SCAFFOLDING FOR PRE-SERVICE TEACHERS' REFLECTION TOWARD CULTURALLY RESPONSIVE TEACHING

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ABSTRACT

Reflection is fundamental in pre-service teachers' learning to teach. Given the increasing diversity in US classrooms, pre-service teachers need to be prepared to teach culturally responsively in the future classrooms. Culturally responsive teaching entails in-depth, critical reflection. As they lack real teaching experience, pre-service teachers usually reflect descriptively. Despite its importance in teacher education for future culturally responsive teaching, there are few studies that investigate how scaffolds should be designed to promote critical reflection for effective culturally responsive teaching.

This dissertation research examines how metacognitive, conceptual, and procedural scaffolds should be designed to support pre-service teachers' reflection for their future culturally responsive teaching. A digital tool, iReflectNow, which includes several scaffolding mechanisms, such as prompts, videos, annotations, hints, and displays was developed. Two studies have been conducted so far to design and refine iReflectNow.

This dissertation employs the manuscript format and consists of three publishable papers. The first manuscript (Chapter 2) describes theoretical foundations of iReflectNow and offers literature-driven guidelines for its design. The second manuscript (Chapter 3) reports findings of

a pilot study in which prompts and cultural case scenarios were examined as scaffolding mechanisms. The study which was conducted with early childhood and elementary pre-service teachers at a large public university in the southeastern US proposed some revisions for the design of iReflectNow. The third manuscript (Chapter 4) presents an empirical study that explored how pre-service teacher's reflection for culturally responsive teaching evolved when and after they used a prototype of iReflectNow, which was designed based on the suggested revisions in the second manuscript. Both studies were multi-case qualitative studies. Overall findings suggest that scaffolding may not be the only dimension that shapes evolution and depth of reflection for CRT as it is a complex process during which several elements interplay. In the conclusion of the dissertation, limitations, research and practice implications, and future research directions are discussed (Chapter 5).

INDEX WORDS: Reflection, Critical reflection, Culturally responsive teaching, Culturally relevant teaching, Scaffolding, Digital scaffolding, Teacher education, Teacher preparation

DEDICATION

This dissertation is dedicated to my beloved family, whose continuous love, encouragement, and support helped me become the person I am today and overcome every challenge in this journey.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

Most of the classrooms in the United States are now multicultural and multiethnic with constantly changing demographics. While most teachers in the United States are White Americans, the students they teach come from different cultural settings (Howard, 2003; Ladson-Billings, 2014; Nieto, 2009). African American and Latino students are often underserved in the US education system, which is generally associated with the achievement gap between White students and students of color (Ladson-Billings, 2014; National Center for Education Statistics [NCES], 2015). One way to bridge the gap is by helping teachers acknowledge that we are all human beings with different values, beliefs, languages, and cultures, and apply such knowledge to their teaching practice (Allen, Hancock, Starker-Glass, & Lewis, 2017; Weinstein, Curran, & Tomlinson-Clarke, 2003) that is responsive to the needs of their students from diverse backgrounds.

Approaches to diversity in classrooms have been researched for decades. For instance, focusing on teachers rather than *at-risk students*, Ladson-Billings (1995) proposed Culturally Relevant Pedagogy (CRP) to help teachers satisfy the needs of diverse students. CRP aims to use students' prior experience and cultural funds of knowledge as a means to teach them effectively (Gay, 2000). To prepare teachers for culturally diverse learning environments, teacher education programs need to address issues related to culture for *all* students' positive learning outcomes (Cooks, 1998; Nieto, 2009).

Critical reflection is one of the ways that can enable teachers to become culturally responsive (Allen at al., 2017; Gay, 2000; Howard, 2003). Reflection is a process influenced greatly by teachers' beliefs, values, experiences, assumptions, and professional knowledge base (Colton & Sparks-Langer, 1993; Kagan, 1992). In multicultural classrooms, the beliefs, values, and cultures that a teacher and students bring into the classroom matter and influence the teaching-learning process. Teachers need to reflect on their own beliefs and assumptions critically and learn about different cultural backgrounds to create inclusive learning environments for *all* students (Allen et al., 2017; Delpit, 2012; Interstate Teacher Assessment and Support Consortium [InTASC], 2011; Nieto, 2009).

Statement of Problem

Although reflection is considered a crucial component of teacher education programs, its practice rarely occurs in teacher education classes. As they have few opportunities to practice reflection, reflections of pre-service teachers generally remain descriptive (Baker & Shahid, 2003; Bean & Stevens, 2012; Gordinier, Conway, & Journet, 2006; Lai & Calandra, 2010). That is, pre-service teachers mostly describe the event or the experience they had without critical thinking. This is what Larrivee (2008) categorized as *surface-level reflection*. To embrace diversity, become culturally responsive, and create inclusive classrooms, pre-service teachers need to be involved in *critical reflection*, which is the deepest reflection level (Larrivee, 2008). Critical reflection is a demanding process, especially for pre-service and beginning teachers as they need to question their own beliefs and values while planning lessons or instruction and analyze the ethical, sociopolitical, and moral consequences of teaching and decisions (Allen et al., 2017; Howard, 2003; Larrivee, 2000; van Manen, 1991).

Considering teaching in multicultural classrooms is not widely emphasized in teacher education curricula (Borrero, Ziauddin, & Ahn, 2018; Nieto, 2009; Rychly & Graves, 2012), it is easy to reason that pre-service teachers may struggle in their future multicultural classrooms. These pre-service teachers may struggle not just from a lack of knowledge of culturally responsive teaching (CRT) but also from the descriptive reflection they are accustomed to (Allen et al., 2017). Thus, pre-service teachers need to learn to critically reflect on cultural responsiveness (Blair, 2012; Colton & Sparks-Langer, 1993; Lai & Calandra, 2010; Savage, 2016). There are many ways to scaffold the reflection processes, such as using question prompts, videotaped classes, and reflection journals (Lai &Calandra, 2010; Rich & Hannafin, 2009). However, there is little research that focuses on how to scaffold critical reflection for pre-service teachers' cultural responsiveness in teacher education programs (Allen et al., 2017; Howard, 2010).

Purpose Statement

The overarching research questions of these studies are how pre-service teachers' reflection can be scaffolded effectively for culturally responsive teaching in their future classrooms and how digital scaffolds should be designed for reflection-in-action. Reflection-in-action means reflection during an action. The purposes of this research are to (a) explore the potential ways to scaffold pre-service teachers' reflection-in-action, (b) design scaffolds to support pre-service teachers' learning to reflect critically *during* their analysis of case scenarios for culturally responsive teaching, and (c) examine how their reflection evolves during and after they engage in computer-based and in-class activities.

To attain these goals, educational design-based research was employed. Educational design-based research typically involves iterative cycles of design and development through data

collection and analysis to refine the use and impact of an instructional intervention (Anderson & Shattuck, 2012; Design-Based Research Collective, 2003; McKenney & Reeves, 2012). Through these iterative cycles, educational design-based research aims to provide more solid and empirical data that can be used for the design of more useful interventions.

After a review of relevant literature, design guidelines were proposed (in Chapter 2) to inform the design and development of a digital scaffolding tool for reflection-in-action, named iReflectNow. iReflectNow was implemented in two phases. A pilot study - the first phase - was conducted in a science teaching methods course for early childhood pre-service teachers. The case scenarios and reflection prompts were tested to see how they engaged pre-service teachers in deep reflection. Results from the pilot study (reported in Chapter 3) informed the redesign and refinement of the case scenarios and the reflection prompts in iReflectNow, which was implemented in another science teaching methods course - the second phase (reported in Chapter 4). The ultimate goal of this series of studies is to enable teachers to create inclusive classrooms by preparing them to reflect critically and implement CRT effectively.

Significance of the Study

iReflectNow includes various embedded scaffolding features aimed to promote pre-service teachers' critical reflection to become culturally responsive in their future classes. Becoming culturally responsive for teachers is a demanding task that entails critical reflection (Allen et al., 2017; Howard, 2003). Critical reflection can be reached through use of support mechanisms (Coulson & Harvey, 2013; Larrivee, 2000). In the literature on teacher education research, there is a scarcity of scaffolding designs that aim to support critical reflection. Findings from the studies in this dissertation will contribute to the literature on how critical reflection for culturally responsive teaching should be promoted in teacher education programs.

This research is also significant due to its emphasis on reflection-in-action. Sufficient time for reflection is rare in teacher education courses, so pre-service teachers may not practice reflection-in-action to become proficient (Fletcher, 1997). Future versions of iReflectNow will include design features that can make practice of reflection-in-action viable. For instance, adaptive and customized reflection prompts based on pre-service teachers' responses could be provided in iReflectNow via Natural Language Processing. Pre-service teachers have the opportunity to practice reflection-in-action before they start teaching in real classrooms. Given its focus on instant reflection, this line of studies, to our knowledge, are the first systematic studies that aim to improve pre-service teachers' reflection-in-action via a digital scaffolding environment.

Definitions of Terms

Reflection

Reflection is a complementary part of learning. Learning from experience cannot occur without reflection (Dewey, 1933; Kolb, 1984; Schön, 1983). Lessons learnt from previous experiences may activate deeper learning and inform decisions for following events (Dewey, 1933; Schön, 1983). Reflective thinking is useful because it (1) is purposeful, (2) enables one to get prepared for problematic situations, and (3) enriches experiences and instances with meaning so that one can learn lessons for future situations (Dewey, 1933).

In teacher education, reflection plays a key role since it facilitates pre-service teachers' forming their teaching philosophy and decision-making skills. Many typologies of reflection (e.g. Hatton & Smith, 1995; Jay & Johnson, 2002; van Manen, 1991) have been proposed to explain the depth and breadth of teacher reflection. In this dissertation, Larrivee's (2000, 2008) typology is adapted to explore the depth of pre-service teachers' reflection. There are four

dimensions of reflection in Larrivee's typology (2008, p. 348): (1) pre-reflection, (2) surface-level reflection, (3) pedagogical reflection, and (4) critical reflection. In this dissertation research, reflection is not considered to be a linear process. Rather, it is conceptualized as a process comprised of multiple dimensions that can happen simultaneously. Critical reflection - adapted from Larrivee's typology - refers to teachers' deep examination of (a) their own beliefs about the learning capacity of students who are from different ethnic, social, and cultural backgrounds, (b) assumptions about these students' behaviors, and (c) expectations from them to adjust their teaching practice and instruction.

Reflection is also categorized in terms of when it occurs: reflection-*on*-action and reflection-*in*-action (Schön, 1987). Reflection-on-action refers to reflecting on past experiences, whereas reflection-in-action means reflecting during an action or practice. In this dissertation research, reflection-in-action was the focus although pre-service teachers were supported for both reflection-in-action and reflection-on-action. Reflection-in-action in this dissertation research refers to pre-service teachers' critical reflection in the moment of analyzing cultural case scenarios. Case scenario discussions and synthesis papers on the case scenarios after the completion of the analysis were considered as reflection-on-action.

Culture

Culture is the way that people live (Kalman, 2009). It is comprised of beliefs and values that are specific to individuals, communities, and societies. It may involve a variety of beliefs and values that are shaped by or derive from people's religion, nationality, ethnicity, family lives, and socioeconomic statuses (Reeves-Ellington & Yammarino, 2010). In the present research, culture is conceptualized as beliefs, values, and attitudes that teachers and students bring into classrooms from homes and into homes from classrooms and that can be influenced by

students' previous learning experiences, home life, gender, ethnicity, and religion and teachers' pedagogies and assumptions about students.

Culturally Responsive Teaching

Studying excellent teachers of African American students, Ladson-Billings (1995) searched for ways of linking home/family culture with schooling. To eliminate the inconsistency between a student's home life and his/her experiences with teachers and peers at school, Ladson-Billings (1995) proposed CRP. The rationale behind CRP is that academic achievement of African American and other students who are underserved in the education system can be ensured if a cultural consistency between home and school life is provided (Ladson-Billings, 1995).

Gay (2000) conceptualizes CRT as power pedagogy and argues that cultural diversity should be seen as a strength. In Gay (2000), she further asserts that teaching is dynamic and contextual; that is, it can be influenced by various factors such as students' race, gender, language, and community they live in. Culture used as a tool for power pedagogy involves using students' cultural funds of knowledge, experiences, values and beliefs to design meaningful learning activities. This is one way to ensure equity in schools.

In this dissertation, CRT refers to pre-service teachers' taking students' cultural background, needs, family/home lives, and beliefs into consideration during the case scenario analysis and proposing culturally responsive solutions to the case scenarios through critical reflection. In the main study of this dissertation, depth of reflection was analyzed based on whether the pre-service teachers noticed explicit or implicit CRT aspects in the case scenarios through reflection. Learning to notice is an important part of reflection because noticing an incident triggers deeper reflection (Baecher, McCormack, & Kung, 2014; van Es & Sherin,

2002). In this dissertation, *explicit CRT aspects* refer to the CRT aspects that were presented noticeably in the given dilemmas or challenges and/or through the reflection prompts to the pre-service teachers. When the pre-service teachers discovered only explicit CRT aspects, they were considered being involved in surface-level reflection (Larrivee, 2008). *Implicit CRT aspects* are the CRT aspects that were hidden in the given dilemmas or challenges and/or was not mentioned in the reflection prompts but required the pre-service teachers to go beyond the given situations and see and analyze the CRT aspects in broader contexts (Larrivee, 2008). When the pre-service teachers detected implicit CRT aspects in addition to explicit ones, they were regarded as being engaged in critical reflection.

Scaffolding

Scaffolding is the process of providing dynamic support to learners for their inadequate skills and understanding to engage them in the task and to enable them to complete similar tasks independently in the future (Belland, 2017; Pea, 2004; Sharma & Hannafin, 2007; Wood, Bruner, & Ross, 1976). Scaffolding functions are categorized as *conceptual scaffolding*, *procedural scaffolding*, *strategic scaffolding*, *metacognitive scaffolding*, and *motivation scaffolding* (Hannafin, Land, & Oliver, 1999). Conceptual scaffolding supports learners when they try to determine what concepts, elements, or things to consider during problem solving. Procedural scaffolding guides learners during problem-solving and helps them make progress. Strategic scaffolding provides strategies that learners can use during problem solving. Metacognitive scaffolding can help learners analyze their own thinking and improve metacognitive skills, such as regulation, monitoring, and reflection (Quintana, Zhang, & Krajcik, 2005). Motivation scaffolding aims to enhance leaners motivation to perform the target task. The

digital intervention implemented in the dissertation studies involves metacognitive, conceptual, and procedural scaffolding to improve pre-service teachers' reflection.

