

Mathematics: Strategies for Teaching Limited English Proficient (LEP) Students

**A Supplemental Resource to the
K-12 Mathematics Standards of Learning
Enhanced Scope and Sequence**



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Division of Instruction**

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I. Purpose

This document serves as a supplement to the K-12 Mathematics Standards of Learning Enhanced Scope and Sequence, which helps teachers align their classroom instruction with the revised Mathematics Standards of Learning that were adopted by the Virginia Board of Education in October 2001. The purpose of the document is to provide mathematics teachers with a brief overview of second language acquisition theory and suggest effective strategies for differentiating instruction for limited English proficient (LEP) students. Differentiated instruction is particularly effective in helping LEP students acquire English and meet academic achievement standards in content classes as it recognizes students' varying background knowledge and experiences, language, culture, learning styles, and readiness.

Just as the school-aged LEP population throughout the United States has experienced significant growth over the past decades, so has the school-aged LEP population in Virginia. Since 1992 the number of LEP students in Virginia public schools has more than tripled, resulting in LEP students residing in all eight regions of the state, speaking over 118 different languages, and representing over 72 countries.

In addition to an increased number of LEP students, school divisions have also responded to the federal requirements under the reauthorization of Public Law 107-110, the *No Child Left Behind Act of 2001* (NCLB). One of the performance goals of NCLB requires LEP students to become proficient in English while reaching high academic achievement standards in reading/language arts and mathematics. NCLB also requires that LEP students participate in annual academic assessments in reading/language arts and mathematics, which are used to determine adequate yearly progress for schools, school divisions, and the state [Public Law 107-110, Sec. 1111(b)(3)(A)].

The rapid growth of the LEP student population in Virginia coupled with the increased federal accountability requirements under NCLB have resulted in an increased need for mathematics teachers to understand the unique needs of LEP students in their classes. The strategies described in this document will provide mathematics teachers with effective practices for incorporating Mathematics Standards of Learning and the English Language Proficiency (ELP) Standards of Learning in daily instruction. The ELP Standards of Learning can be accessed through the Virginia Department of Education Web site at the following link: <http://www.pen.k12.va.us/VDOE/Superintendent/Sols/EnglishSOL02.html> Incorporation of these strategies will increase the likelihood of LEP student success in the mathematics classroom.

II. Second Language Acquisition Research

Learning a second language is a complex process that develops in predictable, sequential stages. This progression closely mirrors the stages children go through as they learn their first language (Krashen & Terrell, 1983). During the initial period of learning a second language, LEP students may experience a “silent period” during which they concentrate on comprehension and respond using non-verbal means of communication (Krashen, 1985).

With increased exposure to the English language, LEP students progress through several additional stages of language acquisition. Following the “silent period,” LEP students typically begin to produce one- or two-word responses and use short repetitive phrases. At the next stage, LEP students start to produce simple sentences and engage in basic dialogue. Within one to two years, LEP students begin to use more complex statements, can sustain longer conversations, and state their opinions. At the final stage of language acquisition, most LEP students can understand grade-level classroom activities, argue and defend academic points, read grade-level textbooks, and write organized and fluent essays (Krashen, 1982).

The chart below summarizes general behaviors of LEP students at each stage of language acquisition (Krashen, 1982).

Stage of Language Acquisition	General Behaviors of LEP Students
Silent/Receptive Stage <ul style="list-style-type: none"> ▪ 10 hours to 6 months ▪ 500 receptive words 	<ul style="list-style-type: none"> ▪ point to objects, act, nod, or use gestures ▪ say yes or no ▪ speak hesitantly
Early Production Stage <ul style="list-style-type: none"> ▪ 6 months to 1 year ▪ 1000 receptive/active words 	<ul style="list-style-type: none"> ▪ produce one- or two-word phrases ▪ use short repetitive language ▪ focus on key words and context clues
Speech Emergence Stage <ul style="list-style-type: none"> ▪ 1-2 years ▪ 3000 active words 	<ul style="list-style-type: none"> ▪ engage in basic dialogue ▪ respond using simple sentences
Intermediate Fluency Stage <ul style="list-style-type: none"> ▪ 2-3 years ▪ 6000 active words 	<ul style="list-style-type: none"> ▪ use complex statements ▪ state opinions and original thoughts ▪ ask questions ▪ interact in more lengthy conversations
Advanced Fluency Stage <ul style="list-style-type: none"> ▪ 5-7 years ▪ content area vocabulary 	<ul style="list-style-type: none"> ▪ converse fluently ▪ understand grade-level classroom activities ▪ argue and defend academic points ▪ read grade-level textbooks ▪ write organized and fluent essays

The five stages of language acquisition described above are a general framework for understanding how LEP students progress; however, language learning is an ongoing, fluid process that differs for every student. Students may move back and forth between stages depending on the academic demands of a lesson and the amount of participation required. For example, a LEP student may be functioning at the

intermediate fluency stage when performing routine tasks or accessing previously learned skills. However, when the academic content is new and the student lacks adequate background knowledge or experiences, the student may regress to the prior stage (early production).

