NCTM Annual Meeting & Exposition April 7, 2017

MATCHING AN EFFECTIVE STRATEGY TO THE LANGUAGE LEVEL OF ELLS

Presented By: Ricardo Martinez and Ji Yeong I

TODOS Mathematics for ALL

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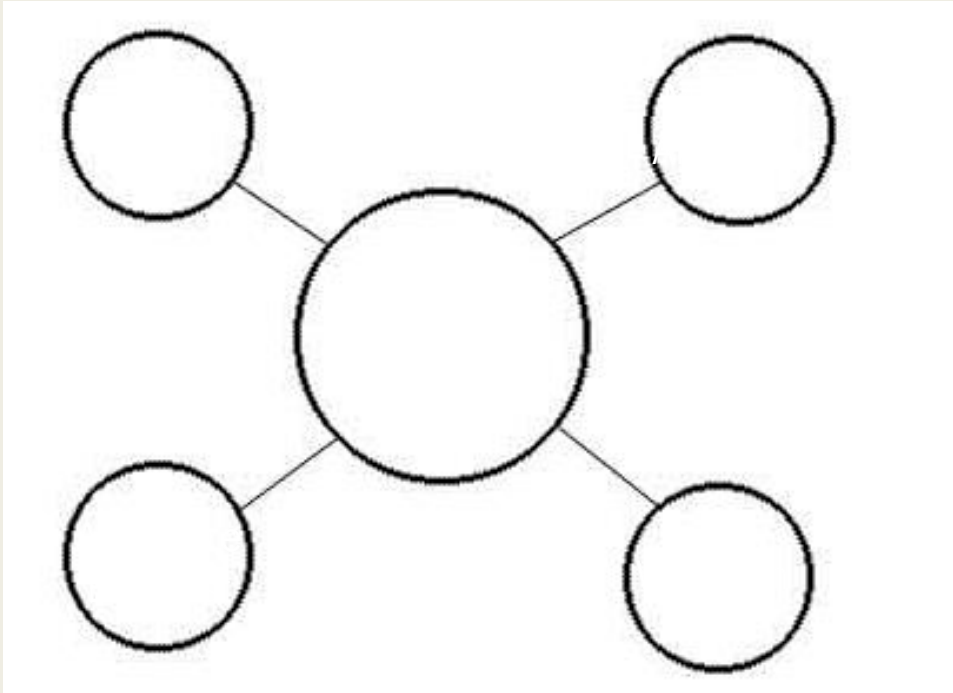
Introductions on Identity

Place your name in the center circle of the structure below. Write an important aspect of your identity in each of the satellite circles -- an identifier or descriptor that you feel is important in defining you. This can include anything: Asian American, female, mother, athlete, educator, Taoist, scientist, or any descriptor with which you identify.



Introductions on Identity (Who is Ricardo)

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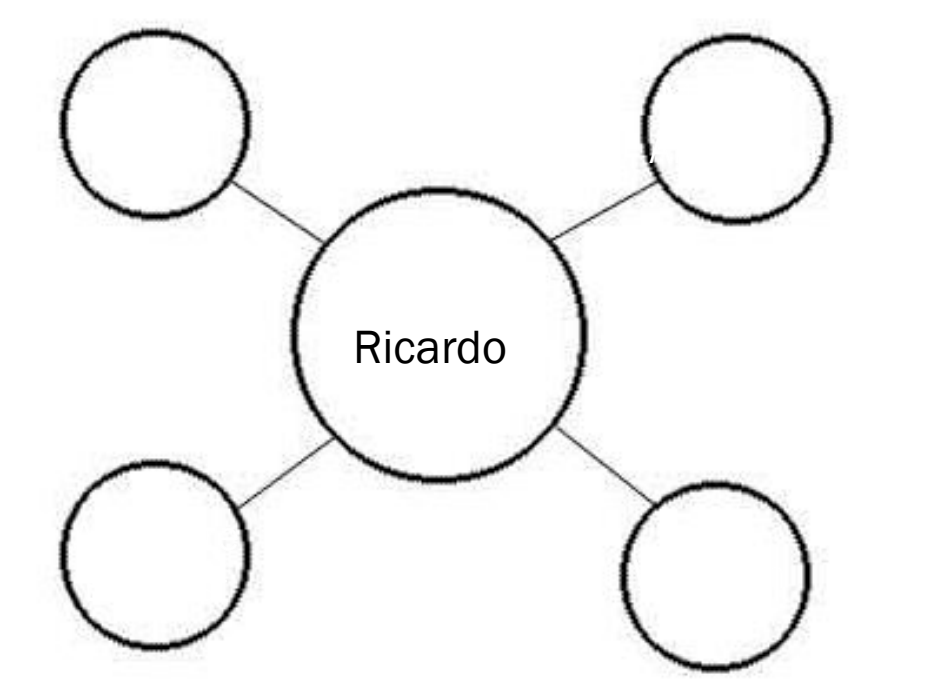

