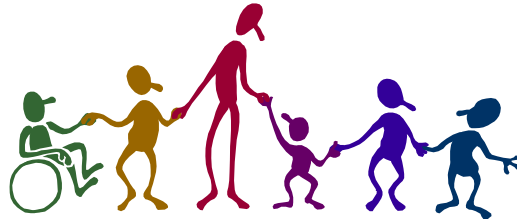


Teaching Mathematics to All Learners

INCLUDING English Language Learners

Miriam A. Leiva, Founding President, **TODOS: Mathematics for All**



Equity without Excellence is useless. Excellence without equity is unjust. *G. Mendieta 2008*

All students, regardless of their personal characteristics, backgrounds, or physical challenges, must have opportunities to study - and support to learn - mathematics. Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students.

NCTM Equity Principle, p.12. *Principles and Standards for School Mathematics, 2005*

Every student should have equitable and optimal opportunities to learn mathematics free from bias - intentional or unintentional- based on race, gender, socioeconomic status, or language. In order to close the achievement gap, all students need the opportunity to learn challenging mathematics from a well-qualified teacher who will make connections to the background, needs, and cultures of all learners.

NCTM Position Paper, *Closing the Achievement Gap, 2005*

Ideally, all children who are not proficient in English should receive mathematics instruction in their first language as they work to acquire English proficiency. Alternative and authentic assessment practices should be used, and the federal mandate for achievement, insofar as it is based on inadequate and inequitable standardized assessments, should be challenged.

NCTM Position Paper, *Closing the Achievement Gap, 2005*

Miriam A. Leiva, Distinguished Professor Emerita
Mathematics Department, University of NC Charlotte
maleiva@unc.edu, www.todos-math.org

Our Responsibilities for ALL Students: High Expectations, Rigorous programs

DEMAND MORE: Each student has unique talents, abilities. Have high expectations and demand knowledge, and discipline. Let them know that you believe in their abilities. *If you believe it you will see it.*

DIFFERENCES: Provide for a variety of learning styles, prior knowledge, experiences, and all differences.

HONOR: Promote pride in each student's personal history, ethnic and cultural heritage.

CLASSROOM: Develop a community of learners in a **supportive non-threatening** environment.

LESSONS: Design lessons to draw on students' strengths and experiences.

Include language in the lesson plan, as an integral part of the lesson!

- **TEACHING TOOLS:** Make use of visuals, models, manipulatives, graphs, diagrams, technology, realia, and other resources Connect models to words so that students understand the math and the problems.
- **COLLABORATION:** Use creative cooperative teaching with teachers of other disciplines, including bilingual. Use peers, same and other grades, and others volunteers to assist.



TEACHING STRATEGIES: Accommodate differences! Use the best teaching strategies, see *NCTM Professional Teaching Standards*. Speak clearly and face the class. Connect spoken words to written visually. Use dialogues (teacher and student-centered) not monologues (teacher-centered). Do Wait Time.

- **GROUPING:** Whole class, small groups, pairs. Assign students partner/s to help, content or language.

PROBLEM SOLVING, APPLICATIONS: Do not focus on mindless worksheets but on Problem Solving. Give problems/projects that require time (hours, day, week, month).. Applications and real world problems are not solved in a minute. *Life is full of complex problems not exercises.*

- **CONTEXT:** Learning is contextual. Students learn, Mathematics and English, when they learn it in a context, applications, meaningful to them.
- **REASONING, DISCOURSE:** Encourage reflection, discussion, and communication. Conjecturing and justifying are essential to demonstrating knowledge, and assessing understanding.

COMMUNICATIVE TEACHING: USE LANGUAGE 1 and LANGUAGE 2, AS NEEDED.

