a Math Lesson 10 pts.
- 3. Book chapter presentation (your contribution) 5 pts.
- 4. Midterm 12 pts.
- 4. Notebook & Microteaching Form: (due 13th week) 14 pts.
- 5. Course Final: (written, 13th week of class) 15 pts
- 6. On-Time/Participation: (classes wk. 1-12; 0-3 pts.* per class) 36 pts.

** 1 pt. for on-time, 1 pt. for attendance, 1 pt. for active participation*

Extra credit: perfect attendance (+.5 pt.); no tardies (+.5pts.) (if both: +2); exemplary binder (extra activ. etc.) = (+.5 - 1 pts.)

Letter Grade:

94-100 = A 90-93= A - 88-89 = B+ 84-87 = B 80-83 = B - 78 - 79 = C+ 74-77 = C 70-73= C - 68-69= D+ etc.

Late Work is not accepted, however, I reserve the right to make an exception based upon compelling reasons, however a **50% reduction in grade** will be assessed. If the quality of the work is not up to graduate level or in accordance with the class instructions, the student may one opportunity to redo the assignment with a **50% reduction in grade**.

Notification of Special Needs: Consistent with University policy, students must file a form with the Students and Disabilities Office and provide the instructor of all classes with a copy of the form by the end of the 2nd week of classes. In this way, we can accommodate the needs of students with disabilities.

Incompletes: Please note that a grade of Incomplete must be awarded in accordance with University policy-there must be a specific, identifiable course requirement that needs to be met due to unforeseen but fully justified reasons, and that there is still a possibility of earning credit. Students have two semesters to complete the work. (Fall 2006 inc. due by Dec 18, 2007).

Assignment 1: Student Informal Assessment 8 points Due: Week 6

If you need help, talk to me EARLY (before week 3!) in the semester!!

- A. Select a student who is having problems in a class or who has special needs. Ask your CT!! It doesn't have to be a student who is in a special education placement- just someone who needs help. (Please include a school/teacher contact number in case I need to confirm details of the assignment.)
- B. Develop a brief, informal assessment activity involving (shape/color sorting, patterning, number recognition, place value, addition/subtraction facts, multiplication/division facts, or fraction recognition/ etc.) See pages 8 & 9 of the syllabus.
- C. Complete the assessment, being sure to include a student response sheet.
- D. Outline a plan for a "treatment" to help the student.

FORMAT: *Your report must be typewritten and graduate level quality of work. Be sure to address all of the issues below. It should be 3-4 pages in length, generally, not including the copies of the assessment.*

- 1. A description of the student and why the level of assessment you selected was appropriate.
- 2. The framework citation for the concept you are working on. It may be a lower grade level concept!
- 3. A description of the assessment you selected and a copy of it with the student responses).
- 4. A write-up of the procedure you followed in giving the assessment, including the student's reactions/comments.
- 5. Your evaluation of the student performance.
- 6. Your concrete suggestions for assistance/intervention.

Note: if you assess a student and they pass with "flying colors", you will need to find a different concept to assess or a different student!

Assignment 2: Signature Assignment 10 (8 plus 2 for presentation) points Due Week 11

Take an existing textbook and select a three-day sequence of instruction that you believe can be improved upon using SDAIE and Diverse Learner strategies. Teach at least two days of the sequence. Fill out the reflection form after you have completed teaching the lessons. Use the organizational sequence below. The final product must include:

- 1. A three day sequence using the format below. **THIS IS BASED ON THE TUCKER TEXTBOOK EXAMPLES!**
- 2. Photocopy of the lesson plans from the Teacher's Edition of the textbook you used.
- 3. Copy of any additional pages you may have created to augment the lessons.
- 4. A 2-3 page reflection, following your teaching at least two days of the sequence. The reflection should cover the following points: First, note changes, if any, you made "on the spot," and tell why you made them. What was good? What needed improvement? What would you change, if you taught this lesson again? How was your monitoring of student involvement? How was your assessment?
- 5. **Your presentation of the Sig. Assignment during week 12, 13 or 14 should include a 3-5 minute overview of changes you made and a one—two page (front and back) handout for your classmates describing the topic/T. Ed. Textbook section, your basic changes/ideas, description of any activities, worksheets etc. you created.**

Signature Assignment Fall 2006

Take an existing textbook and select a three-day sequence of instruction that you believe can be improved upon using SDAIE and Inclusive Classroom strategies. Teach at least two days of the sequence. Fill out the reflection form after you have completed teaching the lessons. Use the organizational sequence below. You may use small font (9) to make the table easier to read. **The table should expand as you fill it.** For SDAIE and Diverse Learner elements, refer to last pages of syllabus, Tucker textbook, Hammeken textbook and on line resources. You may use abbreviations. *

Turn in a hard copy which includes:

- 1. A photocopy of the lesson plans from the Teacher's Edition of the textbook you used for each day of the lesson.
- 2. A copy of any additional pages you may have created to augment the lessons.
- 3. Three days worth of the tables below filled out completely.
- 4. Your reflection on the assignment.

