49th Annual Conference

National Association for Bilingual Education (NABE)

Las Vegas, NV

Friday, February 25-28, 2020

Thursday, February 27, 2020
2:10 PM - 3:00 PM
Partagas 2

Advancing Mathematical Biliteracy Practices with Novice Bilingual Teachers

Jorge Solís, Marco Bravo, Cynthia Lima,
Alejandra Treviño, Lina Martin Corredor

Thursday, February 27, 2020
2:10 PM - 3:00 PM, Room: Partagas 2

Santa Clara University

UTSA

UNIVERSITY OF CALIFORNIA SANTA CRUZ

Agenda

Overview of MALLI Model

Intervention & Methodology

Analysis & Findings, Next Steps

Resources, Contact Information

Questions/Discussion

Preparing Teachers to Teach Mathematics Bilingually

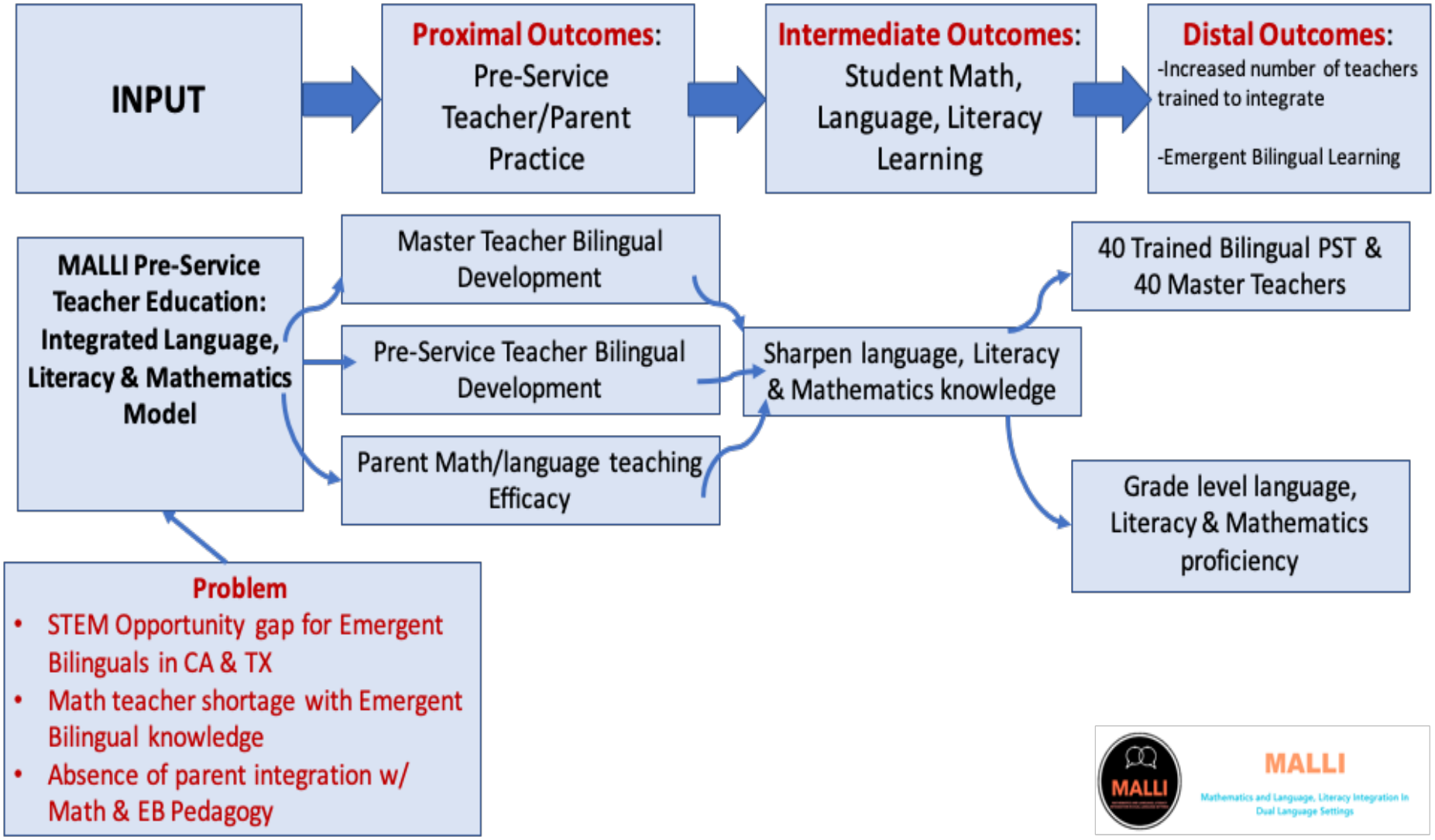
- There is scant available research that addresses the preparation of bilingual/multilingual teachers in the U.S. (Lavadenz and Baca, 2017).
- Preliminary Evidence shows potential for integrated (language, literacy, discipline) instruction for Emergent Bilinguals
  - Authentic mathematics language practices (Authors, 2014, Celedón-Pattichis et al., 2012; Yeh, 2017).

