Culturally Responsive Teaching in Mathematics with Preservice Teachers

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Objective of the study

Investigate the impact of learning culturally responsive teaching (CRT) techniques on preservice teachers' understanding and application of CRT in teaching math

What is Culturally Responsive Teaching (CRT)?

(Bottoms et. al, 2017; Gay, 2010, 2013; Hackenberg, 2005; RAND Mathematics Study Panel, 2002; Stowe, 2017; Walter, 2018)

CRT

Student-based &

through students own lenses

Meaningful learning,

Positive Attitudes, &

Improved achievement

cultural knowledge, prior experiences, frames of reference, and performance styles

Examples of CRT Approaches

- Developing materials that are culturally relevant,
- Modifying instruction to meet students' prior knowledge,
- Providing context for instruction that is familiar,
- Using cooperative learning strategies,
- Using model-based approaches, and
- Encouraging instructor reflections about how students are progressing

(Bransford, 2000; Eglash, Bennett, O'Donnell, Jennings, Cintorino, 2006; Villegas & Lucas, 2002).

The Study

38 teacher candidates

- 28 ECE(grades preK-3) and 10 MCE (grades 4– 9)
- 30 female and 8 male; and all Caucasian.
- 74% of TCs had both junior and senior field experience in high poverty schools.

What we did with TCs

Year 1: Improving understanding of CRT techniques
(Introduction to Exceptional Children)

- ✓ read articles/textbook on CRT techniques and specific techniques for mathematics.
- ✓ created graphic organizers summarizing readings.
- ✓ Paper on 'Family and Community' about practitioner's and their own CRT techniques.

Year 2: Applying CRT theory/strategies into practice
(Math Methods & Reflective Seminar)

- ✓ read articles/textbook on CRT techniques and differentiation for mathematics.
- ✓ developed lesson plans, analyzed own instruction, and reflected on teaching
- ✓ developed stations for differentiation
- ✓ evaluated students' learning