Case Scenario

In this dissertation, cultural case scenarios were used as scaffolding features for reflection. A case scenario has a story and a plot that occurs over a time period in a specific context (Shulman, 1992). In teacher education, cases are used to show complexity and diversity in classroom through ill-structured dilemmas (Mostert, 2007). Case scenarios refer to narratives of dilemmas or challenges that teachers can encounter in culturally diverse classrooms. The goal of presenting case scenarios in the studies was to provide authentic, complex classroom-like environments through real stories where pre-service teachers could practice reflection.

Subjectivity Statement

My current research interest in teachers' critical reflection began in 2011. I graduated from the Foreign Language Education program in 2008 and was in my third year of teaching English as a second language to kindergarteners at a private school in Istanbul. Although I took several teaching methodology courses in my undergraduate education, something novel for me happened that year. The administration of the school where I was working asked teachers to use tablets in their classes, which was one of the first implementations in Turkey.

I brought tablets to my class to do some activities and play games with my students. However, things did not go the way I had envisioned because my colleagues and I had not analyzed whether the students would really need tablets in class before bringing them to class. I did not ask these questions to myself: "Can we implement the activities offered on tablets better when we use paper-based materials?", "Which is more useful for our young learners: Drawing or coloring with crayons or on tablets with their fingers?" Later, we realized that we had just tried

to use tablets for some activities in our classrooms for the sake of their popularity because it was obvious hands-on activities such as coloring and building could be more helpful for fine-motor skill development.

After this experience, I realized that technology-enhanced learning environments require more than bringing technological tools to the classroom. This experience has shaped my standpoint in teaching and led me to get a master's degree in educational technology, become a doctoral student in Learning, Design, and Technology program, and get 'obsessed' with reflection. If my colleagues and I had reflected on our lesson design and technology use in classroom effectively then, we could have designed a better lesson for our students. Many years later, I took this 'obsession' as a starting point for my current research.

The 'culturally responsive teaching' aspect of my research originates from the fact I am currently an international student in the US. This is a double-sided issue for me. I used to teach academic English in the intensive English program at one of the most prestigious universities in Istanbul, Turkey. I had international students in my classes. I also had many students from the East regions of Turkey. Istanbul is located on the West side of Turkey, which differs a lot from the East side. I had a chance to observe cultural differences that my students brought into my classes. Yet, I had not realized how influential a teacher's culturally responsiveness is in students' learning until I became an international student in another country. I experienced and observed lots of cultural differences in US classrooms, especially my first semester here. For instance, I observed that American students tend to ask many questions to their professors and comment on others' ideas without hesitation. However, this was not the case for many international students and for myself. I should acknowledge that language can be a barrier for international students whose native language is not English. Other than that, these observed

differences also seem related to culture. For instance, in Turkish culture, a teacher is the authority and you cannot question him/her and his/her ideas. You should respect your teacher. There could be a tendency to consider whatever a teacher teaches as right.

The triggering point for me to integrate my cultural diversity experience into my research was a course about culturally relevant pedagogy I took in Fall 2017. It has influenced my teaching philosophy and my ideas about teaching diverse students. I learnt how teachers' attitudes, instructional strategies, and beliefs may shape the learning experience of diverse students in class. Now, I think the stance that *all* learners can succeed should be adopted by all teachers. Yet, as far as I have interpreted from the literature, reaching this stance is a demanding process because it entails teachers' critical reflection, which ties back to my research agenda about teacher reflection.

Based on my interpretations from both the literature and my own experience, I resonate with Critical Pedagogy (Freire, 2001) in educational settings. I believe that all students regardless of their race, nationality, gender, religion, and socioeconomic status should have equal rights in terms of access to high-quality education. I am currently studying scaffolding pre-service teachers' critical reflection about culturally responsive teaching. I have been exploring what pre-service teachers experience when they are asked to reflect critically on culturally responsive teaching as a part of my research studies that focus on science teaching. I use prompts as one of the scaffolding features to improve pre-service teachers' reflection. I should acknowledge that my viewpoint aligns with critical pedagogy and this may have influenced how I designed the prompts and even caused some of the prompts to be biased. Other researchers with different theoretical lenses may have prepared a different set of prompts. As a former teacher and a current doctoral student interested in teacher education, I believe that reflection affects both

pedagogies that teachers implement in classrooms and students' learning outcomes. Due to this belief, I may not be neutral about the necessity and importance of critical reflection, and this may influence how I interpret participants' reflections, interviews, and the core themes I may identify from the data.

Dissertation Overview

Following a manuscript format, this dissertation includes three publishable papers. Chapter 2, entitled *Design Guidelines for Scaffolding Pre-Service Teachers' Reflection-in-Action Toward Culturally Responsive Teaching,* first explores the concepts of reflection and scaffolding for culturally responsive teaching in teacher education. After providing the theoretical foundations for the design of iReflectNow, it presents three design guidelines for scaffolding pre-service teachers' reflection-in-action for culturally responsive teaching. Each guideline also includes a description of how the guideline is implemented in iReflectNow. Finally, the chapter provides a summary of affordances of iReflectNow and discusses directions for further research and its implication. This manuscript is in revision after receiving a major revision request for publication in *Educational Technology Research and Development*.

Chapter 3 is entitled *An Exploratory Study of Scaffolding Pre-service Teachers' Reflection for Culturally Responsive Teaching*. The chapter reports the findings of a pilot study conducted in a science methods course with pre-service teachers in the early childhood and elementary education program. The purpose of the study was to explore how cultural case scenarios and reflection prompts help pre-service teachers reflect more critically. With this purpose, prompts were given to pre-service teachers via an online survey tool, Qualtrics, in a linear order. That is, the prompts were not customized based on pre-service teachers' responses. This was to create a database of prompts that can promote critical reflection and refine the

prompts for the following studies. The data was analyzed qualitatively, and the findings informed re-design and refinement of the reflection prompts. For instance, the wording and the presentation order of the prompts were revised for the main study of the dissertation. This manuscript will be submitted to *Teachers College Record* in July 2019.

Chapter 4, *iReflectNow: Digital Scaffolding Pre-service Teachers' Reflection-in-action for Culturally Responsive Teaching*, reports the findings of an empirical study using iReflectNow as a scaffolding tool for pre-service teachers' in-depth reflection for CRT. In this study, all the design guidelines presented in Chapter 2 were implemented. The study was conducted in the same science methods course with early childhood and elementary pre-service teachers but in spring 2019. The overall findings suggest that several elements other than scaffolding may interact during the process of in-depth reflection for CRT. The manuscript will be submitted to *Instructional Science* in August 2019.

Finally, Chapter 5 presents a summary of key ideas from the three manuscripts. As only the first two iterations for the design of iReflectNow were completed within this dissertation research, further studies are planned to refine and redesign iReflectNow to be more adaptive. Chapter 5 ends with future research directions and implications for research and practice.

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CHAPTER 2

DESIGN GUIDELINES FOR SCAFFOLDING PRE-SERVICE TEACHERS' REFLECTION-IN-ACTION TOWARD CULTURALLY RESPONSIVE TEACHING[1]

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Abstract

Pre-service teachers need to be prepared for diverse 21st century classrooms. Being culturally responsive, they should affirm students from diverse cultures. Yet, teacher education programs fall behind in terms of focusing on cultural elements. One way to prepare pre-service teachers for culturally responsive teaching is integrating critical reflection into teacher education curricula. Although reflection is considered an important component of teacher education, critical reflection is rarely observed in teacher education classes. Pre-service teachers' reflections tend to be descriptive rather than reflective. This chapter offers a set of guidelines for supporting future teachers in critical reflection for culturally responsive teaching.

Keywords: culturally responsive/relevant teaching, reflection-in-action, critical reflection, scaffolding, teacher education

Introduction

Pre-service teachers have roles in both learning and teaching, as a student and a student-teacher. During their teacher preparation programs, pre-service teachers seek their teacher identity (Lee & Schallert, 2016). The role of reflection is critical to forming teacher identity and learning to teach (Hollingsworth, 1989; Kagan, 1992). Reflection also improves teaching because it involves noticing and analyzing events in learning environments and taking needed actions (Feiman-Nemser, 2001; Maclean & White, 2007; Moore-Russo & Wilsey, 2014; Walkington, 2005). Despite the importance of reflection in teacher education and practice, reflection is practiced only through the Educative Teacher Performance Assessment (EdTPA) in current teacher education programs (Colton & Sparks-Langer, 1993; Fletcher, 1997; Kagan, 1992; Moore-Russo & Wilsey, 2014). When asked to reflect on their experiences, pre-service teachers tend to provide summaries that include descriptive reflection (Baker & Shahid, 2003; Bean & Stevens, 2012; Gordinier, Conway, & Journet, 2006; Lai, Calandra, & Ma, 2009). The content and process of reflection need purposeful design for critical reflection (Moore-Russo & Wilsey, 2014).

A reflective teacher can also address students' needs in diverse classrooms. In the United States, a homogeneous group—mainly White teachers—teach students coming from diverse cultures (Allen, Hancock, Starker-Glass, & Lewis, 2017; Howard, 2003). To affirm and value all students' cultures and become culturally responsive, teachers need to be involved in deeper reflection such as critical reflection (Allen et al., 2017; Howard, 2003). However, critical reflection is a demanding process especially for pre-service teachers. It requires them to question their own beliefs, values, and dispositions about teaching (Allen et al., 2017; Howard, 2003; Larrivee, 2000; van Manen, 1991). Scaffolding is needed to make the reflection process

meaningful and doable (Howard, 2003; Lai & Calandra, 2010; Moore-Russo & Wilsey, 2014). Through scaffolding, critical reflection on values and beliefs about teaching diverse learners can be promoted (Whipp, 2003).

This chapter presents a set of design guidelines to scaffold pre-service teachers' critical reflection for culturally responsive teaching. The overarching research question is: How should digital scaffolds be designed to promote pre-service teachers' reflection for culturally responsive teaching?

Relevant Literature

Critical Reflection

Definition of critical reflection. Reflection is an iterative process in which lessons learnt from previous experiences result in deeper learning and informed decisions for following events (Dewey, 1933). Problems, dilemmas, and/or challenges trigger reflection (Chitpin, Simon, & Galipeau, 2008; Dewey, 1933; Griffin, 2003; Mezirow, 1991). Following an encounter with a problem or a dilemma, reflective people analyze different courses of action, reflect, and make decisions (Dewey, 1933; Hatton & Smith, 1995; Mezirow, 1991).

Reflection can be categorized based on its timing: reflection-in-action and reflection-on-action (Schön, 1987). Reflection-in-action refers to critical and practical thinking in the moment of an action whereas reflection-on-action entails retrospective analysis of previous experiences. That is, reflection-in-action is dynamic whereas reflection-on-action involves a thorough examination of lived experiences. As real-life situations are dynamic and complex, it is suggested professionals be involved in reflection-in-action to handle problems properly, which is called *professional artistry* (Schön, 1987). Professionals need to be familiar with both reflection-

in-action and reflection-on-action for effective reflection-for-action; that is, informed decision-making in the future (Killion & Todnem, 1991).

There have been many other attempts to categorize the process of reflection into different types or dimensions based on its depth and breadth (Jay & Johnson, 2002; Larrivee, 2000; van Manen, 1977, 1991). Larrivee (2000) proposed four types of reflection: *pre-reflection*, *surface-level reflection*, *pedagogical reflection*, and *critical reflection*. *Pre-reflection* refers to the time period before reflection when teachers do actions automatically, whereas teachers try to achieve pre-determined goals in the curriculum during *surface-level reflection*. *Pedagogical reflection* requires teachers to use their pedagogical knowledge and examine practices that can be feasible in classroom settings. The deepest reflection is *critical reflection* for which teachers are to consider and analyze the ethical and moral consequences of their actions and practices on students beyond classroom settings. However, critical reflection can be a demanding process especially for prospective and beginning teachers whose beliefs, assumptions, and values are challenged (Larrivee, 2000, 2008).

Many pre-service teachers need support to trigger and improve their reflection (Korthagen, 1993; Nolan, 2008; Smith & Lennon, 2011). When asked to reflect on their past field experiences, pre-service teachers tend to simply describe or summarize the events without justifying how and why they did a particular action or made a specific decision (Baker & Shahid, 2003; Bean & Stevens, 2012; Gordinier, Conway, & Journet, 2006; Lai, Calandra, & Ma, 2009). As they lack experience in the reflective practice of teaching, pre-service teachers may not know what they should be doing during reflection (Kagan, 1992; Moore-Russo & Wilsey, 2014). Generally little explicit instruction about the foundations and the process of reflection is provided in teacher preparation courses at the undergraduate level (Colton & Sparks-Langer,

1993; Fletcher, 1997; Larrivee, 2008; McCullagh, 2012). To address these gaps, guidelines for a digital scaffolding environment that aims to support pre-service teachers' reflection are offered in this chapter.

Culturally Responsive Teaching and Reflection

With the goal of improving teacher education programs, Ladson-Billings (1995) focused on how to produce new generations of teachers that value their African American students in multicultural urban classroom settings and coined the term *culturally relevant pedagogy (CRP)*. CRP is related to not only teaching-learning environments that include African American students, but also other multicultural and multiethnic ones (Ladson-Billings, 2014). Focusing more on teaching, Gay (2010) named *culturally responsive teaching (CRT)* and defined it as use of students' cultural *funds of knowledge*, experiences, values, and beliefs as a means to design meaningful learning activities for them. In addition, teachers should be knowledgeable and cognizant of their students' cultures and beliefs to prepare culturally responsive, meaningful lessons (Hollie, 2012; Villegas & Lucas, 2002). Deeper reflection, such as critical reflection, can help prospective teachers to implement CRP and CRT effectively to enable meaningful learning among their students in their future classes (Aguirre & Zavala, 2013; Howard & Rodriguez-Minkoff, 2017).