MALLI Collaborators

PI/Co-PIs	School Districts	Advisory Board
• **Marco Bravo, Claudia Rodriguez-Mojica, Kathy Stoehr,** Santa Clara University • **Eduardo Mosqueda, Kip Téllez,** Univiversity of California Santa Cruz • **Jorge Solís and Cynthia Lima,** University Texas at San Antonio	• Northern California • Southcentral Texas	• **Dr. Iliana Alanis**, University Texas at San Antonio • **Dr. Sylvia Celedon Pattichis**, University of New Mexico • **Maria Madrigal** • **Dr. Elizabeth Van Es**, University of California Irvine

Phase	Bilingual Teacher Candidates	Bilingual Master Teachers	Bilingual Pre-Service Teacher Graduates	Parents	K-5 EBLs
Planning (year 1)	-	-	-	-	-
Pilot (year 2)	24	40	--	25	400
Phase 1 (year 3)	20	20	20	10	400
Phase 2 (year 4)	20	20	20	10	400
Phase 3 (year 5)	--	--	20	--	--
Total	**60**	**60**	**60**	**30**	**1,200**

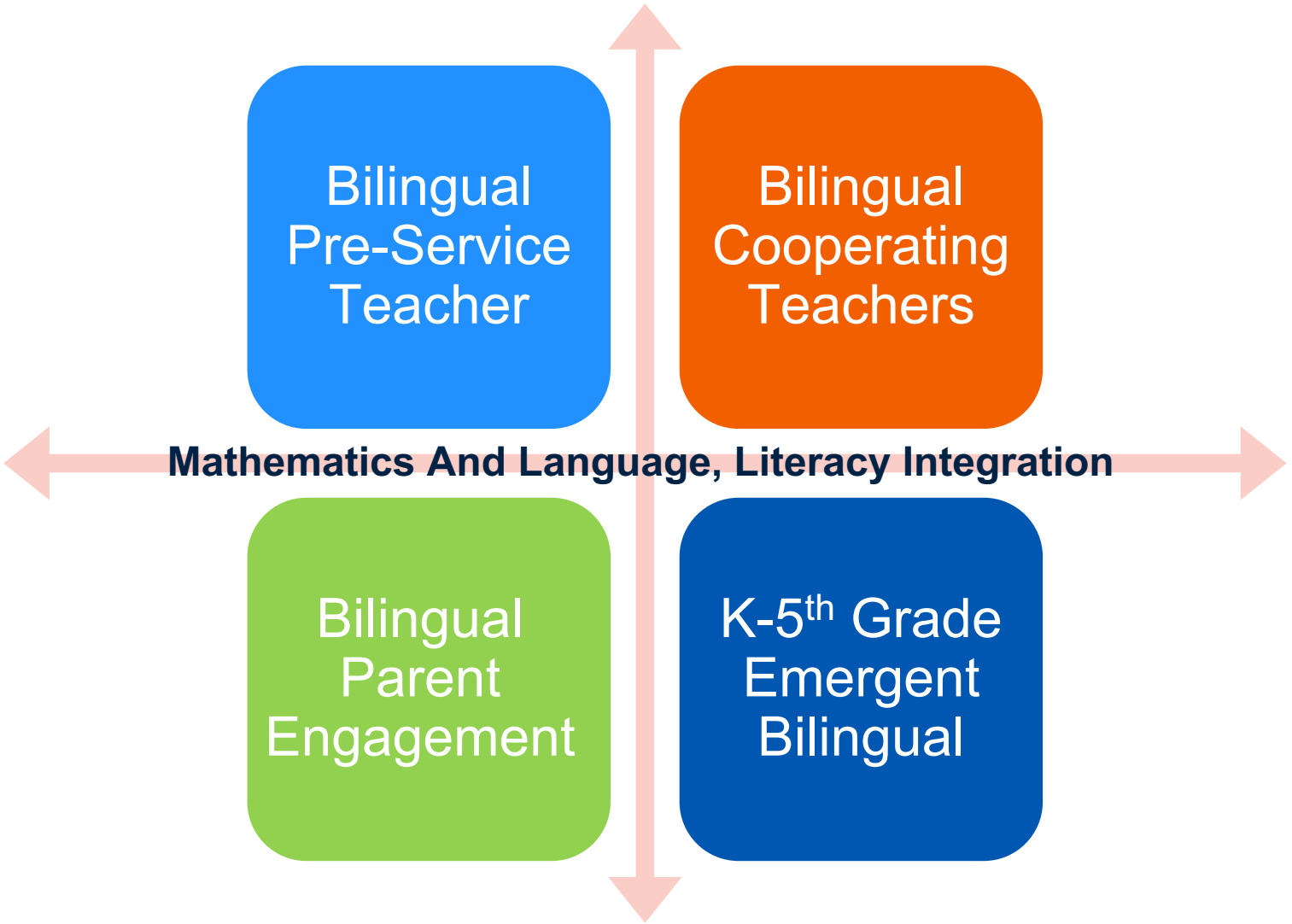
