Ohio Latino Education Summit
Resilience, Equity, and STEAM

Resilience, Equity, & Dual Language Education

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Task-Based Learning in STEAM

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Resilience and Equity in STEAM: Latinx Mathematics Education

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Resilience, Equity, & Dual Language Education

STEAM

Design

Create

Make

STEAM

Design

Create

Make

Curriculum for Languages and Content Learning

Resilience in the U.S.
Who are our Latinx Heritage Learners?

- Estimates range from 70% (American Community Survey, 2014) to 77% (U.S. Department of Education, 2015) of school-aged English Learners are Spanish speakers.
- 75% of English Learners (ELs) were born in the U.S. (77% Latinx origins).
- States with more than 81% Latinx school-aged students designated as ELs: Arizona, Delaware, Kansas, New Mexico, & Texas.
- Of all students, 73% in LA and 60% in Miami Dade County are of Latinx origin.

Resilience in the U.S.
Languages & Language Groups

- Spanish is the leading language of ELLs in <u>all</u> states except Alaska (Yup'ik), Hawai'i (Ilokano), Maine (Somali), Montana (German), and Vermont (Nepali).
- 60% of foreign-born Latinx people are Mexican followed by 14% South American, 10% Central American, 8% Puerto Rican, 2% Cuban (2003, reported in García & Kleifgen).
- Latinx people are linguistically diverse with varying bilingual language skills.

Resilience
Language Shift

Highest percentages of Latinx students who speak Spanish in the home:

17.3% Honduran
17.1% Salvadoran
16.7% Guatemalan
16.7% Paraguayan
16.6% Dominican
15.6% Venezuelan
13.2% Mexican
12.6% Ecuadorean

2015, Office of English Language Acquisition

Resilience in Ohio
Latinx Residents and Students

437,000 Residents with 45% of Mexican Origin

114,000 Students

Ohio Department of Education suggests language support for ELs:

- Bilingual Education
- Immersion
- Pull-Out ESL Instruction
- In-Class/Inclusion
- Individual Tutoring

Resilience
Heritage Language Vitality

Status

Economic
Social
Sociohistorical
Language

Demography

Distribution
- National/Regional
- Concentration
- Proportion

Numbers
- Birth Rates
- Immigration
- Emigration

Institutional Support

Formal
- Mass Media
- Education
- Government

Informal
- Industry
- Religion
- Culture

Giles cited in Pauwels, 2016

Resilience
Heritage Language Vitality

Status

Economic
Social
Sociohistorical
Language

Demography

Distribution
- National
- Concentration
- Proportion

Numbers
- Birth Rates
- Immigration
- Emigration
- Transnational Migration

Institutional Support

Formal
- Mass Media
- Education
- Government

Informal
- Industry
- Religion
- Culture

Giles cited in Pauwels, 2016

Equity
U.S. Government Policy

- 1954 Brown vs. Board of Education – segregated schools are unconstitutional
- 1968 Bilingual Education Act – assist “limited-English-speaking” students in English acquisition
- 1974 Lau vs. Nichols – reaffirm language support (bilingual or ESL) for English Learners
- 2002 No Child Left Behind (NCLB) – “bilingual” gone from government agencies– National Clearinghouse for English Language Acquisition and Language Instruction Educational Programs (NCELA)
- 2015 and 2017 Every Student Succeeds Act (ESSA), Title III

Equity
ESSA, Title III

- Ensure English Learners attain English proficiency and develop high levels of academic achievement;
- Assist all English learners to achieve high levels in academic subjects to meet the same challenging state standards;
- Assist teachers and school leaders to establish, implement, and sustain effective language instruction educational programs;
- Assist teachers and agencies to prepare English learners for all-English instruction;
- Promote parental, family, and community participation in language instruction.

Equity
Challenges in Ohio

Challenges for Young Learners:

- Reading Readiness: 3rd Grade Reading Guarantee
  - 6.2% of students exempt
  - Predictor of HS completion

Challenges for Students with Interrupted Formal Schooling (SIFE):

- Content and Literacy Standards

Equity
Benefits of Bilingualism and Language Rights

- Cognitive benefits of bilingualism:
  - Literacy in the heritage language supports literacy in English;
  - Metacognition of the home language supports English learning;
  - Proficient bilingual Latinx students are more likely to be in advanced math.
- Immigrants from Latinx countries may have heritage languages that are <u>not</u> Spanish.
- Communities need support in heritage language development.

Case Study 1: Mexicans in NYC (Makar, 2013)

Asociación Tepeyac de New York

- Integrating language learning strategies appropriate to Mexican transnationals;
- Recognizing and supporting indigenous language speakers from Mexico;
- Providing social support in communities.