Figure 1. CRT Self-Efficacy Beliefs

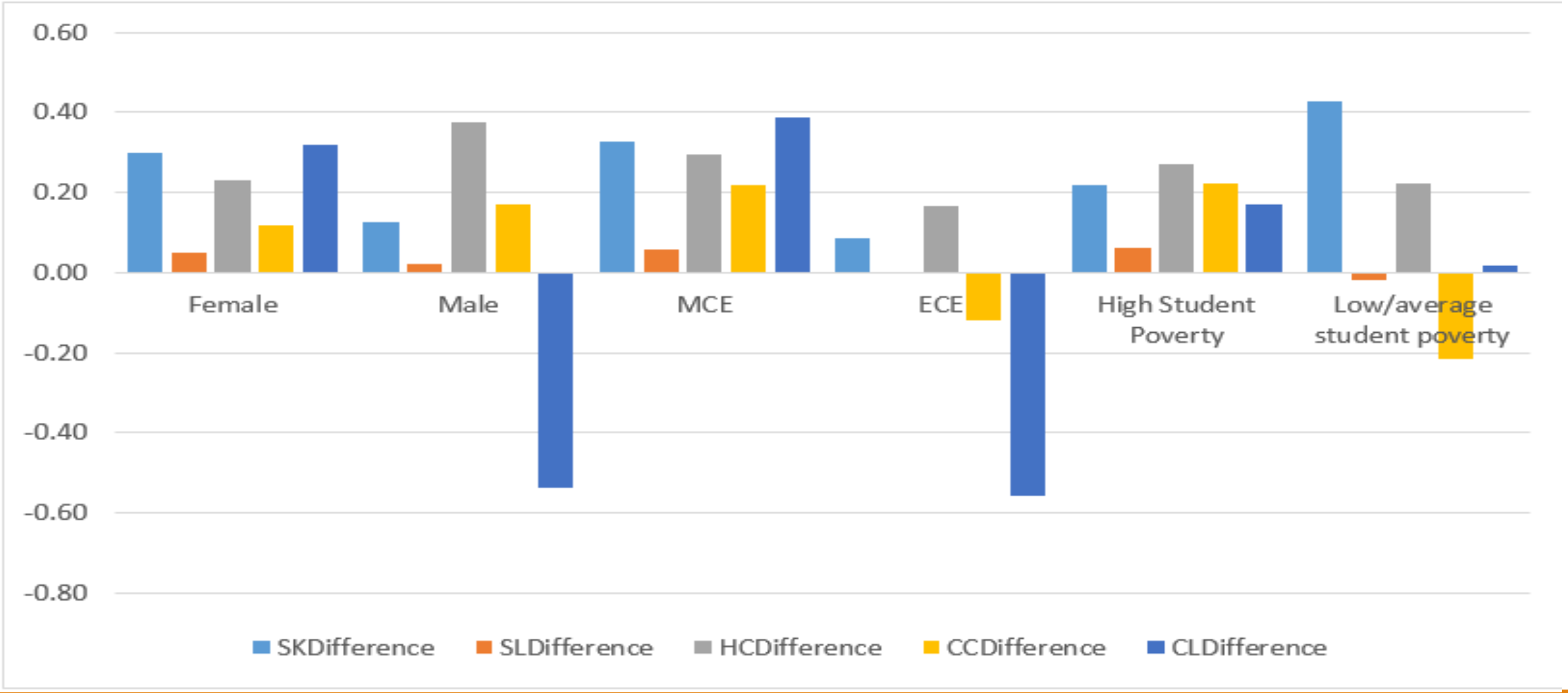


Figure 2. TCs' CRT Knowledge Levels (Year 1)

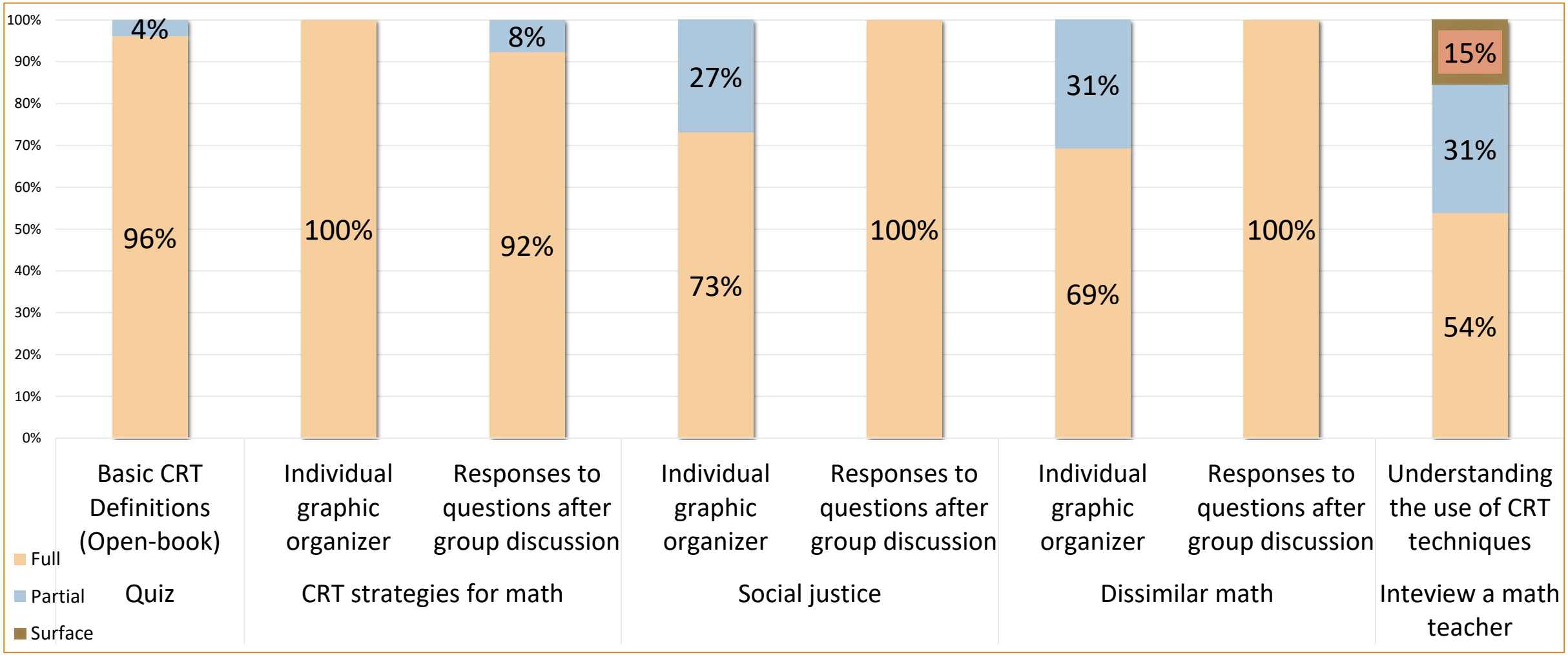


Figure 3. TCs' CRT Knowledge Levels (Year 2)

