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The Effect of Case-Based Instruction on Teacher Candidates' Culturally Responsive Knowledge: A Mixed-Methods Study

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Abstract: The rapid growth of culturally and linguistically diverse populations in K-12 schools has increased the need for preparing culturally responsive teachers. Yet, many pre-service teachers feel unprepared to work with diverse students. With the urgent need to connect educational theory to classroom practice, teacher preparation programs have turned to case-based instruction and worked examples to relay important content. In an explanatory sequential mixed-methods study, 95 pre-service teachers came into a lab to engage in a 4-week instructional sequence that examined two factors, namely, 1) case-based instruction (classroom cases vs. textbook) and 2) worked examples (expert worked examples vs. student exploration), on pre-service teachers' understanding of culturally responsive pedagogy. Results of a multilevel growth model show that pre-service teachers who learned from the case-based instruction performed higher than those in the textbook condition. Participants' rate of change was dependent upon viewing classroom cases but not an expert-worked example. Qualitative findings indicate that preparing culturally responsive teachers through case-based instruction could offer a more in-depth, rich, realistic, and inclusive experience associated with understanding multiple perspectives.

Keywords: culturally responsive practices, case-based instruction, teacher education

A goal of the U.S. Department of Education and state education agencies has been to reduce the achievement gap for students from culturally and linguistically diverse (CLD) backgrounds (McFarland et al., 2017). These efforts include initiatives, funding opportunities, and other incentives for states, school districts, and teachers to increase academic scores, lower dropout rates, and open access to higher education. Although the U.S. Department of Education has made sustained efforts, the disparity in academic achievement continues (McFarland et al., 2017). These differences in achievement and the rapid growth of CLD populations in K-12 schools have heightened the need for preparing culturally responsive teachers (Gay, 2018). Yet, many pre-service teachers feel unprepared to work with CLD students (Nieto, 2010l; King & Butler, 2015). With this urgency, teacher preparation programs have turned to case-based instruction (CBI) and expert examples as authentic, practicum-like experiences of the school environment.

Contrary to textbook instruction, CBI engages pre-service teachers by having them (a) review classroom cases and (b) generate analyses of instructional efficacy and alternative solutions, allowing for practice-oriented learning. Despite the intuitive notion that CBI supports a pragmatic foundation, little empirical evidence exists concerning this approach's effectiveness in relation to culturally

responsive pedagogy. Therefore, in this study, we use an explanatory sequential mixed methods design to evaluate the instructional effectiveness of CBI to increase elementary and secondary pre-service teachers' knowledge of working with CLD students. Additionally, as research on the mechanisms of CBI-supported learning is limited, we also examine the effectiveness of integrating an expert worked example, an elaborated analysis of problems presented in the case and/or textbook material by an expert, to see if this strategy would further enhance CBI effectiveness in comparison to other conditions.

Culturally Responsive Pedagogy in Teacher Education

When teachers engage in culturally responsive pedagogy (CRP), they draw on CLD students' experiences, cultural knowledge, frames of reference, and other essential components to make learning experiences as relevant and effective as possible (Gay, 2018). CRP provides a framework based on scholarship (e.g., Gay, 2018; Ladson-Billings, 2001) holding that "teachers knowing who they are as people, understanding the context in which they teach, and questioning their knowledge and assumptions are as important as the mastery of techniques for instructional effectiveness" (Gay & Kirkland, 2003, p. 181). CRP is an educational initiative in which acceptance, respect, and celebration of diverse cultural, ethnic, racial, and linguistic groups are vital to the development of society and an essential part of the human condition (Gay, 2018). Because CRP is a practice that encompasses all aspects of students' learning and teachers are the instructional facilitators, the foundational knowledge, and skills that teachers must possess are the same across ages, grade levels, subject areas, and student populations (Gay, 2018; Santamaria, 2009).

Studies show that culturally responsive teaching promotes k-12 student academic achievement and engagement, feelings of belonging, and a positive orientation toward others outside one's racial/cultural group (e.g., Byrd, 2016; Christianakis, 2011; Ensign, 2003). A synthesis by Aronson and Laughter (2016) shows that CRP increases student engagement and motivation across all content areas, as evidenced by achievement scores in mathematics, science, English/language arts, and history/social studies. Although evidence-based research connecting CRP and positive student outcomes has shown promise, the best way to support preservice teachers in developing this knowledge has yet to be thoroughly investigated.

Potential Mechanisms for Enhancing CRP in Teacher Education

Case-Based Instruction

In their review of CBI, Koehler et al. (2018) underscored several of its benefits. These benefits include: (a) engagement with experiences comparable to those pre-service teachers will have in their classrooms/schools; (b) interactions with complex problems in nonthreatening environments supportive of reflective learning; (c) opportunities for collaborative learning through exposure to diverse perspectives; and (d) opportunities to develop relevant problem-solving skills and self-directed learning behaviors, skills that are in high demand in the profession as full-time teachers. In other words, CBI helps future teachers learn how to interpret student behaviors "in rich, accurate, and complex ways" through analysis of the data of practice (Cochran-Smith et al., 2015, p. 117).

Empirically solid evidence across disciplines has demonstrated CBI's potential for enhancing pre-service teachers' critical thinking and pedagogical skills (e.g., Goeze et al., 2014; Gravett et al., 2017; Koehler et al., 2018) as well as improving student achievement and social well-being (Kane et al., 2011). Although emergent (e.g., Andrews, 2002; Cochran-Smith et al., 2015), CBI research on diversity and multicultural awareness remains limited, a significant gap that our study aimed to fill.

Additionally, research on the mechanisms of CBI that support pre-service teachers' learning is limited. Thus, expanding upon cross-disciplinary research (e.g., Crippen & Earl, 2004), we not only contrast CBI with a textbook condition, but we also examine the effectiveness of integrating expert worked examples of the cases and/or textbook material to see if these strategies would further enhance CBI effectiveness.