Asociación Tepeyac de New York

Supporting dual language programming in NYC

- After school & summer: English & Spanish tutoring in reading, writing, and math;
- Culture/Arts/Sports: Soccer & folkloric ballet;
- Storytelling: “a powerful way human beings organize experience” (p. 55).

Government and Other Programs (Makar, 2013)

Binational Migrant Education Program

PROBEM, Spanish; BMEP, English

- Teacher Exchange
- Transcript Exchange (Binational Transfer Document)

Plazas Comunitarias

- Youth and Adult Literacy Programs in Spanish
- Preparation for General Education Diploma (GED)

Transnational Case Study 2 (Farr, 2010)

Michoacán, Mx ⟷ Chicago, Il

Dense, Multiplex Social Networks

Radio Talk

Literacy tied to Religion, Commerce, & Government

Rural	Urban
City Planning Project	Traditional gender roles
Plaza "an icon of urbanity and modern (Mexican) life" (p. 47)	
Expanded ed opportunities (more kids secondary school)	Expanded ed opportunities (esp in 2nd 3rd generation)

Education

Michoacán, Mx ⟷ Chicago, Il

Binational Schooling

Teachers complain:

Students don't have formal Spanish;

Math skills, geography, history and natural sciences lag;

Students are too extroverted.

All U.S. Education

Go further in school;

Have strong English literacy;

Women more likely to seek advanced degrees.

Transnational Practices

- Media
  - Television/radio
  - News (spoken and print)
- Dynamic Bilingualism
  - Translanguaging
  - Transnational Identity
- Philosophy
  - Roots – keep communities grounded in culture
  - Wings – “to freely travel in the present, from one country to another, from one language to the other in a dialectic exercise of their identity and dreams” (Makar, p. 57).

Equity
Seal of Biliteracy

- In the U.S. since 2012, 35 states award. “Being biliterate can often translate into tangible employment benefits. Many employers take language abilities into consideration when hiring and may offer a stipend or "differential pay" for employees who speak more than one language” <https://sealofbiliteracy.org/about-us/>
- Ohio Recognizes
  - Skills-Focused Assessments – L S R W
- Problems for Immigrants
  - Potential lack of all language skills in heritage language;
  - Potential conflict with Spanish variety;
  - No tests of indigenous Latinx countries;
  - English not a World (Foreign) Language recognized by ODE;
  - Testing $$.

Dual Language Learning

- Materials resources for bilingual learning and content learning through home language materials and texts in schools, libraries, and online for STEAM;
- Community supports for theater, public art and readings, etc.;
- Peer support in the classroom;
- Literacy (oral and written) programs that support Spanish and indigenous language development and use;
- Principals, teachers, and tutors who recognize the cognitive and socio-affective value of biliterate practices;
- Principals, teachers, and tutors who recognize that some immigrants may speak indigenous languages and that Spanish is their second language;
- Principals, teachers, and tutors who recognize that oral language skills are not always indicative of academic literacy;
- Bilingual teachers;
- Bilingual teacher credentials within Ohio.

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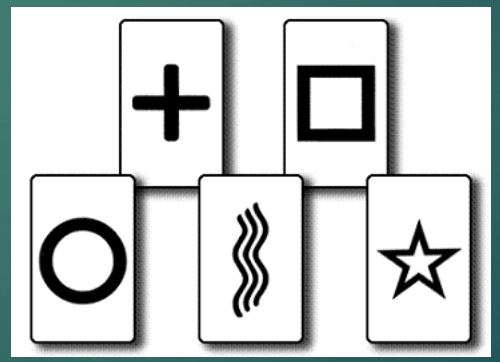
Jason Gearin