Although the need for integration courses that introduce CRT into teacher education programs is clear, most of the programs require their students to take only one such kind of course (Hernandez, Morales, & Shroyer, 2013). With the help of teacher educators, pre-service teachers can analyze the diversity of real classroom settings critically (Howard, 2003; Nieto, 2009). Through teacher education programs, prospective teachers can develop an awareness of how students' cultures and diverse backgrounds impact learning, how discrimination exists in

educational settings, and how instructional strategies need to be adapted to enhance learning and academic achievement of *all* students (Gay, 2010; Jacobs, 2001; Nieto, 2009; Rychly & Graves, 2012). The strategies in this chapter are to scaffold pre-service teachers not only to become a critical reflective practitioner but also to prepare them for culturally responsive teaching.

Scaffolding and Reflection

Scaffolding is a process of support that enables a learner to succeed a goal or perform a task which would be beyond the learner's capacity without assistance (Belland, 2014; Pea, 2004; Saye & Brush, 2002; Sharma & Hannafin, 2007; Wood, Bruner, & Ross, 1976). Scaffolding is provided selectively at the points where learners need help during the task completion, and it can be removed when the task is achieved (Wood et al., 1976).

During the scaffolding process in class, a teacher models a skill, provides assistance, and then gradually reduces the support so the learner can master that skill individually (Wood et al., 1976). The concept of *more knowledgeable others* (Vygotsky, 1978) is usually associated with teachers; however, it can also refer to a more knowledgeable peer. Computers or other technological devices can be MKOs when digital scaffolds are used (Belland, 2017). Computer tools, rather than teachers or peers, help learners perform the tasks beyond their unsupported abilities (Belland, 2014; Hannafin, Land, & Oliver, 1999; Reiser, 2004). Scaffolds appear in different forms with multiple functions depending on the nature of the activity (Shin, Brush, & Glazewski, 2017). Digital scaffolds are focused on in this chapter since they are applicable to teacher preparation in ways that reflection is practiced outside of class.

Examples of tools used for reflection in teacher education. Reflection and reflective practice have been a focus of teacher education for years; however, generally the content of reflections remains at the descriptive level and do not show critical and analytical thinking

(Larrivee, 2000). Without deep analysis of personal beliefs and assumptions and the ethical and cultural results of instructional decisions, the reflection process remains a technical routine and cannot go beyond surface-level reflection (Larrivee, 2000, 2008). In previous studies (listed in Table 2.1), different types of interventions have been used for reflection, which can be categorized as *self-reflection*, *reflection through interaction with peers*, and *reflection through interaction with experts*.

Table 2.1

Previous Interventions to Promote Pre-service Teachers' Reflection

Intervention category	Studies	Tools used to scaffold reflection	Findings
Self-reflection	Cavanagh & McMaster (2015)	Journal writing (without scaffolding prompts)	Reflection generally included how teachers managed their classrooms rather than learning of their students.
	Lai & Calandra (2010)	Journal writing (with question prompts and visual writing process display)	Pre-service teachers reflected on authentic class problems more deeply when they were scaffolded.
	Rich & Hannafin (2009)	Videotaped classes (self-analysis)	Participants used videos to reflect on their actions, and planned their future teaching based on these reflections.
	Gordinier, Conway, & Journet (2006)	Portfolios (with Guided Reflections)	Student teachers' reflective writing developed a lot, and more critical thinking indicators could be found in their reflections.
	Hoban (2000)	Journal writing (with web-based templates / analyze, synthesize, theorize)	Student teachers reported using web-templates while reflecting helped them a lot to conceptualize real classroom dynamics.
	Chung & van Es, (2014)	Portfolios (with embedded reflection prompts)	Pre-service teachers analyzed their own teaching. The given reflection prompts during this analysis were found to be useful.

Reflection through interaction with peers	Blair (2012)	Collaborative journals (peer feedback on entries)	Student teachers' reflection got deeper at the end of the term.
	Rhine & Bryant (2007)	Online discussions with peers and experts on video-taped lessons	The design helped to enhance pre-service teachers' reflective practice; however, the authors were still skeptical how it can be transferred to "reflection-in-action".
Reflection through interaction with experts	Chen (2012)	Online collaboration of pre- and in-service teachers: interviews and lesson planning	Three types of reflection, that is occupational, academic, and pedagogical were found. The study resulted in mutual benefit for both groups in terms of reflective thinking.
	Hrevnack (2011)	Observation of in-service teachers	The "Guided Reflective Observation and Analysis Model" was used. This guiding model enabled teacher candidates to link theory to practice.

These interventions were mostly used to promote reflection-*on*-action—reflecting on previous experiences (see Table 2.1). There is no study on how pre-service teachers reflect-*in*-action. In the complexity of the teaching-learning environment, it can be challenging and overwhelming to reflect during teaching, especially for pre-service teachers (Cavanagh & McMaster, 2015; Fletcher, 1997; Jay & Johnson, 2002). However, to become reflective practitioners, pre-service teachers need to be prepared for both reflection-on-action and reflection-in-action (Fletcher, 1997; Killion & Todnem, 1991; Schön, 1987). Thus, scaffolding pre-service teachers' reflection-in-action is presented in this chapter to prepare pre-service teachers for critical reflection-in-action with regard to culturally responsive teaching.

Theoretical Foundations of iReflectNow

Learning is a complex process that might be influenced by various factors. Usually overlooked, culture is one of these factors. The integral role of culture in learning has often been insufficiently addressed in the fields of learning sciences and instructional design (Lee, 2008;

Nasir, Rosebery, Warren, & Lee, 2014). The primary goal of iReflectNow is to enhance pre-service teachers' cultural responsiveness through critical reflection. Multiple theoretical discourses about culture in learning inform the design of iReflectNow.

There is inconsistency between school culture where values and beliefs of Whites are mainstreamed and the home culture of students from diverse minority cultures (Irvine, 1990; Ladson-Billings, 1995). Especially, the ethnicity, socioeconomic status, language, and culture of diverse minority students collide with mainly monocultural teachers and learning environments at schools (Giroux, 1992; Romo & Chavez, 2006). One way to cope with this absence of *cultural synchronization* (Irvine, 1990) is encouraging teachers to become *cultural catalyzers* for their students who need to navigate through different cultures (Aikenhead, 1996). Another way is to equip teachers enough to be *equity warriors* for justice and inclusivity in classrooms (Rochmes, Penner, & Loeb, 2017; Romo & Roseman, 2004).

Students' academic success in classes and effectiveness of instruction depends on: (1) how much students' culture in their daily lives differs from school culture, (2) how easily students move from home or real-life culture to school culture, and (3) the quality of support they take during cultural navigation (Jegede & Aikenhead, 1999). Sometimes students experience difficulty navigating between these cultures because there is the lack of synchronization and culture is flowing (Irvine, 1990; Ladson-Billings, 1995, 2014). The primary role of teachers is to facilitate this cultural transition between cultures of home and school by using students' funds of knowledge (Gay, 2000; Moll, Amati, Neff, & Gonzalez, 1992). This may show that cultural transition is two-way. It is both from school to home and from home to school. Schools are to adjust to what students bring from home and use students' funds of

knowledge effectively (Gay, 2000). Bridging the gap between these cultures can be achieved through culture-based instruction and CRT (Gay, 2000; Ladson- Billings, 2014; Young, 2014).

As cultural catalyzers, teachers and prospective teachers can help students navigate through home and school cultures. Students' navigation becomes easier when cultures of home and school are integrated rather than separated. Integration of these cultures is a demanding process because it requires teachers to acknowledge and reflect critically about both their own and their students' cultural values, beliefs, and assumptions (Allen et al., 2017; Howard, 2010; Rychly & Graves, 2012). It is even more challenging for pre-service teachers who lack teaching experience since there is little opportunity to practice CRT and critical reflection in teacher education courses (Aguirre & Zavala, 2013; Howard & Rodriguez-Minkoff, 2017).

Addressing this gap, iReflectNow involves various scaffolding features to support pre-service teachers in their learning process to become culturally responsive teachers through critical reflection. The scaffolding features in the iReflectNow such as case scenarios, reflection prompts, hints, and textual annotations are designed to develop critical reflection-in-action and CRT among pre-service teachers (see Figure 2.1). Pre-service teachers who learn to be reflective thinkers also become adept at blending cultures, which eases students' cultural transition.

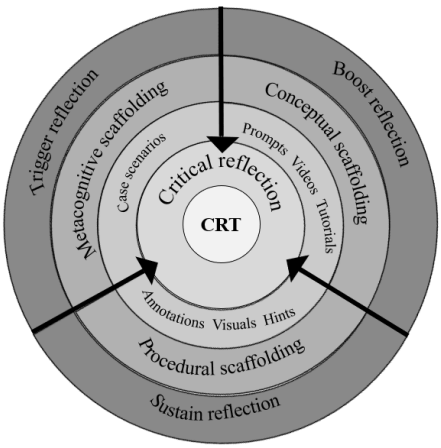

Figure 2.1. Map of the related concepts

Methods

Putting all the constructs together, we have conducted a comprehensive, systematic literature search using different combinations of the terms “Reflection,” “Critical Reflection,” “Reflection in Teacher Education,” “Scaffolding,” “Digital Scaffolding,” “Culturally Relevant Pedagogy/ Teaching,” and “Culturally Responsive Pedagogy/ Teaching.” With an inclusive approach, we have retrieved reviews, conceptual papers, and empirical studies from various fields including teacher education, instructional scaffolding, and multicultural education. 109 articles published in peer-reviewed journals, dissertations, reports, and conference presentations were included in our review. For empirical studies, the literature between 2000 and 2018 was reviewed while for conceptual papers, seminal articles written long before 2000 (e.g., Dewey, 1933; Schön, 1983, 1987) were included in the literature review. Both national and international data in the literature written in English were located and reviewed. As a result of this review, we have formed three design guidelines.

Scaffolding Design Framework for Reflection-in-action

Three guidelines are proposed in the design framework to scaffold pre-service teachers to learn culturally responsive teaching through critical reflection-*in*-action (see Table 2.2). Three types of scaffolding (Hannafin et al., 1999) are integrated: (1) *metacognitive scaffolding* via real-life case scenarios, prompts, and annotations (2) *conceptual scaffolding* via expert modeling and tutorials, and (3) *procedural scaffolding* via displays, templates, and hints (see Table 2.2).

Table 2.2

The Design Guidelines

	The Design Guidelines	Scaffolding Strategies	Key studies
Metacognitive scaffolding	1. Trigger pre-service teachers’ reflection for	1.1. Present real-world case scenarios with a cultural	Chitpin, Simon, & Galipeau, 2008; Dewey, 1933

	culturally responsive teaching.	dilemma to engage them in reflection.	
Metacognitive & conceptual scaffolding	2. Boost and facilitate pre-service teachers' reflection for culturally responsive teaching.	2.1. Give instant prompts to pre-service teachers for deeper reflection-in-action.	Davis & Linn, 2000; Sharma & Hannafin, 2007; Wu & Looi, 2012
		2.2. Give access to expert modelling of critical reflection-in-action.	Pea, 2004; Sharma & Hannafin, 2007
		2.3. Give access to tutorials and some resources about culturally responsive teaching and pedagogy.	Leelawong & Biswas, 2008; Shin, Brush, & Glazewski, 2017
Metacognitive & procedural scaffolding	3. Sustain in-depth reflection for culturally responsive teaching.	3.1. Provide textual annotations to make important points of a case salient.	Lee & Calandra,2004; Shin, Brush, & Glazewski, 2017
		3.2. Embed hints that enable pre-service teachers to analyze the given cases properly.	Belland, Glazewski, & Richardson, 2008; Oliver & Hannafin, 2000
		3.3. Provide displays to clarify the reflection-in-action process during the case analysis.	Lin, Hmelo, Kinzer, & Secules, 1999; Smith, Barlow, Peters, & Skolits, 2015

In iReflectNow, there are three sections that are aligned with the scaffolding functions: "What is Critical Reflection?", "What is CRT?", and "Practice Scenarios." Additionally, a "Hints" button is embedded in the practice scenarios (see Figure 2.2). In the sections of "What is Critical Reflection?" and "What is CRT?", videos are included as expert modelling to show what critical reflection and CRT look like. In the "Practice Scenarios" section, cultural case scenarios including dilemmas and challenges in culturally diverse classrooms are presented. These case scenarios are stories that real teachers have experienced in classrooms and were collected into a book by Tippins, Koballa, and Payne (2002). Pre-service teachers are scaffolded to engage in critical reflection while analyzing these case scenarios that other teachers experienced in real

classrooms in iReflectNow. *Action* in the context iReflectNow means pre-service teachers' analyzing cultural case scenarios.

