Developing as Culturally Responsive Mathematics Teacher Educators: Reviewing and Framing Perspectives in the Research

Kathleen Nolana
Faculty of Education
University of Regina, Regina
SK, Canada

Lindsay Keazerb
Department of Teacher Education
Sacred Heart University
Fairfield, CT, United States

Abstract

Teacher educators developing and modeling their culturally responsive pedagogies (CRP) is essential for furthering the development of culturally responsive prospective and practicing teachers. To date, no tool has been developed for supporting the self-study and growth of mathematics teacher educators' CRP. Thus, this article shares the process of identifying, synthesizing, and analyzing key scholarly texts in the field of teacher educator CRP, to extract from the research: a) how the scholars define CRP in the context of their studies (that is, what does CRP mean?) and b) how the scholars elaborate on this definition of CRP through the naming of components or characteristics (that is, what does CRP look like?). This review provides broad theoretical grounding for CRP, as well as a lens through which (mathematics) teacher educators can interrogate enactments of CRP in their practice.

Keywords: *culturally responsive pedagogy; mathematics teacher educator; research review; reflective practice; CRP framework*

1.Introduction

Culturally responsive pedagogies (CRP) are widely accepted as a critical component of teaching in ways that value and incorporate children's diverse cultural and community knowledge resources (Gay, 2010; Ladson-Billings, 1995a, 1995b). Ladson-Billings (2014) describes the need for a fluid and dynamic understanding of culture, as well as a fluidity to one's scholarship on CRP, suggesting that "if we ever get to a place of complete certainty and assuredness about our practice, we will stop growing" (p. 77). She describes common hazards of becoming stuck in limited understandings of culture, or ignoring the sociopolitical dimensions. As such, growing one's CRP is important ongoing work for mathematics teacher educators (MTEs).

Growing our own culturally responsive pedagogical (CRP) practices as mathematics teacher educators has been our goal for some time now (Authors, 2019, 2021a; Authors, 2021b). In the context of teaching mathematics education courses, we are committed to reflect on our efforts to enact a pedagogy that is responsive to the culture(s) and knowledge(s) of our students (i.e., practicing and prospective teachers). Our efforts respond to Averill et al.'s (2009) challenge for educators to "critically reflect on their own culturally responsive practices, ideally in discussion with other practitioners, teacher educators, and students" (p. 181). To date, no specific tool has been proposed for supporting and guiding the professional growth of culturally responsive (mathematics) teacher educators. Thus, this review shares our process and outcomes of identifying, synthesizing, and analysing a collection of key scholarly texts in the field of teacher educator culturally responsive pedagogy, that provide framing around: a) how CRP has been defined (that is, what does CRP *mean*?) and b) how CRP has been

described through the naming of dimensions, components, characteristics, or questions (that is, what does CRP *look like*?).

2. Background and Context

Research on CRP in mathematics teacher education has primarily focused on the CRP of prospective/practicing teachers (PTs) (e.g., Willey & Drake, 2013) and/or the mathematics curriculum (e.g., Aguirre & Zavala, 2013), rather than that of MTEs. However, we support Han et al.'s (2014) claim that an essential element of teacher educators' efforts to support the development of PTs' CRP is to examine and model their own CRP.

While Ladson-Billing's (1995a, 1995b) original theory was termed culturally *relevant* pedagogy, the varied implementation and execution of CRP inspired revisions to this term, which have included culturally *responsive* (Gay, 2010) and culturally *sustaining* pedagogies

(Alim & Paris, 2017)— terms created to further clarify the intention of the pedagogy and to respond to the "misunderstood" and "neglected" dimensions of culturally relevant pedagogy, progress which Ladson-Billings herself has validated (2014, 2017). Thus, in seeing these terms as sharing an intended meaning and goal of supporting the mission of responding to and sustaining cultural pluralism, we use the general term culturally responsive pedagogies to encompass the varied terms.

To initiate the development of an MTE self-study framework for growing CRP (Authors, 2021a), we began searching for existing frameworks designed for analyzing CRP in mathematics teacher education. While we found several existing frameworks for use by MTEs to develop PTs' culturally responsive practices (see, for example, Aguirre & Zavala, 2013; Gallivan, 2017), we were not successful in locating a framework for explicit use by MTEs to reflect upon their *own* practices as culturally responsive pedagogues. Some of the questions posed by existing PT-focused frameworks (for example, "How does my lesson make student thinking/understanding visible and deep? (Aguirre & Zavala, 2013, p. 183)) could make valuable contributions to our MTE self-study framework for growing CRP. Nonetheless, developing an explicit framework for MTEs is a response to calls for MTEs to model and promote culturally responsive practices in their teacher education classrooms.