TASK-BASED LEARNING IN STEAM

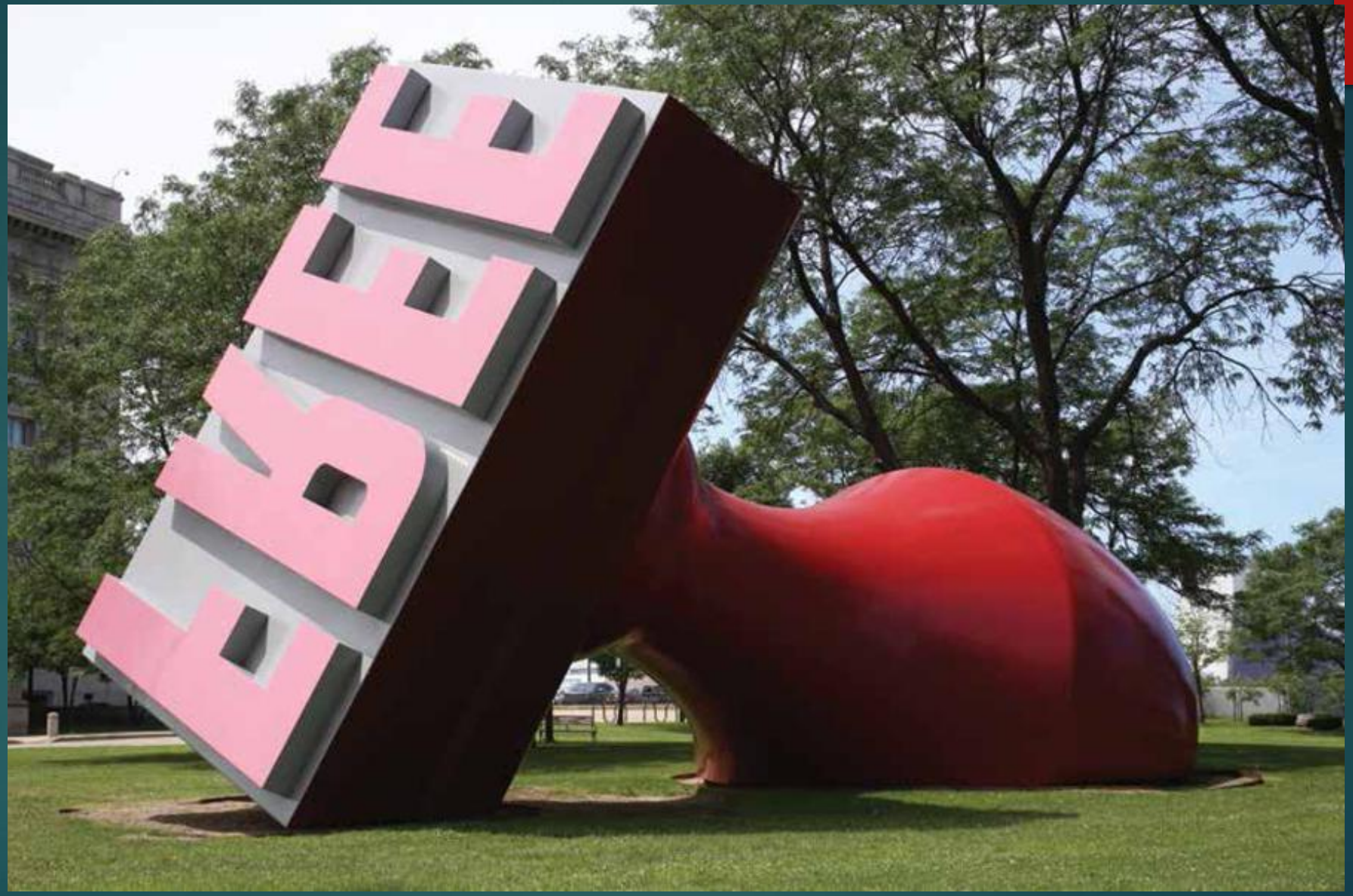
Lecture Goals

- My Background
- Engineering & Art
- STEAM (NOT WATER VAPOR!)
- ESP (NOT A SIXTH SENSE!)
- Task-Based Learning
- Rationale



ART

- My background in printing
- Living in Japan
- Hanko Stamp


EBEEE

Free Stamp

Claes Oldenburg and Coosje Van Bruggen

Willard Park, Cleveland, Ohio

Steel and aluminum; painted with polyurethane enamel
28 ft. 10 in. x 26 ft. x 49 ft. (8.8 x 7.9 x 14.9 m) ***Fabricated by Lippincott Inc.**

Commissioned December 1982 by SOHIO (later BP America, Inc.)
Gift of BP America, Inc. to the city of Cleveland
Installed August – October 1991
Inaugurated November 15, 1991

Free Stamp, Engineering, & Art

- Free Stamp is a great example of how engineers & artists collaborate.
- Science, Technology, Engineering, the Arts, & Mathematics (STEAM)
- *STEAM is an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking.*
- https://educationcloset.com/steam/what-is-steam/