** EDTE 314 students must **upload** the assignment (not copies of textbook pages) to Taskstream by week 14 in the semester to receive a grade in the class.

Name:		Date:			
School and grade:		Textbook:			
Cooperating Teacher:		(list page)			
Day 1	Day 1 Lesson Objective	Framework Citation:			
Original from textbook		Changes you would make		SDAIE elements*	Diverse learner elements*
	Teacher actions	Student Actions	Teacher actions	Student Actions	
Lesson Objective					
Development					
Monitoring Learning					
Practice					
Assessment					
Classroom					

The signature assignment must be uploaded to taskstream prior to Dec. 12, 2006, to pass the course.

I have an online MS Word version of this. Email me for the forms. rmj@sportsmath.com

Reminders: Adapting Lessons for Diverse Learners (Expand development; Increase visual input; Increase kinesthetic activity; Increase student communication; Monitor learning continually) See your textbook for the details!

SDAIE Strategies *See handout with excerpts from Dr. Sadek for the details!

- 1. Emphasis on the Academic Language
- 2. Active Learning: Students must be constantly giving the teacher EVIDENCE OF LEARNING.
- 3. Assessing/Tapping Prior Knowledge: become very familiar with the background knowledge that students bring to the learning situation.
- 4. Building New Knowledge: Each and every lesson must result in the acquisition of new knowledge by students.
- 5. Collaborative Problem-Solving; Cooperative and Other Groupings: Teachers need to plan instruction through educational activities that provide for flexible groupings of students to meet specific purposes.
- 6. Cultural Affirmation / Multicultural Perspectives.
- 7. Using Graphic Organizers.
- 8. Demonstration and Modeling
- 9. Integrating Listening, Speaking, Reading and Writing Across the Curriculum.
- 10. Developing Higher Order Thinking Skills.
- 11. Using effective questioning techniques.
- 12. Facilitate learning through visual aids, manipulatives, verbal and non-verbal cues.

Assignment 3: Math Resource Notebook Due: Week 12

1. Get a VERY large 3-ring binder, several smaller 3-ring binders, or a big box of labeled files and bring to the second week of class.

Suggested Format (minimum 19 dividers) Section Labels
(If something else works better for your situation, talk to me!!)

Extra Sections at beginning:

- A. Syllabus
- B. Assignments
- C. Assessment/Curriculum Ideas/general handouts

Divide up my course packet into the sections below and add 1 activity (minimum) to each section below:

1. Grouping/Patterns/Logic/Problem Solving
2. Counting and Place Value
3. Whole Number Add. and Sub.
4. Whole Number Multiplication
5. Whole Number Division
6. Fractions naming parts & equiv.
7. Fractions add. and sub.
8. Fractions mult and division
9. Decimals
10. Percents
11. Integers
12. Measurement, Perimeter, Circum., Area, Volume (inc. time, angles, etc.)
13. Geometry, Spatial Relationships
14. Statistics & Probability
15. Graphing
16. Algebra

Additional activities added to sections 1-16.

The activities should come from a variety of areas:

- Check out books that I have!! (I have over 200, some at CSUS in my office, and some in my car!)
- Ask the teachers at your school or other friends.
- Go on the Internet! Use a variety of sources.
- **Good web site to start with:** <http://archives.math.utk.edu/k12.html>
- Choose any grade level or ability for your activities, whatever appeals to you! Ok to mix grade levels.
- **Note:** many activities overlap a number of content areas, for example a perimeter activity could include geometry, or even fractions. Choose whichever category you want. If you have questions, see me.

Although you may share some activities with other students -
MAKE SURE YOUR NOTEBOOK IS UNIQUE!!