Theory of Change



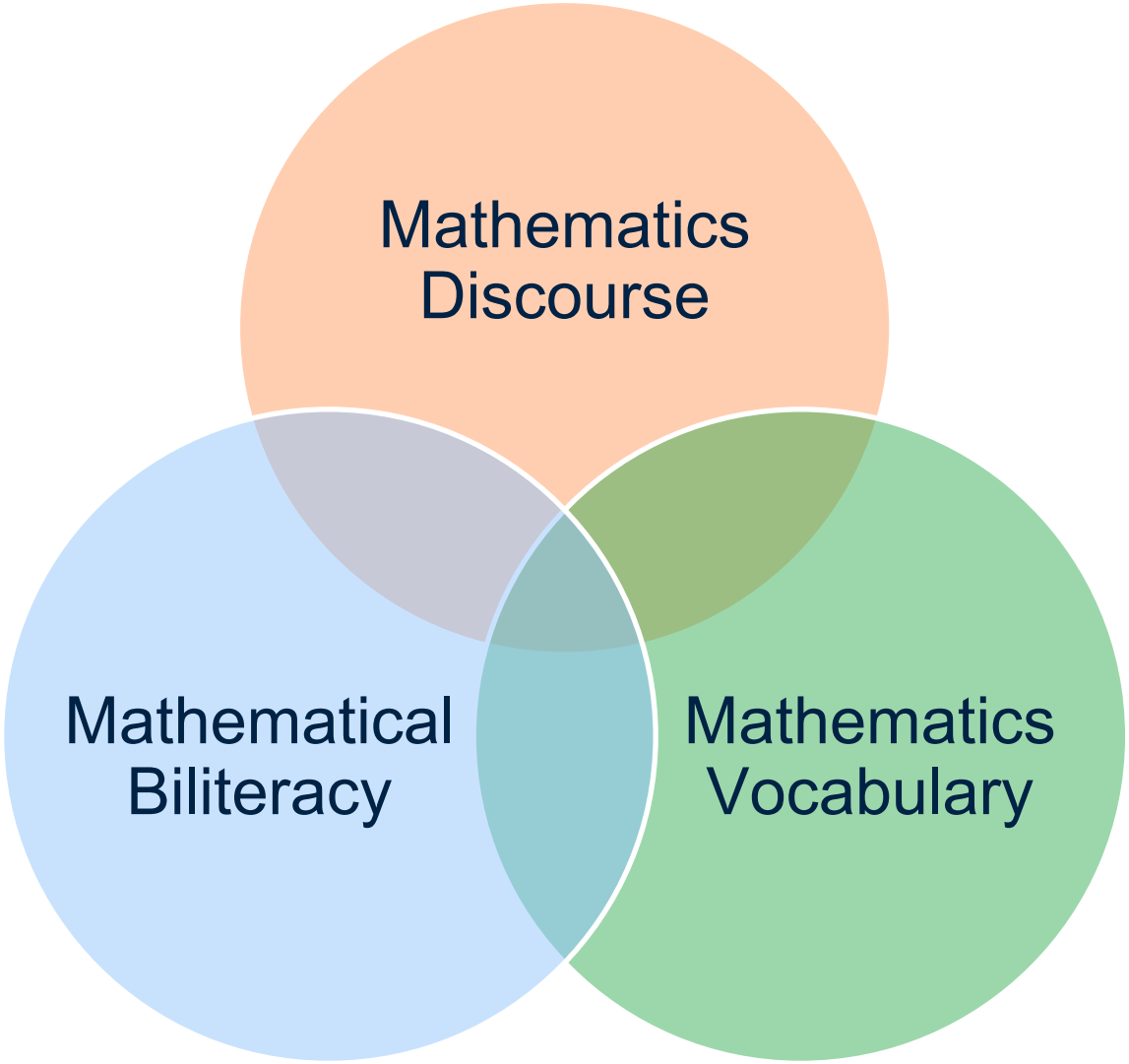
MALLI

Mathematics and Language, Literacy Integration In Dual Language Settings

Integrating and Aligning Practices Across Contexts



MALLI Instructional Framework



MALLI Instructional Practices

Mathematics Discourse	***Talking*** *to accomplish* ***mathematics practices*** *such as* ***proving or explaining*** *math solutions, problems, or statements*
Mathematical Biliteracy	***Attention to reading and writing*** *in mathematics including discussions and* ***interpretations of math texts*** *and/or how to produce different types math texts*
Mathematics Vocabulary	***Attention to the special meanings of words*** *used in mathematics and how to learn to* ***reinforce specialized and precise meanings*** *through the use of background knowledge, morphology, cognates, collocations, and noun phrases*