For language acquisition to occur, students must (1) receive understandable and meaningful messages that are a little beyond their comprehension level and (2) learn in an environment where there is little or no anxiety (Krashen, 1981, 1982; Vygotsky, 1978). Recognizing these two principles can assist teachers in creating a natural language learning environment in their classrooms.

Outlined below are five key elements of an effective language learning environment. Use of these strategies can assist all students in accessing the content material.

- 1) Comprehensible input – Teachers can make their language more comprehensible by modifying their speech, adjusting teaching materials, and adding context to lessons.
- 2) Reduced anxiety level – A student’s emotions play a pivotal role in assisting or interfering with learning a second language. Teachers can assist students by creating a comfortable classroom environment that encourages participation and risk-taking without fear of feeling embarrassed or foolish (Krashen, 1981; Krashen & Terrell, 1983).
- 3) Contextual clues – Visual support makes language more comprehensible. For example, a lesson about fractions using manipulatives is more understandable than an explanation of the concept. Even social language is more comprehensible when context is added. For example, understanding a face-to-face conversation using facial expressions and gestures is easier than a telephone conversation (Cummins, 1981).
- 4) Verbal interaction – Students need opportunities to work together to solve problems and use English for real, meaningful purposes. They need to give and receive information and complete authentic tasks.
- 5) Active participation - Lessons that encourage active involvement motivate LEP students, engage them in the learning process, and help them remember content more easily.

Section VI of this document provides a more detailed description of effective teaching strategies specific to mathematics.

Types of Language Proficiency

Another theory about language acquisition that can help teachers understand the challenges of LEP students is the distinction between social and academic language proficiency. Jim Cummins (1981) suggests that there are two types of language proficiency:

- 1) Basic interpersonal communication skills (BICS)
- 2) Cognitive academic language proficiency (CALP)

According to Cummins, LEP students generally develop conversational fluency (BICS) within two years of studying a second language; whereas, developing fluency in more technical, grade-appropriate academic language (CALP) can take from five to seven years depending on the student's age and level of native language literacy. Failure to understand the distinction between these two types of language proficiency can lead to false assumptions about a student's language ability (Cummins, 1984). For example, LEP students may be exited prematurely from direct English instructional programs because they appear fluent in conversational English; however, they lack the necessary academic language and reading and writing skills to succeed in mainstream content classes. Several more years of direct English instruction are required before the students are fluent in all four skill areas (listening, speaking, reading, and writing) necessary for academic success.

Factors that Influence Learning a Second Language

The pace at which a LEP student moves through the five stages of language acquisition and develops conversational and academic fluency in English depends on a number of influencing factors.

1. Age of student – Age affects second language learning in a number of ways.
 - Many older language learners enter the second language classroom with prior knowledge and skills in a first language that can transfer to a second language. For example, students do not have to learn concepts such as division, reading, and taking notes if they already possess these skills in another language. However, older language learners need to learn the English vocabulary words to discuss and study the concepts they are learning in the second language (Cummins, 1981).
 - Younger students often do not have as much prior knowledge and skills. If they have not learned a concept in their native language, it may take them longer to learn the new academic content than native speakers. These students are learning a new concept and the accompanying English vocabulary simultaneously.

- Older language learners are often more inhibited to speak in front of peers because they feel vulnerable about taking risks and making mistakes.
- Class discussions and the reading level of textbooks are more academically demanding for the LEP student at the secondary level than at the elementary level. As a result, it may take older language learners longer to achieve on grade level in content area classes.
- Younger students generally achieve native-like pronunciation more easily than older language learners.

2. Limited or interrupted schooling and literacy in a first language

Literacy in a first language can positively influence the process of learning a second language. LEP students who are literate in another language have more background knowledge and skills to draw on to support them in learning a second language. However, this is not the case for all LEP students. Some may enter U.S. schools with limited and/or interrupted schooling. Some may come from rural communities where literacy and schooling were not emphasized, while others may come from countries where political turmoil prevented them from attending school regularly.

These students face the additional challenge of learning appropriate school behaviors and expectations at the same time as they are learning English and mathematical concepts. Teachers can assist these students by explicitly modeling appropriate school behaviors such as: 1) raising their hand before speaking; 2) organizing a notebook; 3) working in collaborative groups; 4) lining up to leave the classroom and remaining in that line while walking through the hallway; and 5) remaining seated and quiet in the cafeteria or auditorium. Teachers can also assist these students by assessing their background knowledge before a unit of study to identify knowledge gaps and create experiences to build background knowledge that may be missing.