- **LANGUAGE:** Vocabulary focus: words, phrases, sentences. Use L1, L2. Use English to learn Mathematics and Mathematics and social English to learn Academic English.
- **COMMUNICATION:** We must communicate to learn languages and mathematics. Focus on mathematical representations, mathematics language syntax, grammar, and semantics.
 - Model: Use objects, drawings, pictures, and graphs to model a situation
 - Read: Help students read, interpret, understand information, and restate the problem.
 - Write: Write to describe, record and explain, to create and solve problems.
 - Speak: Discuss and solve in small groups, explain to the class

ASSESSMENT: Seamless approach to Curriculum, Teaching, Assessment. Assess if the barriers are academic or linguistic. When assessing, focus on both! Be flexible with grammar or spelling.

WAIT TIME, PATIENCE: In all instances, academic an otherwise, we must support students adjustments to school/classroom, culture, routines. **Patience is Golden.**

Summary of key points in presentation.

All students must have an equal opportunity to be different, **M. A. Leiva**

What language to use: Learning is most efficient in the child's primary language. For English Language Learners try use the first language to teach the second (English) and the third (Mathematics).

We are dealing with several languages: Social English, Academic English, and the Language of Mathematics:

- **Mathematics and language:** Students must learn the language of Mathematics (symbols, syntax, grammar) and become proficient in translating to and from various representations: symbols, graph, data, pictures, models, the Mathematical Language “in English” to the English Language and back.
- **Problems with words are a challenge to ALL students.**
- **Being fluent in social situations in English is far from being fluent in the math classroom.**

Mathematics and Problem Solving. For success in **problem solving** we must promote:

- Students *translating* problems to-from the “languages” used. They must be multilingual.
- Students *reasoning, making connections* from “exercises” to more complex, realistic problems
- Students *solving problems, reflecting* on their solution, and *communicating* results effectively.
- Students *solving problems with applications/connections* with mathematics and other disciplines

Language and assessment: Measure mathematics knowledge and understanding and language proficiency.

Language and Teaching Strategies:

- Seamless Approach to Instruction, Curriculum, and Assessment.
- High Expectations. Problem Solving Approach.
- Flexible groupings.
- Use of visuals, models and manipulatives.

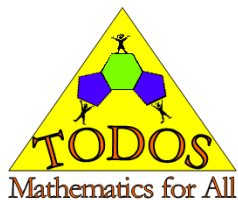
Instruction that ...diminishes educational inequities by considering the linguistic factors ... must be designed and implemented for Latino children to have an opportunity to maximize their learning from instruction. N. Hernandez, p. 57, Perspectives on Latinos, NCTM (1999)

Language and concept development – Adapted from Garrison/Mora

Reference: L. Garrison, J.K.Mora, *Adapting Mathematics Instruction for ELL*, Changing Faces of Mathematics: Perspectives on Latinos, NCTM, (1999).

<i>Language of instruction</i>	<i>Mathematics concept</i>	<i>Learning</i>	<i>Teaching</i>
Unknown	Unknown	Limited Learning opportunities; modify instruction	Use students' language to teach concept or develop concepts through other known concepts, pictures, manipulatives, acting out.
Known	Unknown	Concept development	Use known language to teach concepts. Develop English through visuals, etc.
Unknown	Known	Language development	Use known concept to develop language.
Known	Known	Advance to next conceptual or linguistic development	Review, Assessment, reevaluate language and mathematics concept.

As a member of TODOS you will receive a copy of the
Research Monograph, on the Achievement Gap &
The first two issues of our Research Journal:
Teaching for Excellence and Equity in Mathematics Education



Complete the membership form below

TODOS: Mathematics for ALL

An Affiliate of the National Council of Teachers of Mathematics

The mission of **TODOS: Mathematics for All** is to advocate for an equitable and high quality mathematics education for all students, in particular Latino/Hispanic students, by increasing educators' equity awareness and their ability to foster students' proficiency in rigorous and coherent mathematics.

www.todos-math.org

TODOS: Mathematics for ALL

Name:

Mailing Address:

City, State, Zip:

Work phone:

Home phone:

Fax:

Email:

Work place:

Position:

Grade Level(s)

New Membership _____ Renewing Member _____

All members will be included in the TODOS Directory unless NO is specified here: _____.