Expert Worked Examples

Expert worked examples, often employed in well-structured domains such as mathematics, are statements that provide the learner with an expert's solution to the problem for learners to study. These statements often include a problem statement, solution steps, and a final solution (Wittwer & Renkl, 2010). Empirical evidence suggests that learning from well-designed expert worked examples can benefit learners who need more prior knowledge in that area (Kalyuga et al., 2001; Schwaighofer et al., 2016; van Loon-Hillen et al., 2012), such as pre

Research on worked examples has demonstrated several benefits for learning. Notably, research suggests that integrating worked examples increases understanding of problem-solving procedures (Atkinson et al., 2000; Renkl, 2014) and supports novice learners in knowledge acquisition (Bokosmaty et al., 2015; Chen et al., 2015). These benefits manifest themselves when learners can focus their attention on how experts viewed and solved the problem, facilitating the construction of a schema for solving similar issues or cases in the future (Paas & Van Gog, 2006; Schworm & Renkl, 2006; van Loon-Hillen et al., 2012).

Rationale for Selecting CBI and Expert Worked Examples

In reviewing teacher preparation literature, Cochran-Smith et al. (2015) identified two approaches to changing teacher attitudes and practices related to enacting CRP. To change CRP attitudes, Cohran-Smith and colleagues suggest providing pre-service teachers with opportunities to explore their sociocultural identities and learn about diversity through direct interactions with people of diverse backgrounds. CBI and worked examples have the potential to combine the benefits of the approaches identified by Cochran-Smith et al. (2015) as effective in enhancing CRP attitudes and practices. Inviting pre-service teachers' analysis and reflection upon cases of practice, including identifying issues and biases, and designing practical solutions, exposes them to their own thinking and pre-conceptions. This work, in turn, provides an opportunity to consider ideas related to multicultural curricula and including through expert responses to various situations, much like in a real-life practicum.

Theory-practice connections may be particularly beneficial for pre-service educators, helping them interpret a range of CLD students' learning strengths and needs that are different from their own. Indeed, as negative stereotyping of CLD students persists, often due to a lack of exposure to diversity among prospective teachers (e.g., Sleeter, 2017; Youngs & Youngs, 2001), CBI and worked examples may provide the much-needed exposure, albeit 'virtual,' along with creating positive first experiences of successfully identifying and solving diversity-related cases of practice through connecting cross-cultural perspectives. Analysis of cases from practice allows teacher candidates to interact with complex problems while studying in non-threatening environments supportive of more reflective learning (Koehler et al., 2018). That said, although emergent evidence supports the benefits of CBI in enhancing teachers' facilities with CRP (e.g., Cochran-Smith et al., 2015), the generalizability of findings with worked examples as mechanisms for enhancing CRP needs to be empirically investigated, a gap in our study aims to address.

Present Study

Guided by the following research questions, we employed an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009), seeking to evaluate the effectiveness (quantitative) and perception (qualitative) of using CBI to teach pre-service teachers about CRP. First, we asked: Compared to traditional approaches of teaching CRP (i.e., textbook), does reading classroom cases, with or without an expert worked example, influence pre-service teachers' ability to evaluate classroom cases across time? To provide evidence for this question, we conducted a study with 95 pre-service teachers who were assigned to one of four conditions created by crossing two factors: mode of instruction (i.e., CBI or textbook) and an expert worked example (i.e., present or not) and assessed by their written reactions to a classroom case. Grounded in theory and empirical work (Cochran-Smith et al., 2015), we anticipated that pre-service teachers who viewed classroom cases would increase their knowledge over time to a greater extent than those who learned the same content from a textbook. In relation to expert worked examples, and again, grounding our findings in theory (e.g., Kolb et al., 2000), we hypothesize that worked examples may further the effects of CBI in enhancing CRP.

Second, using focus groups, we asked three qualitative research questions: What are participants' perceptions of culturally responsive practices? What are the participants' perceptions of the study's content? Lastly, what are participants' perceived challenges and benefits of the two instructional factors (cases vs. text; expert worked example vs. student exploration)? To explore these perceptions, we selected twelve of the 95 participants to participate in focus groups. Following the integration of Teddlie and Tashakkori's (2009) methods, we developed a meta-inference from quantitative and qualitative findings to provide a more holistic, in-depth understanding of the phenomena under investigation.

Materials and Methods

Quantitative Strand

Participants

Pre-service teachers ($N = 95$) were recruited through emails and education courses at a Northwestern University. Participants were paid $15 for each week they attended their research session. Most participants were female (91.5%) and white (70.5%), with English as their first language (93.7%). Of the 95 participants, 8.4% self-identified as Asian; the remaining indicated a different race (e.g., Black, Native American, Latinx, and Hawaiian). Participants came from elementary (80.0%) and secondary (20.2%) general education teacher programs. Our sample was representative of the more extensive pre-service education programs at our largest campus, typically consisting of 80% white, approximately 15% Latinx, and around 5% Native American, Asian, Black, and Native Hawaiian, collectively. In addition, the majority of education students, in general, are female (80% in elementary education and 65% in secondary education).

Participants' exposure to and experience with CLD populations was minimal. At the programmatic level, all elementary and secondary programs require at least one course in these three areas: diversity, special education, and English learners. Although the program highlights culturally responsive pedagogy in program learning objectives, observation of information on CRP was rare outside of these three courses. At the individual level, many participants (71.6%) stated that their only experience was a once-a-week practicum. Although 22.1% of participants did have more exposure to classrooms through their work and student teaching, the remaining 6% either had no classroom

experience (2.1%) or only volunteer experience (4.2%). Informal exposure to CLD populations was also minor, with 47.4% of the participants stating that they had traveled abroad and only 12.6% saying that they came from a culturally and linguistically diverse high school.

Procedure

In week one, participants completed a demographic questionnaire and a CRP knowledge pre-test. During this week, all participants received instruction on how to evaluate information presented in cases and written text. In weeks 2-4, the focus of this study, participants received weekly one-hour condition-specific instructional sessions in a lab. Participants in the CBI-with-an-expert-worked-example (CE) and those in the textbook-with-an-expert-worked-example (TE) conditions read a classroom case or textbook excerpt and then read an expert-worked analysis of the information. Next, participants reviewed a new classroom case. Participants in the CBI or textbook with student exploration conditions (CSE and TSE) followed the same procedures; however, after reading the first case or text, they were asked questions about the case without reading an expert worked example before reading and evaluating the second novel case.