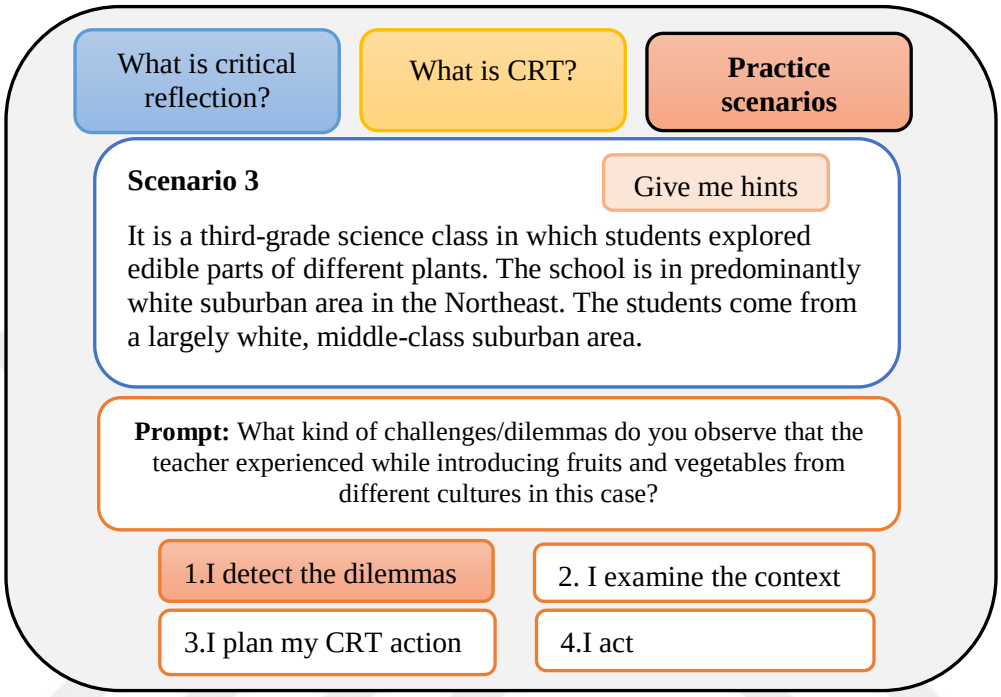

Figure 2.2. A sketch of iReflectNow

Design Guideline 1: Trigger Pre-service Teachers' Reflection for CRT

Present real-world case scenarios with a cultural dilemma to engage them in reflection. Perplexity or a disorienting dilemma triggers reflection because it is different from routine activities (Chitpin, Simon, & Galipeau, 2008; Dewey, 1933; Mezirow, 1997). Professionals should be able to tackle ill-structured real-world problems through reflection (Schön, 1983). Use of such authentic cases may help pre-service teachers become reflective practitioners (Malkani & Allen, 2005). Research has shown that the exposure to cases improves pre-service teachers' reflective thinking (Allen, 1994; Lundeberg & Fawver, 1994; Lundeberg, Levin, & Harrington, 1999; Moje & Wade, 1997). Authentic cases are used as pedagogical tools to familiarize pre-service teachers with ill-structured, real-world problems (Malkani & Allen, 2005; Wasserman, 1993; Whittaker & van Garderen, 2009) because there are gaps between what

pre-service teachers learn from teacher education programs and what actually happens in real classrooms (Malkani & Allen, 2005). Cases are also used when there is effort in showing pre-service teachers how theories are applied to practice (Feiman-Nemser, 2001; Hammerness, Darling-Hammond, & Shulman, 2002). Case-based pedagogy or cases can also be used to raise pre-service teachers' awareness about equity and social justice (Lundeberg, 1993; Nieto, 1999). Cultural case scenarios can be used to show prospective teachers how cultural, linguistic, and social differences shape students' learning experience and how ethical dilemmas are prevalent in real-life classrooms (Butler, Lee, & Tippins, 2006; Nieto, 1999).

Authentic cases about diversity in classrooms are presented to pre-service teachers to trigger their reflection process and to familiarize them with real classroom settings that require being culturally responsive in the "Practice Scenarios" section of iReflectNow. For example, one of the case scenarios (Koch, 2002), adapted from the book *Learning from Cases: Unraveling the Complexities of Elementary Science Teaching* (Tippins, Koballa, & Payne, 2002), presents a dilemma where students from different cultures are unfamiliar with certain types of fruit and vegetables in a third-grade science class. It is an open-ended case scenario which was experienced and written by a teacher. Pre-service teachers would have an opportunity to analyze the dilemma and engage in critical reflection during this analysis in iReflectNow.

Design Guideline 2: Boost and Facilitate Pre-service Teachers' Reflection for CRT

Give instant prompts to pre-service teachers for deeper reflection-in-action. Reflection can be scaffolded through question prompts because questioning encourages learners to monitor and analyze what they have done or experienced retrospectively (Davis & Linn, 2000; Larrivee, 2000; Lai & Calandra, 2010; Sharma & Hannafin, 2007). Socratic questioning is a

method to question and analyze actions and decisions, which maintains and improves reflection quality (Sharma & Hannafin, 2007).

Wu and Looi (2012) also investigated whether agent prompts used as scaffolding tools promote student-tutors' reflection in their study. They formed generic prompts and specific prompts to see whether prompts help learners assess their own learning. Both types of prompts were found to be effective in enhancing reflection. Similarly, activity prompts and self-monitoring prompts were used in Davis and Linn's study (2000). Both activity prompts, which were designed to motivate learners to reflect on their progress in a certain activity, and self-monitoring ones, which were aimed to encourage learners to reflect on their own learning, were found to better the learning process.

Digital scaffolding affords (a) instant reflection prompts in a virtual environment, (b) infinite patience to provide reflection prompts, and (c) purposeful guidance for critical reflection through use of pre-defined prompts (Davis & Linn, 2000; Leelawong & Biswas, 2008). Reflection-*in*-action can be facilitated by means of instant reflection prompts during their analysis of cases. These instant cases will be adapted and customized depending on the response to the previous prompt via Natural Language Processing (NLP), which is a subcategory of artificial intelligence that can process natural language as used by humans.

In iReflectNow, while analyzing and planning how to handle the given cases, pre-service teachers are exposed to the following reflection prompts (see Figure 2.3). These prompts are selected from a pool of prompts after the learner submits his/her response to the previous prompt. That is, learners' responses are processed via NLP to provide meaningful prompts and to mock reflection-in-action in a digital scaffolding environment. The prompts are designed and categorized based on an adapted version of the DATA (Describe-Analyze-Theorize-Act) model

of reflection (Smith, Barlow, Peters, & Skolits, 2015) to address cultural elements given in the case scenarios: *I detect the dilemmas/challenges*, *I examine the context*, *I plan my CRT action*, and *I act* (see Figure 2.3).

I detect the dilemmas/challenges

- What kind of challenges/dilemmas do you observe that the teacher experienced while introducing fruits and vegetables from different cultures in this case?
- Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Mango case.

I examine the context

- The case occurs at a school which is in predominantly white, middle-class, suburban area in the Northeast, and it is just beginning to experience some diversity from recent Central American immigration. Kim brought some new and different plants to the class. Here, what are the teacher's assumptions about the students' cultural background?
- What are your thoughts about the instructional approaches Kim used to introduce her 3rd grade students to new plants grown and eaten in different cultures?

I plan my CRT

- What could Kim have done to avoid the challenge/dilemma/problem(s) in the case?
- Taking diversity in classrooms into consideration, how would you justify your recommendations/solutions you offered for the previous prompt?
- What strategies might Kim have tried to engage her students in dissecting the strange plants?
- What lessons do you think you can draw from this case in terms of teaching in multicultural classrooms and/or introducing different cultures in class?

I act

- What are the cultural holes that Kim overlooked in this lesson plan?
- In what other ways, could the lesson have been designed to avoid or soften the students' negative reaction to new fruits and vegetables?

Figure 2.3. Reflection prompts given during case scenario analysis

Give access to expert modeling of critical reflection-in-action. Due to the complexity of teaching, pre-service teachers encounter difficulties with reflection (Cavanagh & McMaster, 2015; Colton & Sparks-Langer, 1993; Yost, Sentner, & Forlenza-Bailey, 2000). When pre-service teachers are asked to reflect, they generally do not know what is expected of them

(Fletcher, 1997). It is necessary to help them learn what critical reflection is. Modelling is one of the effective ways of scaffolding (Pea, 2004; Saye & Brush, 2002; Sharma & Hannafin, 2007; Shin & Song, 2016).

Modelling illustrates expert knowledge to novices, and novices are expected to imitate how an expert handles or solves a given task or a problem (Dennen, 2004; Jonassen, 2012; Wood et al., 1976). Videotaping experienced teachers' classes is one of the most frequently-used modelling methods for reflection (see Table 2.1). Teaching diaries of experienced teachers also works for modelling, especially for reflection-on-action (see Table 2.1). These tools can help pre-service teachers both improve and sustain their critical reflection.

To promote pre-service teachers' critical reflection-in-action, videotaped classes of experienced in-service teachers who reflect while teaching can be used for modelling. The "What is Critical Reflection?" section in the proposed design includes videotaped classes of in-service teachers and presentations about critical reflection. By watching them, pre-service teachers may get familiar with the reflection-in-action process.

Give access to tutorials and some resources about CRT. Pre-service teachers tend to have difficulty establishing links between theories and actual teaching (Feiman-Nemser, 2001; Hoban, 2000; Lai et al., 2009; Oner & Adadan, 2011; Orland-Barak, & Yinon, 2007). Providing access to important background information as a resource is a common scaffolding feature (Leelawong & Biswas, 2008; Shin & Song, 2016), which is commonly categorized as hard scaffolds (Saye & Brush, 2002). For instance, in their scaffolding design, Shin and Song (2016) embedded tools such as *resources*, *help*, and *glossary*. These tools were aimed to give background information that learners may need, and it was found these tools improved the learners' problem-solving skills. Textual annotations can also be used to give background

information to learners during problem solving (Shin et al., 2017). With the goal of maintaining the quality of the reflection process, the "What is CRT?" section offers tutorials and interactive presentations about culturally responsive teaching in the proposed design.

Design Guideline 3: Sustain In-depth Reflection for Culturally Responsive Teaching

Provide textual annotations to make important points of a case scenario salient. One of the key tenets of scaffolding is making important aspects of a task salient to the learner (Wood et al., 1976; Reiser 2002, 2004). In a digital environment, hypermedia, hypertext, and textual annotation can be used for scaffolding learners' understanding of the instructional content (Azevedo, 2005; Jacobson, Maori, Mishra, & Kolar, 1996; Lee & Calandra, 2004; Saye & Brush, 2002). For instance, Lee and Calandra (2004) provided textual annotation to 50 high school students in a history class. The students were asked to explore the United States Constitution in a web-based environment and were given textual annotations for selected concepts in the constitution for conceptual scaffolding. It was found that when annotations were provided, the depth of students' responses improved because the annotations activated students' prior knowledge about the content (Lee & Calandra, 2004).

In their study, Shin, Brush, and Glazewski (2017) embedded three types of annotations in an online system they designed for socio-scientific inquiry for a 9th-grade biology class. Relevant definitions, information, and questions were provided to the students via color-coded annotations during their inquiry. After the analysis of students' screencasts, Shin et al. (2017) found that annotations increased student engagement in inquiry activities, helped students pay attention to important information and provided structured guidance during problem-solving. In iReflectNow, textual annotation embedded in the case scenario (see Figure 2.4) will be provided

to pre-service teachers. In this way, they may be prompted to notice what to reflect about (Cavanagh & McMaster, 2015) since annotations show the important aspects of case scenarios.

It is a third-grade science class in which students explored edible pats of different plants. The school is in predominantly white suburban area in the Northeast. The students come from a largely white, middle-class suburban area that is just beginning to experience some diversity from recent Central American immigration. The students and the teacher have been studying, examining, and planting various seeds for several days. The science table in the classroom is like a local market that includes plant seeds that the students are familiar with.

In the second class of the day, the students were getting ready to explore some fruits and vegetables as a part of the science unit. They had been instructed to bring one fruit and one vegetable to explore in class. By doing this, the teacher wanted to connect the science class with her students' daily lives. However, she also believes that science should serve as a mirror and window to explore different worlds and lives.

The students started to examine a wide variety of fruits and vegetables. They discussed the features of fruits and vegetables such as tomatoes, apples, bananas, cucumbers. They analyzed different parts of vegetables such as root, stem, and leaves.

At this point of the lesson, the teacher decided to introduce some new and less familiar fruits and vegetables such as avocado, mango, papaya, fennel, and collard greens. She tried to encourage her students to examine the new fruits and vegetables, but there were no volunteers. She was disappointed by her students' unwillingness to explore fruits and vegetables from different cultures. With the goal of classifying where these fruits and vegetables are grown and eaten, the teacher sliced a large mango and asked: "Who eats the mango?".

These statements provide school **context** in terms of race and location.

Teacher's beliefs and assumptions about teaching science are provided.

This is the moment the **problem/dilemma** is presented.

A key phrase in terms of **CRP**

Figure 2.4. A sample case scenario with annotations

Embed hints that enable pre-service teachers to analyze the given cases properly. Giving hints is a powerful scaffolding strategy. This is especially true for students with less prior knowledge because their cognitive load can be reduced by the information provided to them through hints (Belland, Glazewski, & Richardson, 2008; Oliver & Hannafin, 2000; Shin & Song, 2016), so they can solve the problems more successfully (Quintana et al., 2004). For instance, content hints were given to learners in the Knowledge Integration Environment (KIE) to encourage complex thinking about the content (Bell & Davis, 2000).

Being culturally responsive can be demanding for pre-service teachers because it entails being aware of and knowledgeable about various cultures (Gay, 2013). Pre-service teachers may need some background information about different cultures to analyze the given cases accurately. They may also need some support to notice some particular points or features during the case analysis. Information about different cultures that are related to the given cases is provided through hints embedded in iReflectNow.

There is a "Hints" button in the proposed design of the tool. For instance, a hint that aims to provide cultural background information specific to the example case can be as follows: *Some fruits and vegetables that are grown in different parts of the world can be strange for students*. Moreover, in the "Examine the context" phase of reflection-in-action, some hints such as "*Check out the school context/ subject of the lesson/ student's grade/ home country / culture.*" can be provided to pre-service teachers so they may better contextualize the case.

Provide displays to clarify the reflection-in-action process during the case analysis. Process displays as scaffolds help leaners to visualize the reflection process (Lin, Hmelo, Kinzer, & Secules, 1999; Lai & Calandra, 2010). For instance, Lai and Calandra (2010) examined the effects of visual displays in pre-service teachers' reflective journal writing. The teacher candidates in the display group wrote deeper reflections than the control group. They also reported that visual displays provided them with a structure for their writing as their writing process was chunked into easy-to-follow steps.

To enhance reflection-in-action, the visual display is designed according to the DATA model of reflection (Smith, Barlow, Peters, & Skolits, 2015). The DATA model includes four steps: *describe*, *analyze*, *theorize*, and *act*. It is revised for reflection-in-action in the proposed design. The first step will be "I detect the dilemmas/challenges" in the given case. It will be

followed by the step of “I examine the context” to find out more about the diversity and culture the student would bring to the classroom in the given case, “I plan my CRT action”, and “I act” (see Figure 2.1). Appropriate, instant prompts will be provided in each step.