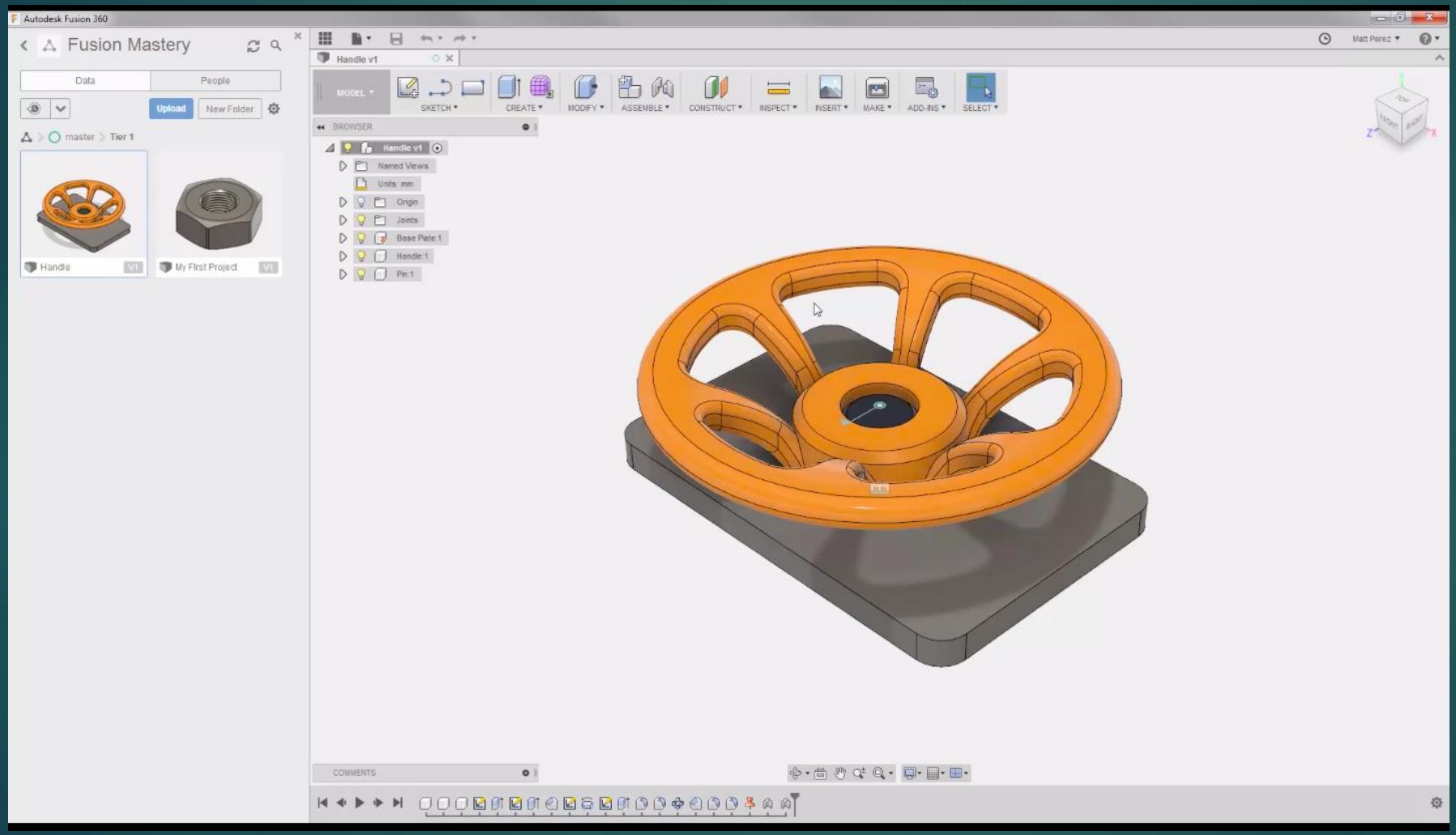
STEAM & ESP

- English for Specific Purposes (ESP)
- Teaching ESL/EAP (in the discipline of engineering & art)
- Needs Analysis
- Language Learning Objectives
- Materials & Methods
- Evaluation

Needs Analysis

- Team Work
- Communicate Effectively
- Organizational Skills
- Problem Solving Methodologies
- Use Techniques, Skills, and Modern Engineering Tools (e.g. Autodesk Fusion 360)
- https://cooper.edu/engineering/civil-engineering

Autodesk Fusion 360



Language Learning Objectives

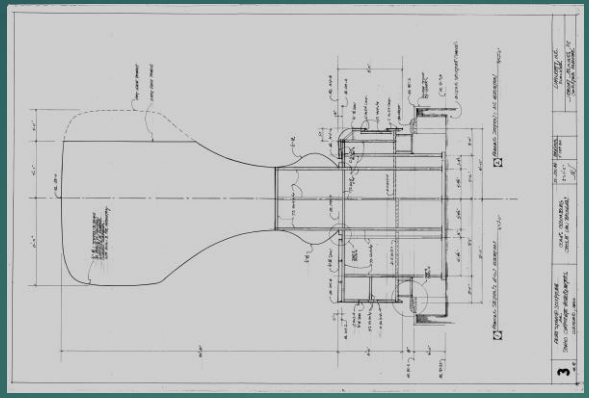
- Genre Specific Language and Patterns
- Second Language Performance (output)
- Complexity, Accuracy, & Fluency

Examples of Complexity, Accuracy, & Fluency

- Complexity: # of clauses per sentence
- Accuracy: # of error-free sentences
- Fluency: # of sentences per unit (e.g., per paragraph or per minute of speech)

Materials & Methods

- Blue-Prints



- Autodesk Fusion 360

- Task-based Learning

Pegagogic Task 1	Pedagogic Task 2	Pedagogic Task 3	Pedagogic Task 4
Reporting –Reasoning + Planning time	**Reporting** –Reasoning –Planning time	**Reporting** +Simple reasoning –Planning time	**Reporting** +Complex reasoning –Planning time

Figure 3. Increasingly complex pedagogic task versions of a target task

Pre-Tasks

- Introduce new language
- Vocabulary, Modals, Imperatives, etc.