As we began attempts to develop such a framework for MTE self-study of CRP, we embraced the powerful influence of the work of Ladson-Billings on our own conceptualizations of CRP, specifically Ladson-Billings' 3 critical components of culturally relevant teaching: Academic success, cultural competence, and sociopolitical consciousness (Ladson-Billings, 1995b, 2006). We deliberately foregrounded this third component of sociopolitical consciousness, since it has been shown to be an often-neglected component of Ladson-Billing's (1995b, 2006, 2014, 2017) theory of CRP. Ladson-Billings (2014) states: "Even when people have demonstrated a more expansive knowledge of culture, few have taken up the sociopolitical dimensions of the work, instead dulling its critical edge or omitting it all together." (p.77) Thus, as MTEs, we are urged "to sharpen our sociopolitical lenses in order to notice and disrupt manifestations of privilege and oppression in mathematics education" (Willey & Drake, 2013, p. 68).

As a result of our reflections on the absence of an MTE self-reflection framework, and the tendency to neglect critical components of CRP, we recognized the need to conduct a review of existing frameworks and perspectives, to provide theoretical grounding from the research and methodological work on CRP in mathematics education and teacher education (e.g., Gay, 2010; Gist, 2014; Gutiérrez, 2012; Ladson-Billings, 1995b). In this paper we present the outcome of an examination of the ways CRP is defined and described through components, characteristics, or questions within existing research and theory on CRP.

3. Methodology and Methods: The Review Process

The published literature in the area of CRP is extensive. As noted by Young (2010) with regard to research in the area of CRP, "[t]he void in scholarly research is not in the knowledge of theories but in the knowledge of how to implement them, particularly in a way that has a wide-reaching and sustainable impact on teacher education" (p. 259). Moreover, Sleeter (2012) suggests it is critical for this research "to attend to two related issues. The first is describing and clarifying what culturally responsive pedagogy means and looks like in any given study…The second related issue that warrants attention is the cultural context(s) of students, and how a given conception of

culturally responsive pedagogy derives from or fits that context" (p. 576). These issues – what CRP means, what CRP looks like, and attending to the cultural contexts – form the structure of our review.

In recognizing the need to narrow down the field of research texts, and to select only those texts (peer-reviewed journal articles and book chapters) that would advance our overall goal of constructing a MTE self-study framework, we identified two selection criteria to guide us. First, we searched for literature which presented example frameworks in use, either original frameworks proposed by the researchers or a set of guiding questions related to developing or identifying CRP in the classroom. Since not all relevant texts included existing frameworks, we expanded this criterion to include texts which presented a very clear theoretical and methodological grounding for their work and which were widely cited in the field of CRP. Second, we realized that keeping our focus specific to the context of mathematics teacher educators was quite limiting, so we included literature which also focused on the practices of teacher educators in general. In the end, we settled on 25 research texts that match our outlined selection criteria and provide substantial foundation for developing a comprehensive MTE self-study framework.

As mentioned previously, the review of frameworks and perspectives of CRP that we present here was structured by two overarching goals. The first goal was to explore and document how each scholar defines CRP; that is, *what does CRP mean*? Similar to Young (2010), we felt that even though research on CRP is theoretically rich and innovative, our experience "demonstrated how inconsistently culturally relevant pedagogy has been defined and utilized in scholarly research" (p. 249). Thus, as part of developing a CRP-focused self-study framework, we identify clear definitions or meanings that we draw on. Thus, the first part of this review offers a selection of key definitions of CRP drawn from the literature.

The second goal of this review was to explore and document how each of the scholars elaborate on their definitions of CRP through naming dimensions (or components, characteristics or questions); that is, *what does CRP look like*? Given that our goal was to mine ideas from the literature to develop a reflective framework, we focused less on other aspects of the studies, such as the data and analysis. We were more concerned with unpacking conceptions and dimensions of CRP, such that this review can provide guidance in response to the matter that "what it means to be a culturally relevant pedagogue is widely misconceived by scholars and practitioners alike" (Young, 2010, p. 249). As noted previously, we were interested in exploring more deeply how the often-neglected sociopolitical perspectives (Ladson-Billings, 2014, 2017) might inform self-reflection of CRP.

4. Classification of Research Texts: The Review

This review of frameworks and perspectives shares our process of identifying, synthesizing, and analysing a collection of key scholarly texts in the field of culturally responsive pedagogy, with the two overarching goals of extracting from the research: a) how the scholars define CRP in the context of their studies (that is, what does CRP *mean*?) and b) how the scholars elaborate on this definition of CRP through the naming of dimensions, components, characteristics, or questions (that is, what does CRP *look like*?).