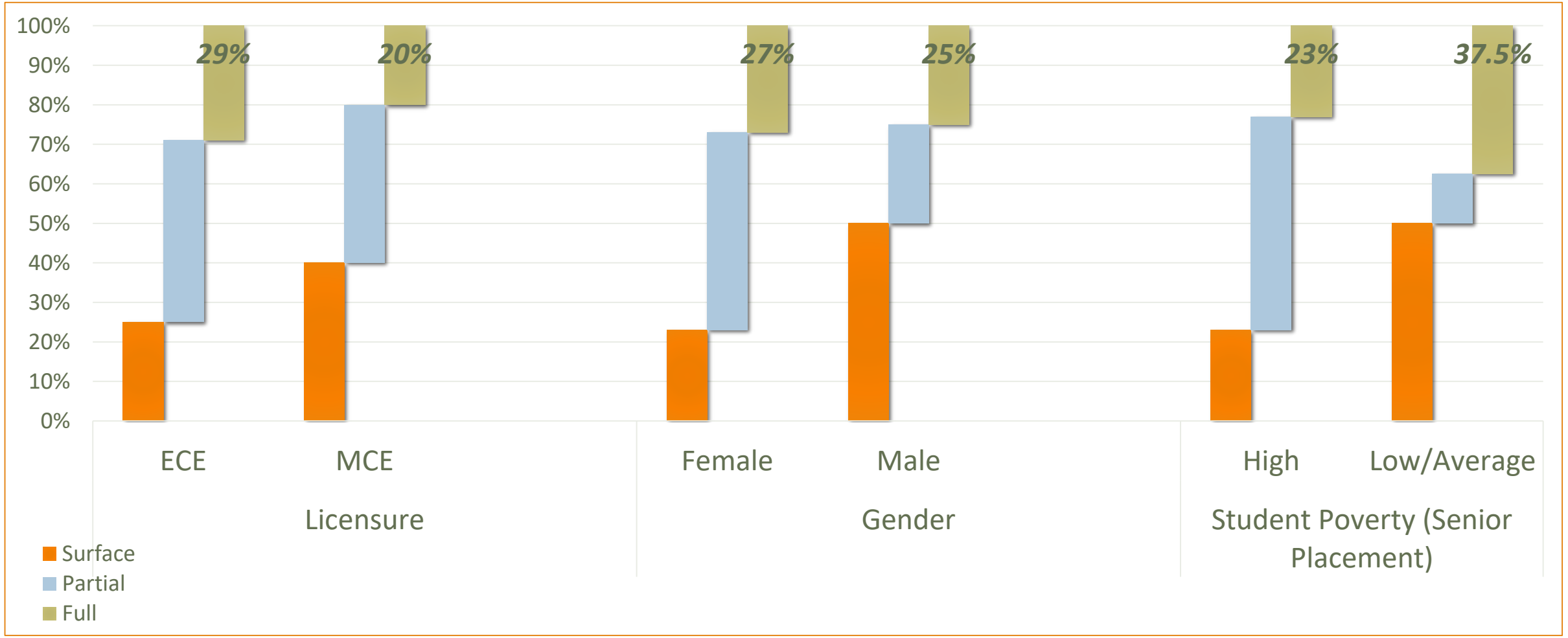
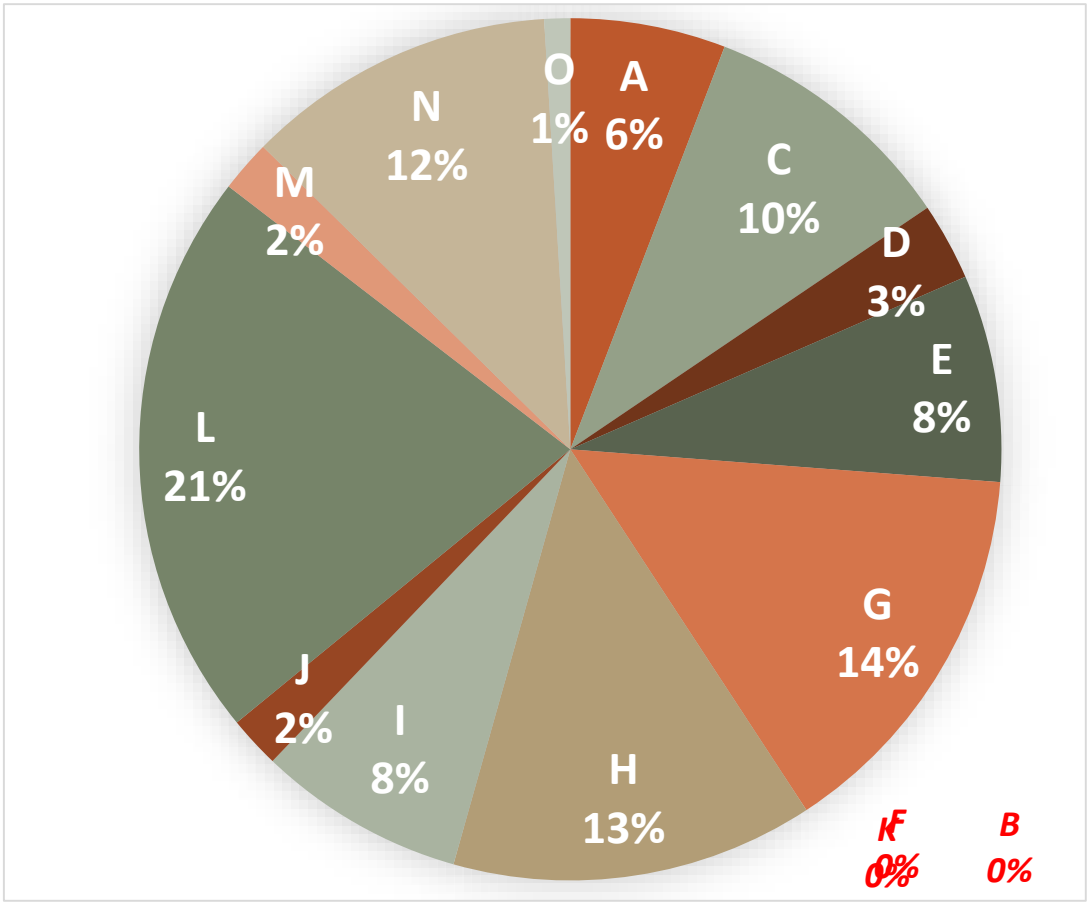