Text vs. Case

Each weekly textbook excerpt and classroom case were on the same CLD topic. In the first week of receiving information (week two), all participants read about differences in classroom management. In week three, they read about differences in language proficiency. Lastly, in week 4, participants read about differences related to student motivation. Table 1 provides an overview of each classroom case and text. Cases and textbook excerpts were adopted from the textbook *Educational Psychology* by Moreno (2010).

Table 1. Case and text topic and the main message

Topic	Case	Text	Expert Response
Differences in classroom behaviors	A student is labeled as "disruptive" and "out of control," and possible referral to special education, highlighting deficit thinking. (WC = 1130)	The effectiveness of specific rewards and deterrents of undesirable behavior can be influenced by students' differences, such as their interests, needs, and goals. (WC = 1219)	Cautions against biased thinking and labeling. Provides concrete strategies for behavior management based on self-regulation theory.
Language proficiency	A student is supported as a student with a learning disability, when, in fact, she needs support in the English language. (WC = 1407)	Respecting a student's first language is essential for building a solid classroom community. (WC = 1467)	Emphasizes using students' first language and setting high expectations for all students.
Between and within-group differences in motivation	To encourage participation, the teacher uses non-specific praise, which doesn't allow students to clarify responses or use their language and adversely affects students' level of engagement. (WC = 1079)	Students will vary in their levels of intrinsic motivation, need for choice, and autonomy. These individual differences help explain why some students respond more positively to classroom choices than others. (WC = 1103)	Suggests that when teachers integrate students' culture, language, and other motivational factors, they help make instruction more meaningful and relevant.

Note: WC = word count

Expert Worked Examples vs. Student Exploration

After reading the CLD information presented through a text or classroom case, participants were asked to either read an expert worked example or to write their evaluation of the information (i.e., student exploration). Specifically, participants either read information or wrote about their understanding of 1) the main idea of the text or case and how it related to student development, learning, assessment, or motivation; 2) what teaching strategies were associated with the presented information; and 3) how this information could be implemented in a classroom.

Instruments

We scored pre-service teacher evaluations on the focus, justification of practices, and use of culturally responsive practices. For all instruments, two trained raters independently scored all responses. Table 2 provides a breakdown of interrater reliability, measured by an ICC, for each instrument by week.

Table 2. Inter-rater reliability as measured by ICC by instrument and week.

Week	Pretest	Focus	Depth	CRP
One	.86	.78	.82	.79
Two	-	.79	.81	.80
Three	-	.80	.80	.80
Four	-	.80	.87	.81

Demographic Survey

Participants were asked to specify basic demographic information, including ethnicity, race, self-identified gender, education program, endorsement, GPA, and what languages they spoke. In addition, to gauge experience with CLD populations, we asked participants how diverse their high school was, if they have traveled abroad, and what, if any, experience they may have had working with CLD students.

Pre-test

To determine if group differences existed, we assessed participants' prior knowledge of CRP by asking participants to list up to ten teaching strategies for working with CLD students. Specifically, participants were asked *to list ten (or fewer if unknown) teaching strategies or practices that they feel are effective for teaching culturally and linguistically diverse students.* Each strategy was reviewed by the two independent raters, coded, and given a 0 if the strategy was not related to CRP or left blank. One point was awarded if the strategy was related (e.g., using translanguaging, universal design methods, or multiple means of representation). Scores across strategies were then totaled.

Focus and Justification

We used a measure of pedagogical content knowledge adopted from Authors (2019) to measure both focus and justification. The focus of the weekly evaluations pertained to the degree to which participants focused on the given case's problem. We also scored participants on their justification for using teaching practices in the case and on whether any additional teaching practices were suggested. Table 3 provides the rubric with examples used for scoring focus and justification.

Table 3. Focus and justification of teacher practices evaluation rubric

Score	Criteria	Example Responses
Focus		
0	The answer focus was not on the teacher or the student	The main problem in this case was that the flashcards were old and meaningless.
1-2	The answer focuses on the student	The issue in this case was that the student was different from everyone else and did not try to fit in with the school.
3-4	The answer focuses on the teacher	The main problem in this case was the lack of background knowledge the teacher had of the student.
5-6	The answer includes both teacher and student focus	In this case, the students did not seem to know how to work together, and the teacher showed favoritism.
	Justification of Teacher Practices	
0	Repeat of case strategies: Restates what the teacher did	I would use the strategies that this teacher used because she did really well.
1	Surface features: Pure description of strategies	I would give students non-examples of arthropods.
2	Simple structural based explanation-misconception: Based on misunderstandings of theory or misuse of theory	I would bring in science books to teach the students because research says they learn more when the information is organized in books.
3	Simple structural-based explanations: Based in theory however, does not explicitly state how the strategy relates to the theory but the response is principle-based	I would use student's names to keep their attention.
4	Elaborated structural-based explanations based on theory: Makes statements on how the strategy relates to theory/why they are using strategy	I would have students translate the text into modern language so they can relate better to the characters.
5-6	Metacognition: Strategies for reflection on teaching practices, reevaluation of case, evidence of taking multiple perspectives	I would keep a journal and use an assessment so I can reflect back on what was working and what was not working.

Culturally Responsive Practices Rubric

We adopted Santamaria's (2009) framework to assess CRP. Based on case study findings, Santamaria (2009) developed guidelines and ten indicators of what CRP and differentiated instruction might look like in the classroom. For our study, we developed a rubric that classified these indicators into three categories: 1) academic achievement (e.g., presumes student is capable); 2) cultural competence (e.g., promotes flexible use of students' local and global cultures); and 3) multidimensionality (e.g., use of encompassing curriculum, content, learning contexts, and classroom climate). For each culturally responsive practice listed on the rubric, we scored the practice as present (1) or not present (0) in a

participant's evaluation. A half point was awarded if there was some discussion of the indicator. We then created a total score ranging from zero to ten by adding across all indicators.

Data Analysis

A multilevel growth model examined the effect of cases and expert worked examples across time. Multilevel modeling allowed for the examination of variance at two separate levels: time-specific growth at Level 1 and nested within individual level intercepts and slopes for each outcome variable at Level 2. More specifically, growth models examined changes in pre-service teachers' focus, justification of practices, and use of culturally responsive practices across the three weeks of lab learning activities. To determine if changes in these outcomes differed by learning condition, assignment to each factor and the interaction between these two conditions were entered as a possible predictor of growth at Level 2.