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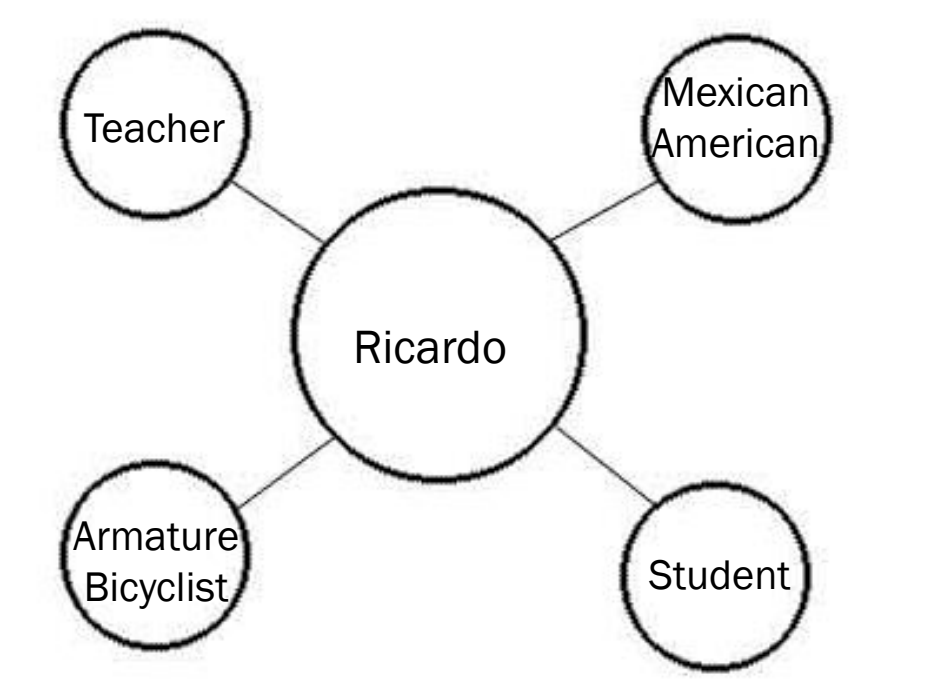
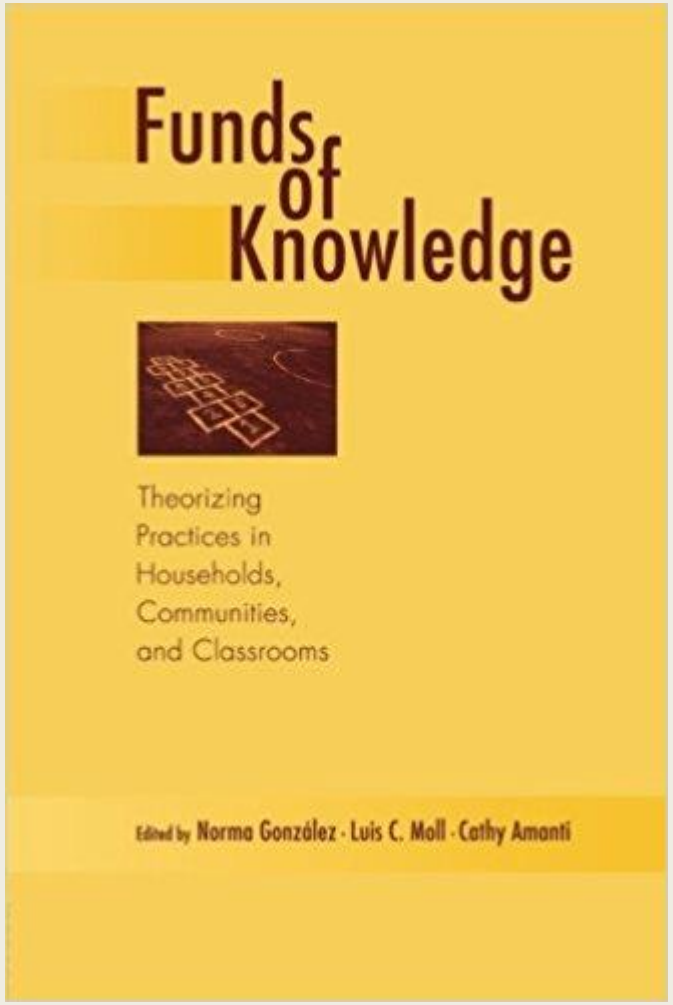
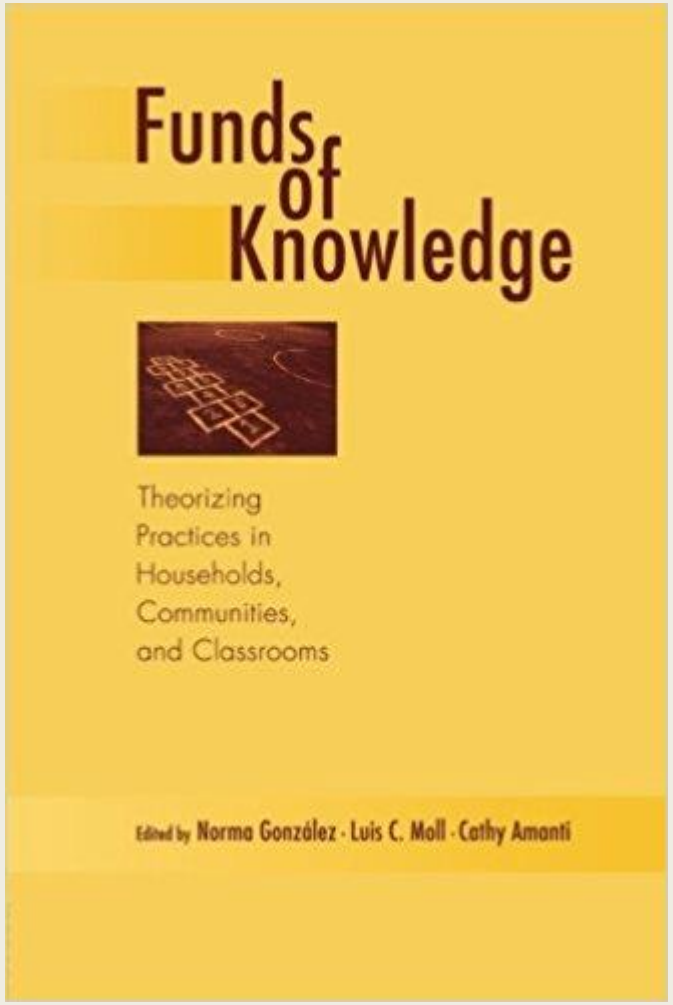



Funds of Knowledge
Theorizing Practices in Households, Communities, and Classrooms
Edited by Norma González · Luis C. Moll · Cathy Amanti

“[p]retending that we can “improve” marginalized students’ mathematical opportunities without taking into account lived experience is educationally naïve at best” (Civil, 2014).