Notebook Grading: 9-12 points notebook, and 0-2 points microteaching sheet

- Basic notebook*, dividers, my packet divided up, 1 additional quality activity per section: 9 points (C)
- Basic notebook*, dividers, my packet divided up, 2 or 3 additional quality activities per section: 10 points (B-)
- Creative notebook*, dividers, my packet divided up, 3 additional quality activities per section: 11 points (B+)
- Creative notebook*, dividers, my packet divided up, 4 additional quality activities per section: 12 points (A)
-
- Exceptionally creative, 5 or more additional activities per section, lots of other goodies: 12.5–13 pts. (ex. cr.)

Syllabus p. 5 EDTE 314 Book Chapters Presentation (Class shared responsibility) - from the required textbooks by Tucker and Hammeken.

Partners will share the responsibility of presenting key points and some activities from the class textbooks to their fellow classmates and give 1-2 page (total from all partners!) handout/summary (Link to book pages!!) to be given to each classmate. **10–15 min.** allowed for presentation. (Practice & time yourself!) *All students will be expected to bring textbooks to follow along to highlight and take notes.*

<p>Week 1 Chap. 1, 2, and 3 <i>Tucker</i></p>	<p>Presented by Instructor: Key Points: What are students learning? Overview of Developmental, practice, application and assessment activities. Level of Involvement!! Diversity in the classroom. Lesson Design: adapting for diverse learners</p>
<p>Week 2: 9/15 <u>Tucker:</u> Chap. 4 <u>Hammeken:</u> Chap. 7.</p>	<p>Presented by students: _____ <u>Chap. 4 Key points:</u> Tucker: Common Misconception; About Young Children; Overview of Classification, Comparison, Seriation, Geometric Concepts—relative position; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 7.</p>
<p>Week 3: 9/22 <u>Tucker:</u> Chap. 5 <u>Hammeken:</u> Chap. 3</p>	<p>Presented by students: _____ <u>Chap. 5 Key points:</u> Tucker: Number Sense; Foundations of Algebra; Building on What Children Already Know; The Big Picture; Development of Numbers & Numeration; One-Digit numbers; rounding; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 3.</p>
<p>Week 4: 9/29 <u>Tucker:</u> Chap. 6 <u>Hammeken:</u> Chap. 4</p>	<p>Presented by students: _____ <u>Chap 6 Key points:</u> Tucker: Meaning of the operation; Basic Facts; Algorithms; Developing the meaning of addition; Making the process more efficient; Discovering relationships among the facts; Memorization of the Easy Basic Addition Facts; Thinking Strategies for hard basic addition facts; Summary of the developmental sequence for addition; Developing the meaning of subtraction; Developing the easy and hard subtraction facts; Summary of the developmental sequence for subtraction; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 4.</p>
<p>Week 5: 10/6 <u>Tucker:</u> Chap. 7 <u>Hammeken:</u> Chap. 5</p>	<p>Presented by students: _____ <u>Chap. 7 Key points:</u> Tucker: Developing the meaning of multiplication; Developing and memorizing the easy multiplication facts; Developing and memorizing the hard multiplication facts; Teaching the Multiplication Algorithm—briefly mention two big ideas; Summary of the developmental sequence for Multiplication; Developing the meaning of Division—measurement and partition; Teaching easy and hard basic division facts; Big ideas for division; Teaching problem solving using multiplication and division; Major points from adapted (revised) division lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 5.</p>
<p>Week 6: 10/13 <u>Tucker:</u> Chap. 8 start <u>Hammeken:</u> Chap. 6</p>	<p>Presented by students: _____ <u>Chap 8 part 1 Key points:</u> Tucker: Three sides of fractions; Fractional units; Beyond unit fractions; fractions of a set; equivalent fractions; Using the laboratory approach; comparison of fractions; Least Common denominators; Improper fractions and mixed numbers; Common error/remediation note; Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 6.</p>
<p>Week 7: 10/20 <u>Tucker:</u> Chap. 8 cont <u>Hammeken:</u> Chap. 8</p>	<p>Presented by students: _____ <u>Chap 8 part 2 Key points:</u> Tucker: Briefly describe 3 approaches to multiplying fractions, listing why only 2 are considered usable. Dividing fractions; Describe some multiplication and division activities for fractions; Major points from adapted (revised) division lesson; Solving problems using fractions; Problem solving strategies. Hammeken: Brief highlights of Chap. 8.</p>
<p>Week 8: 10/27 <u>Tucker:</u> Chap. 9 <u>Hammeken:</u> Chap. 9</p>	<p>Presented by students: _____ <u>Chap. 9 Key points:</u> Tucker: Decimal models; place value; symmetry!; Reading decimal numbers; Comparing decimals; Remediation note for addition of decimals; Defining percent; Using decimals to solve problems; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 9.</p>
<p>Week 9: 11/3 <u>Tucker:</u> Chap. 10 <u>Hammeken:</u> Chap. 10</p>	<p>Presented by students: _____ <u>Chap. 10 Key points:</u> Tucker: Defining measurement; Standardization of units; Five steps to teach measurement; Teaching area measurement; Four main ideas for teaching area; Big idea for developing area formulas; Teaching volume measurement; Volume of pyramids and prisms; Measuring angles; Direct and indirect units; Measuring time, weight, and temperature; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 10.</p>
<p>Week 10: 11/17 <u>Tucker:</u> Chap. 11 <u>Hammeken:</u> Chap. 11</p>	<p>Presented by students: _____ <u>Chap. 11 Key points:</u> Tucker: The six big ideas of elementary school geometry; Teaching rectangles, circles, angles, and prisms in K–8 grades; Using geometry to solve problems; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 11.</p>
<p>Week 11: 12/1 <u>Tucker:</u> Chap. 12 <u>Hammeken:</u> Chap. 12</p>	<p>Presented by students: _____ <u>Chap. 12 Key points:</u> Tucker: Distinguish between statistics and probability—how different and how related; Data Analysis—big ideas; Data analysis in K-1; 2-3, 4-5, and 6-8'; Probability—big ideas; Probability in K-1; 2-3, 4-5, and 6-8'; Major points from adapted (revised) lesson Mention a couple of interesting "activities" which are in the chapter. Hammeken: Brief highlights of Chap. 12.</p>