Figure 4. CRT Strategies used (Unit Lesson Plan)



A. Learn about your students
B. Interview students
C. Integrate relevant word problems
D. Present new concepts using student vocabulary
E. Bring in guest speakers
F. Use learning stations
G. Gamify lessons
H. Call on each student
I. Use media that positively depict a range of cultures
J. Offer different types of free study time
K. Encouraging students to propose ideas for projects
L. Experiment with peer teaching
M. Establish cooperative base groups
N. Run problem-based learning scenarios
O. Involve parents by using take-home letters

CRT for Math (K-12 Teachers)

What it looks like in a classroom.

https://www.youtube.com/watch?v=K1U6wj-5K1I

Goal is to provide windows and mirrors.

- Windows into the curriculum
- Mirrors in terms of including artifacts that mirror their cultures.
- https://www.youtube.com/watch?v=YnckuoUb3o8&list=PL410C5AD12261AAC2
- Call and response example in mathematics.

CRT for Math (K-12 Teachers)

Popular choices for our preservice teachers.

Integrate word problems

- Include student names
- Include student interests
- Reference diverse cultures not represented in your class

Gamify lessons

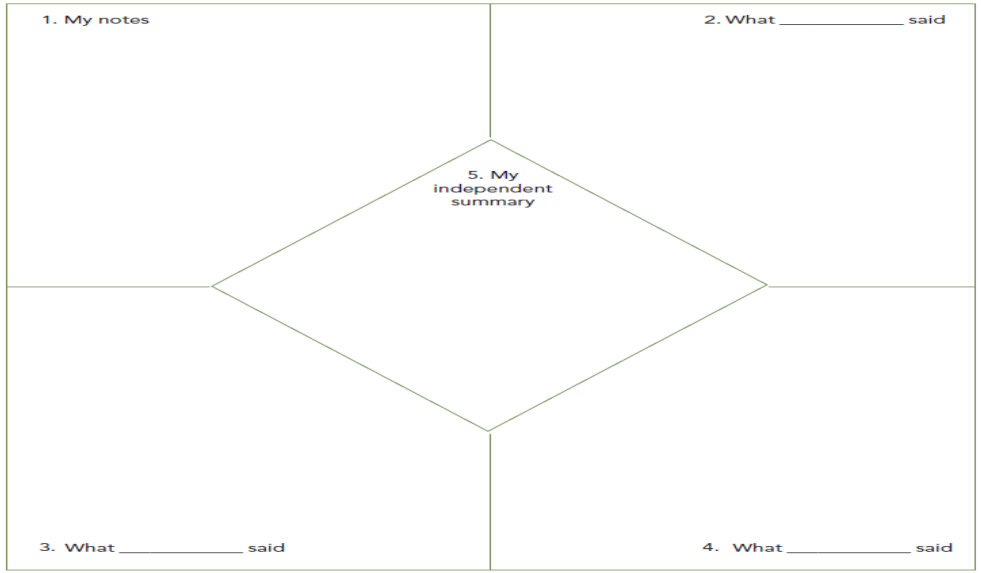
- Games for review- Prodigy
- Instead of an outline for a project create an “instruction” manual
- Set a goal and ways for students to get badges or pass levels (based on prior assessment)

Call on each student

- It seems obvious, but isn’t always done. Pick names from a stick jar. Plan with your students with challenges ahead of time so they can be successful when called on.
- Call and response

CRT for Math (K-12 Teachers)

Experiment with peer teaching
- Jigsaw
- Peer buddies
- Conversation organizer



Source: Adapted from Frey and Fisher (2013).

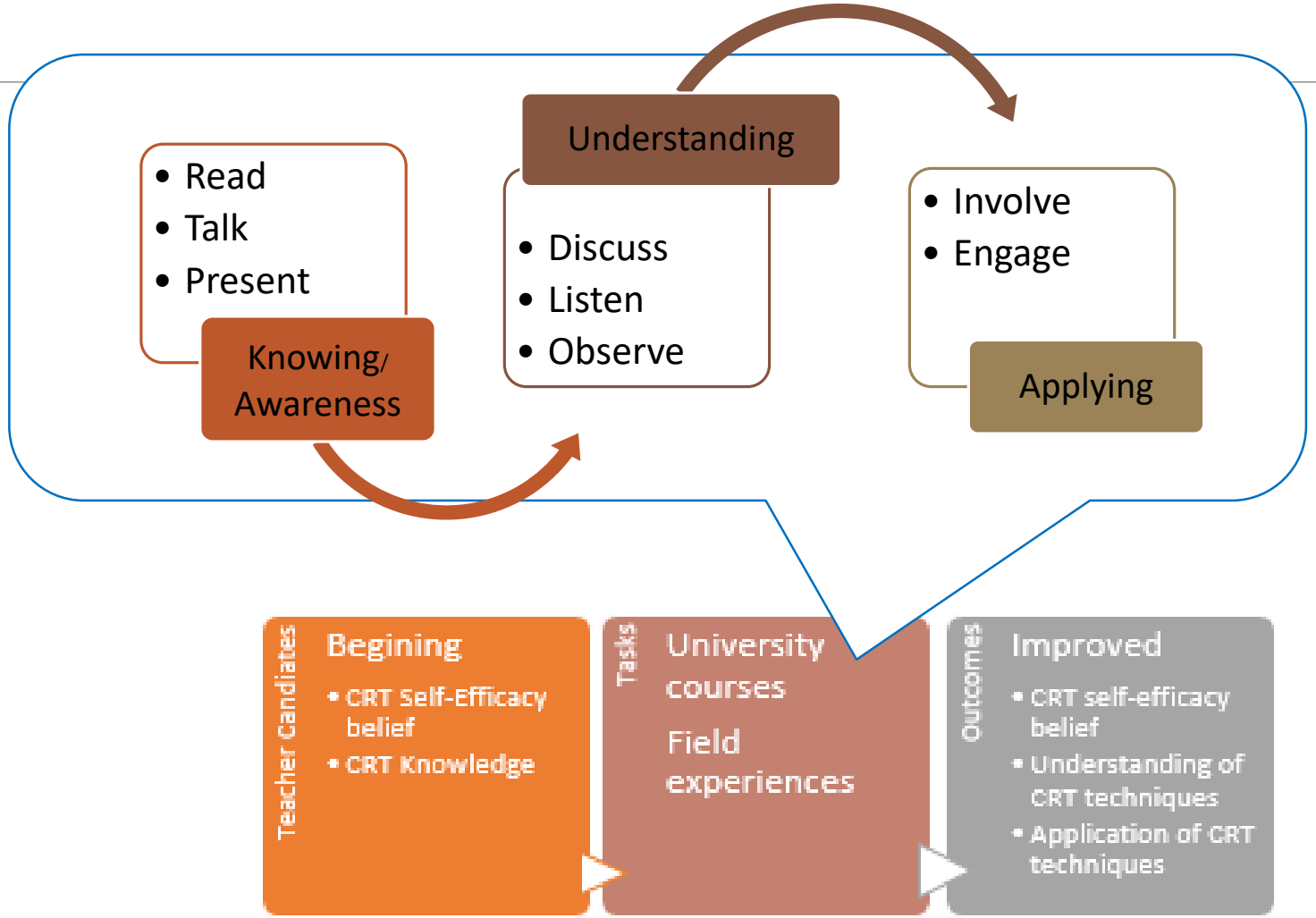
Run problem based scenarios
- Weave historical events into the problems
- Include a culturally event well known to the Students.