3. Family and home circumstances that bring students to the United States

The circumstances that bring LEP students and their families to the U.S. vary greatly. Some students come from war-torn countries or refugee camps, while others follow their families to seek employment, join family members, or obtain a better education. The circumstances that surround a family's decision to move can greatly affect the emotional and psychological well-being of LEP students, thereby affecting their motivation level and academic achievement.

III. Misconceptions about Language Learners

Following are several common misconceptions about second language learners. Understanding the process of learning a second language can help avoid making these faulty assumptions.

- 1) A LEP student who appears to speak English well is fluent.

A LEP student who can converse comfortably in English (i.e., social language) is not necessarily fully fluent in English. Research suggests that it can take up to five years of English language instruction before a LEP student will be able to read and write proficiently in English (i.e., academic language). Oral language skills precede reading and writing skills. To gain academic fluency takes time, exposure to the language, and effective instructional strategies (Cummins, 1979).

- 2) A LEP student who is silent in class does not understand anything.

A LEP student who does not participate in class discussions is still acquiring an understanding of the English language and its structures. During this “silent period,” LEP students are listening and internalizing the vocabulary and common patterns and structure of the English language.

Most LEP students bring a wealth of content knowledge and reading, writing, and thinking skills to the classroom that transfer from their native language to English (Cummins, 1981). LEP students may know the answer to a question because they have studied the concept in their own language; however, they do not have sufficient skills in the English language to produce an answer that can be understood by others. Typically listening comprehension precedes speaking, reading, and writing fluency (Krashen, 1983).

Multiple Challenges for Students and Teachers

In addition to learning the English language, LEP students confront a number of challenges upon entering the U.S. classroom. LEP students must also learn about U.S. cultural norms and behaviors as well as learn new academic concepts and vocabulary in content-area classes. For example, many LEP students struggle with even the most basic routines of school such as opening a locker, buying lunch in a cafeteria, or finding the bus. LEP students are not only learning a new language but also a new way of life.

Teachers of LEP students may face a number of challenges as well in meeting the instructional needs of this culturally and linguistically diverse group. For example, most teachers of LEP students do not know how to read or speak the native languages of their students, and they often do not know the cultural norms of their ethnically diverse group of students. Teachers’ inability to communicate with LEP students can lead to miscommunication, mismatches in teacher and student expectations, under- or over-estimation of student abilities, and frustration.

The table below summarizes the cultural, linguistic, and academic challenges addressed in later sections of this document.

Student Challenges	Teacher Challenges
LEP students must learn about U.S. cultural norms and behaviors.	Teachers can assist LEP students by: <ul style="list-style-type: none"> ▪ being knowledgeable of the cultures represented in their classroom. ▪ understanding the impact of cultural differences on classroom behaviors and academic performance.
LEP students must: <ol style="list-style-type: none"> 1) learn the English language (for social and academic purposes), 2) learn new academic concepts in content-area classes, and 3) transfer already known skills and concepts into English. 	Teachers can assist LEP students by: <ul style="list-style-type: none"> ▪ creating a comfortable classroom environment. ▪ modifying speech. ▪ integrating language and content instruction. ▪ using instructional strategies that increase comprehension. ▪ providing explicit instruction and practice in using academic vocabulary unique to a content-area. ▪ assessing LEP students' English comprehension and mastery of academic concepts.

Section IV describes some of the general cultural differences that teachers of LEP students may observe in their classrooms and suggests strategies for addressing diversity.

Section V describes cultural differences related to teaching and learning mathematics in the U.S. and in other countries.

Section VI suggests classroom management, instructional, and assessment strategies that mathematics teachers can use to give LEP students more opportunities to participate in class, demonstrate their comprehension, and succeed in content-area classes.

IV. Cultural Differences in the Classroom

Teachers can assist LEP students and avoid misunderstandings by becoming knowledgeable of their students' linguistic, cultural, and academic backgrounds. Students' cultural perspectives and experiences can greatly impact their behavior in the classroom, relationship with the teacher and classmates, and academic performance.

1. Cultural norms related to body language

LEP students often come from cultures that have different norms about interacting with other people. Teachers play an important role in fostering an appreciation for and respect of different cultural norms among students in a class.

Following are several examples of differing cultural norms:

- a. Eye contact: Some LEP students such as those from Middle Eastern, Asian, and/or African countries may avoid direct eye contact, especially with someone who is an authority figure, as a sign of respect. They may feel more comfortable looking down or away. This type of behavior should not be misinterpreted as evasive or disrespectful.
- b. Speaking distances: Some LEP students such as those from Latin American countries have differing norms about personal space. They may stand next to or speak face-to-face with another person at a closer distance than is commonly accepted in the U.S. This behavior can be perceived as an invasion of personal space and can lead to discomfort when students are working in pairs or small groups.
- c. Girls holding hands - In some cultures it is common for girls to hold hands with one another. Educating other students about this cultural norm can prevent students from being teased or ridiculed for their behavior.
- d. Styles of clothing – Some LEP students wear traditional clothing from their native country to school. They may come from cultures that require women to cover their heads, arms, and legs when in public. Other students in the school may not be accustomed to this type of clothing and need to understand the cultural reasons for wearing them.