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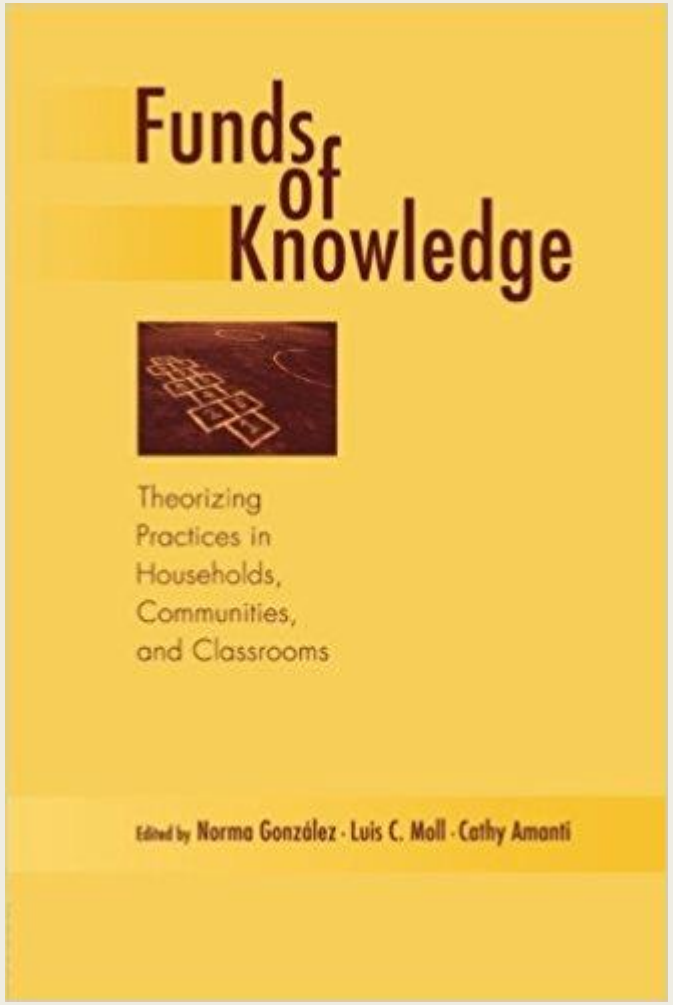