- Assist learners in organizing their ideas

- Activate existing knowledge

Task-Based Activity (Information Gap)

- Pedagogic Task 1

- Pre-modified Input (e.g. Simplified Blue Print)

+ Planning Time - Reasoning

- Student A has blue print & Student B uses Autodesk
- Student A has planning time to plan oral directions to Student B
- Student B listens & completes task in Autodesk (save version 1)

Pedagogic Task 2

- Pre-modified Input (e.g. Simplified Blue Print)

- Planning Time - Reasoning

- Student A has blue print & Student B uses Autodesk
- Student A has no planning time to plan oral directions to Student B
- Student B listens & completes task in Autodesk (save version 2)

Pedagogic Task 3

- Pre-modified Input (e.g. Less Simplified Blue Print)

- Planning Time - Reasoning

- Student A has blue print & Student B uses Autodesk
- Student A has no planning time to plan oral directions to Student B
- Student B listens & completes task in Autodesk (save version 3)

Pedagogic Task 4

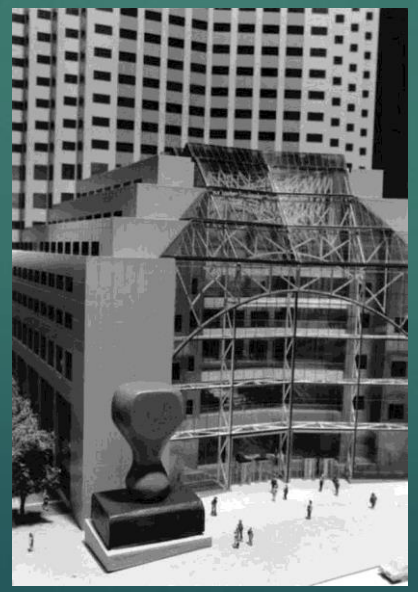
- Unmodified Input (e.g. Authentic Blue Print)

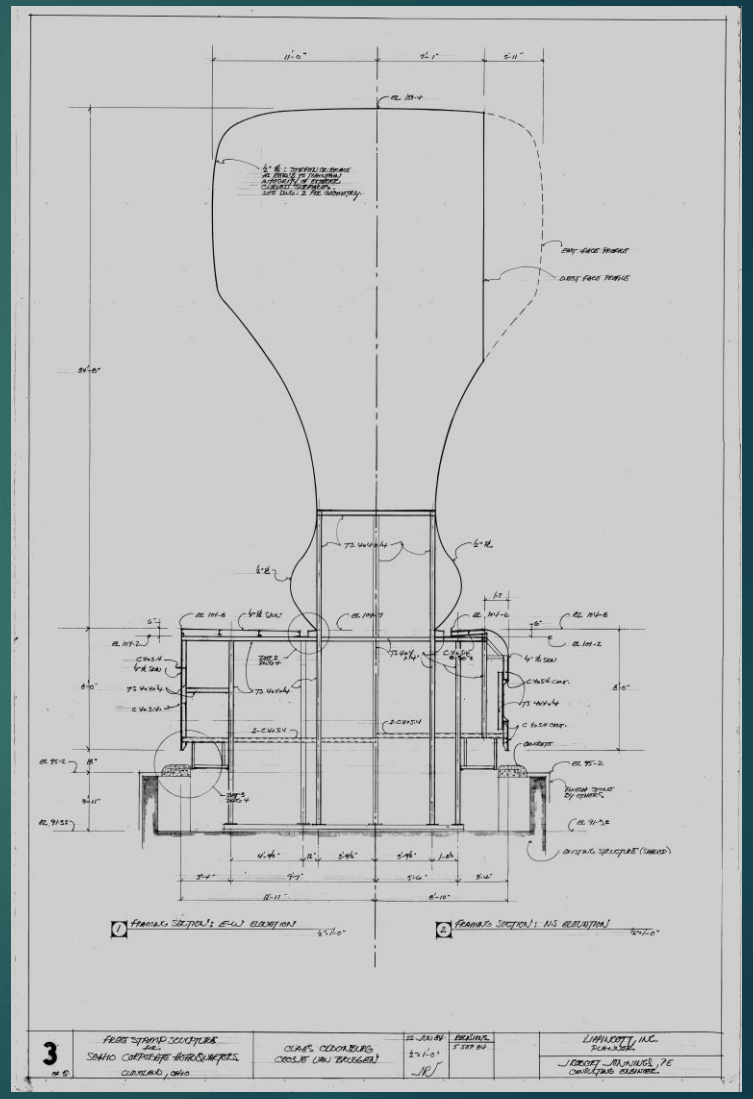
- Planning Time + Reasoning

- Student A has blue print & Student B uses Autodesk
- Student A has no planning time to plan oral directions to Student B
- Student A is presented with a reasoning component
- Student B listens & completes task in Autodesk (save version 4)