2. Method of instruction used in U.S classrooms

Some LEP students are not familiar with collaborative activities and active learning, which are commonly used in U.S. classrooms. In many of their countries, the classroom instruction occurs in the form of a lecture or emphasizes rote learning. Students are not considered active participants in the learning process. Class work is generally completed silently and independently. When designing lessons, teachers of LEP students need to consider the following issues:

- Vary instructional groupings (individual, pair work, small group work, and whole class instruction) often throughout a lesson. This gives all students an opportunity to work in a grouping that is most comfortable to them.
- Introduce collaborative work gradually to LEP students. First, let LEP students work in pairs, and then introduce small-group activities to them. It can be overwhelming and intimidating for a LEP student to speak in a group, especially if it contains primarily native English speakers.
- Consider gender and the ethnic, racial, and religious background of LEP students when designing collaborative groups. Some students have never been in mixed gender classes and/or may feel uncomfortable working with some ethnic groups.
- Consider grouping LEP students with native English speakers. Listening to and talking with a fluent speaker helps LEP students internalize the structure of the English language.
- Teach LEP students that collaborative learning is not acceptable during a test. Sometimes LEP students, new to the concept, may think they can ask a classmate to help on a test as well. In some countries it is considered acceptable to assist another student during a test. Failure to understand this cultural difference can lead to inaccurately assuming that a LEP student is trying to cheat.

3. Acculturation

Newcomers to the U.S. may experience a variety of emotions ranging from unhappiness, loneliness, homesickness, frustration, or anger during the first six months in a new culture. In addition to not speaking or understanding the native language, they are learning to live in a foreign culture (home and school). Even for students who have studied English before coming to the U.S., it is likely that their previous experiences will not have prepared them for being a student in a school in the U.S.

The process of acculturation (i.e. the process of adapting to a new culture) often follows the four stages described below:

- 1) Excitement and euphoria - Newcomers are initially excited about their new surroundings.
- 2) Culture shock - Newcomers begin to feel disoriented as they recognize cognitive and emotional differences in the new culture.
- 3) Recovery - Newcomers gradually accept the different ways of thinking and feeling in the new culture.
- 4) Acceptance - Newcomers adapt or assimilate to the new culture (Brown, 1994).

Following are some strategies that teachers may want to use to help the newcomer acclimate to a new culture and feel more comfortable in their new school environment:

- Foster an appreciation of and respect for cultural diversity among the students in the classroom.
- Assign buddies to LEP students. Buddies do not necessarily have to speak the same native language. Assigning a native English-speaking buddy can often be just as effective. What is important is that the buddy is helpful, patient, and culturally sensitive to the new student. A buddy may be a high-level or low-level student.

In addition to helping students during class, LEP students often need buddies to help them adjust to many basic routines in U.S. schools (i.e., using a locker, buying lunch in the cafeteria, finding the bus, understanding the bell system, etc.)

- Create predictable daily classroom routines (starting class, collecting homework, moving into groups, etc.) and visual/verbal cues so that LEP students will know what to expect. This will let LEP students focus on learning the content rather than exerting energy understanding the classroom behavior.
- Find ways for LEP students to give non-verbal responses (especially those in the “silent period”). Students can use flashcards, raise their hands, write or draw, nod their head, or point to an object to indicate comprehension.
- Put up note cards labeling common classroom objects.
- Learn how to pronounce the names of LEP students

- Incorporate LEP students' cultural backgrounds and experiences into lessons and class discussions whenever possible. Ask LEP students to bring in items that represent their culture and show them to the class.
- Encourage LEP students to use bilingual and/or picture dictionaries.
- Let LEP students speak to one another in their native language at times throughout the lesson to clarify what they are learning and clear up misunderstandings. Explain to the rest of the class the reason why LEP students are speaking to one another in their native language. Failure to understand the behaviors of LEP students can lead native-English speakers to wrongly assume that the LEP students are talking about them.

V. Cultural Differences Related to Mathematics

Mathematics can be particularly challenging to LEP students because mathematical knowledge consists of three components: linguistic knowledge, conceptual knowledge, and procedural knowledge.

1. **Linguistic Knowledge:** Mathematics is not limited to performing computations in isolation; it is dependent on the English language. Academic standards in mathematics require students to apply computational skills in a variety of real-life problem-solving situations, read and solve word problems, communicate their mathematical thinking, and collaborate with their peers to complete a task.