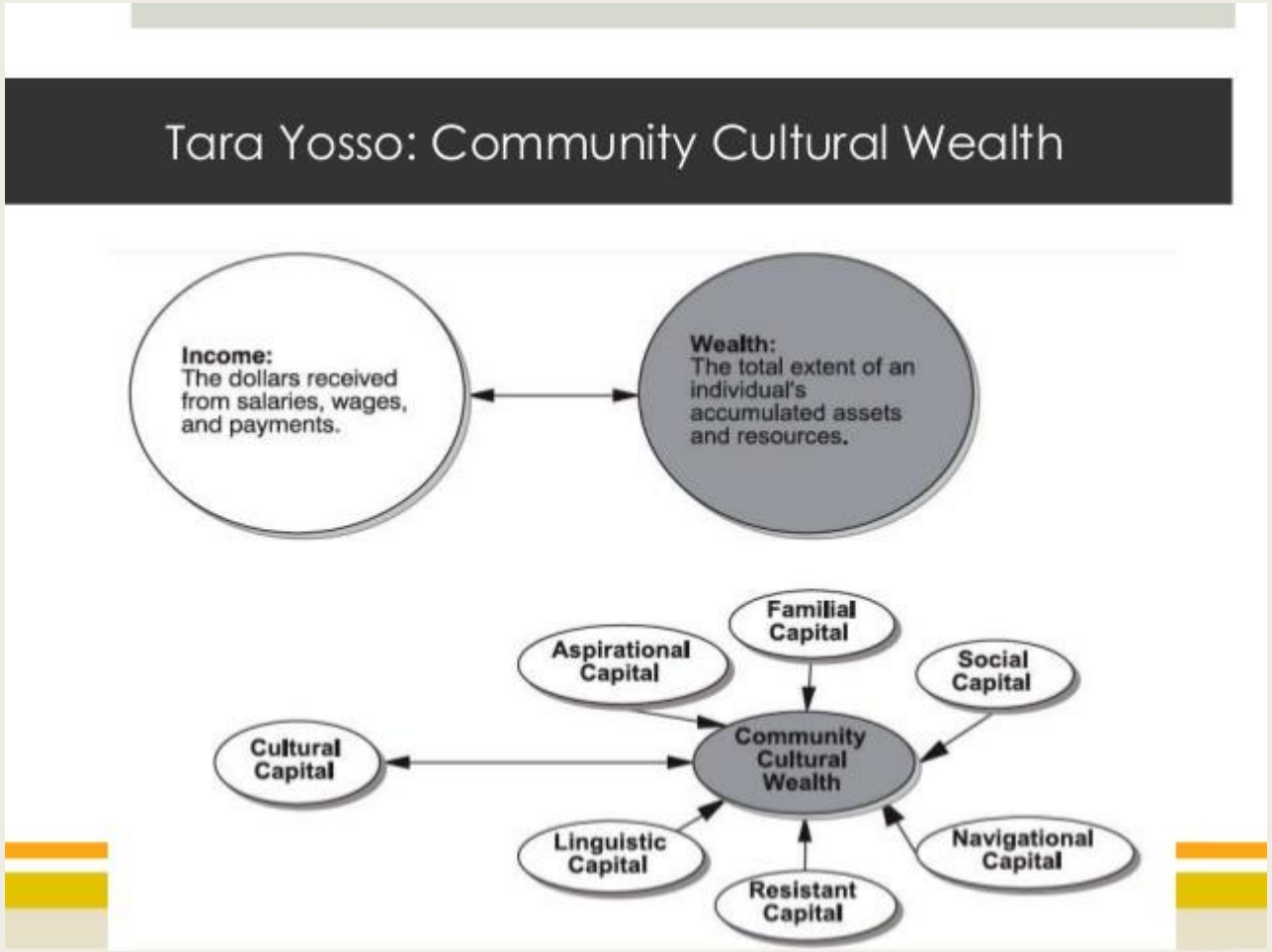

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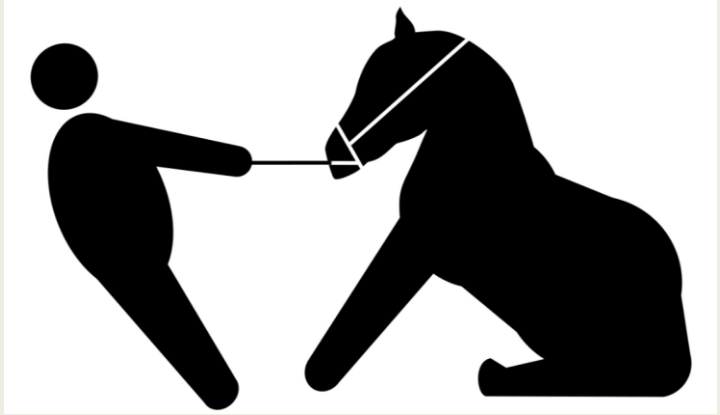
It's ALL about ALL Students Learning Quality Mathematics: Advocating for Equity and Social Justice

TODOS: Mathematics for ALL

Scottsdale Plaza Resort, Phoenix Metropolitan Area

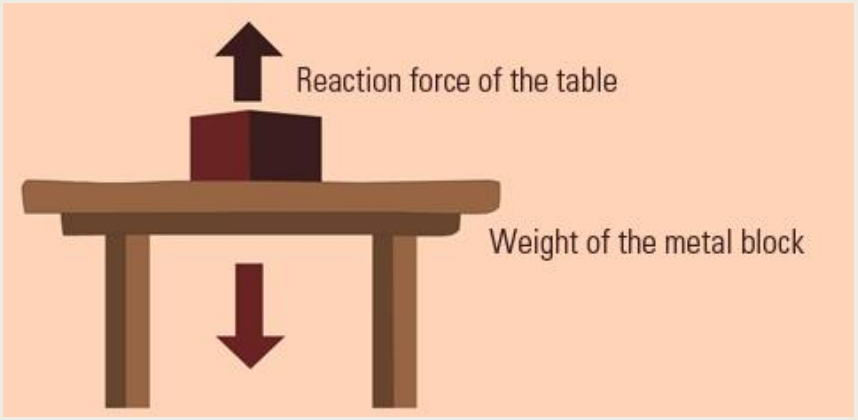
Epistemology – Ideology

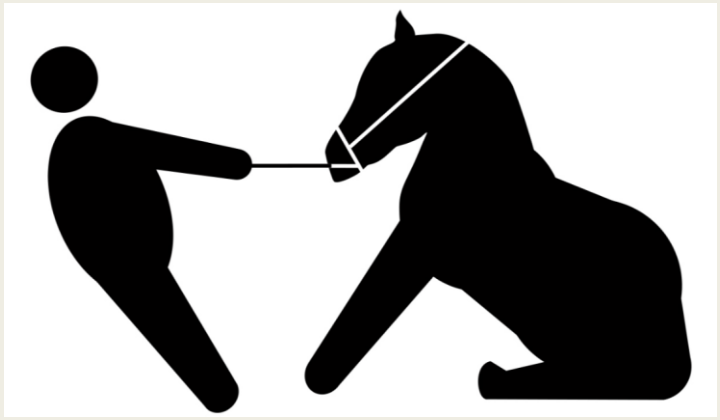
- "Teaching the purely technical aspect of the procedure is not difficult; the difficulty lies rather in the creation of a new attitude - that of dialogue, so absent in our own upbringing and education." from Education for Critical Consciousness by Paulo Freire



Epistemology – Ideology Resistance is Learning

- "Teaching the purely technical aspect of the procedure is not difficult; the difficulty lies rather in the creation of a new attitude - that of dialogue, so absent in our own upbringing and education." from Education for Critical Consciousness, Freire
- "The term counter-hegemony is used within critical pedagogy to refer to those intellectual and social spaces where power relationships are reconstructed to make central the voices and experiences of those who have historically existed within the margins of mainstream instruction." – Antonia Darder