Reasoning Component

- Surprise Element
- No Planning Time
- Critical Thinking
- Own Resources





Post-tasks

- Follow-up with online Autodesk Fusion 360 posts
- Further Collaboration & Project Development
- Teacher/Peer Feedback on Language Use
- Correct Problems (e.g. Modals)

Why Task-Based Teaching in STEAM?

- Student Needs (Language & Real-World Tasks)
- Simple-to-Complex Learning (Natural)
- Repetition (practice, practice, practice!)

- Communication & Interaction
- Attention, Awareness, *Noticing*

- Evaluation

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ReSilience and Equity in STEAM Latinx Mathematics Education

Presented by

Karl W. Kosko
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Brief Overview

- Just a *bit* about the presenters

- What *is* Equity in Mathematics Education
- Math Achievement (overview & implications)
- Inequities in Latinx Mathematics Education
- Promoting Higher Cognitive Demand for Latinx Math Students
- Word Problems – An illustrative point.
- Equity Principles for Mathematics Education

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Equity as a Construct in Math Ed

- The National Council of Teachers of Mathematics (NCTM) has highlighted issues of equity as a central focus since the 1980s.
  - National Council of Teachers of Mathematics (www.nctm.org).
  - TODOS: Mathematics for ALL: www.todos-math.org
  - Center for Mathematics Education of Latinos/as (https://cemela.math.arizona.edu/)
  - Journal of Urban Mathematics Education (Georgia State University)

- Within Mathematics Education, Equity has been both broadly and narrowly defined. The most commonly (and generic) accepted definition is:
  - Equity in mathematics education demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students (NCTM, 2000).
    - Equity requires high expectation and worthwhile opportunities for all.

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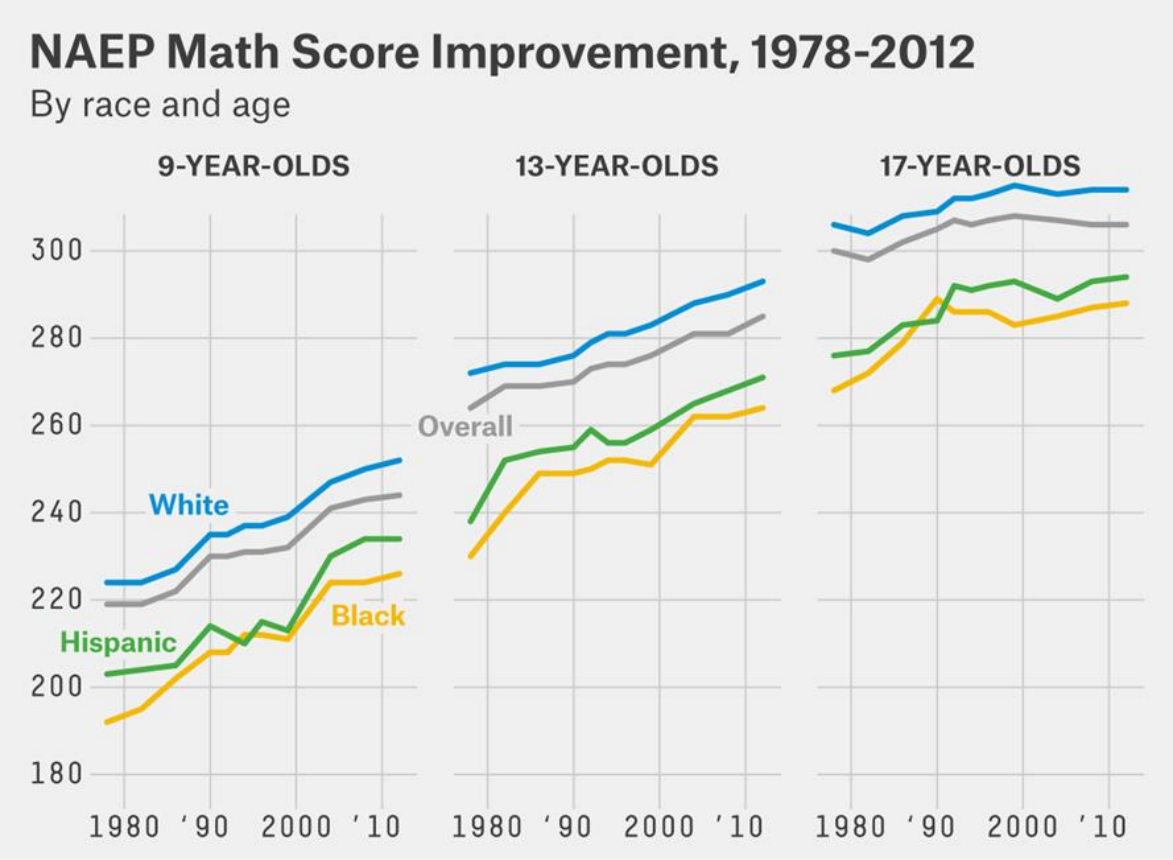
Historic and Current Differences in Math Achievement