SDAIE Teaching Strategies

From: Dr. CARMEN SANCHEZ SADEK <http://www.educationalquestions.com/qa24.htm>

"All students are ELL (English Language Learners)!" All students are LEP (Limited English Proficient) at some point in their education (especially when faced with a new concept and vocabulary). What procedures and ideas can you provide that will help all students in the classroom as well as ESOL students? Good teaching strategies are good for everyone."

Indeed, good teaching strategies are good for everyone! This question in particular refers to "Specially Designed Academic Instruction in English" or SDAIE, that is, the academic classes taught by qualified teachers who are "endorsed" or "certified" in teaching methods for content area classes in which English Language Learners or ELL's participate. In SDAIE classes ALL students can participate: English-only speakers and ELL's at all stages of language acquisition: ELL's at Pre-Production, Early Production, Speech Emergence and Intermediate Fluency levels, and former ELL's now re-designated as Fluent English Proficient (FEP) students. What are the methods, techniques or strategies that a teacher can use to successfully promote content area concept development with such a heterogeneous group of students?

Here they are!!!

STRATEGIES USED IN SDAIE:

1. Emphasis on the **Academic Language**: This is the key instructional component in SDAIE. It is NOT to develop general English language skills, but to develop the use of, and proficiency in, the academic language of the content areas. This key component of SDAIE is the same for ALL students, English-only speakers and English Language Learners. Teachers must make sure that the academic language is mastered, otherwise teachers cannot obtain evidence of learning. To facilitate mastery teachers must implement two essential "best instructional practices:"

Posting the academic language: ALL words, not just a few key words. Words need to be organized by meaning categories, for example, "clean, tidy, neat, spotless, immaculate, impeccable, scrubbed, disinfected, sterilized, pristine, etc." THEN POST THE CATEGORY!!!!

Consciously using the academic language constantly, and requiring that all students express themselves using the academic language, too. That is why all academic language words must be posted: For teacher and students TO ALWAYS REMEMBER to use them!

2. **Active Learning**: Students must be constantly giving the teacher EVIDENCE OF LEARNING. To provide the teacher with evidence of learning, students must DO some observable action or behavior that the teacher has requested. Throughout the lesson, the teacher must plan educational activities that give students opportunities to:

Observe, Recognize, Locate, Identify, Classify, Practice, Collect, Distinguish, Categorize, Repeat, Match, Show, Select, Construct, Assemble, Arrange, Put Things In Order, Etc.

Name, Recall, Give Examples, Draw, Organize, Decide, Describe, Tell, Imagine, Restate, Create, Appraise, Dramatize, Contrast, Compare, Question, Map, Discriminate, Etc.

List, Underline, Review, Interpret, Compose, Dictate, Point Out, Record, Report, Predict, Express, Plan And Evaluate.