Bicultural and Multicultural Education

Bicultural and Multicultural Education

- “The term bicultural is utilized instead of minority – a term that linguistically, and hence politically, reflects and perpetuates a view of subordinate cultures as deficient and disempowered. Bicultural, in this context, connotes an enculturation process that is distinct from that of affluent monocultural Euroamerican students” Antonia Dardar – Culture and Power in the Classroom

Eliminate a deficit view of mathematics learning

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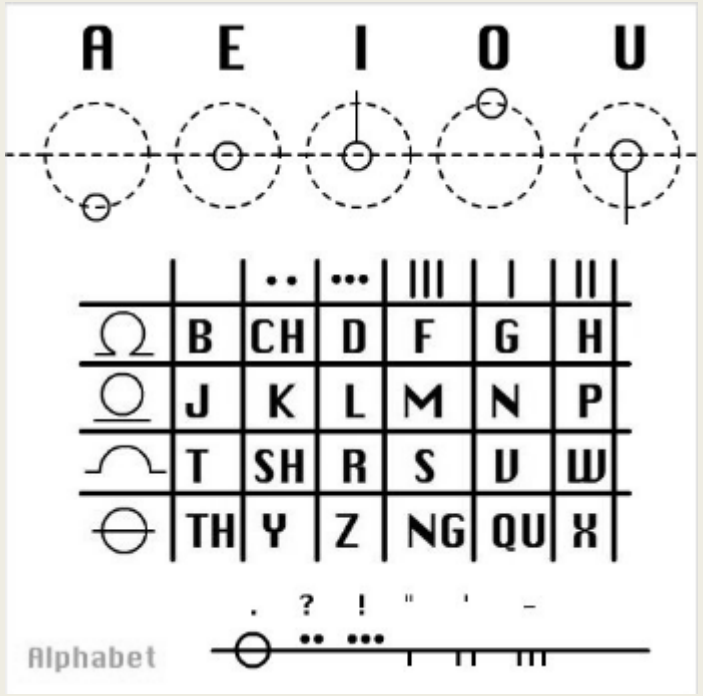

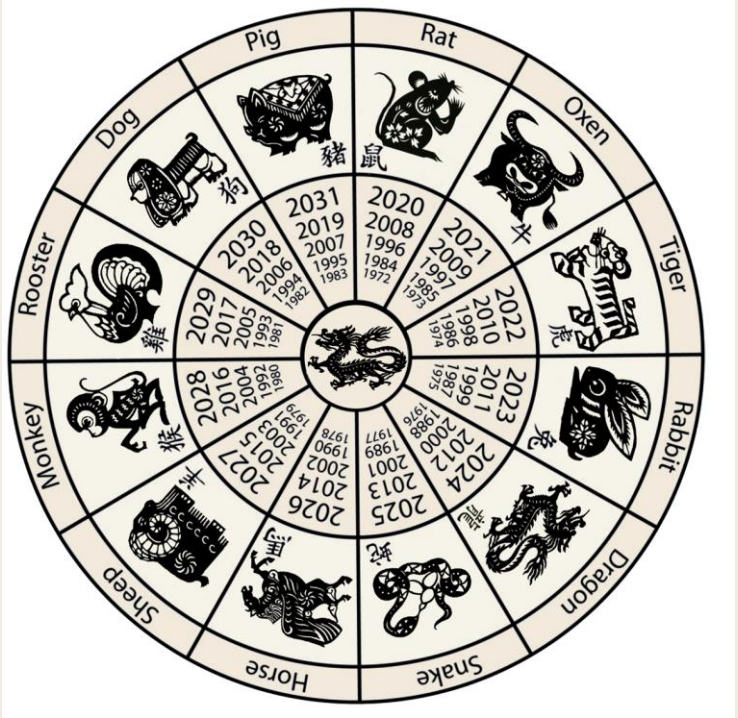

Defining ELLs

- **Definition 1**: "*A student's language background is in a language other than English, and the student's proficiency in English is such that the probability of the student's academic success in an English-only classroom is below that of an academically successful peer with an English language background*." (Iowa Code section 280.4)

- **Definition 2**: Ballantyne et al. (2008) define ELLs as “who are not yet proficient in English and who require instructional support in order to fully access academic content in their classes” (p. 2).

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Defining ELLs with Respect to Language Levels: Beginning stage

- Experiences this stage for about two years
- Exhibits periods of silence followed by speech emergence.
- Uses unclear pronunciation that may inhibit communication.
- May or may not be at the beginning stage of mathematical development

Defining ELLs with Respect to Language Levels: Intermediate stage

- Experiences this stage for approximately 2-4 years.
- Uses simple sentences in the present tense
- Speaks in phrases and sentences in first language and English (code-switching) while making sense of mathematical concepts.
- Speaks to convey simple messages and is understood by those who are acquainted with him or her.
- Frequently requires repetition or clarification of mathematical concepts or linguistic structures.

Defining ELLs with Respect to Language Levels: Advanced Stage

- Experiences this stage for approximately 4-7 years.
- Continues to require processing time for more advanced content-based terminology.
- Can read and write, using grade-appropriate written text containing all tenses.
- Speaks so that most listeners understand.
- Uses all tenses in speaking with few errors.
- Occasionally requests repetition or clarification of unfamiliar concepts or terminology.

Task 1.0

120 – 20 =

Task 1.1

120 – 20 =

111 + 24 =

Task 1.2

120 – 20 =

111 + 24 =

5, 16, 27, 38, _____ , _____

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Task 1.3

- Traveling 120km/h in your lorry, you are stopped by a bobby. Afraid to be nicked you apologize and say that you are just knackered and really had to send a penny. The policewomen said you were driving like a radge. She was talking nineteen to the dozen and said you were traveling 20km/h over the limit. What does the advisory sign reads?