Discussion

Summary

Diversity in classrooms has increased with the globalization of the world. Pre-service teachers need to be prepared to address the needs of diverse learners. Critical reflection, which is the most in-depth reflection type (Larrivee, 2008; van Manen, 1977, 1991), is a facilitator for pre-service teachers to become culturally responsive (Howard, 2003; Allen et al., 2017). Reflection and reflective thinking, however, are not the focal points in teacher education programs (Colton & Sparks-Langer, 1993; Fletcher, 1997; Howard, 2003). At this point, technology offers us some affordances that make the practice of reflection in teacher education curriculum viable. This chapter presented the design guidelines to scaffold pre-service teachers’ reflection-in-action about being culturally responsive, and a digital scaffolding tool, called iReflectNow.

iReflectNow is designed to simulate an authentic context for pre-service teachers’ learning of culturally responsive teaching through cultural cases. All of the case scenarios are practicing teachers’ lived experiences that include cultural elements or dilemmas (Tippins, Koballa, & Payne, 2002). When pre-service teachers are exposed to these authentic case scenarios, their reflection and awareness about what kind of cultural background students can bring into classrooms are triggered (Lundeberg, 1999; Nieto, 1999). Another feature of case scenarios is that they provide practice context (Allen, 1994; Feiman-Nemser, 2001; Hammerness, Darling-Hammond, & Shulman, 2002). That is, pre-service teachers have the

opportunity to analyze the case scenarios multiple times and learn to think reflectively (Lundeberg & Fawver, 1994; Moje & Wade, 1997). By doing so, they become familiar with deeper dimensions of reflection and CRT (Butler et al., 2006; Larrivee, 2000, 2008).

Use of reflections prompts in teacher education is not new (e.g. Chung & van Es, 2014; Lai & Calandra, 2010). But use of reflections prompts in the moment of reflection *while* analyzing case scenarios is new. The prompts scaffold the reflection process adaptively by customizing the prompts based on previous responses via NLP (Litman, 2016). This feature of iReflectNow simulates reflection-in-action and makes it viable in teacher education courses. iReflectNow provides an authentic context where pre-service teachers can get familiar with the dynamicity of real teaching in classrooms (Coulson & Harvey, 2013; Giaimo- Ballard & Hyatt, 2012).

Addressing needs of students in a diverse classroom can be challenging since teachers may not be familiar with students' cultures (Howard & Rodriguez-Minkoff, 2017). Hints (Bell & Davis, 2000) about the cultural elements in the case scenarios are embedded into iReflectNow to facilitate the practice of critical reflection for CRT (Aguirre & Zavala, 2013). As visual displays and templates in iReflectNow guide pre-service teachers by allowing them to keep track of their process, they become reflective thinkers (Hoban, 2000; Lai & Calandra, 2010). Scaffolding is also provided by showing expert models to novices and providing some background information about critical reflection and CRT in iReflectNow. Showing expected reflection and practice through expert modeling supports the learning of novice learners who lack relevant experience (Collins, Brown, & Newman, 1987; Nasir et al., 2014).

Directions for Further Research

In the beginning of the 21st century, providing effective and adaptive digital scaffolding was still seen as a demanding task. Some researchers argue that digital scaffolding designs generally lack *dynamicity* (Belland, 2014; Puntambekar & Kolodner, 2005). Combining digital scaffolds with one-to-one teacher or peer scaffolding was recommended for dynamicity (Belland, 2014; Kim & Hannafin, 2011; Tabak, 2004). Recent revolutionary developments in computational linguistics, speech recognition, and discourse processing have made it possible for computers to process natural language dialogs more appropriately (Graesser, Chipman, & King, 2008). For example, computers can process the natural language almost as it is used by humans (Hirschberg & Manning, 2015). In this way, adaptive, human-like scaffolding can be provided by computers in the future.

In future studies, the design guidelines proposed in this chapter can be adapted to different content areas (e.g., language teaching) and different types of cases can be used. For instance, cases to make pre-service teachers reflective about classroom management problems or learning disabilities can provide appropriate contexts for further studies. Cases of teaching dilemmas can be used to promote reflection when teaching controversial topics in multicultural learning settings (e.g. socio-scientific issues). Another direction for future research may include integrating different scaffolding features to iReflectNow depending on the length of time that pre-service teachers spend in their programs.

Implications

The design guidelines provide guidance about how to create digital scaffolding environments for pre-service teachers' critical reflection. The guidelines can be used to create effective teacher education programs since the digital environment makes practice of reflection-

in-action and CRT outside class time and before teaching in real classrooms feasible. It can be recommended that teacher educators use the scaffolding tool in their classes to encourage and show the importance of critical reflection and cultural responsiveness. The adaptive scaffolding environment proposed here can serve as a foundation of future interventions on reflection-in-action through artificial intelligence applications.

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CHAPTER 3

AN EXPLORATORY STUDY OF SCAFFOLDING PRE-SERVICE TEACHERS' REFLECTION FOR CULTURALLY RESPONSIVE TEACHING[2]

[2] Umutlu, D. & Kim, C. To be submitted to *Teachers College Record*.

Abstract

Reflection is integral to teaching. To be culturally responsive, teachers need to engage in critical reflection. Yet, reaching critical reflection is challenging, especially for pre-service teachers with a lack of teaching experience. Scaffolding can help them learn to reflect critically. Being the first iteration of a design-based research study series, this multi-case qualitative study explored how cultural case scenarios and reflection prompts scaffolded early childhood pre-service teachers' reflection process. Four White female pre-service early childhood teachers were selected for this multiple case study. They analyzed four case scenarios that included cultural elements and dilemmas. Scaffolding was provided through purposefully designed prompts. The findings indicate that several elements seem to have shaped the pre-service teachers' reflective thinking process for culturally responsive teaching. Two of these elements identified in this study are (a) how they framed the dilemma in the case scenarios and (b) whether they had previous cultural experience similar to the case scenario. Going beyond the description of a dilemma encountered while analyzing the case critically and making meaningful connections between the encountered dilemma and previous experience helped these four pre-service teachers engage in critical reflection for culturally responsive teaching.

Keywords: reflection, culturally responsive teaching, cultural case scenarios, reflection prompts, teacher education

Introduction

In our globalized world, being sensitive to all students' cultures is critical to creating inclusive classrooms. Being culturally responsive to diverse students' needs, skills, and backgrounds is necessary for teachers to ensure inclusive classrooms (Ladson-Billings, 1995; Weinstein, Curran, & Tomlinson-Clarke, 2003). Reflection, especially critical reflection, plays an important role in preparing culturally responsive teachers for their future diverse classrooms (Allen, Hancock, & Lewis, 2017). Teacher education programs can provide opportunities to pre-service teachers to practice reflection and gain experience through meaningful learning activities (Moore-Russo & Wilsey, 2014). In this way, they may improve their reflection skills and become cognizant of dynamics in classrooms where they are likely to experience various kinds of diversity.

Portfolios, journals, and video-taped classes are often used to promote pre-service teachers' reflection in teacher education programs (Freese, 2006; Lai & Calandra, 2007; Oakely, Pegrum, & Johnston, 2014; Rich & Hannafin, 2009; Roberts, Maor, & Herrington, 2016). However, pre-service teacher reflection usually does not go beyond surface-level reflection (Larrivee, 2008). Scaffolding within these tools (Coulson & Harvey, 2013; McCullagh, 2012; Moore-Russo & Wilsey, 2014) could enable pre-service teachers to reach deeper reflection such as pedagogical and critical reflection (Larrivee, 2008). Reflection prompts (Baker & Shahid, 2003) are one of these scaffolding features that support pre-service teachers' reflection process. Reflection needs to be dialogic to go beyond description to critical explanations (Mena Marcos, Sánchez, & Tilleman, 2008) and question prompts create that dialogue which guides reflective thinking of teacher candidates (Blomberg, Sherin, Renkl, Glogger, & Seidel, 2014; Engin, 2016).

In the present study, reflection prompts were employed as part of scaffolding features for pre-service teachers' critical reflection in case scenarios including cultural elements and dilemmas. The study aimed to examine how the reflection prompts worked during pre-service teachers' analysis of cultural case scenarios. The research question that guided the study was: *How do cultural case scenarios and reflection prompts engage pre-service teachers in reflection for culturally responsive teaching?*

Relevant Literature

There is a pressing need for preparing teachers to teach in diverse classrooms because the multicultural student population does not correspond to the 80% middle-class monolingual White population of teachers in US schools (U.S. Department of Education, 2012). A chasm between student and teacher populations, a *demographic divide*, can occur when students from diverse backgrounds enter classrooms (Gay & Howard, 2001). Some reforms such as No Child Left Behind and the Every Student Succeeds Act have been enacted with the proposed aim of minimizing this divide, but students of color still underachieve compared to their White peers (National Center for Education Statistics [NCES], 2015).

To address this divide, Ladson-Billings (1995) offered a pedagogy, named culturally relevant pedagogy (CRP), for teachers to use in diverse classrooms. Teachers who resonate with CRP affirm and value diversity in their classrooms and hold the stance that *all* learners can succeed regardless their backgrounds (Gay & Howard, 2001; Ladson-Billings, 1995, 2014). CRP gains more importance in early childhood classes since this is when children first enter classrooms with their home culture and start to interact with different cultures (Santamaria, 2009). Although CRP (Ladson-Billings, 1995, 2014) is a great tool to assess the cultural responsiveness of instruction, it is difficult for most teachers to conceptualize what it is and how

it is practiced in real classroom settings (Howard & Rodriguez-Minkoff, 2017). Some researchers (e.g., Milner, 2011; Sleeter, 2012) attribute the underperformance of diverse students partially to the lack of authentic, pedagogical interventions in teacher education programs. Groulx and Silva's (2010) study revealed that pre-service teachers were familiar with theoretical underpinnings of culturally responsive teaching (CRT) but had little opportunity to practice it in authentic or real classroom settings.

CRT is more than teaching pre-determined standard-based curriculum (Lee, 2007). It is an evolving mindset that includes culture and learning (Milner, 2011; Souto-Manning & Mitchell, 2010). Teacher educators need to offer meaningful learning contexts to support pre-service teachers in gaining such a mindset. Authentic learning contexts about CRT should enable pre-service teachers to go beyond just understanding what CRT is and become equipped to use it (Howard & Rodriguez-Minkoff, 2017).

Culture is not static. It changes and evolves continuously even in classrooms (Henry, 2017; Ladson-Billings, 2014; Nieto, 1999). Cultural dilemmas encountered in classrooms usually include uncertainty and fluidity (Jonassen, 2011). Teachers may have difficulty adapting themselves to this uncertainty and situating themselves in the dynamicity of culture when provided with only a set of principles or to-do lists about CRT (Milner, 2011; Sleeter, 2012; Souto-Manning & Mitchell, 2010). They need more than a set of principles or to-do lists to gain *cultural competence* (Ladson-Billings, 1995) through authentic practice to teach effectively in diverse classrooms.

Some researchers (e.g., Aikenhead 1996; Carter & Walker, 2010; Giroux, 2005) assert there are borders between diverse students' home culture and school culture. Due to the dynamicity of culture, these borders are unclear (Aikenhead, 1996). Pre-service teachers need to

be skillful *cultural navigators* (Jegede & Aikenhead, 1999) to bridge the gap between those cultures and provide quality support to students when they move through the cultures. This can be achieved by taking students' home culture into consideration, because there should be an ongoing interaction between home and school cultures (Aikenhead, 1996). To become cultural navigators who create caring classrooms for *all* learners (Delpit, 2012), pre-service teachers are to go beyond the conceptualization of CRT by putting the theory into practice in authentic settings in teacher education programs (Howard & Rodriguez-Minkoff, 2017; Milner, 2011).

Case scenarios can provide authentic contexts to practice pedagogies and theories for teachers (Choi & Lee, 2009; Gorski & Pothini, 2014; Lundeberg, 1993). Case scenarios also provide environments for pseudo-practice in which pre-service teachers try out their teaching ideas without being involved in high-risk contexts (Moje & Wade, 1996). Cultural case scenarios are useful in providing culture-embedded contexts to pre-service teachers (Lundeberg, 1999; Nieto, 1999). As most case scenarios include ill-structured problems (Jonassen, 2011), they can simulate the fluidity and uncertainty of real diverse classrooms that pre-service teachers may encounter in the future.

During their learning from case scenarios, pre-service teachers can also improve their reflective thinking skills as they engage in problem-solving through critical reasoning (Lundeberg, 1999). Critical reasoning and reflective decision-making involve several elements, such as identifying a problem, analyzing a problem from multiple aspects, proposing alternative solutions, and considering and foreseeing the consequences of these solutions (Harrington, 1995; Lundeberg & Fawver, 1994). Particularly, cases that include dilemmas help pre-service teachers enhance their problem-solving skills and reflective practice as they present complex situations

that are analogous to real-life problems with a certain level of uncertainty (Harrington & Garrison, 1992; Lundeberg & Fawver, 1994; Merseth, 1991).

Cultural cases can be used to show prospective teachers (a) that cultural and ethical dilemmas can happen frequently in classrooms and (b) how cultural, linguistic, and social diversity impacts student learning (Lundeberg, 1993; Nieto, 1999). For instance, in Butler, Lee, and Tippins (2006), early childhood pre-service teachers indicated cases helped them become aware of and empathetic to cultures they were unfamiliar with. In another study by Lundeberg (1993), a case about gender equity was given to pre-service teachers. In the case the teacher calls on 14 male students in his lesson and praises all of them, however, he calls on only 8 female students and praises none of them. Only 46% of the pre-service teachers framed gender equity as a problem in the case at the beginning of the semester whereas 92% of them included it as an issue in their case analyses 14 weeks later. These findings suggest that case scenarios can be used to prepare pre-service teachers for diverse environments (Butler et al., 2006; Lundeberg, 1993).