Qualitative Strand

Participants

We recruited a sub-sample of participants from our original sample of 95. The sub-sample consisted of volunteers willing to participate in a one-hour focus group session. These focus group participants were compensated $20. The sub-sample of 12 were similar in their demographic backgrounds to our original sample, with 91.6% of participants identifying as female and 83.3% as white. Of the 12 participants, two were from a secondary education program, while the remaining ten were from an elementary education program. The sub-sample included representative participants for each of the four conditions.

Procedure

We conducted two one-hour focus groups two weeks after the end of the quantitative data collection. We met in a lab space with one large rectangular table and chairs for each participant for their one-hour session. The first focus group included six female participants, the majority white (83.3%), with one participant identifying as Hispanic. Participants in this group came from all four conditions, with overrepresentation from two conditions (CE and TSE). The second focus group, again with six participants, represented each condition with overrepresentation from two conditions (CSE and TE). Most were female (83.3%) and white (83.3%). The lack of diversity among this focus group may have influenced the themes that emerged during our session.

The sessions began with the lead author introducing the second author and reading the consent script. The main author led the conversation while the second author took notes and asked additional questions when needed. We invited all participants to participate but noted that they were not required to answer each question. Both focus groups were audio recorded.

Focus Group Questions

Informed by previous research, the results of the quantitative analysis, and our initial research questions, we asked questions related to participants' perceptions of their CRP knowledge, the content of the study, and their opinions on the strengths and weaknesses of learning in their assigned conditions. For example, we asked questions related to CRP, such as: *What were some of the big ideas you*

learned? Strategies?; condition format, such as: *How did you feel about how the information was presented to you*; and specific content, such as: *Which classroom scenario or text did you find most helpful? Least helpful? Why?*

Data Analysis

We employed a thematic analysis (Braun & Clarke, 2006) to understand the phenomena under investigation during the qualitative data analysis. Although the quantitative results guided some focus group interview questions, an inductive approach was taken when coding and building themes. The qualitative data analysis was reflexive (Braun & Clarke, 2019) and contained several iterations of coding the data. Before conducting the focus groups, the authors reviewed the data and reflected on possible interview questions that could help inform the research questions posed. During the focus group interview process conducted by the two first authors, both researchers wrote extensive notes and memos and debriefed as soon as the focus group concluded. These discussions formed and reconciled the first coding between both researchers. Braun and Clarke (2019) explain this reflexive analysis method as a theme development process in which the researchers are immersed in the data, questioning, reflecting, wondering, writing, and more, as a pre-conceptualization of the themes. Once all data were collected, and following the transcription of the focus group interviews, the second author led the formal coding and thematic analysis by using coding patterns to determine specific placements of pre-service teachers' discussion, understanding, and learning about culturally responsive practices, as well as the CBI process in which they had engaged.

Grounded in theory and using a reflexive process, the second author dove deep into the data at several points in time, and using the memos written during the focus groups, and returned to the data to "continuously and rigorously reflect [in our] own taken for granted thinking" (Ho et al., 2017, p. 1760), the first author then served as a coder to reach consensus. In our codes, we considered each researcher's positionality as a teacher educator whose work focuses on using culturally responsive practices in teacher education. Two of the researchers come from white, privileged backgrounds, while the other two authors were not born in the United States and are from CLD backgrounds. The second author, who led the qualitative data analysis, identifies as a person of color and was labeled as an English learner when they immigrated to the United States at an early age. Three of the authors are bilingual, and two are parents of mixed-ethnic children. The positionality of the entire research team, as teacher educators, researchers, and former K-12 teachers, is important to note, as our perspective, background, and expertise in this topic could have led to asking specific questions and leading the conversation to a more social-justice-oriented one. This intersectionality could also play a role in the thematic analysis.

Meta-Inference

Upon completing both quantitative and qualitative data analyses, we engaged in an integrative approach to develop meta-inferences (Teddlie & Tashakkori, 2009) about the phenomenon under investigation. More specifically, from the conception of the research study, a mixed-methods research design was developed to strengthen the results through observation and understanding the depth and breadth of our study's impact on pre-service teachers' culturally responsive practices. The design included the development of inference or meta-inferences to yield a more well-rounded and detailed analysis of the phenomenon.

Results

Quantitative Results

Basic descriptive statistics, including means and standard deviations for weekly scores (weeks 2-4), are provided in Table 4. Before any analysis, assumptions associated with general linear models (e.g., homoscedasticity) were tested and passed. Using a series of analyses of variance (ANOVAs) and chi-squares, we assessed if there were any differences by conditions in participants' prior knowledge of CRP teaching strategies (i.e., pretest asking participants to list up to ten teaching strategies for working with CLD students), as well as other demographic variables, that might influence participants' response. No differences in prior knowledge were detected for viewing cases or expert responses, $F(1,91) = 1.13$, $p = .29$, and $F(1,91) = 0.07$, $p = .77$, respectively. Demographic responses were also similar across all groups (all $p > .05$). As noted earlier, we initially examined an unconditional means model to calculate the ICC. The ICC for the two-level unconditional model provides an estimate of the variance proportion at each level. Results from the unconditional means model indicated that for focus, justification, and culturally responsive practice outcomes, 54%, 18%, and 20% of the variance were at the assigned condition (Level 2). The ICC values for all models suggested that multilevel modeling was an appropriate analytic approach, as all models surpassed the recommended standard of at least 10% of variance at each level (Kreft & De Leeuw, 1998).

Table 4. Means and standard deviations for case evaluations by week and condition.