Task 1: Reflection

- What is the role of having a challenging tasks?
- What is the role of slang when using/designing math tasks?
- How can a students culture be incorporated in to problems?
- How did talking to someone next to help you make meaning of the problem?
- What consideration should you as a teacher make when giving this task?
  - *What accommodations can be made? If any?*

Reminder to Self

DO NOT REDUCE COGNITIVE LOAD

KEEP THE SAME HIGH EXPECTATIONS FOR ALL STUDENTS

Task 1.3

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Strategies Part 1

- Lesson planning – Identify key non math vocabulary words.
  - *Be mindful of slang and idioms in both English and Spanish*
- Incorporate a language goal with the math goal
  - *Just because it is math does not mean they cannot learn E*
- Dictionaries and Thesaurus should still be utilized.
  - *Make sure to give students ample time to use them.*
    - Extend waiting time
- Use images with labels and utilize synonyms
- Use Manipulatives (physical examples)
- Use graphic organizers
- Encourage classroom discussion.
  - *Allow students to make meaning*

Lorry = Truck


British Lorries - 1960s
GOLDEN YEARS
Atkinson L646
(Holt Lane Transport)
ALBION SUGAR Co LTD
Foden S34/36
(Albion Sugar Co.)
AEC Mercury
(Shell-Mex & BP Ltd.)
SHELL
PETROLEUM PRODUCTS
BP
Scammell Highwayman
(Shell-Mex & BP Ltd.)
Albion Reiver
(Pollock of Mutterlough)
ERF LV
(Bank's Brewery)
Leyland Retriever
(Ready Mixed Concrete)
BRITISH LORRIES
The long history of British commercial motor vehicle manufacturing, stretches back more than 100 years, reaching its peak in the postwar era of the late 1940s to the 1960s. This was a glorious period when the classic British manufacturers such as Leyland, Foden, ERF, Bedford, Thornycroft and Scammell dominated our roads and although long since disappeared are still fondly remembered today. This original print by Golden Era features the original illustrations of British artist Kenneth C. Wisdom.

Bobby = Officer = Cop = Law Enforcement

Task 1.3

- Traveling 120km/h in your lorry, you are stopped by a bobby. Afraid to be nicked you apologise and say that you are just knackered and really had to send a penny. The policewoman said you were driving like a radge. She was talking nineteen to the dozen and said you were traveling 20km/h over the limit. What does the advisory sign reads?

Task 1.21

- Traveling 120km/h in your lorry, you are stopped by a bobby. ~~Afraid to be nicked you apologise and say that you are just knackered and really had to send a penny. The policewoman said you were driving like a radge.~~ She ~~was talking nineteen to the dozen and~~ said you were traveling 20km/h over the limit. ~~What does the advisory sign reads?~~ How can you determine what the advisory sign reads?

Task 1.21

- Traveling 120km/h in your lorry, you are stopped by a bobby. ~~Afraid to be nicked you apologise and say that you are just knackered and really had to send a penny. The policewoman said you were driving like a radge.~~ She ~~was talking nineteen to the dozen and~~ said you were traveling 20km/h over the limit. ~~What does the advisory sign reads?~~ How can you determine what the advisory sign reads? What additional context would be needed to prove you were not speeding (assume that the device measuring speed is broken).

Defining ELLs with Respect to Language Levels: Intermediate stage

- Experiences this stage for approximately 2-4 years.
- Uses simple sentences in the present tense
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- Speaks to convey simple messages and is understood by those who are acquainted with him or her.
- Frequently requires repetition or clarification of mathematical concepts or linguistic structures.

Task 2

Un tren para atravesar un túnel de 900 metros de longitud, tarda 76 segundos y para pasar delante de un observador tarda 16 segundos. ¿Cuál es la longitud del tren?

Task 2: Reflection

- What is the role using images/drawings?
- What difficulties if any did you have understanding the problem?
- How can a students culture be incorporated in to problems?
- How did talking to someone next to help you make meaning of the problem?
- What consideration should you as a teacher make when giving this task?
  - *What accommodations can be made? If any?*

Strategies Part 2

- Lesson planning – Identify key non math vocabulary words.
  - *Be mindful of slang and idioms in both English and Spanish*
- Incorporate a language goal with the math goal
  - *Just because it is math does not mean they cannot learn E*
- Problem posing education
  - *Situate students as problem solvers*
    - Extend waiting time
- Use images with labels with strategic color coding.
- Use gestures while incorporating storytelling.
- Use graphic organizers
- Encourage classroom discussion.
  - *Allow students to make meaning*

Task 2

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Task 4

(1) 신하가 받을 밀의 양을 구하여, 아래 표를 완성하여라.

날	첫째 날	둘째 날	셋째 날	넷째 날	다섯째 날	여섯째 날	…
밀의 양 (톨)	1	2	4				…

(2) 신하가 10번째 날에 받을 밀의 양을 구하여라.

(3) 체스판의 마지막에 해당하는 64번째 칸에 해당하는 날에 받을 밀의 양을 거듭제곱을 사용하여 나타내어라.