Ex. Bubonic Plague-

Charts and tables and %

http://math.unipa.it/~grim/21_project/Klowss328-330.pdf

CRT for Math (For Teacher educators)



CRT for Math (For Teacher educators)

- Group Discussions
  - Take a lesson plan (I used an edTPA lesson plan) and look at it critically for CRT strategies.
    - What did the person use?
      - What could they have added to their lesson to make it culturally responsive?
- Graphic organizers
  - Read literature about CRT independently (create your own organizers) and then compare with a peer.
    - Questions your organizer should help you answer:
      What does it mean to be a culturally responsive teacher?
      What does it look like during math?
      What does it mean to be a dissimilar math learner?
      How is math for social justice different from a typical math class? How is it the same? What does this mean for students with special needs or those living in poverty?
      How do these authors' challenge the traditional view of teaching? Does it work? Why or Why not?

CRT for Math, Resources

Advantages and Disadvantages of Problem Based Learning

- https://www.prodigygame.com/blog/advantages-disadvantages-problem-based-learning/

- Shift the power of working with students instead of teaching students (Weins, 2015)
  - Students are interested in the Civil Rights movement. Have them create math problems with historical context that they researched.
  - There were 3 protest marches from Selma to Montgomery in 1965. March A was X miles. March B was 14 miles. March C was 10 miles. The total mileage marched was 54 miles. Solve for x.
- Use multiple perspectives, as well as students' home culture (Stowe, 2017).
  - IRIS modules https://iris.peabody.vanderbilt.edu/module/di/challenge/#content

CRT for Math, Resources

Misconceptions- be aware

Just because you use call and response doesn't mean you have covered CRT thoroughly.

https://www.cultofpedagogy.com/culturally-responsive-misconceptions/

Use the Framework of CRT (Bottoms, Ciechanowski, Jones, de la Hoz, & Fonseca, 2017; Gay, 2013) to do Family Math and Science Nights. Something we can propose to our preservice teachers.

(1) Changing attitudes and beliefs

(2) Leveraging culture and difference

(3) Grappling with resistance

(4) Improving pedagogical connections.

THANK YOU

"Culture is a matrix of infinite possibilities and choices. From within the same culture matrix we can extract arguments and strategies for the degradation and ennoblement of our species, for its enslavement or liberation, for the suppression of its productive potential or its enhancement."

—Wole Sovinka, Nigerian Nobel Laureate

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