Teacher Candidate Intervention

Re-designed Math Methods courses

- Math Discourse
- Math Vocabulary
- Math Biliteracy

Bilingual Coaching

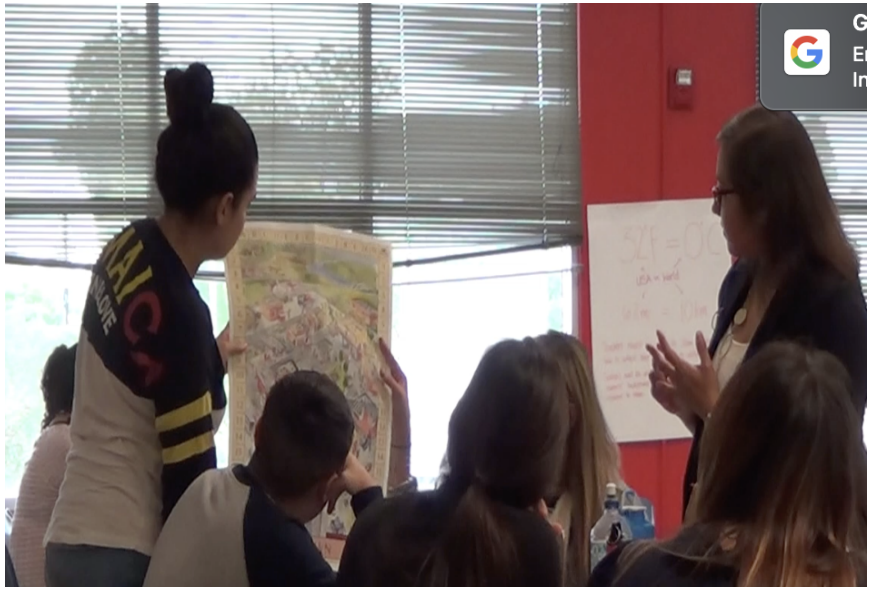
- Mentor Teacher aligned with MALLI Goals

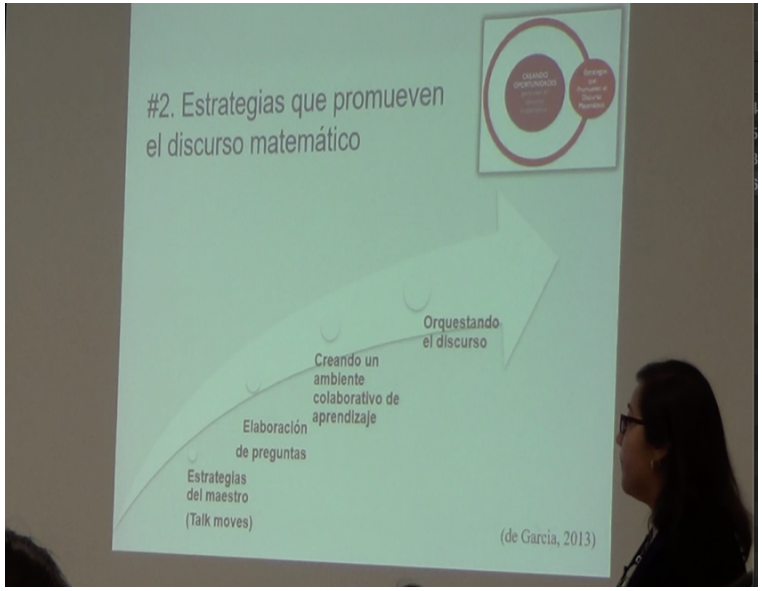
Lesson Study

- Cycle of Inquiry
- Peer-collaboration

Course Re-Development
Lesson Modules

	TX Site	**CA Site**
6 Anchor Lessons	Taught in 2 of 4-course block sequence	Taught Anchor Lessons in math methods I & II