Task 4 Video

Task 3: Reflection

- What is the role using images/drawings?
- What difficulties if any did you have understanding the problem?
- How can a students culture be incorporated in to problems?
- How did talking to someone next to help you make meaning of the problem?
- What consideration should you as a teacher make when giving this task?
  - *What accommodations can be made? If any?*

Strategies Part 3

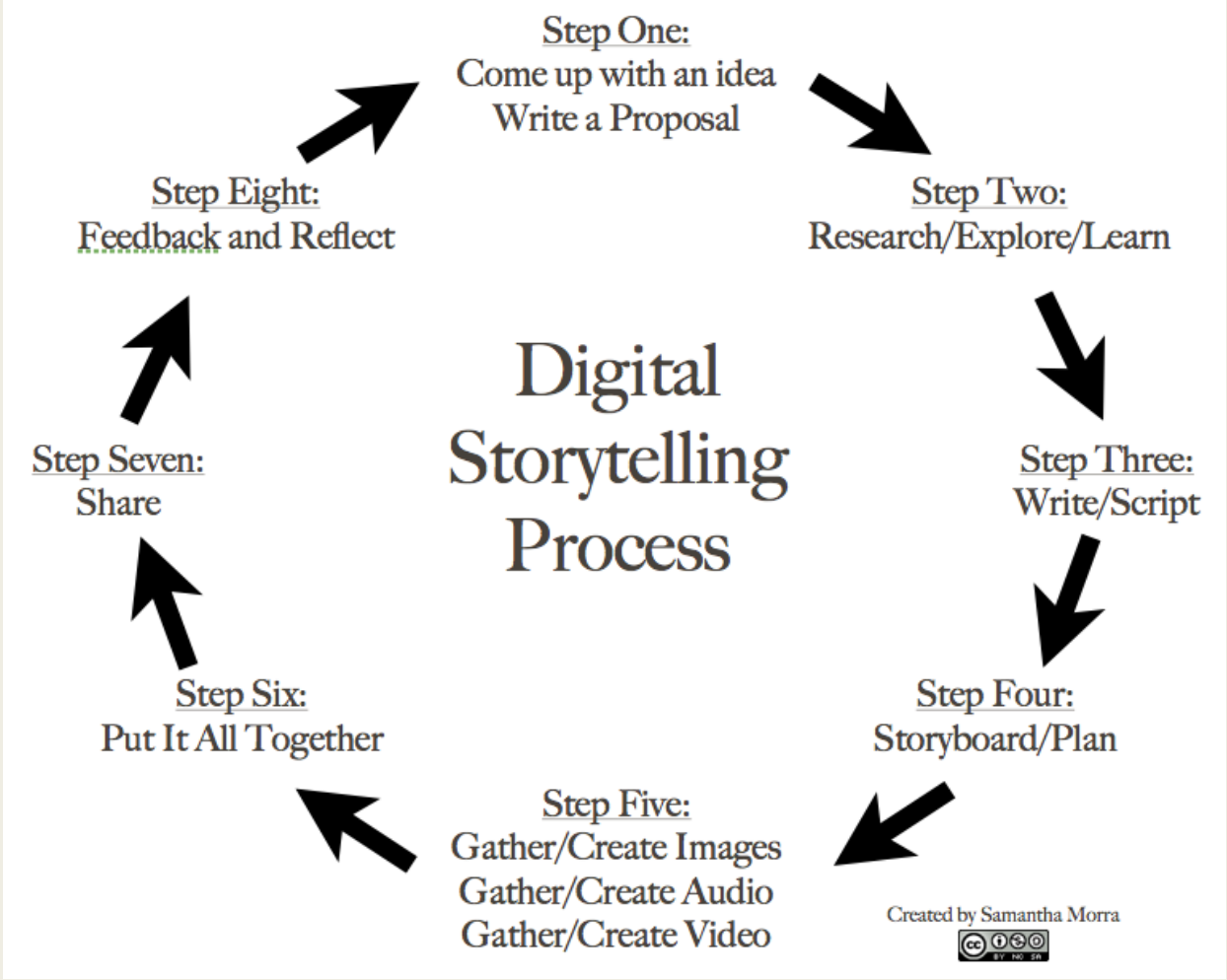
- Lesson planning – Identify key non math vocabulary words.
  - *Lesson Study*
- Incorporate a language goal with the math goal
  - *Just because it is math does not mean they cannot learn English*
- Culturally Responsive Pedagogy
- Technology –
  - *Move past images and utilize simulations*
    - phet.colorado.edu, nlvm.usu.edu, demonstrations.wolfram.com
- Digital Story Telling
- Scaffolding
- Encourage classroom discussion.
  - *Allow students to make meaning*

Digital Storytelling

Article Recommendation : The Power of Digital Storytelling to Support Teaching and Learning

By Bernard R. Robin (2016)

Digital Storytelling



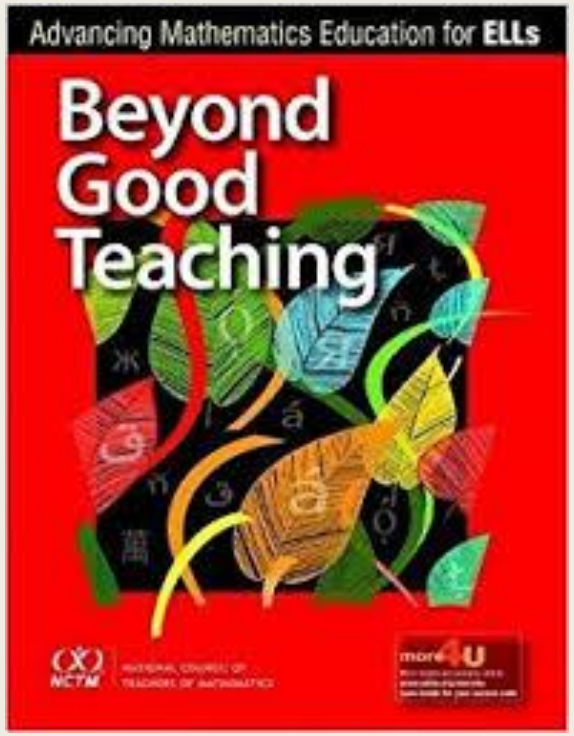
Chval & Chavez (2011)

Fig. 1 These 7 research-based strategies are key to supporting ELLs' mathematical proficiency.