	Expert Worked Example		Student exploration	
Instrument	*Case*	*Textbook*	*Case*	*Textbook*
Focus				
Week 2	3.15 (0.88)	1.79 (0.73)	3.16 (0.56)	2.14 (0.53)
Week 3	3.84 (0.73)	2.16 (0.48)	3.62 (0.49)	1.95 (0.49)
Week 4	4.61 (0.75)	2.33 (0.56)	4.45 (0.83)	2.33 (0.48)
Justification				
Week 2	2.11 (0.99)	2.04 (1.39)	2.08 (1.31)	1.45 (1.21)
Week 3	2.92 (1.29)	2.25 (0.98)	3.00 (1.02)	2.00 (1.26)
Week 4	4.00 (1.13)	2.87 (1.03)	3.79 (0.93)	2.95 (0.86)
Culturally responsive practices				
Week 2	5.26 (1.74)	1.00 (1.47)	5.54 (1.74)	3.23 (1.04)
Week 3	6.30 (3.06)	4.00 (3.81)	6.91 (3.51)	4.28 (3.40)
Week 4	11.23 (5.40)	5.45 (4.51)	13.62 (5.37)	5.71 (4.81)

Next, we examined a conditional time growth model with an assignment to condition (cases vs. text and expert worked example vs. no expert worked example) at Level 2 and time centered on

the last measurement point. The condition of classroom case was coded as 1 for those participants reading the case and 0 for those who read the text. Similarly, the expert worked example condition was coded as 1 for those who viewed an expert worked example and 0 for those who did not. We used the assignment to condition as a predictor of time-specific outcome, wherein slopes induced a cross-level interaction of time-by-case and time-by-expert. The expected difference in scores at the last measurement point is of interest to the current study and how the assignment to conditions impacted each slope. Table 5 provides estimates for each model.

Table 5. Estimates for the effect cases, expert worked examples, and time.

Variable	Coefficient	*SE*	*t*	*p*-value
	Unconditional Means Model			
Focus Intercept	3.01	0.09	30.31	<.001
Justification Intercept	2.64	0.09	28.99	<.001
CRP Intercept	6.14	2.52	15.57	<.001
	Unconditional Growth Model			
Focus				
Intercept	2.10	0.11	18.35	<.001
Time	0.45	0.05	8.39	.001
Justification				
Intercept	1.13	0.17	6.58	<.001
Time	0.75	0.07	10.40	<.001
CRP				
Intercept	0.78	0.62	1.26	0.20
Time	2.68	0.31	8.40	<.001
	Conditional Growth Model			
Focus				
Intercept	4.67	0.12	37.29	<.001
Time	0.48	0.05	9.36	<.001
Case	2.32	0.16	13.90	<.001
Expert	0.21	0.16	1.28	.20
Case X Expert	0.16	0.18	0.86	.39
Time X Case	0.32	0.06	5.36	<.001
Time X Expert	0.06	0.06	0.99	.32
Justification				
Intercept	4.05	0.19	21.29	<.001
Time	0.62	0.07	8.22	<.001
Case	1.13	0.25	4.37	<.001
Expert	0.23	0.25	0.92	.57
Case X Expert	0.25	0.32	0.43	.38
Time X Case	0.19	0.09	2.14	.03
Time X Expert	0.09	0.09	1.05	.29
Culturally responsive practices				
Intercept	11.63	0.92	12.58	<.001
Time	2.34	0.33	6.99	<.001
Case	6.51	1.20	5.39	<.001
Expert	1.08	1.20	0.89	.37
Case X Expert	0.39	1.26	0.30	.75

Time X Case	1.28	0.39	3.23	.002
Time X Expert	0.12	0.40	0.32	.74

Focus

Results from the focus model indicate that at the last evaluation, participants who viewed classroom cases scored, on average, $\beta = 2.32$, $p < .001$ points higher than those who did not view classroom cases. This finding suggests a statistically significant main effect of classroom cases. In addition, the interaction between time and cases was statistically significant, suggesting a significant difference in slopes for those who viewed cases and those who did not. The results indicated that for every evaluation point, those who viewed cases increased by $\beta = 0.32$, $p < .001$ points beyond the growth of those who did not view cases. Figure 1 provides a visual of the relationship between cases and time. No effects (i.e., main effect or interaction) associated with expert worked examples were found.

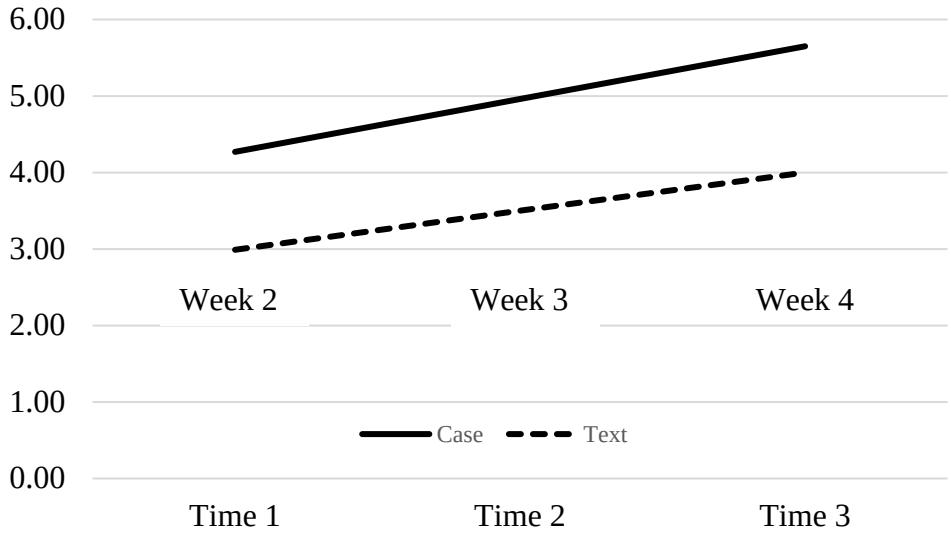

Figure 1. Relationship between time and the effect of reading a classroom case on the outcome of focus.

Justification for Teaching Practices

For the justification growth model, results revealed a similar pattern to focus with significant effects emerging for case versus text and no significant finding associated with viewing an expert worked example. Specifically, on their last evaluation, participants who viewed cases had a statistically significantly higher score than those who did not, $\beta = 1.13$, $p < .001$. The interaction between time and cases was also statistically significant. The latter result indicated that at each evaluation point, those who viewed cases increased by $\beta = 0.19$, $p = .03$ points beyond the growth of those who did not. Figure 2 provides a visual of the relationship between cases and time. No effects related to expert worked examples emerged as statistically significant.