Relate, Generalize, Demonstrate, Outline, Summarize, Suppose, Estimate, Judge, Explain, Debate, Illustrate, Infer, Revise, Rewrite, Assess, Interpret, Justify, Critique, Etc.

All of the above are observable actions that help teachers obtain EVIDENCE OF LEARNING.

3. **Assessing/Tapping Prior Knowledge**: Teachers must become very familiar with the background knowledge that students bring to the learning situation so they can ALWAYS emphasize what students already know, have experienced, are familiar with, and build on those bases that prior knowledge, experience and familiarity provide. Visuals, realia, posted academic language from previous lessons, all kinds of connections to prior knowledge, experience and familiarity need to become essential components of all lessons.

4. **Building New Knowledge**: Each and every lesson must result in the acquisition of new knowledge by students. To determine if new knowledge has been acquired as the result of a lesson, it is only necessary to check on the acquisition of new academic language. EACH WORD IS A CONCEPT. A student who has acquired and begins to use appropriately new academic language at the end of each lesson is a student who has acquired new knowledge.

If at the end of an instructional day the students go home without mastery of at least one new academic word, no new knowledge has been provided or mastered during that entire instructional day. It was a nice school day for reviewing what students already knew. But it was a day when students did not BUILD any new knowledge.

5. **Collaborative Problem-Solving; Cooperative and Other Groupings**: Teachers need to plan instruction through educational activities that provide for flexible groupings of students to meet specific purposes. In SDAIE there are many levels of language proficiency. ELL's may be at different stages of language acquisition: Pre-Production, Early-Production, Speech Emergence, Intermediate Fluency. Fluent English speakers may be English-only speakers or former ELL's now redesignated Fluent English Proficiency (FEP) students. Teachers need to implement varied instructional activities where heterogeneous students can work productively.

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6. **Cultural Affirmation / Multicultural Perspectives:** English Language Learners (ELL's) and English-only students all bring to each and every lesson their prior knowledge, their own experiences, their cultural backgrounds. ELL's may come from many different countries and English-only students may come from many parts of the United States or the English-speaking areas of the world. Each and every student brings something unique to the learning situation. SDAIE content area teachers need to acknowledge that, and need to affirm the value of each student to the cooperative effort of the lesson by acknowledging the individual contributions of each student. SDAIE content area teachers also need to expand the limited experiences and knowledge of each student to include the contributions of many individuals from many backgrounds to the advancement of knowledge.

7. **Demonstration and Modeling:** Here is the most crucial instructional component in ALL lessons, but particularly in SDAIE lessons. The key role of the teacher is to demonstrate and model all the behaviors to be learned in the lesson, ESPECIALLY THE VERBAL BEHAVIORS EXPECTED TO BE MASTERED BY THE STUDENTS, that is, the language of the content areas. ALL teachers must remember that for most students, and especially for ALL English Language Learners, TEACHERS are the ONLY role models that students will ever come in contact with for the language of the content areas. In today's world, few parents have the time or the energy –or the knowledge—to discuss the concepts of the content areas using the language of the content areas at home. ONLY TEACHERS can provide that.

8. **Graphic Organizers:** The language of the content areas, the language of a new reading selection students are about to begin reading, all words students DO NOT KNOW that are used in what students are about to listen or read, all those words MUST BE UNDERSTOOD BEFORE students listen or read. Thus, the SDAIE and the ESL/ELD teachers, cooperatively, must help students acquire, practice, develop, learn, and master 95-100% of the new vocabulary BEFORE they listen or read. Instructional activities that, through visuals, manipulatives, realia, dramatization, or any other means, help students master the new academic vocabulary BEFORE the content area lesson begins, are very important. Graphic organizers can be used to help students become aware of what they know and the new words they are about to learn. Graphic organizers that group words in categories by MEANING are the most effective means to introduce new words. WORD DEFINITIONS, or looking up the meaning of words in a dictionary, **ARE NOT** the most effective means to introduce new words.

For younger ELL's and for ALL young learners, graphic organizers can be used with pictures instead of printed words.

9. **Integrating Listening, Speaking, Reading and Writing Across the Curriculum:** If all instructional strategies described above (1-8) for the implementation of effective practices in Specially Designed Academic Instruction in English (SDAIE) for ALL students, both English-only and English Language Learners, have indeed been implemented, then it follows that students would have had ample opportunities:

(I) to listen to the new academic language of the lesson as the teacher uses visuals, manipulatives, realia, and other means to physically convey the meaning of the academic language,

(II) to speak the new academic language through active learning instructional activities,

(III) to see –in posted graphic organizers or categories—the new academic language.