4.1 How is Culturally Responsive Pedagogy Defined?

The first goal of our review was to explore and document how the scholars define CRP in their own research studies; that is, *what does CRP mean*? We initiate this task with the theoretical model of culturally relevant pedagogy set forth by Ladson-Billings (1995), since her grounded theories have been widely cited and have stood the test of time informing our own work in culturally relevant/responsive pedagogies.

A next step for positing effective pedagogical practice is a theoretical model that not only addresses student achievement but also helps students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools (and other institutions) perpetuate. I term this pedagogy, *culturally relevant pedagogy*. (Ladson-Billings, 1995, p. 469).

Since the development of this theoretical model, Ladson-Billings' ideas of culturally relevant pedagogy have garnered widespread attention. Yet Ladson-Billings (2006) notes that a common misperception of teachers is a focus on what lessons and activities we do with our students, rather than a reframing of "how we think" (p. 30).

Instead of the specific lessons and activities that we select to fill the day, we must begin to understand the ways our theories and philosophies are made to manifest in the pedagogical practices and rationales we exhibit in the classroom." (p. 30)

Echoing these ideas, Gay (2018) proposes that CRP "is the behavioral expressions of knowledge, beliefs, and values that recognize the importance of racial and cultural diversity in learning" (pp. 36-37).

Ladson-Billings delineates three components of CRP: academic success (i.e. student learning), cultural competence, and sociopolitical consciousness (Ladson-Billings, 2006). We have found these three components to be highly informative in our own work. As noted earlier, the third component, developing sociopolitical consciousness, is particularly important for applying a critical lens to how our thinking, our theories, and our philosophies manifest themselves in the classroom. This third element, however, is sometimes neglected in CRP work, as it diverges from the superficial versions of CRP that have gained broad appeal and acceptance within the dominant paradigm (Ladson-Billings, 2014).

The work of Gay (2018) on culturally responsive pedagogy is also widely cited and influential to conceptualizations of CRP. Approaching a definition for CRP from a contextual, instead of content-based, angle, Gay offers a set of four overarching contexts within which we could define CRP: a) social contexts, b) the students, c) the curriculum, d) instruction. This offers us a set of contexts for examining our own teaching with the lens of making it more culturally responsive.

A second layer of our conceptualization of CRP involves explicitly examining and emphasizing the critical lens for a continuously improving CRP. Ladson-Billings (2006) suggests that developing sociopolitical consciousness involves educating oneself about both the sociopolitical issues of the local school community and of the larger world that affect students' lives, and incorporating those issues into the curriculum in order to help students learn to better understand and critique their world. This attention to the critical component of CRP parallels the work of Gutiérrez (2012) on equity within the field of mathematics education. Gutiérrez sheds light on the ways dominant perspectives of equity fail to consider the "critical dimensions" of equity. She suggests that addressing equity must include consideration of four dimensions: access, achievement, identity, and power. Like the critical dimensions of CRP, however, the two critical dimensions of equity (identity, power) are often neglected, while the "dominant dimensions" of equity (access, achievement) and CRP (academic success) are widely accepted and more visible in both research and practice.

The widespread adoption of oversimplified versions of CRP and equity is dangerous. We risk becoming complacent with less robust forms of CRP— versions that distract from the absence of critical components and allow inequitable and biased pedagogies to silently persist. We find the critical elements of developing sociopolitical consciousness in CRP (Ladson-Billings, 2006) and the identity and power dimensions of equity (Gutiérrez, 2012) to be useful indicators for gauging work in CRP. For instance, in our initial review of existing frameworks of CRP, we found that often "something felt missing," and through an analysis of the framework components, we found the critical lens was incomplete.

A third layer in our conceptualization of how CRP is defined is the self-critical approach to examining our practices as white female MTEs attending to our white lenses. We take up the proposition of Chen, Nimmo, and Fraser (2009) for a "pedagogy [where] educators actively seek to counter patterns of institutional bias based on social differences and are proactive in creating classroom environments that reflect the diverse histories and cultures of all learners" (p. 101). Drawing on other research to inform their work (see, for example, Wolpert, 2005), Chen et al. present four anti-bias goals to guide educators' efforts:

(1) to nurture the construction of a knowledgeable, confident identity as an individual and as a member of multiple cultural groups; (2) to promote comfortable, empathetic interactions with people from diverse backgrounds; (3) to foster each child's ability to critically think about bias and injustice; and (4) to cultivate each child's ability to stand up for herself or himself, and for others, in the face of bias and injustice. (p. 101)