Education Affiliations: NCTM _____ NCSM _____ Other(s)

Would you like to be involved in TODOS committees? Circle area(s)

Publications

Research

Website

Help as needed

Other

Additional Member Information:

Mail application along with dues: _____\$25 per year or _____\$70 for 3 years OR _____ \$75 per school/1 year

TODOS

School and Institutional Memberships are also available. See the website for details.
www.todos-math.org

PO Box 25482 Tempe, AZ 85285-5482

References:

- Cuevas, G. & Driscoll, M., Eds. (1993) *Reaching All Students with Mathematics*. Reston, VA: NCTM.
- Cummins, J. (2003) *Supporting ESL students in learning the language of Mathematics*. Issues and Trends in Mathematics. Chicago, IL: Pearson Education/Scott Foresman.
- Echevarria, J. (1998). *Teaching Language Minority Students in Elementary School*. (Research Brief 1). Center for Research on Education, Diversity and Excellence, Santa Cruz, CA.
- Garrison L.& J. K. Mora. (1999). Adapting Mathematics Instruction for ELL. In *Changing Faces of Mathematics: Perspectives on Latinos*. Reston, VA: NCTM.
- Gibbons, P. (2002). *Scaffolding Language, Scaffolding Learning: Teaching and Language Learners in the Mainstream Classroom*. Portsmouth, NH: Heinemann.
- Hernandez, N. (1999). The mathematics-bilingual-education connection: two lessons. In *Changing Faces of Mathematics: Perspectives on Latinos*. Reston, VA: NCTM.
- Jarrett, D. Eds. (2002). *Teaching Mathematics and Science to English – Language Learners. It's Just Good Teaching*. NW Regional Educational Laboratory, Portland, OR.
- Khisty, L.L. (1995). Making inequality: Issues of language and meanings in mathematics teaching with Hispanic students. In W. Secada, E. Fennema, & L. Adajian (Eds.), *New Directions for Equity in Mathematics Education*. NY: Cambridge University Press.
- Khisty, L.L. (1996). Children talking mathematically in multilingual classrooms: Issues in the role of language. In H. Mansfield, N. Pateman, & N. Bednarz (Eds.), *Mathematics for Tomorrow's Young Children: International Perspectives on Curriculum*. Boston, MA: Kluwer Academic Publishers.
- Khisty, L.L. (1997). Making mathematics accessible to Latino students: Rethinking instructional practice. In J. Trentacosta and M. Kenney (Eds.), *Multicultural and Gender Equity in the Mathematics Classroom: The Gift of Diversity, 97th Yearbook*. Reston, VA: NCTM.
- Khisty, L. L.& Viego, G.(1999). Challenging conventional wisdom: A case study. In *Changing the Faces of Mathematics: Perspectives on Latinos and Latinas*. Reston, VA: NCTM.
- Khisty, L. L., (1996). Making mathematics multicultural with meaning and empowerment. *Journal of Educational Issues of Language Minority Students*, 17(3),49-64.
- Khisty, L.L. (2002). Mathematics learning and the Latino student: Suggestions from research for classroom practice. *Teaching Children Mathematics*, 9, (1), 32-35.
- Moschkovich, J.N. (1999). Understanding the needs of Latino students in reform-oriented mathematics classrooms. In L. Ortiz-Franco, N. Hernandez, and Y. De La Cruz (Eds.), *Changing the Faces of Mathematics (Vol. 4): Perspectives on Latinos*. Reston, VA: NCTM.
- Moschkovich, J.N. (2000). Learning mathematics in two languages: Moving from obstacles to resources. In W. Secada (Ed.), *Changing the Faces of Mathematics (Vol. 1): Perspectives on multiculturalism and gender equity* (pp. 85-93). Reston, VA: NCTM.