Mathematics has its own specialized language, grammatical patterns, and rules. While LEP students are learning English, they must also learn the unique meanings that some English words have in a mathematical context. Following are some linguistic challenges that LEP students may encounter in classroom lectures, discussions, and textbooks.

In order to understand mathematics, students must:

- learn many content-specific vocabulary words (i.e., quotient, equivalent, divisor).
- know the meaning of many complex phrases (i.e., least common multiple, greatest common factor). Many complex phrases are not found in bilingual dictionaries. Often times, LEP students will break apart the phrase (i.e., least common multiple) and look up each individual word in a bilingual dictionary to try to understand the meaning of the phrase. LEP students may not get an accurate translation using this strategy.
- understand that many common English words have unique meanings in mathematics (i.e., bring down, tree, face, plane, cone, net, positive, negative).
- understand that prepositions (i.e., by, with, to, into, from, etc.) are used in a variety of ways in word problems to signal operations.
- know the meaning of prefixes and suffixes (i.e., hept-, tri-, bi-, poly-, -gon, -lateral).
- understand unique mathematical sentence constructions (i.e., If $x = 5$, then ...).
- understand statements and questions that are written in passive voice (i.e., twenty is divided by five)

- know that mathematical operations are associated with many different words.

EXAMPLES:

Addition: add, plus, and, combine, sum, total of, more than, increased by, greater than

Subtraction: subtract, minus, less, less than, fewer than, decreased by, difference, lower, take away, from, shorter

Multiplication: multiply, times, product, as a factor, twice, double, triple, groups of

Division: divide, divided by, quotient, separated into equal groups, shared equally, over, into, how many groups

Equal: is, are, result, make

2. **Conceptual Knowledge:** Mathematics requires a conceptual understanding of a mathematical process in order to choose the correct operation(s) and perform the necessary steps to derive an answer. Some mathematical concepts can be very concrete, while others are abstract. To help LEP students succeed in the mathematics classroom, teachers need to connect previous knowledge and experience to new concepts that are being taught.

A LEP student may have learned the mathematical concept in a native language but may not have the English language development to understand a discussion, read a textbook, or be able to express his or her understanding. In this case, the LEP student does not need to re-learn the concept but must learn new English words to talk about a previously learned concept.

If the mathematical concept is new to the LEP student, then the teacher must make the instruction more concrete, visual, collaborative, and hands-on.

A more detailed description of effective instructional strategies for teaching mathematics to LEP students can be found in Section VI of this document.

3. **Procedural Knowledge:** Just as one mathematics textbook differs from another textbook in its approach to teaching a concept, various cultures around the world approach computation using different methods. This can cause tremendous frustration and often confusion for LEP students.

Following are some procedural challenges that LEP students may encounter in classroom lectures, discussions, and textbooks:

- LEP students may be accustomed to reading and writing from right to left instead of from left to right. The teacher needs to explicitly teach the LEP student the expected procedures for using a notebook and completing homework problems.
- LEP students may have learned a different way to write letters and numerals (0-10). For example, LEP students may draw a line through the stem of a 7 or add a serif to a 1. The teacher needs to show LEP students the expected method to write letters and numerals to avoid misinterpretations when reading homework or answers on tests.
- Periods are used instead of commas in some cultures to separate multiples of a thousand (i.e., 1,200,000 could be written as 1.200.000 in some cultures).
- Commas are used instead of decimal points in some cultures (i.e., 7.5 could be written as 7,5 in some cultures).
- Most LEP students are familiar with the metric system but have never studied the U.S. customary system. Students may have difficulty estimating length, weight/mass, and liquid volume using units of measurement that are new to them (inch, foot, yard, ounce, pound, cup, quart). They may also have difficulty understanding the use of fractions in measurements (i.e., half a foot, quarter of an inch). The metric system does not use fractions with measurement in this way (i.e., 5 millimeters is not described as half a centimeter).
- Many LEP students are not familiar with the U.S. monetary system and can have difficulty understanding word problems related to money. They may also have different ways of writing amounts of money (i.e. \$15.00 could be written as \$15,00 in cultures that use commas instead of decimal points).
- Some LEP students learn to add, subtract, multiply, and divide using different computational methods than commonly taught in U.S. schools.

VI. Strategies for Teaching Mathematics to LEP Students

For LEP students who are still acquiring academic English, it is essential that teachers integrate the study of academic vocabulary and grammatical structures while simultaneously building mathematical concepts.

It is critical to integrate language and content instruction because:

- students learn a second language more successfully when instruction focuses on academic content rather than linguistic form (Crandall, 1987).
- studying English in isolation without also learning grade-level concepts can delay a LEP student's academic progress.
- language acquisition occurs when input is meaningful and understandable (Krashen, 1981; Krashen, 1982).
- lessons that use concrete objects, graphics, manipulatives, and hands-on activities clarify and reinforce new concepts (Crandall, 1987).