These anti-bias goals emerged out of Wolpert's (2005) research with young children. These goals remind us, as teacher educators who work with PTs who will work with young children, that we must be diligent in reflecting on our own identity development, including our understandings and experiences of diversity and bias. While our approach in this review is primarily centered on the language of culturally responsive/relevant/sustaining, these

anti-bias goals speak to our desire to forefront the importance of the development of sociopolitical consciousness (Ladson-Billings, 2006) in both ourselves and our students. Moreover, research into anti-bias curriculum impacts our own development as MTEs (see also, Lin et al., 2008). Hence, we include Chen et al.'s ant-bias goals here to signal its key contribution in our conceptualization for how CRP is defined.

Finally, a fourth layer of our conceptualization of CRP is the work of culturally sustaining pedagogies (Alim & Paris, 2017), founded upon Ladson-Billings' (1995b) theory of CRP. Culturally sustaining pedagogies (CSP) offers "loving critiques" (for example, critical reflexivity on cultural practices) pointing to the need for rethinking and reconceptualizing the dominant, more widely accepted, versions of CRP. Alim and Paris (2017) emphasize the critical component, critiquing its absence in existing pedagogies, and describing CSP as "at the asset-based, critical pedagogical edge" (p. 12). CSP emphasizes a decentering of whiteness, the white gaze, and the shift to education which "sustains the life way of communities who have been and continue to be damaged and erased through schooling" (p. 1). Others also join in the struggle for the decentering of whiteness (Gist et al, 2019; Sleeter, 2012) as an essential component of conceptualizing CRP in teacher education.

4.2 What Does Culturally Responsive Pedagogy Look Like?

The second overarching goal of our review was to explore and document how the scholars elaborate on their definitions of CRP through the naming of dimensions (components, characteristics, or questions); that is, *what does CRP look like?* To gain an understanding of what CRP looks like, we processed and categorized the 25 selected research texts based on two descriptive features: the educational context for the research, and the key components or characteristics that the authors of the research text used to describe what CRP looks like; that is, if they offered their own framework or set of guiding questions to explore what CRP looks like in their own contexts. We describe these two descriptive features below and then present the resulting categorization in the form of a summary chart (see Figure 1).

4.2.1 Educational Context

By educational context, we refer to a number of sub-features that describe, for example, the kind of research text, the field, the cultural context, etc. (see the six questions presented below). In other words, educational context consists of a number of characteristics that are important in describing the setting or environment for each of the research texts that we reviewed. Sleeter (2012) reminds us that, while it is important to understand which aspects of CRP might apply across cultural groups and national boundaries, "researchers cannot skip over the task of grounding what [CRP] means in the context being studied" (p. 576). In addition to context or setting, we also draw attention to the many different ways in which the specific content of CRP is being conceptualized across the research texts, as alluded to in the previous section of this paper, where we address how culturally responsive pedagogy is being defined. While we have chosen to adopt the term *culturally responsive* to describe our pedagogy, we are also fully aware that researchers across the literature select variations on these two words; for example: "cultural synchronization" (Irvine, 1990), "culturally congruent" (Mohatt & Erickson, 1981), "culturally appropriate" (Au & Jordan, 1981), "culturally revitalizing*"* (McCarty & Lee, 2014), "culturally sustaining" (Paris, 2012), as well as several others (Aronson & Laughter, 2016). In addition, some researchers adopt terms that focus on one or other specific area of CRP; for example, "multicultural teaching, equity pedagogy, … and social justice teaching" (Sleeter, 2012, p. 573).

With this in mind, we examined each of our reviewed research texts to identify the key educational contexts by responding to the following six questions:

(1) *Is the research text presenting an empirical study, a literature review, or a theoretical piece?* For this question our aim is to identify the type of research text that we reviewed.

(2) *Is the context of the research text teacher education in general (TE) or mathematics teacher education (MTE)?* Here, we describe whether the research text focuses on mathematics teacher education specifically, or teacher education in general. In some cases, the research text is from the broader field of mathematics education (ME), and then the text is categorized as MTE or ME in the table.

(3) *Does the research text focus on a specific area of teacher education (for instance, classroom, curriculum, field experience, or professional development) and/or level (age group)?* This question acknowledges the fact that teacher education includes both classroom-based experiences as well as non-classroom-based

experiences such as those based in curriculum design, field experience/practicum, or professional development experiences. In addition to a specific area, the research text may focus on a specific level or age group within teacher education, such as early childhood, elementary, middle years, secondary or university.