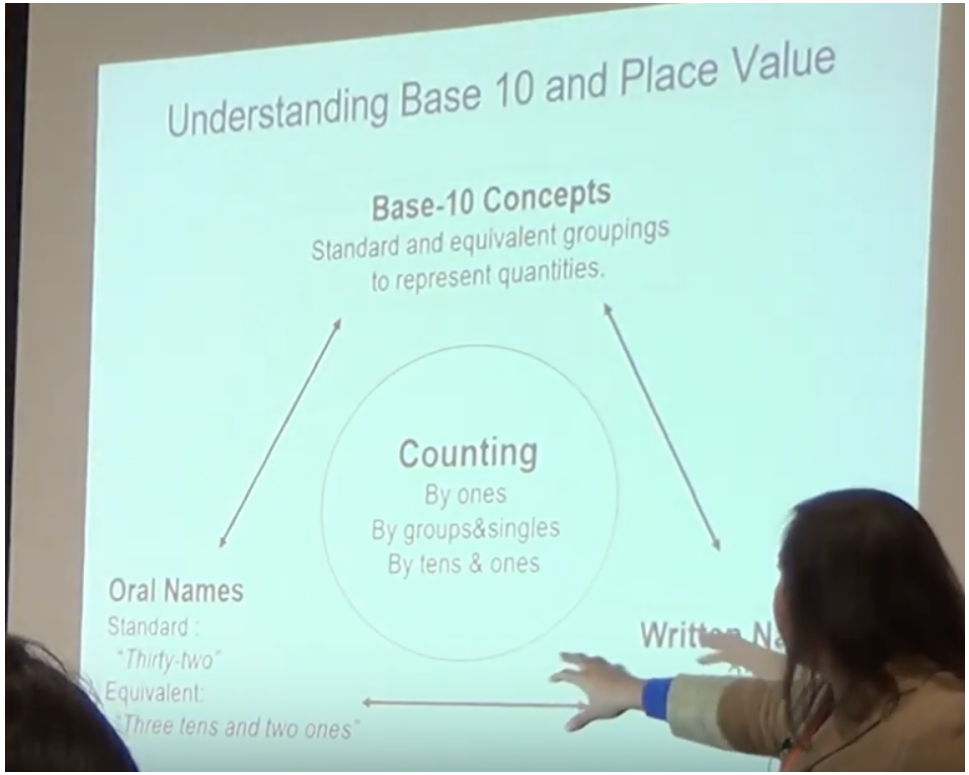




Lesson Module Example

Activity:TI asks BTCs to create concept maps

Recap 29:10-32:00
Lesson 2, part 2



Bilingual Teacher Candidate Information

BTCs Background

Female	89%
Latino/x	93%
Median Age	24
Employed Full-time or Part-time	81%

Source: Education Northwest.

Cohort 1, N= 27

5-Year Professional Goals

Teach in dual language/bilingual classroom	78%
Earn a graduate degree	78%
Become a language specialist	19%
Become a math specialist	15%

Source: Education Northwest.

Cohort 1, N= 27

Spanish Language Proficiency

	Novice	Intermediate	Advanced/ Distinguished/ Superior
Reading	0%	4%	96%
Writing	0%	46%	64%
Speaking	0%	27%	73%
Listening	0%	8%	82%

Source: Education Northwest.

Cohort 1, N= 27

English Language Proficiency

	Novice	Intermediate	Advanced/ Distinguished/ Superior
Reading	0%	4%	96%
Writing	0%	8%	92%
Speaking	0%	0%	100%
Listening	0%	0%	100%

Source: Education Northwest.

Cohort 1, N= 27

Mixed Methods Methodology

- BTC ***dispositions*** and ***practices*** of 27 BTCs over the course of the program.
- The study takes place in California and Texas.
- Target course lessons were also video-recorded and transcribed to capture fidelity of the model.

Data Collected

Quantitative Measures	Qualitative Analysis
• Pre and Post Survey • MALLI Classroom Observation Protocol (MCOP)	• Transcribed Lesson Study Reflections • Qualitative Analysis of Video Recorded Lessons

Instruments

Survey: 83-initial items

Section I. Teaching literacy in Math (8)	**Section IV.** Teaching Math to Bilingual students (7)
Section II. Teaching Math Vocabulary (8)	**Section V.** Efficacy in Teaching Bilingual students (8)
Section III. Teaching Math Discourse (8)	**Section VI.** Learning Experiences (12) & Bilingual pedagogy knowledge (12)
	Section VII. Background (20)

Sample Efficacy Items

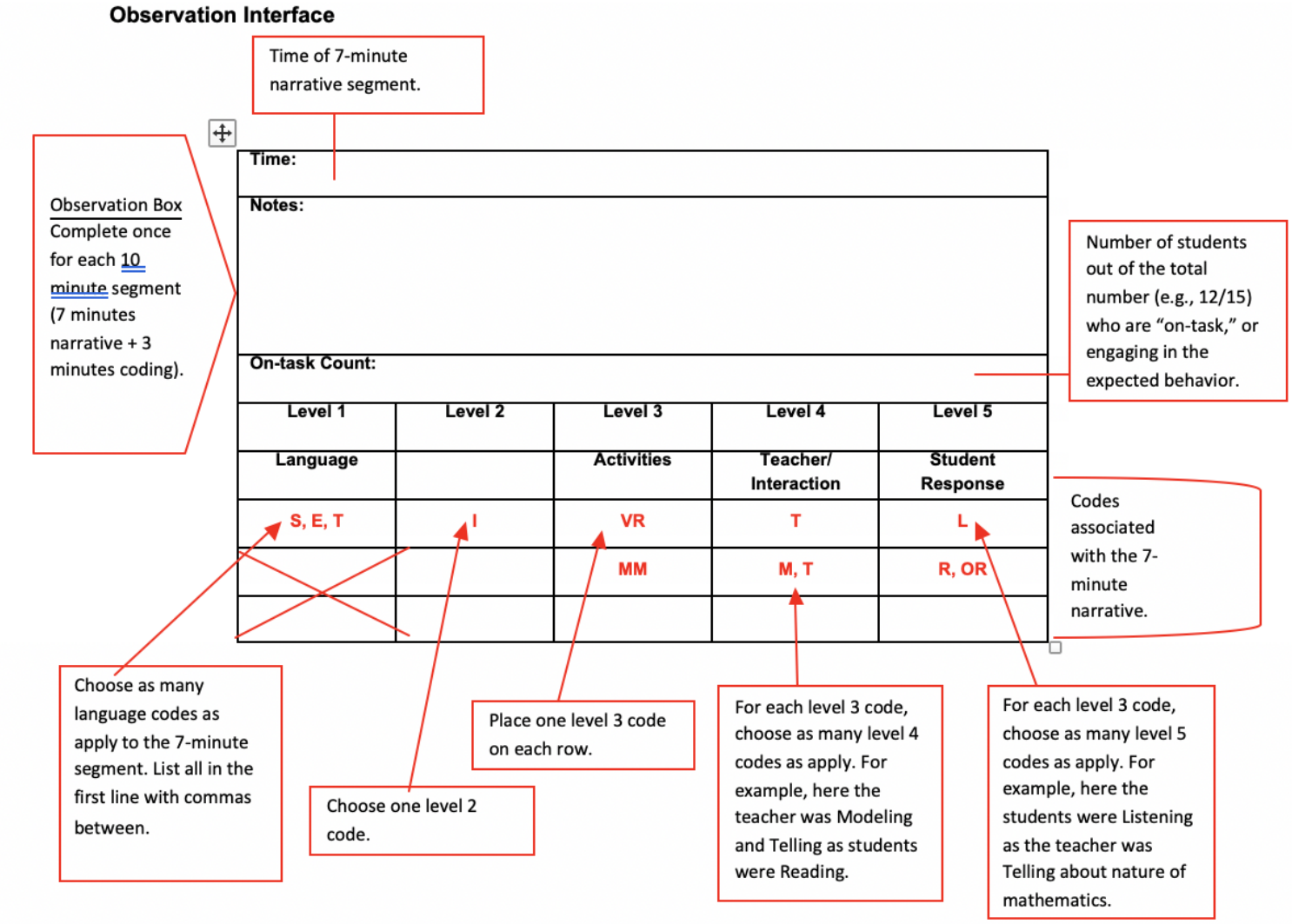
Questions	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
I find it difficult to explain lessons in Spanish to bilingual students					
I find it difficult to explain lessons in English to bilingual students					
I find it difficult to explain math lessons to bilingual students					
I do not have enough training in math to teach math effectively					