Now students are ready to read the textbook or parts of the textbook or reading selection, and they will do so with 100% understanding the first time around! And then students can write about what they have learned –expressive writing—or answer the textbook questions IN THEIR VERY OWN WORDS. Only when students have been provided fully integrated visual, listening, speaking, reading and writing instructional activities would they be able to provide ample evidence of learning the language of the content areas.

10. **Higher Order Thinking Skills:** In SDAIE Strategy Number 2, above, we indicated that students must be engaged in Active Learning and suggested a series of observable behaviors that students can perform to give evidence of learning. That series of observable behaviors, (listed in 2 above) describe simple to complex or higher order thinking skills. Students who can perform these observable behaviors are giving evidence that they are operating and developing from simple to complex or higher order thinking skills.

11. **Questioning techniques:** The most effective tool a teacher has to promote all of the above SDAIE Strategies is the question. Every time a teacher asks a question the student must actively respond – active learning. Through questions, teachers can monitor student use of the language of the content areas. Questions help assess prior knowledge and provide the most effective tool to obtain evidence of learning. Through questions teachers can provide new information to students while demonstrating and modeling the use of the academic language. Questions can be asked at the lowest –knowledge—and the highest –evaluation—levels of thinking skills. Questions give teachers the best opportunity to provide opportunities for students to listen and to speak.

In fact, questioning techniques allow a teacher to keep control of (h)is/er classroom while helping students succeed. How? By controlling the level of LANGUAGE difficulty of the questions.

The following four questions all have the exact same answer. Thus, a teacher can choose which question to ask a student depending on how much knowledge the student has. By choosing the right question appropriate for each student, teachers can promote learning while at the same time allow students to experience success.

1. Who was the 22nd President of the United States?

2. Who was the 22nd President, was it Nixon, Cleveland, John Quincy Adams or Zachary Taylor?

3. Who was the 22nd President, was it Abraham Lincoln, Reagan, John Adams or Cleveland?

4. Cleveland was the 22nd President of the United States, right?

12. **The Teacher is a Facilitator of Learning:** Because a teacher must be constantly interacting with students, teachers in SDAIE content area classes have a primary role of facilitators. Through **visual aids and manipulatives, verbal and non-verbal cues,** teachers guided students into practicing the academic language as they acquire the concepts represented by the words.

These twelve instructional strategies characterize effective lessons in Specially Designed Academic Instruction in English for ALL learners.

Informal Assessment

Why Use Informal Math Assessment?

Determination and evaluation of teaching strategies; gathering of preferential information; development and evaluation of IEPs.

Who Should Use It? Teachers.

The area of mathematics can be easily assessed using various informal techniques. The sequential nature of most arithmetic skills (particularly computation) allows for the use of both criterion-referenced testing and curriculum-based assessment (discussed in Chapter 5). These approaches can help determine which skills to target for teaching and remediation. Also, because the student usually creates a written product when computing or solving math problems, error analysis can offer important insight about the correct and incorrect strategies the student uses. This information can then be translated into instructional recommendations.

Error Analysis

Error analyses in mathematics are relatively simple, because, as a rule, a written product is available; thus, the teacher has a tremendous amount of potential information from the students' routine math work in school. Several in-depth studies have been conducted to determine the typical extent and types of mathematics errors. Miller and Milam (1987) specifically looked at the error patterns of students with learning disabilities in the areas of multiplication and division.

They found that poor memory for basic multiplication and addition facts was the most common multiplication error, whereas omitting the remainder was the most common division error. Cawley, Farmer, Yan, and Miller (1996), in a comprehensive study of mathematics performance of students with learning disabilities, reported that they made more algorithmic errors than computation errors. This implies that they tend to use incorrect strategies when solving problems. The area of subtraction has been studied relatively extensively. Frank, Logan, and Martin (1987) found that students with learning disabilities had a definite pattern to their subtraction errors rather than making random errors. Cebulski and Bucher (1986) reported that borrowing and inversion (subtracting smaller number from larger regardless of their position) errors were most common.