(4) *If the research text is an empirical study, who are the research participants (teacher educators, prospective teachers, or practicing teachers)?* For this question we provide a description of whether the study focused on participants within a teacher education program (where participants would be teacher educators or prospective teachers) or participants within K-12 schools.

(5) *If the research text is an empirical study, what are the 'cultural' contexts of those involved in the study?* For this question, we were interested in understanding whether the study takes place in a monocultural context or if there is a diversity of cultures represented, and to describe what cultures are represented. Here we were limited to the ways that cultural contexts were described by the authors of the research study.

(6) *What is the area of content focus (or sub-field) of CRP?* In this question, we refer to the research text's primary area of CRP content focus. That is, authors of the research texts may draw on the term of CRP in general, or they may refer specifically to a focus on equity or Indigenous education, for example. Elsewhere, one of the authors (Author 1, 2020) proposes that CRP in mathematics could be conceptualized as an inclusive term to include a number of mathematics education research subfields: ethnomathematics (EM), critical mathematics (CM), indigenous education (IE), social justice (SJ), language diversity (LD) and equity-based (E-b) approaches. Thus, one goal in this review was to identify the primary sub-field that, we consider, best describes the content (or sub-field) focus for each of the selected research texts. Responses to each of the six questions (where applicable) are presented in the table (Figure 1) through the use of abbreviations, separated by semi-colons.

4.2.2 Key Components or Characteristics

The second descriptive feature to assist us with understanding *what CRP looks like* in each research text focuses on key components or characteristics. This feature is significant in order to gain an appreciation for what, specifically, each of the research texts offers toward developing an MTE reflective framework and, in particular, a framework with an emphasis on critical consciousness (sociopolitical dimension). That is, we set out to determine if each research text offered their own framework or set of guiding questions and what aspects (if any) of their CRP nurtured and provoked the development of a critical consciousness. Due to space available, we present only brief phrases and/or titles in Figure 1 which point to the specific focus and significance of those frameworks or guiding questions.

Figure 1: What Does Culturally Responsive Pedagogy Look Like? A Summary of 25 Studies

	Research Text	**Educational CONTEXT for research**
1	Aguirre & Zavala (2013)	Empirical study; MTE; professional development focus; practicing elementary (K-8) teacher participants (6 white (1M, 6F) teachers); CRP [culturally responsive mathematics teaching, CRMT], LD, SJ
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: The CRMT tool consists of 8 dimensions in total across 4 categories: Mathematical thinking (5 dim: Intellectual support, depth of student knowledge and understanding, mathematical analysis, mathematical discourse and communication, student engagement); Language (1 dim: Academic language support for ELL); Culture (1 dim: Funds of knowledge/culture/community support); Social justice (1 dim: Use of critical knowledge/social justice). (p. 169)	
2	Alim & Paris (2017)	Theoretical; TE; CRP (Culturally sustaining pedagogies, CSP)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 4 parts to their definition of culturally sustaining pedagogy (CSP): To sustain linguistic, literate, and cultural pluralism; To position dynamic cultural dexterity as a necessary good; To see the outcome of learning as additive rather than subtractive, whole rather than broken, strengths rather than deficits; To sustain the lifeway of communities who are damaged and erased through schooling. (p. 1) AND	