Case scenarios can provide authentic contexts for pre-service teachers for an effective cultural navigation. Cultural navigation requires critical reflection (Aguirre & Zavala, 2013; Allen et al., 2017; Aronson & Laughter, 2016). Critical reflection involves not only teachers' self-inquiry of their own beliefs and values about teaching and their students but also their questioning of social, ethical, and cultural implications of their teaching practice beyond classroom contexts (Larrivee, 2008; van Manen, 1991; Whipp, 2003). Teachers who critically reflect usually inquire about social justice and educational equity and situate themselves in broader contexts than the classroom (Valli, 1997; Van Manen, 1991).

Although critical reflection is considered the deepest reflection by several researchers (Hatton & Smith, 1995; Larrivee, 2008), teachers' reflection process does not necessarily progress linearly. Teachers can engage in different dimensions of reflection concurrently (Larrivee, 2008). Descriptive reflection is often observed among pre-service teachers due to the process of searching their teaching identity (Lee & Schallert, 2016; Larrivee, 2008). Pre-service teachers usually only summarize what has happened in classrooms during descriptive reflection (Hatton & Smith, 1995; Jay & Johnson, 2002), while they are expected to find effective pedagogical and instructional practices to teach content through pedagogical reflection (Larrivee, 2008). For critical reflection, pre-service teachers need to first recognize and accept their own beliefs and assumptions, and then recognize and value their students through self-reflection (Larrivee, 2008). Critical reflection can be pressing for pre-service teachers during their teaching identity development. To facilitate and enhance their learning to reflect critically, the reflection process should be designed purposefully and intentionally (Moore-Russo & Wilsey, 2014). They need to have support that facilitates this process (Cavanagh & McMaster, 2015; Lai & Calandra, 2010; Whipp, 2003).

Prompts have been used widely to promote reflection in teacher education (e.g., Bean & Stevens, 2002; Blair, 2012; Nolan, 2008). Prompts are considered as support structures in reflection processes as they provide guidance to prospective teachers (Cavanagh & McMaster, 2015; Etscheidt, Curran, & Sawyer, 2012; Lai & Calandra, 2010). Prompts also promote questioning which enables pre-service teachers to look back at their previous experiences more critically (Davis & Linn, 2000; Larrivee, 2000; Sharma & Hannafin, 2007). As a result, prompts are considered to improve reflection depth and quality (Sharma & Hannafin, 2007). For instance, in Baker and Shahid (2003), pre-service teachers were asked to write reflection journals during

their 9-week field experience and were exposed to such prompts as “Describe your initial impressions of the classroom,” “What challenges and opportunities do you see for yourself as a teacher?,” and “What strategies are effective for all learners?” (p. 6). The prompts enhanced the quality and depth of pre-service teachers’ reflection compared to unstructured reflection journaling. Prompts were also effective in enhancing pre-service teachers’ reflection in several other studies (e.g., Lai & Calandra, 2010; Salehinia, & Abdolmanafi-Rokni, 2015).

This study aimed to engage pre-service teachers in critical reflection for their cultural responsiveness in future classrooms. Cultural case scenarios and reflection prompts were used to provide an authentic learning environment and to enhance prospective teachers’ reflective skills in the process of becoming potential cultural navigators (Milner, 2011; Moore-Russo & Wilsey, 2014; Nieto, 1999; Sleeter, 2012).

The Scope of the Current Study

This study was the first one of a design-based research (Anderson & Shattuck, 2012; Bradley & Reinking, 2010; Brown, 1992; McKenney & Reeves, 2012) series. The ultimate goal of this series is to create a dynamic and adaptive digital scaffolding environment (iReflectNow) for reflection-*in*-action. How to provide meaningful, instant prompts based on pre-service teachers’ responses during reflection-in-action is a crucial part of this research considering the *dynamicity* feature of scaffolding is key to digital scaffolding designs (Belland, 2014; Puntambekar & Kolodner, 2005). The present study focused on designing, testing, and refining reflection prompts within case scenarios as scaffolding features to achieve dynamicity in the later iterations of the environment and this research.

Design of the Intervention: Digital Scaffolding Environment iReflectNow

iReflectNow includes three main components based on scaffolding strategies: (1) "What is critical reflection?" section for modeling of and resources for critical reflection, (2) "What is CRT?" section that involves resources about CRT, and (3) "Practice Scenarios" that include cultural case scenarios and instant reflection prompts for critical reflection-in-action (see Figure 3.1). Within iReflectNow, reflection-in-action involves pre-service teachers' being engaged in in-depth reflection through use of the scaffolds while analyzing cultural case scenarios in the "Practice Scenarios" section. These cultural case scenarios are real experiences of teachers. In the "Practice Scenarios" section, pre-service teachers are asked to analyze lived experiences of teachers in real classroom settings and expected to be engaged in critical reflection through use of the scaffolding features such as prompts, displays, and hints during this analysis.

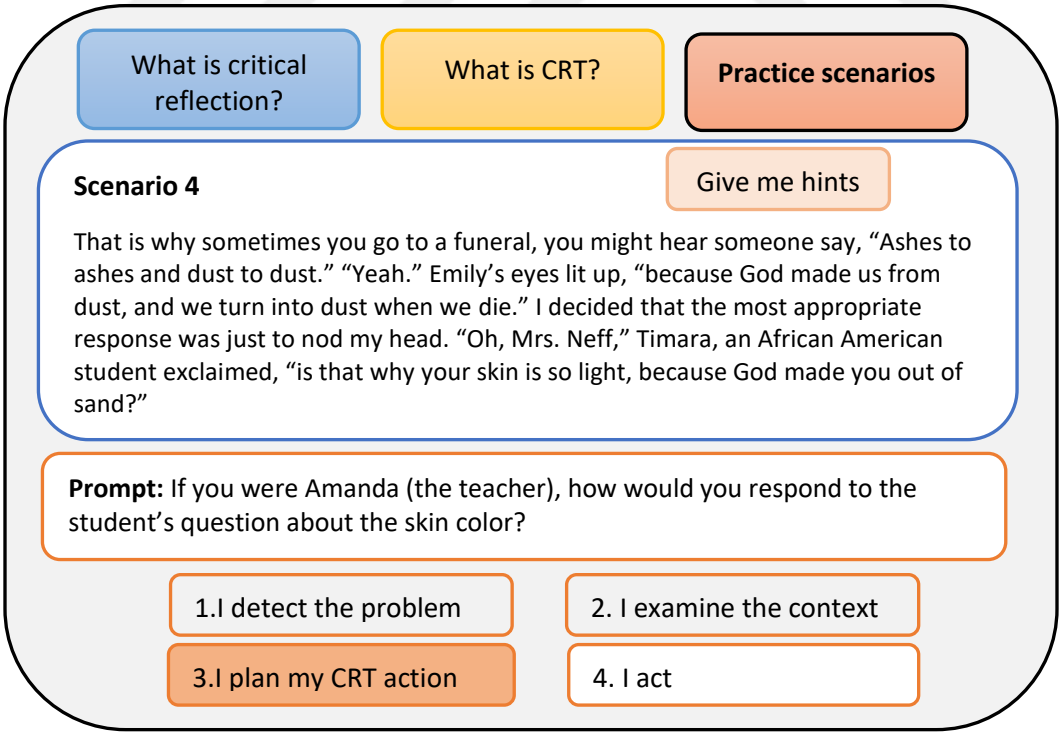

Figure 3.1. A sketch of iReflectNow

It includes a combination of three scaffolding types: metacognitive, conceptual, and procedural scaffolding. Different scaffolding features are used within each scaffolding type. For instance, case scenarios and reflection prompts were used as metacognitive scaffolding within the scope of the current study. Resources and modeling of critical reflection and CRT are provided as conceptual scaffolding whereas hints, visual displays, and text annotations are presented as procedural scaffolding within iReflectNow.

Research Purpose and Questions

The goal of this study was to explore pre-service teachers' reflection for CRT and to examine how cultural case scenarios and reflection prompts engaged them in the reflection process. The research question of the study was: How do cultural case scenarios and reflection prompts engage pre-service teachers in reflection for CRT?

Methods

Research Design

A multiple case study design (Miles & Huberman, 1994) was used to provide an in-depth understanding of the participants' reflection process. The purpose was to explore how the cultural case scenarios and prompts interacted within the pre-service teachers' reflection process during the case analysis. Data were examined to identify patterns (e.g., depth of their reflection) and themes (e.g., how they frame cultural dilemmas) that characterized these pre-service teachers' reflection for culturally responsive teaching.

Research Context and Participants

Context. The study took place in a required undergraduate science methods course for pre-service teachers at a public university in the southeastern region of the USA. There were 22 students in the class. All were White female early childhood and elementary education majors.

Being 3rd block students, they were all placed in the same school in the local area for their field experience. The course was taught by a science teacher educator who is well versed in using case scenarios for teacher education. The class met once a week for about three hours. In the first half of the class, the students did various experiments and then discussed how to teach about the experiments to elementary school students. The students did not receive any explicit instruction about CRT in this course. In the second half of the class, all the students discussed the case scenarios assigned by the course instructor.

Participants. After receiving approval from Institutional Review Board, the first author introduced the study to the students on the first day of classes. All of the 22 students in the class agreed to participate in the study by signing the consent form. All 22 participants read and analyzed the case scenarios and provided responses to the prompts prior to the class meeting on campus for four weeks. After they completed the case scenarios and some other related class activities, four participants volunteered to be interviewed in the sixth week of the study.

We employed *purposeful criterion sampling* (Patton, 2002) and selected the four interviewees as the cases in this study. The criterion for the case selection was whether participants completed all of the data collection instruments—written reflections, in-class discussions, synthesis papers, and interviews. The rationale in using this sampling technique was to get an in-depth understanding of their reflection processes and to explore the interviewees' experiences in a variety of contexts (Schostak, 2006; Turner III, 2010). Four pre-service teachers—Ashley, Elizabeth, Erica, and Melanie—participated in this study (see Table 3.1). All the names are pseudonyms.

Table 3.1

Basic Information of Each Case

	Current field experience placement	Previous field experience in diverse classrooms	Previous field experience
Ashley	Kindergarten	Yes	Pre-K and 4th grade
Elizabeth	5th grade	Yes	Pre-K and 3rd grade
Erica	5th grade	Yes	Pre-K and 1st grade
Melanie	3rd grade	Yes	Pre-K and 4th grade

A short synopsis of each case is provided here to share their previous experience in diverse classrooms. It is important to note that these pre-service teachers started going to their current field experience after the study. The information in the synopses comes from the "Getting to Know You" survey provided to participants on the first day of classes.

Ashley is a 21-year-old White female early childhood pre-service teacher. Her previous field experiences were in classes that included students from different ethnicities and socioeconomic status. She recognizes that negative home lives of students, such as not having enough food at home, may impact how students interact with teachers and their peers in school.

Elizabeth is a 21-year-old White female early childhood pre-service teacher. In her previous field experiences, she was in English to Speakers of Other Languages (ESOL) and special education classes. She acknowledges that most of the students in her field experience classes would speak Spanish at home.

Erica is a 21-year-old White female early childhood pre-service teacher from Midwest USA. She indicates that diversity includes not only ethnicity, but also learning disabilities and language. Erica also worked as a tutor since high school and learned "Just because you explain it and one child understands it, it doesn't mean that everyone will. Sometimes you need to do or say things differently, so others can learn as well."

Melanie is a 21-year-old White female early childhood pre-service teacher. She had her previous field experiences in ESOL and special education classes. She stated that all of her field experiences were positive. She also worked at a summer camp where—she indicated—she learnt planning different activities and leading students for two years.

Data Sources and Data Collection Procedures

The data sources for this study were “Getting to Know You” surveys, online written reflections in response to the prompts for all case scenarios, video-recorded in-class case discussions, case synthesis papers, and interviews. Data for this multi-case qualitative study were collected for 6 weeks (see Figure 3.2).

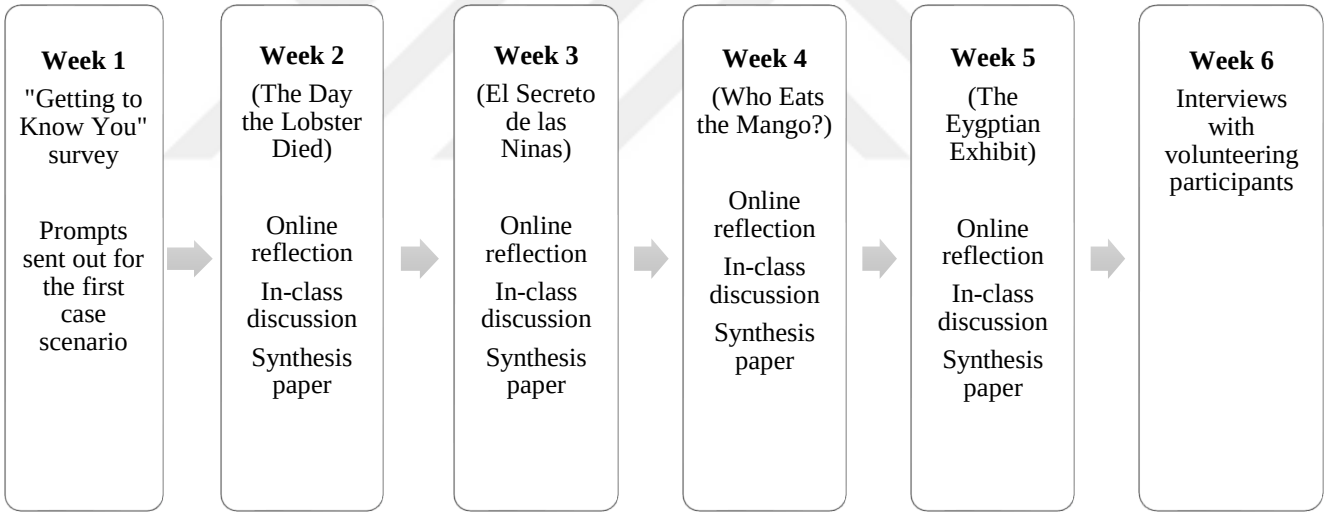

Figure 3.2. Timeline of the study activities

In the first week, the participants were asked to complete a ‘Getting to Know You’ survey. Example items in this survey include “What grade level are you placed in for your Block 3 field experience? What levels have you been placed in for previous field experiences?” and “Have you ever taught or had field experience and/or student teaching in a diverse classroom?” (see Appendix A). Some background information about the participants, such as the grade level

they were placed for field experience and previous experience in diverse classrooms was collected via this survey (see Table 3.1).