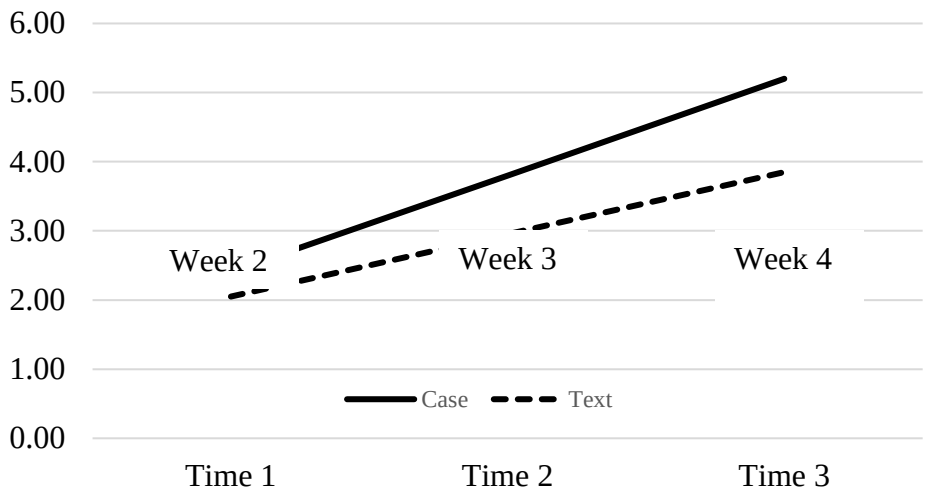

Figure 2. Relationship between time and the effect of reading a classroom case on the outcome of justification.

Culturally Responsive Practices

Lastly, for the outcome of culturally responsive practices, participants who viewed cases, again, outperformed those who did not with no effect of expert worked example found. On average, participants who viewed the cases scored $\beta = 6.51$ $p < .001$, points higher than those who did not. The interaction between viewing cases and time was also significant, $\beta = 1.28$, $p < .001$, suggesting that at each evaluation point, those who viewed cases increased by 1.28 points beyond the growth of those who did not view cases (see Figure 3). As with the results for Focus and Justification, no effects related to expert worked examples were found.

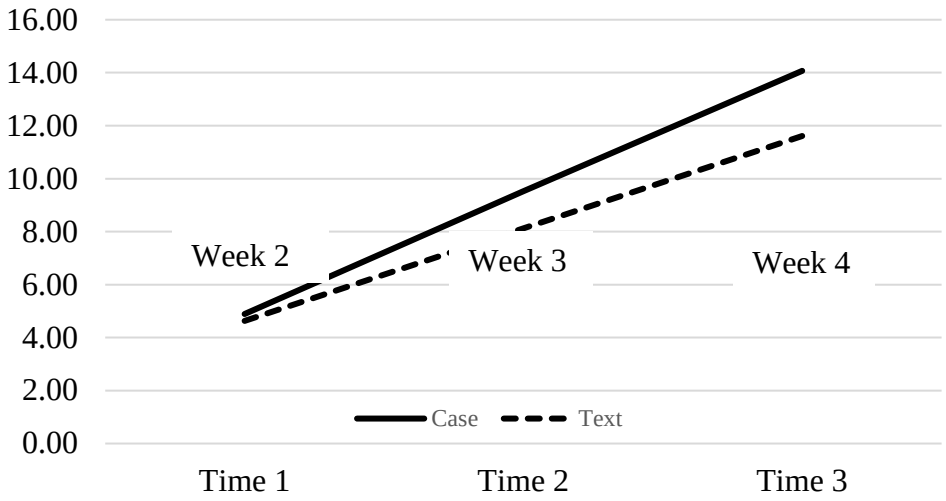

Figure 3. Relationship between time and the effect of reading a classroom case on the outcome of CRP.

Qualitative Results

Qualitative results from the focus groups yielded deeper consideration of the effects of using culturally responsive case-based instruction and provided in-depth information that supported the quantitative results. More specifically, the pre-service teachers' understandings of culturally responsive practices learned through this study, regardless of their condition, were detailed through five themes. These themes, selected through thematic analysis (Braun & Clarke, 2006), encompassed *In-Depth Reality, Application and Connection to Previous Knowledge, Inclusion, Multiple Perspectives,* and *the Importance of learn*ing. Across conditions, all participants agreed that classroom cases—used as either the learning and assessment tool (case conditions) or only as the assessment tool (text conditions)—were most helpful in eliciting their thinking about using culturally responsive practices.

In-Depth Reality

Most pre-service teachers expressed the central theme during this study: *In-Depth Reality*. This theme stemmed from participants' conversations about how culturally responsive pedagogy facilitated a more realistic impression of students and their lived experiences, especially as presented in cases. For example, one pre-service teacher stated that the cases "challenged me to think more" while discussing culturally responsive case-based instruction as a guide for reflecting upon the student as a real person rather than as an "unknown." Another pre-service teacher agreed by saying that the "complexity was good… building on high[er] learning experiences" by pursuing a more realistic and in-depth understanding than the traditional way of "romanticizing" diversity (e.g., coloring sheets about different holidays). More importantly, many pre-service teachers discussed how, although they may feel more confident and comfortable working with CLD students, they "now know that [they] need to learn more."

Application and Connection to Previous Knowledge

The second most frequently discussed theme was the use of culturally responsive practices through CBI to apply and connect their knowledge. One pre-service teacher stated they "didn't think about implementing [culturally responsive practices] into my curriculum before," but now they do. The pre-service teachers could connect these practices with various courses in their teacher preparation program. They stated that this had "taken them a step further" toward creating and applying culturally responsive practices. For example, one pre-service teacher in secondary education stated that "representation is very important" when discussing the importance of integrating books and authors from the same background as their students. More specifically, they expressed the usefulness of cases to embed culturally responsive thinking throughout their teacher preparation program rather than just discussing it in their diversity course. Others agreed and expressed how the behavior case included in this study helped them "think about behavior and how to view it differently," as they had never considered differences in cultural practices related to behavior. The same thing was discussed from a diversity-in-language perspective, as pre-service teachers said the CBI study made them "go deeper" and helped them apply concepts for English learners from their English Language Learning courses rather than remaining focused on basic conceptual understandings of different topics.