MALLI Classroom Observation Protocol (MCOP)

Score each 7 minute segment

- Level 1: Language(s) Used
- Level 2: Major Focus
- Level 3: Instructional Activities
- Level 4: Teacher Interactions
- Level 5: Student Response

MALLI Classroom Observation Protocol (MCOP)



MCOP Level 2: Major Focus

- ◯ **Listening:** Listening to teacher or other students about math activities (e.g., listen to lecture)
- ◯ **Reading:** This includes teacher read-alouds or students reading about math
- ◯ **Writing:** Writing about math concepts, procedures or reasoning
- ◯ **Talking/Discussing:** Talking/discussing about any math topic, including discussing data or solving math problem
- ◯ **Not applicable:** None of the above seems to apply; no instruction is taking place

MCOP Level 3: Instructional Activities

Math Concepts
Math Procedural
Math Procedural & Conceptual connection
Math Models
Analyzing or sharing data
Vocabulary Concepts
Vocabulary Strategy
Reading
Reading Instruction/ Discussion

Writing
Writing Instructions
Language Development
Explanations/Use of Evidence
Math Argumentation
Math Talk
Questions about math
Eliciting Prior Math knowledge
Other

Qualitative Findings

Peer Feedback on Lesson Plans

BI/LITERACY DEVELOPMENT				
	1	2	3	N/O
Lesson plan includes teacher explanations on how to read or write math texts to students		✓✓		
Teacher scaffolds student reading of math texts			✓✓	
Teacher scaffolds student creation of math texts				
Teacher has explicit opportunities or examples to show connections between languages in classroom				
DISCOURSE DEVELOPMENT				
Lesson plan has pre-written questions for teacher to ask students during lesson				✓
Lesson plan has pre-written model answers to guide student responses				✓
Lesson plan allows time for students to engage in a structured or small group discussion			✓	
Teacher scaffolds students on how to make good math arguments or explanations (i.e. teachers goes around the room during small discussions)			✓	
VOCABULARY DEVELOPMENT				
Lesson plan reflects appropriate selection of math vocabulary for targeted instruction				
Lesson has opportunities for teacher to use and explain academic math terms/concepts				
Lesson has opportunities for teacher to scaffold students to use academic math terms/concepts				
Teacher has explicit opportunities/examples that focus on word meanings (i.e. translation, morphology) or word analysis (i.e. cognates)				

* **STRENGTHS identified in this Lesson Plan regarding MALLI practices**

1) Going around the classroom to asses students
2) Students are working in groups
3) Having a balanced, safe environment

* **RECOMMENDATIONS for this Lesson Plan regarding MALLI practices**

1) Will students integrate technology in some way?
2) Anchor charts would help students

Peer Feedback from Video

R	**Did you, and you gave each other feedback?**
Lori	Yeah
	And, **so Ari had told me** that, um, having the students like maybe, uh, cause **I was talking a lot** during like the word problem. **She's like maybe having them like come up and read it or like having them be more interactive** into the lesson would have been better
Ari	And then also that **they sat for [a long] time** in the lesson and--
Lori	Yeah.
Lori	They sat for a long time. So **I noticed, I was like "They're sitting for a long time**. But that's what happened to me the first time too"