1. Connect mathematics with students' life experiences and existing knowledge (Barwell 2003; Secada and De La Cruz 1996).
2. Create classroom environments that are rich in language and mathematics content (Anstrom 1997; Khisty and Chval 2002).
3. Emphasize meaning and the multiple meanings of words. Students may need to communicate meaning by using gestures, drawings, or their first language while they develop command of the English language and mathematics (Moll 1988, 1989; Morales, Khisty, and Chval 2003; Moschkovich 2002).
4. Use visual supports such as concrete objects, videos, illustrations, and gestures in classroom conversations (Moschkovich 2002; Raborn 1995).
5. Connect language with mathematical representations (e.g., pictures, tables, graphs, equations) (Khisty and Chval 2002).
6. Write essential ideas, concepts, representations, and words on the board without erasing so that students can refer to them throughout the lesson (Stigler, Fernandez, and Yoshida 1996).
7. Discuss examples of students' mathematical writing and provide opportunities for students to revise their writing (Chval and Khisty 2009).

Guiding Principles for Teaching Mathematics To ELLs

1. Challenging Mathematical Task
2. Linguistically sensitive social environment
3. Support for learning English while learning mathematics
4. Mathematical tools and modeling as resources
5. Cultural and linguistic differences as intellectual resources



Sylvia Celedon-Pattichis
&
Nora G. Ramirez

Clause and Relevant Information Organizer

Information Provided	Mathematical Concepts	Mathematical Representations and Procedures
Clause 1: Three sisters attended a movie that cost $5 per person.	Number of sisters = 3 Price of movie per person = $5	$5 + $2 = $7 $7 × 3 = $21
Clause 2: Each sister spent $2 on popcorn.	Each sister = 1 Money spent on popcorn for each sister = $2	**Clause 1 Representation** Sister 1 $5 Sister 2 $5 Sister 3 $5 } $15 on movies **Clause 2 Representation** movie popcorn Sister 1 $5 $2 Sister 2 $5 $2 Sister 3 $5 $2 } $21 on movies and popcorn
Clause 3: Their mother gave them $30 to spend for all three.	Total money they had = $30	$30 – $21 = $9 money the mother gave $30 money the sisters spent $21

Three sisters attended a movie that cost $5 per person. Each sister spent $2 on popcorn. Their mother gave them $30 to spend for all three. How much money was left?

Sylvia Celedon-Pattichis
&
Nora G. Ramirez

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To
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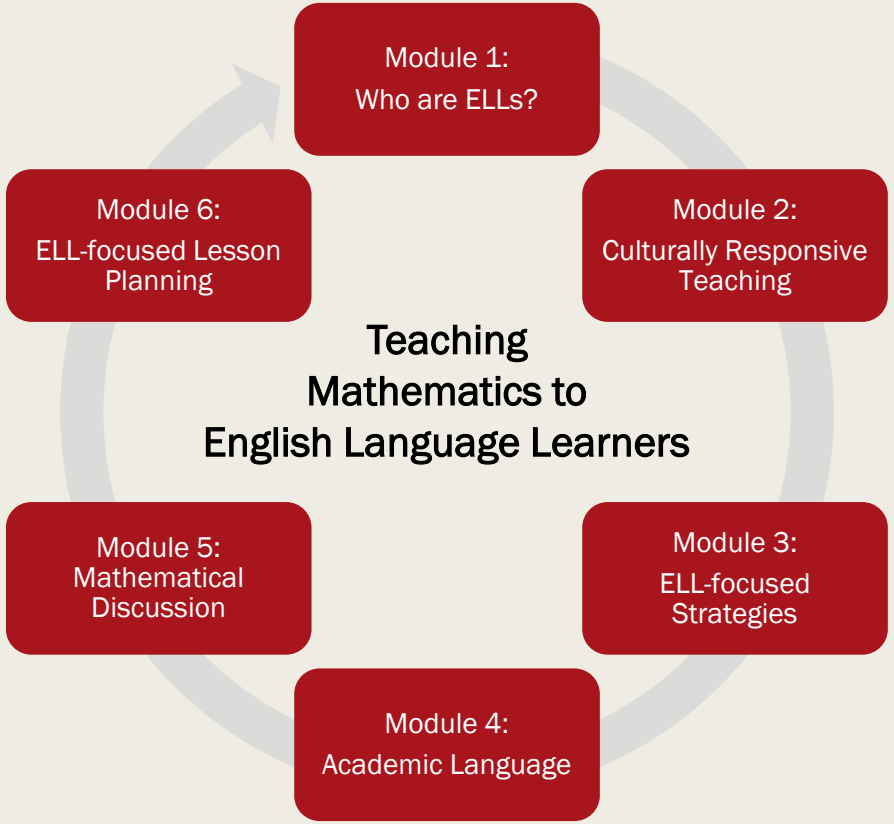

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EXHIBIT

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Booth 648

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Questions or Comments

Ricardo Martinez
Email: ricardom@iastate.edu
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Thank you. And do enjoy the rest of the day