Inclusion

Based on the conversations from the focus groups, and similarly to the theme of *Application and Connection to Previous Knowledge*, *Inclusion* reflected a more comprehensive range of understanding of diversity and willingness to build a more inclusive and safer environment. That is, the pre-service teachers' attitudes of acceptance suggested a deeper and more inclusive level of thinking, including disability as part of diversity. For example, many discussed how accommodations are primarily focused on within their Special Education course but should be included "in every other subject." They also established, as previously discussed, a better understanding of behavior and behavior management in relation to differences in culture and background. Many in the focus group discussed how they had never thought about diversity within a cultural context and how this context affects how we view or manage behavioral needs in students with or without disabilities. They even made connections with building inclusive classrooms, such as making sure they "connect materials [for CLD students with disabilities] to participate in" (e.g., science instruction in Spanish with accommodations). Although this was a focused theme, they believed they needed further knowledge and skills to build a safe and inclusive classroom where confronting disrespectful or even racist comments could be more effectively addressed.

Multiple Perspectives

The *Multiple Perspectives* theme included discussion from pre-service teachers about how classroom cases in our study helped them see that their perspectives may differ from their students' perspectives and that they need to pay closer attention to observe "student-to-student interaction and perspectives." The Motivation Case was one of the cases the pre-service teachers referred to as being the most eye-opening and most useful. They recognized that motivation theories had not been discussed much in their teacher preparation program and had yet to make the connection that diversity occurs in all theories, even motivation. One participant in the focus group called cases related to diversity in motivation "thought-provoking." The case helped them to "reflect and help [see] from a diverse perspective." An important finding related to this content was that the focus group participants

discussed how "listening to students is an important part of addressing problems," demonstrating a needed mindset for working with CLD students.

Importance to Learn

Finally, the last theme that emerged from the focus groups was *the Importance of learn*ing. As an overarching theme, pre-service teachers in the focus groups discussed the importance of learning to make connections from courses and experiences in a more profound manner, stemming from their reflection after the culturally responsive practices CBI study. For example, pre-service teachers discussed how they cannot be "colorblind" and how colorblindness does not provide equity, but rather, they need to continue to learn more and reflect to sustain their efforts at being culturally responsive. Many of the pre-service teachers we talked with referenced the importance of learning from their students and evaluating their mentor or current teachers' methods as examples or non-examples of culturally responsive teaching. They all discussed wanting to learn more about culturally responsive practices and how, in the context of working with students with disabilities, they did not feel prepared to do so.

Discussion

A focus on the intentional preparation of teachers to respond to and support students from diverse cultural and linguistic backgrounds, challenge inequities, and promote social justice has grown significantly over the past twenty years (Cochran-Smith et al., 2016). Although some studies have shown success in teacher education programs (Kreamelmeyer et al., 2016), most pre-service teachers still need help to apply culturally responsive practices (King & Butler, 2015). As teacher preparation programs extend their models to bridge theory into practice, embedding culturally responsive case-based instruction in all components of teacher preparation (e.g., courses, practica) could be a way to increase pre-service teachers' disposition, knowledge, and preparedness to enact culturally responsive teaching, as per Gay's (2018) recommendations. Yet, this assumption requires further empirical verification. Our study lays the foundation for this examination by assessing if learning in a lab setting case- or text-based content, with or without expert worked examples promotes pre-service teachers' ability to evaluate classroom cases.

Case-Based Instruction

We found that providing realistic cases as the primary source of information related to CRP benefited pre-service teachers in their pedagogical growth, which is evidence for part of our first research question. Although authentic experiences continue to be the best way pre-service teachers can enhance their culturally responsive practices (Gay, 2018), embedding culturally responsive case-based instruction could provide similar benefits (Herreid & Schiller, 2013) in a lower-stakes environment. This may be particularly beneficial in early coursework or while distance learning is a norm, as practicum experiences may be limited.

Indeed, the results of this study show that all participating pre-service teachers gained greater skills and the ability to apply culturally responsive practices through intentional exposure to this content. Yet, those pre-service teachers who were afforded CBI had greater gains than their counterparts. As Miller and Fuller (2006) and Gay (2018) suggest, building reflective practices about cultural diversity, exposing pre-service teachers to critical analysis of their self-consciousness and assumptions, and guiding them through opportunities to convert beliefs into practices provides pre-service teachers with a framework and tools for enhancing their culturally responsive teaching.

Through culturally responsive CBI, teacher preparation programs could increase pre-service teachers' knowledge and ability to enact culturally responsive classroom practices. Subsequently, increased culturally responsive practices should foster effective instructional outcomes associated with increased student learning and well-being (Byrd, 2016; Christianakis, 2011). As pre-service teachers learn to enact culturally responsive practices as a reflective and ongoing cycle, the academic and socio-emotional needs of culturally and linguistically diverse students will be met. Most importantly, the results of this study show that to increase equitable learning opportunities, preparing culturally responsive teachers through CBI could be a more in-depth, rich, realistic, and inclusive experience that could easily be included in pre-service teacher preparation.

Expert Worked Examples

Also related to our first research question, the lack of a statistically significant effect of including expert worked examples is somewhat unexpected. One plausible explanation may be that the domain of culturally responsive pedagogy and practices may lend itself to something other than the worked example approach. That is, although the approach is known to benefit, to some extent, learning in well-structured domains, such as mathematics, where worked examples are often used to show steps in solving mathematical problems (see Wittwer & Renkl, 2010), the approach may be less practical in instructional design due to the complexity of the information. Additional research is needed to examine if combining worked examples with elaborated feedback (Stark et al., 2011) would better support learning in such a complex domain as culturally responsive pedagogy.