1st Grade Language & Literacy Support

8	BTC	*¿Sí, pero qué tipo de gráficas hemos visto?* ((Yes, but what type of graphs have we seen?))
9	Stu2	*Estamos viendo graficas de barra* ((We are seeing bar graphs))
10	BTC	*Graficas de barra* ((bar graphs))
11	Stu3	*Picto, Pictografia, no sabia como pronunciarlo* ((Picto, pictograph, I didn't know how to say it))
12	BTC	*Hemos aprendido sobre gráficas de barra y pictografía* ((We have learned about bar graphs and pictographs))
13	Stu4	*Y también picto*—((and also picto))
14	BTC	*¿Se acuerdan que es pictografía?* ((Do you remember what is a pictograph?))
15	Stu5	*Sí, cuando tiene fotos* ((Yes when it has pictures))
16	BTC	*Cuando tiene símbolos de fotos* ((when it has symbols of pictures))

Quantitative Findings

Preliminary MALLI Classroom Observations

- **80%** of observed Bilingual Teacher Candidates demonstrated use of **all MALLI practices** (math vocabulary, math literacy, student discourse) in their instructional activities

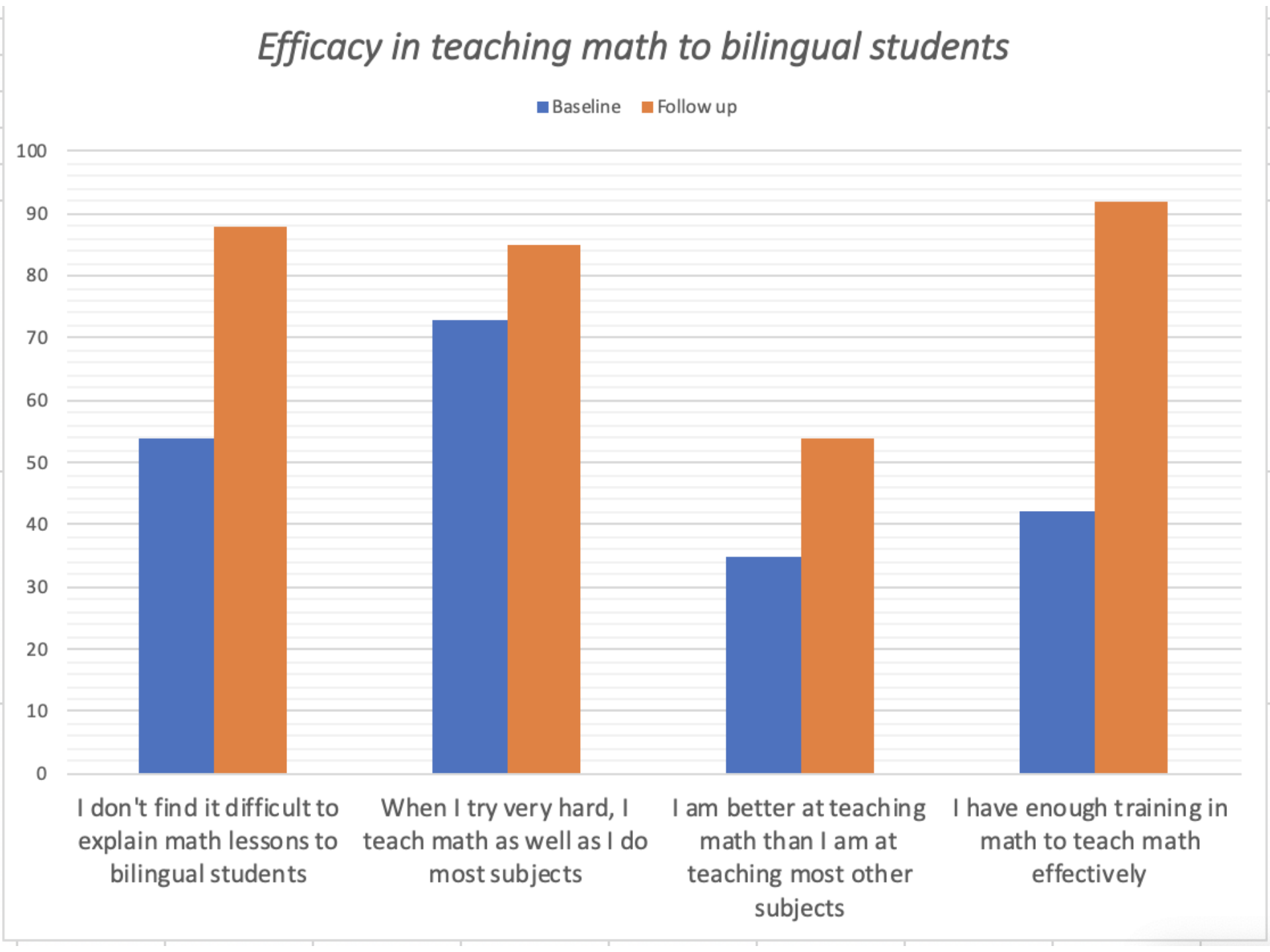
Survey Findings

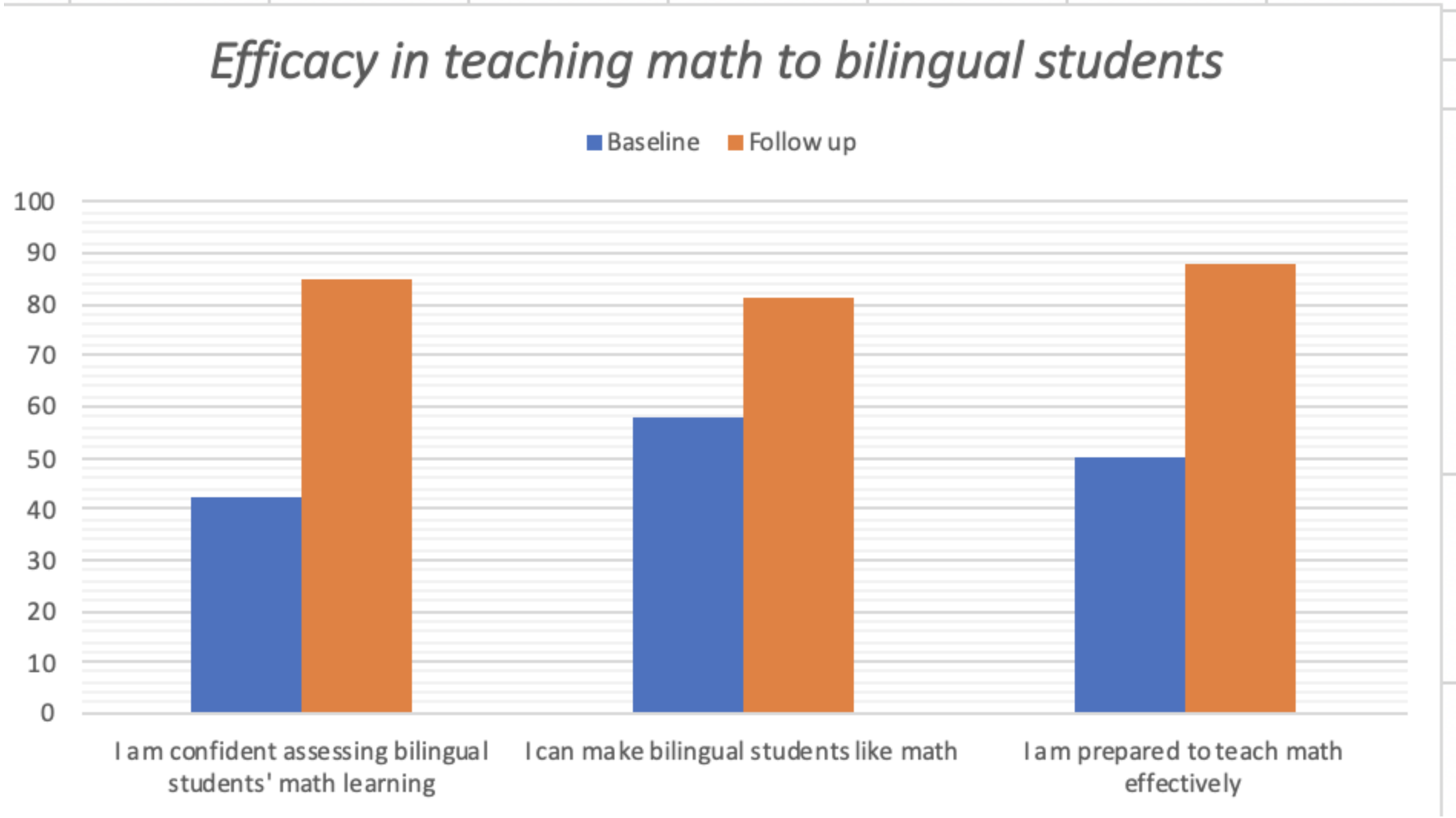
BTCs postive views of mentoring

modeled effective ways to promote student **discourse** during math class	91%
improved my ability to **teach math in a dual language** classroom setting	87%
modeled how to assess bilingual students to understand mathematical learning	87%
modeled instructions that **links** mathematics with literacy	87%

BTCs postive views of mentoring

provided me with **feedback** about my teaching **frequently enough**	83%
modeled effective ways of teaching mathematics **vocabulary**	78%
modeled how to use student work to reflect on one's instruction	77%
analyzed student work with me frequently enough	70%


Efficacy in teaching math to bilingual students
Baseline
Follow up
100
90
80
70
60
50
40
30
20
10
0
I don't find it difficult to explain math lessons to bilingual students
When I try very hard, I teach math as well as I do most subjects
I am better at teaching math than I am at teaching most other subjects
I have enough training in math to teach math effectively


Efficacy in teaching math to bilingual students
Baseline
Follow up
100
90
80
70
60
50
40
30
20
10
0
I am confident assessing bilingual students' math learning
I can make bilingual students like math
I am prepared to teach math effectively

Discussion

Bilingual Teacher Candidates:

- feel ***more prepared*** to teach math
- feel teaching math is harder

- found mentors modeling practices helpful ***for teaching practices***
- found mentors modeling practices helpful ***for reflecting on teaching***

- ***Can*** learn and teach disciplinary practices

CONTACT INFORMATION

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