	3 "loving critiques" based in problematizing asset pedagogies: critiques of enactments of asset pedagogies; sustaining dynamic community practices; critical reflexivity on cultural practices. (pp. 4-10)	
3	Averill, et al (2020)	Empirical (self-study); MTE; curriculum focus; 5 teacher educator participants (3 Maori & 2 NZ European); IE, E-b
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 main factors affecting the MTE's teaching and research: Responsiveness to educational perspectives (being flexible to changing policies, changing student needs, and feedback on their work); Responsiveness to culture (having natives to the culture share knowledge with the non-natives and non-natives learn about and use culture in their teaching); The way MTEs work together (shared decision making, equal status in planning and teaching, multiple cultural backgrounds and perspectives learning from and with each other). (pp. 9-18)	
4	Bennett (2012)	Empirical; TE; field experience focus; elementary; 35 prospective teacher participants (all white, English-speaking, middle class, 18-24); CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: The 5 dimensions of multicultural education (taken from Banks, 2001): Content integration; Knowledge construction; Prejudice reduction; Equity pedagogy; Empowering school culture. (p. 383)	
5	Boutte (2018)	Theoretical; TE; curriculum/course development focus; early childhood (P-3); SE US white university; CRP, E-b
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: Course design integrated Ladson-Billing's (2005) 3 dimensions of culturally relevant pedagogy (academic achievement, cultural competence and critical consciousness) with 4 other key components: Understanding structural inequities and institutionalized oppression; Understanding various social identities; Understanding funds of knowledge, wisdom, and strengths of children, families, and communities; Engaging in praxis. (p. 174)	
6	Brown-Jeffy & Cooper (2011)	Literature review; K-12 teacher context; CRP, CM (through CRT)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 5 themes (with several sub-concepts under each theme) in their conceptual framework of CRP teaching behaviors: Identity and achievement (5 sub-concepts: Identity development, cultural heritage, multiple perspectives, affirmation of diversity, public validation of home-community cultures); Equity and excellence (4 sub-concepts: Dispositions, multicultural curriculum content, equal access, high expectations for all); Developmental appropriateness (3 sub-concepts: Learning styles, teaching styles, cultural variation in psychological needs); Teaching the whole child (5 sub-concepts: Skill development in cultural context, bridge home/school/community, learning outcomes, supportive learning community, empower students); Student-teacher relationships (4 sub-concepts: Caring, relationships, interaction, classroom atmosphere). (pp. 71-77)	
7	Chen, Nimmo, & Fraser (2009)	Literature review; TE; classroom focus; early childhood; E-b (through anti-bias focus)
	The COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: A self-study tool focused on anti-bias curriculum with 4 sections: Self-awareness; Physical environment; Pedagogical environment; Relationship with families and community. (p. 104)	
8	Dray & Wisneski (2011)	Theoretical; TE; professional development focus; K-12; CRP, LD, E-b
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 5 actions based in a process of mindful reflection and communication on part of teacher: Examine own assumptions, prejudices, and biases; Describe, without interpreting, student behaviors; Interpret behaviors in a non-deficit way; Consider alternative ways that students may be demonstrating engagement and attentiveness; Reflect on how/if you have different behavioral expectations for different	

		children. (p. 34)
9	Gallivan (2017)	Empirical; MTE; curriculum focus; middle school; 4 prospective teacher participants (1 female, 3 male; all 4 White middle-class at a mid-Atlantic US university); CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: The 5 components of their *Analytic Framework for Revising a High-Level Mathematics Task to Be Culturally Relevant*: Connects to students' nonmathematical funds of knowledge; Connects to the mathematics in the context; Connects to students' mathematical funds of knowledge; Maintains or raises cognitive demand; Addresses the same mathematics content as the original task. (p. 97)	
10	Gay (2018)	Theoretical; TE and general ed; CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 8 descriptors which comprise a 'character profile' of culturally responsive teaching (CRT). CRT is: Validating; Comprehensive and inclusive; Multidimensional; Empowering; Transformative; Emancipatory; Humanistic; Normative and ethical. (pp. 36-46) AND 4 dimensions of culturally responsive teaching: Caring (Ch. 3); Communication (Ch. 4); Curriculum (Ch. 5); Instruction (teaching & learning) (Ch. 6). (p. xxxiii)	
11	Gist (2014)	Empirical; TE; classroom & curriculum focus; university; teacher educator participants (of students of color); CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 7 pedagogical dimensions of CRP: Acting as a change agent; Empowering instructional practices; Learning about students and communities; Cultural competence and congruity; Sociopolitical consciousness; Caring; High expectations. (p. 265)	
12	Gutiérrez (2012)	Theoretical; MTE/ME; Equity-based (E-b)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 4 dimensions of equity: Access; Achievement; Identity; Power. (pp. 33-34)	
13	Han, et al (2014)	Empirical (self-study); TE; all aspects of TE experience; university; 7 teacher educator participants (representing 5 different cultural/linguistic backgrounds); CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: Framework of how they enact CRP which identified 3 major themes, each with related sub-themes: Teaching practice; Building relationship through teaching and advising; Program development. (p. 299) AND Framework of tensions encountered when attempting to actualize CRP which included 3 categories: Students; Institutional structure; Colleagues. (p. 302)	
14	Jester & Fickel (2013)	Empirical; TE; field experience focus; K-12; 53 prospective teacher participants (91% White, 74% female); CRP, IE
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 components of a culturally responsive teacher education curriculum: A culturally responsive conceptual framework that focuses on CRT practices; An emphasis on cultivating critical sociocultural consciousness; Direct engagement with culturally relevant knowledge and epistemologies. (p. 194) AND 2 components of sociocultural consciousness: One's awareness of self and others as cultural beings; A structural orientation that accounts for the sociopolitical/cultural contexts of schools and schooling. (p. 195)	
15	Kitchen & Hodson (2013)	Empirical; TE; classroom & curriculum focus; 8 teacher educator participants (6 Euro-Canadian, 2 Aboriginal); CRP, IE
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 5 key themes to create a model for culturally responsive Aboriginal teacher education: Relational knowing; Promoting self identity and cultural identity; Teaching through language and culture; Curriculum and pedagogical expertise; Epistemic conversations with Aboriginal staff. (p. 154)	