Ashlock (2002) has written a widely used book that addresses error patterns in arithmetic computation. The problems in Figure 13.1 are examples of the error types discussed by Ashlock. It is important to do more than just note whether a problem is worked out correctly. The pattern of error can yield meaningful information, particularly in determining the teaching strategy that is most appropriate. For example, assume a student, Lucy, was making the type of multiplication error noted in Figure 13.1. The following are samples of her work:

$$\begin{array}{r} 1. \quad \begin{array}{r} 3 \\ 14 \\ \times 8 \\ \hline 322 \end{array} \quad 2. \quad \begin{array}{r} 32 \\ \times 4 \\ \hline 128 \end{array} \quad 3. \quad \begin{array}{r} 17 \\ \times 3 \\ \hline 91 \end{array} \quad 4. \quad \begin{array}{r} 23 \\ \times 6 \\ \hline 188 \end{array} \quad 5. \quad \begin{array}{r} 41 \\ \times 9 \\ \hline 369 \end{array} \end{array}$$

Error patterns can indicate appropriate teaching strategies.

Lucy correctly answered #2 and #5, but missed #1, #3, and #4. Her error pattern indicated that she added the carried digit (crutch) to the number in the tens column before multiplying it instead of after. Ashlock made several sug-

gestions for teaching this skill. For example, the crutch could be placed below the bar to remind Lucy that the number should be added after the multiplication has been conducted.

$$\begin{array}{r} 14 \\ \times 8 \\ \hline 32 \end{array} \quad \rightarrow \quad \begin{array}{r} 14 \\ \times 8 \\ \hline 32 \\ +8 \end{array} \quad \rightarrow \quad \begin{array}{r} 14 \\ \times 8 \\ \hline 112 \end{array}$$

FIGURE 13.1 Examples of Math Errors

Addition examples:

$$\begin{array}{r} (1) \quad \begin{array}{r} 82 \\ + 41 \\ \hline 123 \end{array} \quad (2) \quad \begin{array}{r} 68 \\ + 39 \\ \hline 917 \end{array} \quad (3) \quad \begin{array}{r} 45 \\ + 35 \\ \hline 710 \end{array} \end{array}$$

Error Pattern: The student is adding the 1s column and the 10s column independently without carrying or noting the place value in the sum.

Subtraction examples:

$$\begin{array}{r} (1) \quad \begin{array}{r} 63 \\ - 37 \\ \hline 34 \end{array} \quad (2) \quad \begin{array}{r} 49 \\ - 27 \\ \hline 22 \end{array} \quad (3) \quad \begin{array}{r} 81 \\ - 19 \\ \hline 78 \end{array} \end{array}$$

Error Pattern: The student is subtracting the smaller number from the larger number in each column regardless of their positions as subtrahend or minuend.

Multiplication examples:

$$\begin{array}{r} (1) \quad \begin{array}{r} 83 \\ \times 4 \\ \hline 362 \end{array} \quad (2) \quad \begin{array}{r} 63 \\ \times 5 \\ \hline 355 \end{array} \quad (3) \quad \begin{array}{r} 48 \\ \times 2 \\ \hline 106 \end{array} \end{array}$$

Error Pattern: The student is adding the carried digit before instead of after multiplying. In the first example, for instance, the student multiplied 3×4 , wrote the 2, carried the 1, and added this to 8. The student then calculated 4×9 rather than $(4 \times 8) + 1$.

Division examples:

$$\begin{array}{r} 13 \\ (1) \quad 3 \overline{)93} \\ \underline{9} \\ 3 \\ \underline{3} \\ 0 \end{array} \quad (2) \quad \begin{array}{r} 81 \\ 4 \overline{)72} \\ \underline{4} \\ 32 \\ \underline{32} \\ 0 \end{array} \quad (3) \quad \begin{array}{r} 32 \\ 6 \overline{)138} \\ \underline{12} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

Error Pattern: The student is dividing correctly but is writing down the answer from right to left.

This cue, which eventually would be eliminated, should assist her in remembering the correct sequence. In addition, Ashlock suggested that the familiar acronym My Dear Aunt Sally could be introduced to indicate the order of operations (Multiplication, Division, Addition, Subtraction) to be conducted. Thus, Lucy would know to do all multiplication operations before going on to other operations including addition. Enright, Gable, and Hendrickson (1988), described a nine-step model for diagnosing and remediating errors in mathematics computation. Each of these steps will be presented with a brief discussion.

Step 1: Obtain Samples. This involves gathering multiple samples of the student's mathematics computation work. Enright and colleagues (1988) recommend that samples should include at least three to five items for each subskill measured.