Another plausible explanation for the lack of the hypothesized expert worked example effect may be that the participants in our study were false beginners, not needing to rely as much on expert evaluations of materials to support their learning as true novices or even advanced beginners might need (Dreyfus, 2004; see also Dall'Alba, 2009; Dall'Alba & Sandberg, 2006). Indeed, an examination of week two's means for focus, justification of practices, and use of culturally responsive practices (the first assessment point for these three variables; Table 4) indicates that, although not at a proficiency level, participants across conditions may have been at an early competency level as shown by their scores of least two or higher (with only one exception) on measures of pedagogical content knowledge. It is also important to remember that the participants' program required at least one course in these three areas: diversity, special education, and English learners. Evidence suggests that even though pre-service teachers may lack effective pedagogical practices, their pedagogical knowledge may be highly sophisticated (Smetana et al., 2020), indicating a need for teacher preparation programs to establish approaches supporting the developmental progression of teachers (McNew-Birren & van den Kieboom, 2017).

Focus Groups

Related to our second research question, our focus group conversations provide insight into pre-service teachers' thinking about CRP and how case-based instruction influenced their thinking. Findings suggest that learning about CRP through case-based instruction provides the needed exposure to realistic teaching conditions. Exposure to a more in-depth understanding of diversity could positively impact how pre-service teachers think about and enact CRP. This shift is needed within pre-service teacher education. This statement is supported by studies finding only surface-level references and definitions within our teacher preparation programs. For example, Bennet (2013) explored pre-service teachers' CRP knowledge while tutoring CLD students and found that many pre-service teachers' definitions of culturally responsive teaching are overly simplistic, for example, events that present various cultural foods, holidays, and heritage months. Pre-service teachers did not

demonstrate knowledge of how to help students use their cultural backgrounds and experiences as tools for empowerment or to critically analyze the world around them and link learning to their lives.

Surface-level understandings of CRP plague our education programs (Author, 2020), which, in turn, has a negative effect on CLD students' achievement (Aronson & Laughter, 2016). Compared to traditional didactic approaches of reading text and generating "activities" related to CRP, our study was perceived as helpful for furthering pre-service teachers' knowledge (research questions three and four). Participants suggested that CBI provides exposure to culturally and linguistically diverse topics while exposing them to methods for identifying and reflecting upon their biases related to working with CLD students. Reflection and identification of biases are key aspects of Ladson-Billings' (1994) tenets of CRP, which indicate that teachers' practices need to go beyond the surface level of multicultural education.

Meta-Inference

Using Teddlie and Tashakkori's (2009) framework, a meta-inference was developed to better understand the phenomena in a deeper and more holistic manner. The sequential process of understanding the results from the quantitative analyses guided the qualitative strand. Through this meta-inference process, as well as using a reflective process, mixing of the data results came in several phases to better understand the overall phenomenon. First, with the understanding that the quantitative strand yielded specific results, the first and second authors utilized this data to guide the qualitative strand. Although the qualitative strand followed an inductive approach to the data analysis and thematic analysis, the reflective and iterative approach helped the researchers construct a holistic meta-inference once the results of both quantitative and qualitative strands were established. This "mixing of the methods" process was done with the intentionality of viewing the results from an overarching phenomenon with a wide and deep perspective.

The meta-inference we constructed from both quantitative and qualitative strands suggests that any instructional approach used to discuss culturally responsive practices resulted in learning. Specifically, all pre-service teachers in the study demonstrated a positive effect of time in their focus, justification, and culturally responsive practices ($\beta = 0.48$, $\beta = 0.62$, $\beta = 2.34$, $ps < .00$, respectively). This was also demonstrated in our findings of the focus groups, as differences in the mode of instruction between cases and text were not even mentioned as pre-service teachers were discussing their perceptions of the study; instead, they all focused on the content of the cases presented during instruction and/or assessment, even though it was explicitly stated that individuals saw similar content in different formats. Although growth in CRP occurred for all pre-service teachers, the greatest effects were observed for those who were able to use the cases as an instruction format to reflect and apply their current knowledge and skills as a way of transferring their learning about culturally responsive teaching. With this conclusion, we provide evidence that CBI provides a deeper approach that may empower pre-service teachers to celebrate learners as individuals who see the world through different perspectives and who know how to connect personal experiences and resources to their learning in school (Samuels, 2018).

Limitations

Across disciplinary fields, CBI has been highly praised for its positive learning benefits (Herreid & Schiller, 2013). Aligned with this research, our results show growth in pre-service teachers' culturally responsive practices when those are presented through the CBI format. These findings justify the exploration and potential inclusion of culturally responsive CBI in teacher preparation programs and suggest that engagement with issues of practice using cases may be more beneficial for learning than

simply reading about theories underlying such issues of practice. Although this is the case, we have to caution the reader in regard to generalizing our results, as one limitation of the study is our assessment of only one teacher education preparation program. Unique to our sample may be the fact that issues of diversity still tend to be siloed in specific courses. A program with more fluid attention to CRP may differ in its results. Future research should focus on determining if the effect of cases is robust across different samples.

Additionally, it should be noted that our experiment set up a dichotomy between textbook readings and cases and does not consider other important factors such as teaching practica, cases nested within instruction, or problem-based learning. Our goal was to examine the efficacy of reading a case compared to reading a traditional text passage; further evaluation of case-based instruction should consider the effectiveness of this approach nested in an authentic course rather than outside coursework. Lastly, as with any subjective scoring of participants' work, our rating of student case evaluations may influence the results of our study. For example, on our rubrics, we allowed raters to assign a wider point range (5 or 6 points instead of a single point value) within higher levels of the rubric classifications (see Table 3). We did this intentionally to align with the variability in how participants evaluated their classroom cases.

Conclusion

With the understanding that culturally responsive practices do not stem from a single class or workshop, nor are they specific to one content area, teacher preparation programs must embed opportunities to develop culturally responsive teachers in every program component. Integrated findings from quantitative and qualitative data suggest that the culturally responsive case-based instructional sequence for pre-service teachers had positive effects. More specifically, the greatest effects were observed when the pre-service teachers could use the cases to reflect and apply their current knowledge and skills to transfer their learning about culturally responsive teaching. Following the sequential mixing of the methods, qualitative results supported the quantitative findings in a deeper manner, showing that the use of CBI to enhance pre-service teachers' culturally responsive practices can yield broad and deep positive effects. For future teachers to learn, apply, and practice CRP, CBI could be an avenue to provide these experiential opportunities.

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