- Moschkovich, J.N. (1999). Supporting the participation of English language learners in mathematical discussions. *For the Learning of Mathematics*, 19(1), 11-19.
- Moschkovich, J. (2002). A situated and sociocultural perspective on bilingual mathematics learners. *Mathematical Thinking and Learning*, 4(2&3), 189-212.
- National Assessment of Educational Progress (NAEP, 2005). National Center for Education Statistics [NCES]. <<http://nces.ed.gov>
- National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston, Va.: NCTM.
- National Research Council (2001). *Adding it up: Helping Children Learn Mathematics*. Washington, DC: National Academy Press.
- Ortiz-Franco, L., Hernandez, N., & De La Cruz, Y. (Eds.) (1999). *Changing the faces of mathematics (Vol. 4): Perspectives on Latinos*. Reston, VA: National Council of Teachers of Mathematics.
- Secada, W., Fennema, E., & Byrd, L. (Eds.) (1995). *New directions for equity in mathematics education*. NY: Cambridge University Press.
- Secada, W., Ortiz-Franco, L., Hernandez, N. & De La Cruz, Y.(Eds.) (1999). *Changing the Faces of Mathematics, Perspectives on Latinos*, Reston, VA: NCTM, 1999.
- Sowder, J. & Schappelle, B. (Eds.) (2002) *Lessons Learned from Research*, Reston, VA: NCTM.
- Sutton, J. & Krueger, A., (Eds) (2002). *EDThoughts. What We Know About Mathematics Teaching and Learning*. Mid-Continent Research for Education and Learning. In partnership with McREL, ASSM Association of State Supervisors of Mathematics, and The National Network of Eisenhower Regional Consortia and Clearinghouse. Aurora, CO.
- Tharp, R.G. (1997). *From at-risk to Excellence: Research, Theory, and principles for practice (Research Report 1)*. Center for Research on Education, Diversity and Excellence, Santa Cruz, CA.
- Thomas, W.P. & Collier, V. P. *A national study of school effectiveness for language minority students' long-term academic achievement*. Santa Cruz, CA and Washington, DC: Center for Research on Education, Diversity and Excellence.
<http://www.crede.uscsc.edu>, <http://www.cal.org/crede/pubs>
- Trentacosta, J & Kenney, M., Eds. (1997). *Multicultural and Gender Equity in the Mathematics Classroom: The Gift of Diversity. 1997 Yearbook*. Reston, VA: NCTM.

World Wide Web Resources

Center for Applied Linguistics

<http://www.cal.org/>

Center for Bilingual Education and Research (CBER)

<http://www.asu.edu/educ/cber>

Center for Research on Education, Diversity & Excellence

<http://www.crede.ucsc.edu/>

Directory of ESL Programs in the United States

<http://www.globalstudy.com/embark/us/>

Eisenhower National Clearinghouse

<http://www.enc.org>

EQUALS, Lawrence Hall of Science, University of California, Berkeley

<http://equals.lhs.berkeley.edu/>

ESL Magazine

<http://www.eslmag.com>

Fundacion Cientec

<http://www.cientec.or.cr.matematica.html>

The K-12 Mathematics Curriculum Center

<http://www2.edc.org/mcc/>

Mathematical Association of America

<http://www.maa.org/>

Math Forum

<http://mathforum.org/dr.math/>

Mathematics Projects

<http://www.eduplace.com/projects/mathproj.html>

National Academy of Sciences

<http://www.nas.edu/>

National Center for Education Statistics

<http://nces.ed.gov>

The National Coalition for Equity in Education, University of California, Santa Barbara

<http://ncee.education.ucsb.edu/>

National Council of Teachers of Mathematics

<http://www.nctm.org>

National Science Foundation

<http://www.nsf.gov/>

Pew Hispanic Center

<http://pewhispanic.org>

Society for Advancement of Chicanos and Native Americans in Science

<http://www.SACNAS.org/>

U.S. Department of Education

<http://www.ed.gov/index.jhtml>

TODOS: Mathematics for ALL

An Affiliate of the National Council of Teachers of Mathematics (NCTM)

The mission of **TODOS: Mathematics for All** is to advocate for an equitable and high quality mathematics education for all students, in particular Latino/Hispanic students, by increasing educators' equity awareness and their ability to foster students' proficiency in rigorous and coherent mathematics.

Visit our website: www.todos-math.org