After they completed this survey, ten reflection prompts for each case scenario were sent via *Qualtrics*, an online survey software, weekly from Week 2 to Week 5. Example prompts are "What kind of challenges/ dilemmas do you observe that the teacher experienced in this case?" for problem detection in the case scenario; "What are the cultural holes that the teacher overlooked in this case? How are they reflected in the teacher's attitudes and instruction?" for the examination of the case scenario context; and "In what other ways, could the lesson have been designed to avoid or soften the students' negative reaction to new fruits and vegetables?" (see Table 3.2) for the application of CRT (see Appendix B for the entire list of reflection prompts for each case). As described earlier, pre-service teachers' responses to the prompts during the case scenario analysis were considered as reflection-in-action in this study.

Table 3.2

Sample Prompts

Aims	**Sample prompts**	**Research base**
Dilemma/challenge detection	What kind of challenges/dilemmas do you observe that the teacher experienced in this case?	Chitpin, Simon, & Galipeau, 2008; Griffin, 2003
Context examination	Here, what are the teacher's assumptions about the students' cultural background?	Lundeberg, Levin, & Harrington, 1999; Smith et al., 2015

CRT planning	What could the teacher have done differently to avoid the challenges/dilemmas in the case?	Aguirre & Zavala, 2013; Allen et al., 2017;
Act	In what other ways, could the camera activity have been designed to ensure all students' access to science learning?	Kolb, 1984; Smith et al., 2015

During the study, the participants completed four case scenarios (see Table 3.3 and Appendix C). These case scenarios were developed by the course instructor, who is an experienced science teacher educator in using case scenarios for teacher education and a professor in science education. The course instructor with two other science teacher educators interviewed teachers in the local area to elicit cultural dilemmas they encounter in real classrooms and asked the teachers to write the case scenarios (Tippins, Koballa, & Payne, 2002). To analyze and reflect on these case scenarios, the participants responded to the reflection prompts on Qualtrics before the class met. One prompt was presented to the participants on each page of the Qualtrics with the option of back and next buttons. These written reflections as responses to the prompts on Qualtrics were treated as reflection-in-action in this study since they happened during their action of analyzing case scenarios.

After completing the case scenario analysis and online written reflection in response to the prompts, the participants attended the class weekly and discussed each case scenario with the other students in the class. These class discussions were video-recorded. In total, four videos, each of which was 20-25 minutes, were recorded and later transcribed. For each case, there was a group of case discussion leaders, and each case discussion leader submitted a synthesis paper to the course instructor by the end of the case scenario discussions. This synthesis paper was an

individual assignment and was not shared with the whole class. The prompts for the synthesis paper were “How do you think pedagogy, curriculum based on standards, and a teacher’s own beliefs-values are connected to each other?” and “How would you envision yourself providing inclusive and meaningful learning environments in your future classes with learners who have different needs?” (see Appendix D). Ashley and Elizabeth wrote their synthesis papers for case scenario #1 (lobster) and #2 (shoebox) respectively (see Table 3.3). Erica and Melanie wrote their synthesis papers for the fourth case scenario (exhibit). The case scenario discussions and synthesis papers were considered reflection-on-action in this study because the pre-service teachers completed these activities after they read and analyzed the case scenarios through the prompts on Qualtrics.

In Week 6, semi-structured individual interviews were conducted and audio-recorded (see Appendix E). Each interview took about 20 minutes. The sample interview questions were “How do you envision yourself as a teacher in your future classroom which might be multicultural?,” “What did you learn about yourself as a future teacher from the case analyses and discussions?,” and “How did taking the prompts online work for you?.” The interview questions were constructed based on four goals: (a) exploring pre-service teachers’ perspectives about reflection, (b) exploring pre-service teachers’ perspectives about diversity and CRT, (c) exploring pre-service teachers’ experience during the case analysis, and (d) exploring pre-service teachers’ experience of using the reflection prompts (see Appendix E for the goal of each question).

Table 3.3

Summaries of the Case Scenarios

The Day the Lobster Died - *Case scenario #1 (lobster)*
This case raises questions about the ethical treatment of animals in the elementary classroom. An experienced fifth-grader teacher, Stan, wanted to end the oceanography unit with a lobster cookout in his class. He introduced some sea animals such as lobster as food. The school was in a small university town in the southeastern US. When Stan introduced the lobster to the class, one student asked, "What is its name?" Stan responded, "We don't name our food, Erin." Erin fled the room immediately after this response.
El Secreto de las Ninas - *Case scenario #2 (shoebox)*
Cynthia and Jessica, both children of immigrant parents and poor, were living in a homeless shelter. In their science class, the teacher asked each student to bring in an empty shoe box to for their cardboard camera project. The teacher also said to the whole class "If you don't have a shoebox, ask your mother or an elder brother/sister to take you to a discount store and ask for a shoebox. They will give it for free. For those of you who cannot get your own shoebox, you can bring in fifty cents and buy one from me." Neither Cynthia nor Jessica brought in an empty shoe box to the class on the following day. And they were not interested in making cameras anymore.
Who Eats the Mango? - *Case scenario #3 (mango)*
The student teacher, Kim, developed a science lesson with her third-grade students that explores the properties of edible plant parts. The students came from a largely white, middle-class suburban area that is just beginning to experience some diversity from Central American immigration. Wanting to expose students to the plants grown and eaten in diverse cultures, Kim brought in different kinds of fruits and vegetables. She was surprised and disturbed when they rejected learning about these plant parts because they were "strange" and "weird."
The Egyptian Exhibit - *Case scenario #4 (exhibit)*
In this case, Amanda, the teacher, let a gifted first grade student, Emily, share her field trip experience to see an Egyptian Exhibit with her classmates. While talking about mummies, the discussion took a decidedly religious turn. Emily said, "because God made us from dust, we turn back into dust when we die." At this point, Timara, an African-American student, exclaimed "is that why your skin is so light because God made you out of sand?" Amanda had just begun a brief explanation of how the skin color had a lot to do with their ancestors when the bell saved her.

Note. The full case scenarios are in Appendix C.

Data Analysis

The first author and a research fellow with advanced qualitative research experiences analyzed the online written reflections and interviews. Before the data analysis, the first author provided a brief overview of teacher reflection and assigned Larrivee's (2008) article to the researcher to familiarize him with the topic of pre-service teachers' reflection. Larrivee's (2008) article was selected since it includes a reflection typology that was developed specifically for pre-service teachers. After this preparation meeting, the first author and the research fellow employed a combined approach of Boyatzis' (1998) inductive way and Crabtree and Miller's (1999) deductive way to do thematic analysis for the coding phase of data analysis. The approach was selected to get a more holistic understanding of the participants' engagement in reflection through cultural case scenarios and prompts.

The first author created a coding scheme that included *a priori codes* (Swain, 2018) drawn from the literature of teacher reflection and CRT and shared it with the research fellow. Afterwards, they analyzed the datasets of written reflections and interview transcripts and created *posteriori codes* (Swain, 2018) generated from the data. Finally, they discussed analyses to reach a consensus regarding their codes. Based on the consensus, the first author merged and refined a priori and posteriori codes and created a codebook (see Appendix F). After several cycles of coding and refinement, the a priori codes became the categories while the posteriori ones were grouped under these categories. Figure 3.3 shows how the hybrid approach was adapted in this study.

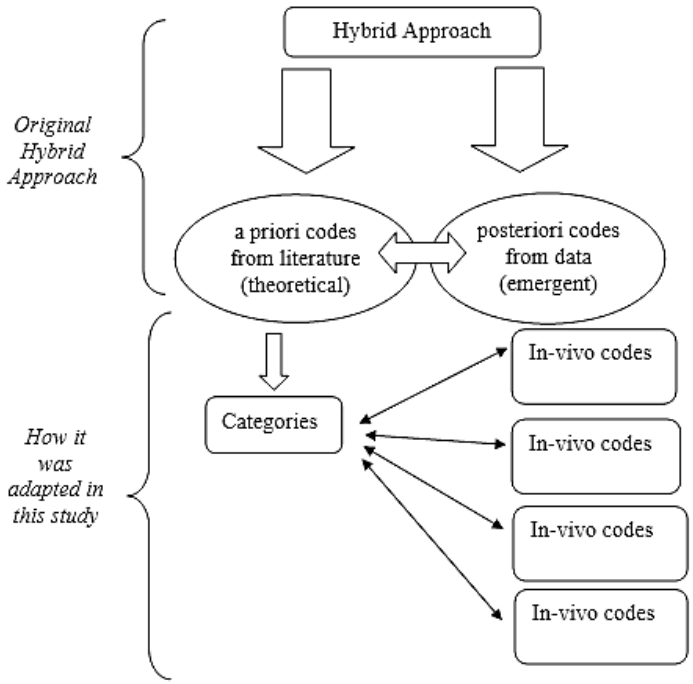

Figure 3.3. Hybrid approach used in the study

The first author transcribed the videos of in-class discussions and coded the in-class discussions and case synthesis papers based on the codebook that the research fellow agreed upon in NVivo (version 11). After coding the whole dataset, the first author used a mixed strategy (Miles & Huberman, 1994) to explore patterns in the data by applying first a within-case analysis and then a cross-case analysis. For these analyses, the "framework matrix" function in NVivo was used.

Trustworthiness. Trustworthiness was ensured in this study by using several techniques to enhance credibility (Lincoln & Guba, 1985). Researcher triangulation was ensured by having two researchers who coded the data independently and discussed the resulting codes to reach a consensus. Data triangulation by employing different data collection methods also established credibility in this study. An experienced qualitative researcher who was not involved in the coding of the data read the emerging themes and provided feedback. Finally, thick description

(Patton, 2002) was used to enhance transferability of this research. The research site, participants, and research design were elaborately described to facilitate implementation of similar studies in different contexts.

Findings and Discussion

This section presents the findings first from the within-case analysis and then from the cross-case analysis. In the effort to answer the research question of the study, written reflections, in-class case discussions, synthesis papers, and interviews of the four pre-service teachers were carefully analyzed. For the within-case analysis, findings for each case are discussed, and then the cross-case analysis findings are discussed.

Within-Case Analysis

Ashley. Ashley seems to identify diversity as a broad concept including a variety of elements. She had been placed in diverse classrooms for her field experience prior to participating in this study. She described those classes as diverse not only racially but also socioeconomically. She was placed in a kindergarten class at the time of the study. She also had a certificate in disability studies. Aligning with her previous experience, she included family life and structure, gender, socioeconomic status, and religion within diversity during reflection depending on the scenario context. For instance, while she pointed out religious diversity in the case scenario #4 (exhibit), she focused mainly on diversity that may have resulted from socioeconomic status and gender in the case scenario #2 (shoebox):

> From the case study [case scenario #2 shoebox], it seems that the teacher believes that success in the classroom is due to hard work and responsibility. These are good characteristics to have, but a teacher also has to consider where these students come from

> in terms of home experiences, culture, socioeconomic status, religion, and negative experiences due to gender.

When asked to define diversity during the interview, Ashley responded that students may have different styles of thinking that may also create diversity: “a student comes in your classroom and they have past experiences of home life, their own biological diversity, and their own thinking.” In the case scenario #2 (shoebox), Ashley seemed to have noticed that gender can be an element of diversity. She seems willing to affirm diversity through in-depth reflection, avoid stereotyping, and facilitate equity in her future classrooms. As a response to the prompt “If instances similar to the case scenario occurred, how would you handle gender-based stereotyping in your future classrooms?” she commented on gender diversity and how she would promote equity in her future classrooms as follows:

> I would show boys and girls as equals in the classroom by never putting one gender over the other and never categorizing one subject as masculine or feminine. I would also stay away from categorizing the class by gender in the first place because some students may not fit the binary genders and feel excluded if I set up my classroom that way.

Ashley attaches importance to ethical implications of pedagogies and instructional strategies used in diverse classrooms. As a response to the prompts “What are the cultural holes that the teacher overlooked in this case scenario? How are they reflected in the teacher’s attitudes and instruction?” in the online reflection of case scenario #2 (shoebox), Ashley also commented on ethical issues that may occur in classrooms:

> When certain students showed up without shoeboxes, the teacher gave them the option to earn their shoebox by cleaning erasers, a job that is typically associated with punishment. This suggestion is demeaning to the students and may create an ethical concern.

Delving into case scenario #1 (lobster) during the in-class discussion, she posed a question, which suggests that she critically questioned the ethical implications of some instructional strategies: “Is there a difference between having the lobster in a box and have it in a tank? Is that an ethical difference? Because it's still in a container in captivity?”

Ashley’s emphasis on ethics in this case scenario may have been partially due to her sister’s experience of a lobster cookout. She shared the following anecdote as a response to the second prompt of online reflection “Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Lobster case” during online reflection. She described her sister’s experience and how it influenced her own viewpoint of the ethical treatment of animals:

> I have had class pets before in my school career, but I have never been shown a live animal that we will later consume. Outside of school, my sister was at a lobster cookout and had to break apart the lobster. The lobster that was given to her ended up being pregnant when it died so when she opened it up, eggs went everywhere. Ever since that shocking experience when she was around 8, she has not been able to eat a lobster. After watching videos of the meat industry in high school, the shock and fear of what food animals go through makes me advocate for a more humane system.

Ashley highlighted the importance of making student voice heard particularly in diverse classrooms. One of the points she focused on when reflecting on this scenario through the prompts was that teachers should allow students to voice their opinions to create inclusive and caring classrooms: “I think Stan [the teacher in the case scenario] should approach the lesson democratically in order to best serve the individuals in his classroom and their diverse needs.” Ashley’s critical reflection is also observed in her following statement, “Giving the students an

opportunity to choose how to structure their learning would cater well to diversity in the classroom because the individual student's opinion would be heard and incorporated into the classroom."