- NAEP Math scores for Latinx students have risen significantly in the past 40 years.

- Noticeable differences still exist.
  - Growth is typically parallel across groups.

  - This suggests improvement in general education but not to underlying inequities in education system.



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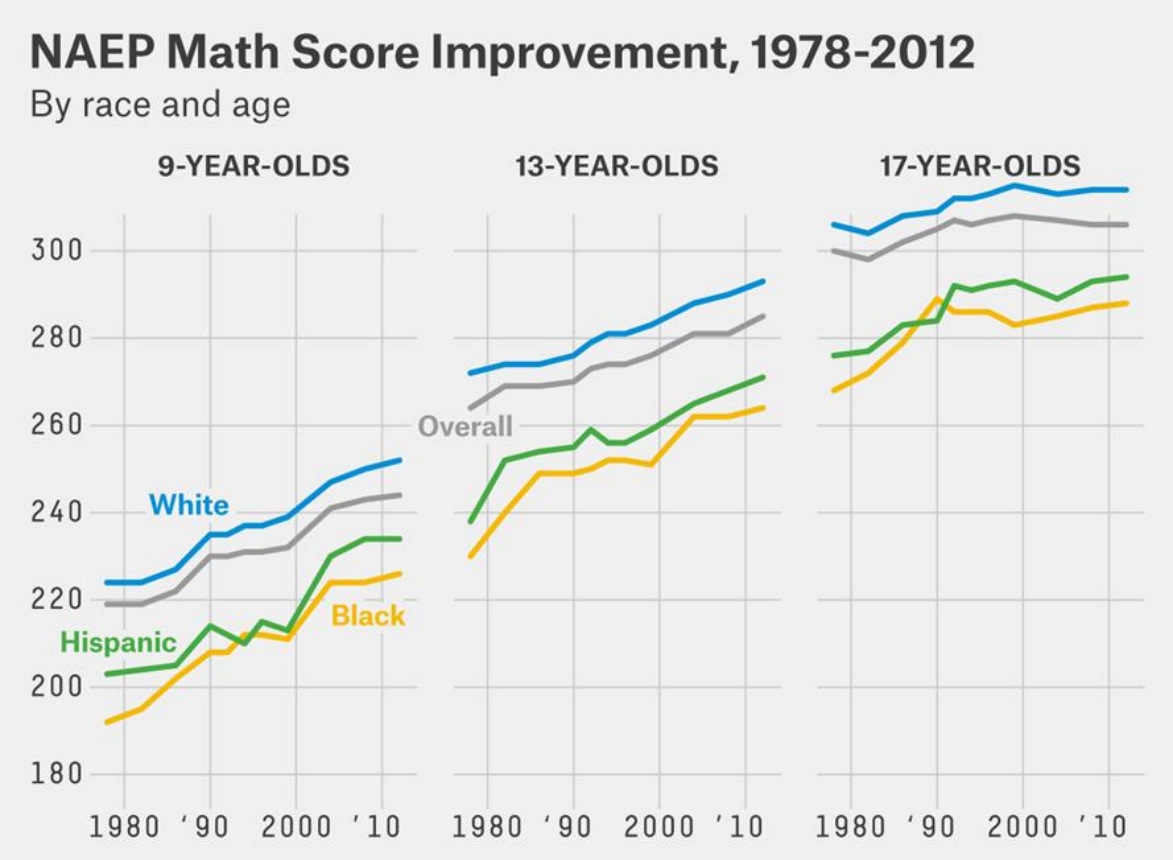
Historic and Current Differences in Math Achievement

"The phrase *achievement gap* highlights some aspects of equality, but not others… Closing the achievement gap implies that our work ought to be on students (or possibly schools and teachers) who do not measure up" (Parks, 2009).

- Simply put – there is currently a deficiency view of Latinx students in regards to math & STEAM, and this contributes to a prevalent & continuous "achievement gap."



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What Inequities are Documented in Current Math Ed?

- Latinx students have access to less quality (or less access to high quality) school resources (Scneider et al., 2006).