Step 2: Interview the Student. The diagnostic interview is a helpful technique in math error analysis. Using this procedure, the examiner employs a variety of techniques to determine how a student arrives at an answer for a certain problem (interviews will be discussed later in this chapter).

Step 3: Analyze Errors and Identify Error Patterns. A variety of major error types have been used in classification. Salvia and Hughes (1990) summarized five distinct types of computational errors. These were a lack of prerequisite skills, wrong operation (e.g., adding instead of subtracting), an obvious computational error, a defective algorithm (when a student tries to apply the correct operation but makes errors in making the necessary steps), and random responses. Gable and Cohen (1990) also included grouping errors (mistakes in placing digits in the proper column when regrouping) in addition to those just listed.

To assist in the analysis, Enright and colleagues (1988) suggested the use of a computational error chart (see Figure 13.2) that indicates the type and number of errors made. As an exercise, try to identify the type of error for each of the following examples using the error chart in Figure 13.2.

1.	2.	3.	4.	5.
$\begin{array}{r} 48 \\ +8 \\ \hline 416 \end{array}$	$\begin{array}{r} 91 \\ \times 4 \\ \hline 157 \end{array}$	$\begin{array}{r} 35 \\ -25 \\ \hline 60 \end{array}$	$\begin{array}{r} 43 \\ \times 6 \\ \hline 308 \end{array}$	$\begin{array}{r} 45 \\ +23 \\ \hline 67 \end{array}$

Answers

1. Grouping (student correctly added but did not carry).
2. Random (no apparent pattern).
3. Wrong operation (student added instead of subtracting).

Step 4: Select Primary Error Pattern and Show the Precise Error to the Student. The information presented in Figure 13.2 might be shared with the student as a means of providing corrective feedback.

Step 5: Demonstrate a Correct Computational Procedure as Part of the Corrective Feedback Mechanism. The teacher should demonstrate the correct computational procedure and leave the completed problem as a permanent model.

Step 6: Select a Corrective Strategy. At this point, the teacher has determined the error pattern and has provided feedback to the student about why the answer was incorrect and how to determine the correct answer. Now the teacher must determine instructional strategies that might be helpful in teaching the correct procedure. For example, color coding the signs, such as green for plus, red for minus, when a student is using the wrong operation might help draw attention to the appropriate operation to complete.

Step 7: Introduce Appropriate Practice. This involves a structured series of practice exercises that reinforces the correct computational procedure that has been taught.

Step 8: Identify and Apply Normative Standards. Essentially, this refers to the establishment of criteria that the teacher feels are necessary to indicate that the child has mastered a particular computational procedure. In a sense, this is similar to establishing criteria for mastery noted in criterion-referenced testing.

Step 9: Evaluate Performance. This refers to the ongoing assessment that is necessary in the diagnostic remedial process. In addition to analyzing mathematics performance to determine an individual student's error patterns, teachers can also use error analysis with groups. Miller and Carr (1997) reported that using a technique called error ratio analysis was very helpful in assisting the teacher to make instructional decisions and monitoring class progress. This approach uses the number of different incorrect responses divided by the total number of incorrect responses.

Interviews

Interviewing a student about math performance is not really a typical interview. Enright, Gable, and Hendrickson (1988) described the diagnostic math interview as asking the students to "talk their way through" the arithmetic problems as they are solving them. In many cases, the examiner will clearly be able to see where and why the student is making an error. Take the following as an example.

12	13	47	13
$3\sqrt{63}$	$4\sqrt{124}$	$2\sqrt{148}$	$5\sqrt{155}$

The student commented, "three into six is two, I put the 2 here (points); three into three is one, so I put that here." In this situation, the student understands division facts but probably is confused because addition, subtraction, and multiplication problems are all solved from right to left. He inappropriately generalized that procedure to division. The student responded in a similar fashion to the other three problems.

Howell and Nohet (2000) suggested that the student act like the teacher and show the examiner how to solve specific types of problems. They argued that this promotes student involvement and makes the thought processes more observable. Further, if this technique is not enough, more specific questions such as "what is the problem about?" "how would you check the steps you have taken or your answer?" and "how did you know you were done?" can be asked. Huinker (1993) noted the importance of using an interview because oftentimes a student who makes an error might lack the necessary conceptual knowledge or simply make a careless mistake. On the other hand, students sometimes might get the right answer for the wrong reason. Using interviews will help determine the process the student is using to solve problems. Similar to Enright and colleagues, Huinker recommends that the think-aloud procedure be used.

Interviews often use a "think-aloud" procedure.