16	Ladson-Billings (1995)	Theoretical; TE; classroom focus; K-12; CRP (R for relevant)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 broad propositions about successful teachers' beliefs and ideologies: Conceptions of self and others; Social relations; Conceptions of knowledge. (pp. 478-482)	
17	Ladson-Billings (2006)	Theoretical; TE; classroom focus; K-12; CRP (R for relevant)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 components of culturally relevant mathematics pedagogy: Academic success; Cultural competence; Critical consciousness. (pp. 34-37) AND 4 salient elements of teacher thinking that contribute to CRT: Social contexts; Students; Curriculum; Instruction. (pp. 30-33)	
18	Lingard & Keddie (2013)	Empirical; TE; classroom focus; K-12; practicing K-12 teacher participants (24 Queensland, Australia schools); SJ
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 4 dimensions for a total of 20 elements of productive pedagogies: Intellectual quality (6 elements: Problematic knowledge, higher-order thinking, depth of knowledge, depth of students' understanding, substantive conversation, metalanguage); Connectedness (4 elements: Connectedness to world beyond classroom, knowledge integration, background knowledge, problem-based curriculum); Supportiveness (5 elements: Students' direction, explicit quality performance criteria, social support, academic engagement, student self-regulation); Working with and valuing difference (5 elements: Cultural knowledges, active citizenship, narrative, group identities in learning communities, representation). (pp. 434-436)	
19	Lucas & Villegas (2013)	Theoretical; TE, curriculum focus; university; LD (Linguistically responsive teaching, LRT)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 orientations of linguistically responsive teaching: Sociolinguistic consciousness; Value for linguistic diversity; Inclination to advocate for English language learners. (p. 101) AND 4 types of pedagogical knowledge and skills of linguistically responsive teaching: Strategies for learning about background of ELLs; Principles of second language learning; Identify language demands of tasks; Strategies for scaffolding instruction for ELLs. (pp. 101-102)	
20	Morrison, et al (2008)	Literature review; K-12 teacher context; 45 K-12 classroom-based research studies reviewed; CRP, SJ
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 tenets of Ladson-Billings, with each being elaborated upon in terms of example teacher actions which can be operationalized in support of that tenet of CRP: High expectations (5 actions: Modeling/scaffolding/clarification of curriculum, students' strengths as instructional starting points, investing/responsibility for students' success, creating/nurturing cooperative environments, high behavioral expectations); Cultural competence (3 actions: Reshaping prescribed curriculum, building on students' funds of knowledge, school/community relationships); Critical consciousness (4 actions: Critical literacy, engaging students in social justice work, making explicit power dynamics of society, sharing power in the classroom). (pp. 435-443)	
21	Nicol, et al (2020)	Theoretical, MTE/ME; curriculum & classroom focus; CRP, IE
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: Archibald's (2008) principles of Indigenous storywork, including: Respect; Reciprocity; Reverence; Responsibility; Interrelatedness; Synergy; Holism. (pp. 6-9) AND 4 characteristics of culturally responsive mathematics education experienced in relation and responsive to community and cultural interests: Focus on relationships with mathematics with/in communities; Acknowledge place/land in considering other ways of being mathematical; Commit to building and sustaining reciprocal relationships; Create ethical spaces and critical stances. (p. 13)	