To increase comprehension and make mathematics more accessible to LEP students, teachers may want to use a variety of strategies:

A. Classroom Management Strategies

- Create predictable classroom routines (starting class, collecting homework, working in groups) so that LEP students will know what to expect. By knowing the predictable routines, LEP students will not have to exert energy understanding classroom behavior. Instead, they can focus their energy on learning the content.
- Use consistent formats for assignments, worksheets, and tests.
- Seat LEP students purposefully (near the teacher or next to a buddy).
- Foster an appreciation of and respect for cultural diversity among the students in the class. Give LEP students opportunities to share stories about their country and culture and teach words from their native language. Decorate the classroom with items from their cultures.
- Write legibly and in print. Some LEP students may not be familiar with cursive and/or the Roman alphabet.
- Give directions step-by-step (orally and in writing) before assigning students to do independent, pair, or group work. Ask a student to repeat the directions aloud for the rest of the class to assess whether all the students understand the assignment.

- Give LEP students more time to process questions and formulate an answer. They have to think about the question in their native language and then work to find the English words to produce an answer in English. A LEP student's hesitance to raise his/her hand to answer a question should not be misinterpreted as shyness. LEP students often have the ability to reason and understand concepts at a much deeper level than they have the vocabulary to express.

To reduce the pressure on LEP students, let them discuss a question in pairs for a minute before calling on a student to give an answer. This strategy gives everyone in the class more time to think about the question and form an answer. It also increases comprehension and gives all students more opportunities to participate in class discussions.

- Allow LEP students to talk to a peer in their native language when necessary to clarify understanding and clear up misunderstandings.
- Keep picture dictionaries in the class and allow LEP students to use bilingual dictionaries.

B. Instructional Strategies that Increase Comprehension

Integrate language and content

- Teach mathematical vocabulary (i.e., estimate, measure) and language structures daily.
- Teach students strategies to learn and study new vocabulary (i.e., vocabulary section in mathematics notebooks, class word wall, student-made bilingual dictionaries, and/or flashcards on spiral-bound index cards with definition, examples, word used in a sentence, picture/diagram, or a native language translation).

Sample flashcard:

word	definition
illustration	real world use

- Integrate the four language modes (listening, speaking, reading, writing) into mathematics class.

- Model the process. Talk aloud while solving problems on the overhead or chalkboard to show the thinking process and common errors.
- Have students explain their thinking process aloud to a classmate while solving a problem.
- Integrate reading and writing through the use of journals, learning logs, poems, literature, etc.
- Give explicit instruction and practice in reading and writing word problems. Teach students to identify key words in word problems that indicate a certain mathematical operation.
- Begin class with warm-up activities using mathematical language to give students practice in sentence construction.
 - Write a cloze exercise (a short paragraph with key words missing) or sentence starters (i.e., Perimeter is the...) on the board for students to copy and complete when they enter class.
 - Give students a computation problem to solve, and then have them write the steps they used to solve it in complete sentences.
- Post labels and vocabulary cards around the classroom on completed word problems, number lines, rulers, fraction diagrams, and/or objects in the class.
- Have students paraphrase and write complex concepts in their own words (individually, pairs, or whole class).
- Review mathematical vocabulary and concepts using games such as TIC TAC TOE, BINGO, Concentration, Charades, etc.

Use a variety of modes of instruction

- Design multi-sensory lessons (visual, auditory, tactile, kinesthetic).
- Use visuals whenever possible to reinforce auditory instruction (i.e., charts, graphs, manipulatives, diagrams, models, real objects).
- Use graphic organizers to visually represent mathematical concepts.
- Design hands-on activities.

- Vary groupings throughout the lesson (i.e., independent work, pair work, small groups, whole class).
- Use real-life problem-solving situations to teach new concepts.
- Make interdisciplinary connections whenever possible.

Tap prior knowledge

- Connect students' prior knowledge and experiences to new learning. Find out what students already know about a topic by making a semantic web on the board. Write the topic in the center of a circle and record students' knowledge around it.
- Integrate LEP students' culture into lessons whenever possible. Give students opportunities to share examples from schools in their country and different ways of learning mathematics.
- Begin a unit of study by eliciting students' own questions about a topic.

Modify speech

- Enunciate clearly and slowly without speaking louder.
- Pause between sentences or thought groups.
- Use gestures and visuals to help clarify the message.
- Avoid using idioms and slang words.
- Use key words frequently.
- Repeat, rephrase, and paraphrase.
- Simplify the language used rather than the mathematical concepts taught (use known vocabulary and simple sentence constructions).
- When LEP students speak, focus on their message rather than their grammatical skills and accuracy. Respond using the proper grammatical form rather than overtly correcting their mistakes.