- Differences in expectations and parental/cultural attitudes (Fan & Chen, 2001).
  - Latinx parents of 1st & 2nd Gen students may defer to the teacher/school, and not advocate for children in ways white middle class parents do (Ream & Stanton-Salaza, 2007).
  - Family / cultural gender stereotypes about math affects male & female children (Denner et al., 2018).
  - Acculturation and education level of parents plays a significant role (McHale et al., 2005).

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What Inequities are Documented in Current Math Ed?

- Resources for Latinx students in mathematics are biased towards lower level cognitive demand tasks:
  - de Araujo et al. (2016) note ***few*** resources found online for English Language Learners promote ***challenging*** students in mathematics.
    - The trend is towards support/remediation rather than challenge/promoting conceptual understanding.
  - Secondary math teachers tend to avoid providing higher level math tasks to Latinx students (de Araujo, 2012).

- American English & Math Slang can alienate English Learners
  - Instead of saying 1 ½ x 2 ½ , a teacher could say “one group of 2 ½ combined with half of 2 ½” and include visual representations (Mendieta, 2009).

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Educational Practices that Affect Latinx Students…

- Teacher Collaboration – when teachers collaborate on planning their lessons together.
  - This has a positive effect on math achievement generally (Goddard et al., 2007).
  - Latinx students are differentially affected by teacher collaboration based on family SES (Moller et al., 2013).
- Early Career Experiences with Latinx students.
  - Such experiences in teacher training improves skills and dispositions of teachers (Fernandes, 2012; Kasmer, 2013).
  - Early career teachers need opportunities to have assumptions about Latinx students *challenged*. Simply being told about equity may be insufficient (de Araujo et al., 2015).
- Providing Higher Cognitive Demand Tasks:
  - Promotes engagement and learning (for <u>all</u> students).

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Providing Higher Cognitive Demand Tasks for English Learners (Myth vs Fact).

- Myth: Students learning to speak English won't be able to explain how or why a math procedure works.
  - Fact: Math is multi-modal. Visual representations (visual proofs) have been used for several thousands of years to prove mathematical concepts and algorithms.
  - Fact: Students will have similar visual representations (across languages) and this can help EL students to learn English and relate the concepts more meaningfully.
  - Fact: Explanations and Justifications do exist in languages beyond English.
- Myth: Since I don't speak/read/write Spanish, I can't provide a meaningful problem/task to EL students.
  - Fact: There are numerous resources that have English / Spanish high cognitive demand tasks. Example: http://mathforum.org/pow/list.html
  - Fact: Google Translate…. It's a thing.
- Myth: Since the student can't speak English well, their work can't be shared with the class.
  - Fact: If the student is comfortable, either they can attempt to share or they may allow the teacher to share a strategy. This helps to build confidence in mathematics (and shows the teacher values their contribution).

¿Puedo compartir esto con la clase?

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Word Problems are Problems

- A significant portion of math achievement differences in NAEP may be due to performance on word problems (Walkington et al., 2018).
- Changing wording of word problems may have benefits to EL students, as well as students from lower SES households.
  - Unfortunately, the specific approach for improved wording is unclear / inconclusive.
- When EL students are tasked with writing their own word problems, they improve in performance (Walkington, in press).

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An illustration with one Word Problem.

Sami installed a 6-foot-tall cylindrical storage tank to collect rainwater from the roof of her house. She used the rainwater to water the lawn and garden during dry spells. Sami recorded the rise in the water level in her storage tank after each of 3 rainstorms. Her results are shown in the table below.

Rainfall (in inches)	Rise of Water Level in Storage Tank (in inches)
1.5	24
0.5	8
2.5	40

Which is the best prediction of the rise of the water level, in inches, in her tank after a storm produced 2.25 inches of rain?

A. 16 inches B. 28 inches
C. 32 inches D. 36 inches

Figure 1. Sample Task 1 (FCAT; Florida Department of Education, 2011)

A 6-foot-tall storage tank is used to collect rainwater which is then used to water the school's garden during dry spells. Sami recorded how much the water level rises in the storage tank after each rainstorm. Her results for 3 rainstorms are in the table below.

Rainfall (in inches)	Rise of Water Level in Storage Tank (in inches)
1.5	24
0.5	8
2.5	40

A recent storm produced 2.25 inches of rain. How much did the water in the tank rise?

A. 16 inches C. 32 inches
B. 28 inches D. 36 inches

Figure 2. Alternative Wording

Given the following relationship between x and y:

x	y
1.5	24
0.5	8
2.5	40

If $x = 2.25$, then $y = ?$

A. 16 C. 32
B. 28 D. 36

Figure 3. Purely symbolic

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General Equity Based Practices (for Math & STEM)

- Position students as sources of expertise.
- Distribute authority (for the content) among students and teachers.
- Create authentic experiences that explore mathematical ideas.

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Questions and Discussion