22	Ragoonaden, et al (2015)	Empirical (self-study); TE; curriculum focus; university; 3 teacher educator participants (2 present as racialized persons); SJ, LD
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: Drawing on Egbo (2009), presents 4 pedagogical frameworks that teacher educators can adopt when introducing diversity to students: Diversity pedagogy; Critical pedagogy; Peace education; Transformative learning (which includes culturally responsive pedagogy and anti-racist pedagogy). (p. 9 of 16)	
23	Sheets (2009)	Theoretical; K-12; CRP (Diversity Pedagogy Theory, DPT)
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: The 8 dimensions of diversity pedagogy theory: Diversity; Identity; Social interaction; Culturally safe classroom context; Language; Culturally inclusive content; Instruction; Assessment (pp. 12-13)	
24	Vass (2017)	Empirical; TE; field experience focus; secondary; 3 prospective teacher participants (all 3 presenting as racialized persons); CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: 3 barriers that negatively impacted on the prospective teachers in terms of enacting CRP: Mentor teachers encouraged limited and limiting focus in terms of pedagogy, curriculum, and assessment; Resistance from mentors to seeing the need for change or what PTs have to offer; Concerns with being evaluated during the professional experience. (p. 456-459)	
25	White, et al (2016)	Empirical; MTE; classroom & curriculum; prospective K-12 teacher participants; CRP
	COMPONENTS / CHARACTERISTICS of CRP contributing to our framework: The 3 goals of their cultural awareness unit: Develop awareness of the role of culture in the teaching and learning of mathematics; Develop awareness of stereotypes about who can do mathematics; Develop strategies to teach mathematics to all students. (p. 165)	

5. Implications: New Directions for Culturally Responsive Pedagogy

CRP has been widely applied, yet misunderstood and misrepresented by scholars and practitioners (Young, 2010), often lacking the critical edge (Alim & Paris, 2017) and the sociopolitical consciousness (Ladson-Billings, 2014, 2017). The review of frameworks and perspectives on CRP organized in this paper provides a theoretical grounding and expression of the components and dimensions needed in a living version of CRP. This review offers MTEs and teacher educators a comprehensive view (a window) into the variety of ways in which scholars are conceptualizing, 'measuring,' and delineating CRP in teacher education. In fact, this review can serve as an indicator or barometer of where and how the field is evolving. In addition, the review can serve as a tool which supports teacher educators in comparing their own understandings of CRP with the understandings of others in the field, as well as a tool with which to interrogate enactments of CRP in their own practice. In that sense, this review not only serves as a window into how CRP is being conceptualized by teacher educators but also as a mirror (Styles, 1988), supporting teacher educators in taking on a critical edge to teaching and to examining ways to better model the development of a sociopolitical consciousness.

To further this work, our next steps are to use this review to develop a framework of self-reflection questions to guide MTEs in growing their own CRP. In doing this, we recognize many warnings to heed, such as that of Sleeter (2012) who proposes there are four (4) simplifications of CRP to guard against: Cultural celebration, trivialization, essentializing culture, and substituting cultural for political analysis of inequalities (p. 568). We are especially aware of the dangers in trivializing CRP through, for example, the design and implementation of a checklist approach to reflecting on our pedagogy (Authors, *in press*). As Sleeter (2012) notes, the use of checklists to identify the presence or absence of certain CRP-related practices "reduce complexity and allow taken-for-granted assumptions to replace inquiry" (p. 570). She adds that educators must guard against "reducing [CRP] to steps to follow rather than understanding it as a paradigm for teaching and learning" (p. 569). In other words, CRP is fundamentally a mindset, a lens, or philosophical perspective, that guides how one looks at and thinks about teaching and learning. The commitment of MTEs and other teacher educators to growing their CRP is a process of inquiry, a process which will never be complete. Another area which risks oversimplification— substituting cultural for political analysis of inequalities— is one that we guard against in the development of our

framework to preserve the integrity of the sociopolitical consciousness. We adhere to Sleeter's advice for educators to "give priority to a political analysis" (p. 572) which is based in antiracist education, critical race theory and critical pedagogy, while also being fully aware of the need to avoid being too "conceptually dense" (p. 572. This final point reminds us that we hope MTEs can model CRP in ways which convey to PTs that CRP is a viable and productive approach to classroom practice, and not one to be simply dismissed as impractical.

6. Concluding Thoughts

This work of framing perspectives to inform MTE growth in CRP is a necessary and critical response to calls to ensure that teacher education programs are adequately modeling and preparing PTs for the diverse and complex classrooms they will encounter. As research suggests, "teacher preparation programs have been slow if not outright resistant to adopt critical frameworks as a programmatic stance for preparing teachers" (Gist, 2019, p. 15 of 26). According to Sobel et al. (2011), focusing teacher educations programs on "coherence between all professional development and a comprehensive program plan of study including courses, internships, activities, assignments, readings, and performance-based assessments" (Sobel et al, 2011, p. 450) may be the most productive approach to cultivating a deep understanding and practice of culturally responsive pedagogy in/for teacher education programs. At the same time, however, we acknowledge that a desire and drive to learn and change must come from within each individual teacher educator. Unless and until mathematics teacher educators themselves take on the responsibility to grow their own CRP, students from diverse cultural and linguistic backgrounds will continue to suffer inequities and injustices within mathematics classrooms.

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