Encourage active learning and verbal interaction

- Design hands-on activities.
- Design meaningful and authentic collaborative activities to increase verbal interaction between students.

- Assign roles to students in collaborative activities. Discover the strengths of LEP students and assign appropriate roles.
- Initiate discussions that are based on real-world mathematical situations.

Teach organizational skills

- Demonstrate how to read a mathematics textbook.
- Point out key sections and resources in the textbook.
- Teach students how to organize notebooks and binders and record homework assignments.
- Teach mnemonic devices that assist memorizing content.
- Teach study and test-taking skills.
- Teach note-taking skills. For beginner LEP students, copying notes is an effective way to begin learning writing conventions.

C. Assessment Strategies

Before instruction

- Use daily warm-up activities to assess mastery of concepts from the previous day's lesson.
- Assess LEP students' knowledge before beginning a unit of study to learn where students have gaps in their learning and avoid unnecessary re-teaching of concepts. Some good techniques are semantic webbing and recording students' comments on a KWL chart. Listed below is an example of a KWL chart.

What Do You <u>K</u> now	What Do You <u>W</u> ant to Know	What Did You <u>L</u> earn

During instruction

- Use a variety of assessment methods to measure English comprehension and mastery of concepts (drawings, charts, demonstrations, diagrams).
- Do quick checks for understanding every day (i.e., thumbs up/down, write answers on wipe boards at desks, hold up manipulatives).
- Observe and record LEP students' participation in small group activities.

After instruction

- Find alternate ways other than written tests for LEP students to show their comprehension (i.e., oral tests, diagrams, drawings, demonstrations).
- Give LEP students (especially beginners) alternate ways to participate in whole-class discussions and respond to questions (think/pair/share, flashcards to raise over head, hand and/or body movements, individual chalkboards for solving computations).
- Assess whether LEP students have mastered mathematical concepts rather than their English grammar and fluency.

VII. Assessment Accommodations for LEP Students

Regulations Establishing Standards for Accrediting Public Schools in Virginia (SOA) and Virginia's implementation of the *No Child Left Behind Act of 2001* require all LEP students to participate in the Mathematics Standards of Learning (SOL) assessments. Each school must form a committee to determine how the LEP student will participate in the SOL assessments, and which, if any, accommodations are required. The committee should include the following people: 1) a person responsible for the education of LEP students in the school or school division; 2) the student's content teacher(s); and 3) an administrator or designee (i.e., guidance counselor or reading specialist). If possible, the student's parent or guardian should also be invited to serve on the committee.

The committee should consider the following factors: 1) the student's level of English proficiency; 2) the level of previous schooling in the home language; and 3) the amount of schooling the student has received in the U.S.

The committee must specify how each LEP student will participate in the SOL assessment:

- with no accommodations
- with accommodations that maintain standard conditions (listing specific accommodations)
- with accommodations that are permissible but do not maintain standard conditions (listing specific accommodations)

The committee's decision must be documented in writing and filed in the student's scholastic record.

The committee should only select accommodations that the LEP student routinely uses in classroom assessment and instruction. The purpose of accommodations is to ensure that LEP students have the opportunity to demonstrate what they know and can do. Students should not be given unnecessary or inappropriate accommodations. Students must take the test in English; translations of the test into a different language are not permitted.

Accommodations that Maintain Standard Conditions (Standard Accommodations)

Standard accommodations allow a student to take the test in a different way without changing what the test is measuring.

Examples of standard accommodations are listed below:

Timing/Scheduling

- time of day
- breaks during test
- multiple test sessions
- order of tests administered

Setting

- preferential seating (at the front of the room or in a study carrel)
- small group testing
- individual testing
- location with minimal distractions

Presentation

- reading the test items in English to the student (except on the English: Reading/Literature, and Research test)
- reading the directions in English to the student
- simplifying oral directions
- place markers to maintain place

Response

- student responds verbally/teacher or proctor marks answer document

Accommodations that are Permissible But Do Not Maintain Standard Conditions (Nonstandard Accommodations)

Nonstandard accommodations significantly change what a test is measuring and do not maintain standard conditions of the test. This type of accommodation should be used only if the committee agrees that the student requires such an accommodation(s) to participate in the SOL assessments. Scores resulting from a nonstandard accommodation must be accompanied by an explanation that these scores resulted from a nonstandard administration.

Examples of accommodations that are permissible but do not maintain standard conditions include:

Presentation

- Reading test items in English on the English Reading/Literature, and Research test
- Bilingual dictionary

Response

- Dictation in English to a scribe (writing sample component of the writing test only)

Further information regarding the participation of LEP students in the SOL assessments can be located on the Web page for the Division of Assessment and Reporting at <http://www.pen.k12.va.us/VDOE/Assessment/LEPsol.html>

VIII. LEP Resources

Center for Applied Linguistics – <http://www.cal.org>

This Web site contains links to the latest articles, research projects, and publications in the field of second language acquisition.

Center for Applied Linguistics (CAL) Resource Guides Online -
<http://www.cal.org/resources/faqs/RGOs/index.html>

The Resource Guides Online contain links to digests, books, listservs, Web sites, and ERIC documents related to teaching LEP students.

Cole, Robert W. (Ed.). (2001). *More Strategies for Educating Everyone's Children*. Alexandria, VA: Association for Supervision and Curriculum Development.

Culture Grams – <http://onlineedition.culturegrams.com/world/index.php>

This Web site contains general information about countries around the world. Viewers can subscribe to an online database and download CultureGrams that contain more detailed information about a country's history, people, and customs.

ESL/Bilingual Resource Guide for Mainstream Teachers -
http://www.pps.k12.or.us/curriculum/PDFs/ESL_Modifications.pdf

This guide, developed by Portland Public Schools in Oregon, contains a chart outlining the stages of language acquisition and several lists of useful tips for teachers of LEP students.

Help Kits produced by the Eastern Stream Center on Resources and Training (ESCORT)
<http://www.escort.org/>

These resources explain some of the cultural differences that teachers may encounter when teaching LEP students in mathematics, English, science, and social studies. It also contains instructional strategies and techniques and sample lessons adapted for teaching LEP students.

National Clearinghouse for English Language Acquisition (NCELA) –
<http://www.ncela.gwu.edu>

This Web site is funded by the U.S. Department of Education Office of English Language Acquisition and contains extensive print and Web resources related to LEP students.

Reed, B., & Railsback, J. (2003). Strategies and Resources for Mainstream Teachers of English Language Learners. Northwest Regional Educational Laboratory.
<http://www.nwrel.org/request/2003may/textonly.html>

Teachers of English to Speakers of Other Languages (TESOL)
<http://www.tesol.org/index.html>

Virginia Department of Education. (2002). English Language Proficiency Standards of Learning.
<http://www.pen.k12.va.us/VDOE/Superintendent/Sols/EnglishSOL02.html>

Virginia Department of Education - ESL Web page.
<http://www.pen.k12.va.us/VDOE/Instruction/ESL/>

IX. Mathematics Resources

Buchanan, K. & Helman, M. "Reforming Mathematics Instruction for ESL Literacy Students". NCBE Program Information Guide Series, Number 15, Fall 1993. <http://www.cal.org/resources/digest/buchan01.html>

FAST Math curriculum (produced by Fairfax County Public Schools) – <http://www.fairfax.k12.va.us>

This compacted mathematics curriculum, developed by teachers in Fairfax County Public Schools, contains lessons, activity sheets, and extension activities for teaching literacy skills and mathematical concepts to LEP students in grades 4-12 who are performing two or more years below grade level in mathematics. The curriculum has two components: 1) an elementary level that covers objectives for grades 1-6, and 2) a pre-algebra level that covers objectives for grades 7 and 8. The curriculum integrates the study of mathematics and English vocabulary and relies heavily on hands-on and collaborative activities using mathematics manipulatives.

School divisions can order the FAST Math curriculum on CD-ROM for \$5.00 by contacting:

National Clearinghouse for
English Language Acquisition (NCELA)
2121 K Street, N.W.
Suite 260
Washington, D.C. 20037
202-467-0867
800-321-6223

Multilingual Handbooks

Various educational publishers produce multilingual handbooks that contain translations (Cambodian, Cantonese, Haitian Creole, Korean, Spanish, and Vietnamese) of some of the most common mathematical terms.

National Council of Teachers of Mathematics (NCTM) – <http://www.nctm.org/> and http://my.nctm.org/store/ECat/product_search_quick.asp?Run=1&search=changing+the+face

Changing the Faces of Mathematics: Perspectives on Latinos

Changing the Faces of Mathematics: Perspectives on Asian Americans and Pacific Islanders

Changing the Faces of Mathematics: Perspectives on Multiculturalism and Gender Equity

Todos: Mathematics for All - <http://www.todos-math.org/resources.html>

This Web site contains a collection of resources for teaching mathematics to Latino/Hispanic students.

Virginia Department of Education. (2001). K-12 Mathematics Standards of Learning
<http://www.pen.k12.va.us/VDOE/Superintendent/Sols/home.shtml>

Virginia Department of Education - K-5 Mathematics Web page
http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/emath.html

Virginia Department of Education - Middle School Mathematics Web page
http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/mmath.html

Virginia Department of Education - Secondary Mathematics Web page
<http://www.pen.k12.va.us/VDOE/Instruction/Math/>

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