Ashley was assigned to be the discussion leader for the case scenario #1 (lobster) in class and handed in her synthesis paper to the course instructor right after the in-class discussion in the second week of the study. In her synthesis paper, she acknowledged "teachers should balance their own beliefs and also students' beliefs by allowing students to voice their own beliefs." Ashley seems to have found it is important to create a democratic classroom and affirm diversity by making student voice heard particularly in diverse classrooms.

Ashley highlighted not only ethical and sociocultural aspects of the problems given in the scenarios, but also instructional strategies that could be implemented in class to handle the problematic situation. During the analysis of case scenario #3 (mango), Ashley mostly focused on potentially useful pedagogical strategies that could be used to introduce new fruits and vegetables to third grade students:

> Instead of pushing the new fruits and vegetables, Kim [the student teacher in the scenario] could have connected how these new, uncommon plants were similar/different to the ones the students just examined. This may have helped students feel more comfortable since they could use plants, they were comfortable with to bridge a gap to the new plants. Also, Kim could have focused on one new plant at a time instead of overwhelming the students with several "weird" looking plants.

She brought up some pedagogical strategies that referred to both cultural and the subject matter [science] - related aspects of the skin color issue in case scenario #4 (exhibit). Her statements below suggest that she made a connection between science and skin color in her

response to the African American student's question in the scenario. At the same time, she embedded some CRP elements by acknowledging the fact that each student's ancestor may come from different parts of the world to the students.

> I would have stated that my skin is light because my ancestors lived in places where they did not need extra pigment to protect themselves from the sun, like in Europe and up North. I might have also offered up that her ancestors most likely lived in places with lots of sun and heat and extra pigment and melanin was needed to protect them from the UV rays of the sun. I might have also explained that extra pigment and melanin is kind of like a form of sunscreen.

While Ashley provided instructional strategies without referring to any cultural implications for the student teacher in the case scenario #3 (mango), she commented on the skin color and religion issues more profoundly for the case scenario #4 (exhibit). She may have simply responded to the problem detection prompt—What kind of challenges/dilemmas/problems do you observe that the teacher experienced in this case?—by describing what happened in the case scenario #3 (mango), but she reflected on religious diversity and skin color more in-depth in the case scenario #4 (exhibit) (see Table 3.4). She also stated that she had experiences similar to the one in the case scenario #4 (exhibit) in her field experience classes and questioned her reactions to her students in the past in her response to the prompt that asked whether she had had similar experiences before (see Table 3.4). These statements suggest that Ashley may have engaged in more in-depth reflection when she could find the problem in the case scenario easily and make a personal connection to the scenario.

These findings may showcase how Ashley views diversity in classrooms. For instance, she pointed out that not all students are the same in terms of their socioeconomic statuses and family backgrounds. It appears that Ashley also thinks gender stereotyping should be eliminated to ensure equity in diverse classrooms. Another suggestion that Ashley made to create to embrace diversity in classrooms is for teachers to give opportunities to students to make their voice heard. She also highlighted the instances of lobster cookout and “earning” shoeboxes to stress the importance of ethical implications of activities completed in class and teachers’ attitudes during activities.

Table 3.4

Excerpts from Ashley’s Responses to the Prompts

	Who Eats the Mango?	**Eygptian Exhibit**
Prompt: What kind of challenges/ dilemmas do you observe that the teacher experienced while introducing fruits and vegetables from different cultures in this case/ while Emily was sharing her experience from her trip?	The students did not want to participate in the activity after new fruits and vegetables from different cultures were introduced. Some were disgusted by the texture and the look of these plants. Others were taken aback by the presentation of the plants since many were messy to examine. (PreR_problem detection, SR)	Emily shared her belief in afterlife and how it was different from the Egyptians. Amanda nodded in agreement instead of commenting. A phrase that Amelia said that is from the Bible, "Ashes to ashes and dust to dust", sparked more religious discussion when Emily made the connection to God. Since Amelia is a Christian, she was proud of Emily and nodded her head. (PreR_problem detection, CR)
Prompt: Have you had similar experiences as a student, teacher or parent? Have	I often do not try new foods if they look or smell unappetizing. While I probably would have still participated in	As a teacher, I have had students mention their religious beliefs in passing. For ex, a kindergarten student said, "God made the whole wide world", while we

colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Mango/ Egyptian Exhibit case.	this lesson as a student when the new fruits and vegetables were introduced, I understand why some students would be somewhat disgusted by these new plants. (PreR_personal connection, SR)	were discussing living things that grew. In these situations, I often do not know how to address these comments. Do I agree, put down, or ignore these proclamations of belief? In the past, I sometimes do what Amanda did, nodded and moved on past the comment, but is there a better way? (preR_personal connection, CR)

Note. "PreR", "SR", "PR" and "CR" indicate pre-reflection, surface-level reflection, pedagogical reflection and critical reflection (Larrivee, 2008) respectively.

Elizabeth. Elizabeth had been placed in English for Speakers of Other Languages (ESOL) classes in her previous (Blocks 1 and 2) field experiences. She was placed in a fifth-grade special education classroom for a half day a week in the semester the study was conducted. Although she provided short responses to the prompts during the case scenario analyses and her interview was shorter than the other cases', her tendency to connect given tasks to her field experience was unique compared to other cases in this study.

Elizabeth seems to have drawn from her previous field experience in ESOL classes and pointed out the girls' homelessness and their parents' linguistic diversity in the case scenario #2 (shoebox). During the online reflection, she commented, "She [the teacher in the scenario] also assumes the parents can speak the language of the cashier to ask for the shoe box and that they have the time in their day to get out to the store." As a response to the prompt "What lessons do you think you can draw from this case in terms of teaching diverse students?" during the online reflection, she stated that she would try to be cognizant of her students' cultural backgrounds including the language they speak at home and socioeconomic statuses in her future classrooms.

The excerpt below from the interview with Elizabeth shows that she recognized language as a diversity element by making connections with her field experience classroom:

> In my field experience, I have a student now who speaks no English and he's only Spanish speaking and so I speak to him in Spanish, but he has to write English even though he doesn't know it. Also, he knows Spanish, but he can write barely in Spanish. So I will definitely pull that into my teaching. It's kind of cultural aspect.

During the in-class discussion for the same scenario, she also indicated that being unable to bring materials, such as the shoeboxes in the case scenario, to the class may have resulted not only from socioeconomic status but also from students' family structures and background. She gave an example from her own family when she was an elementary student: "It's also related to transportation and time. I have parents that work two jobs. If they [her parents] couldn't drive, my elder sister drove us everywhere. But if she [her elder sister] couldn't drive, we didn't do anything like bringing in the materials for class."

Elizabeth may have seen respecting others' beliefs and values as a way of affirming diversity and being culturally sensitive. During the analysis of case scenario #1 (lobster), Elizabeth asserted that a teacher should become culturally sensitive by acknowledging diversity and respecting students' beliefs and values. Her focus on respecting students' beliefs and viewpoints may have resulted from how she framed the dilemma or challenge in the case scenario and her previous experience of dissecting animals as a student (see Table 3.5). She also considered the implications of Stan's,the teacher in the case scenario, lesson beyond the classroom in terms of affirming diversity and made some suggestions about how to introduce different cultures regarding treating animals as (non-)food items in diverse classrooms:

> I would discuss different cultures in terms of food because the teacher just assumed that people only ate lobster. You can discuss cultures that do not eat specific animals due to religious reasons or even cultures like vegan culture who do not eat animals for personal beliefs. You can also discuss the differences in culture and how not one culture is right or wrong. I do not think cooking the lobster should be a part of the lesson. I think he could have passed around the lobster, so the students could be hands on. By giving the students the option to hold the lobster, not to kill it, he respects their beliefs. By respecting the values and beliefs of the students in your classroom, I think you are being culturally sensitive and accepting of everyone's beliefs as well as teaching tolerance and acceptance to your students.

Elizabeth wrote the synthesis paper about the case scenario #2 (shoebox). She emphasized that the girls became disengaged from the lesson due to their lack of access to resources and a caring teacher. Referring to the uncaring teacher in the scenario, Elizabeth explained her teaching philosophy: “It is to get every student to succeed in their own sense of the word; if a child’s idea of success is getting straight C’s because C’s get degrees”, then I will support them (while obviously trying to push further).” These comments showcase her way of affirming diversity: Definition of success can vary from student to student, and *all* students should be encouraged under all circumstances.

Elizabeth emphasized the importance of not making assumptions in diverse classrooms during her reflection on the case scenario #3 (mango). She responded to the prompt “What are the teacher’s assumptions about the students’ cultural background?” by stating, “The teacher’s idea of "unusual" fruits may be incredibly normal to some of her students, especially her immigrant students (fruits she pulled are commonly found in Central America). She assumes all

of her students are the same." Elizabeth also offered some pedagogical strategies to the student teacher in the case scenario that emphasize the importance of not making assumptions in diverse classrooms as follows:

> I would have introduced the fruits at the same time as the fruits the students brought from home so that they weren't already excluded from the "normal" fruits. The students could start the lesson by identifying all of the fruits as "normal" and the issue probably wouldn't have risen so suddenly.

While analyzing the case scenario #4 (exhibit), Elizabeth suggested a pedagogical strategy to steer the conversation away from religion but at the same time to show different cultures to students as a part of CRP in the class: "Mummies can be introduced as a social studies lesson involving study of the Egyptian culture rather than the religion behind the mummies." She also stated that steering discussions away from religion is what she usually did in field experience classrooms to show respect towards her students' beliefs and values (see Table 3.5).

Table 3.5

Excerpts from Elizabeth's Responses to the Prompts

	The Day the Lobster Died	**Who Eats the Mango?**
Prompt: What kind of challenges/ dilemmas do you observe that the teacher experienced in this case?	Questions are raised about the ethical treatment of animals in the classroom. The biggest challenges are determining whether the ethical viewpoints of students should *alter* lesson planning. (PreR_problem detection, CR)	The teacher had the challenge of her students being disengaged because they were not used to the fruit/ vegetables they were experimenting with. They turned "new and interesting" into "disgust" and were turned off from the lesson afterwards. (PreR_problem detection, SR)

Prompt: Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case.	The only ethical issues I faced were in AP Biology senior year of high school. Typically, as part of the curriculum, we dissect a cat in order to learn about the anatomy of the animal kingdom/ mammals because they are all similar. People in the class the year before me who were uneasy over cutting open a cat raised the ethical issues (where did we get it, how did it die, what are we going to do with it after) to the point where my professor completely changed the curriculum for my class. We ended up going to the zoo instead of doing a dissection because she argued we would learn the same standards regardless of the activity. (PreR_personal experience, CR)	I have not had any experiences like this one in particular. I have seen students disengage from lesson because of the fear that is associated with new ideas or topics (i.e. a new math topic turns kids off because it looks "too hard" or they "aren't smart enough" to engage). This is kind of related to the mango case because students see something new as something they are not interested in and choose to disengage from the lesson (despite being engaged just a few minutes prior). (PreR_personal experience, SR)

Note. “PreR”, “SR”, “PR” and “CR” indicate pre-reflection, surface-level reflection, pedagogical reflection and critical reflection (Larrivee, 2008) respectively.

Elizabeth’s viewpoints she shared throughout the study tasks suggest she was aware that students can have diverse backgrounds not only racially but also linguistically. She also pointed out that family structure, such as having working parents, or not having transportation options could result in diversity in classrooms. She consistently emphasized that teachers should encourage all students to succeed by not making any assumptions about them.

Erica. Erica had been placed in diverse Pre-K and 1st grade classrooms for her prior field experience. Although not all of the classrooms were racially diverse, there were diverse students in terms of learning disabilities with Individualized Education Program (IEP). During the semester when the study was conducted, she was placed in two 5th grade classes. The first class was racially diverse, while the second class was less diverse racially, but had many different

types of learning disabilities. Erica also worked as a tutor since her high school years and learned "Just because you explain it and one child understands it, it doesn't mean that everyone will. Sometimes you need to do or say things differently, so others can learn as well."

Erica included students' dietary choices within diversity. During the online reflection on the case scenario #1 (lobster), she responded to the prompt "What could Stan have done differently to avoid the challenges/dilemmas in the case?" She proposed that students' dietary choices are also a form of diversity and put forward, "Stan [the teacher in the scenario] is not considering dietary needs/choices or possibly religion of some students. He is thinking that all students are alright with eating animals, but that is not the case for everyone." By taking different cultural elements into account, she also offered some pedagogical strategies to make the lobster cookout experience more positive for the students: "It may be a better idea to just bring the food prepared already so that the students don't have to watch the living creature become food or so they don't see the food as an animal." It appears that this suggestion related to Erica's own experience that she had with her dad when she was younger (see Table 3.6). This experience might allow her to be able to empathize with Erin, the student who fled the room in the case scenario. Erica highlighted the importance of teachers knowing who their students are and where they come from by asserting that "It is important to remember that each student and each family is different and have had different experiences that you have to be aware of. And they may be different from yours and where you are from."

Table 3.6

Excerpt from Erica's Response in the Lobster Case

Prompt	**Excerpt**
Have you had similar experiences as a student,	I have had a similar experience with my dad. While I do love meat, I remember having a cookout with my family while I

teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case.	was younger. Everything went as normal and the day seemed to be similar to other cookout days, until my dad started talking about cooking "venison." I ignored it the first time, not thinking much of it, but when my dad said it a time or two again, I asked him what it was. He was hesitant to tell me because he knew exactly what my reaction was going to be, but finally he broke down and told me it was deer meat. I immediately became angry and started crying. (Pre-reflection_personal connection)

It seems that Erica was able to detect a wide variety of assumptions the teacher in case scenario #2 (shoebox) made through critical reflection. For instance, as Erica indicated, the teacher assumed that “all the students have family members that are easily able to take them somewhere to get the boxes and overlooked students whose parents work night shifts and some students' parents may not have transportation to get them to the store.” She also pointed out that a classroom should be a place where equity takes place: “As a teacher, it is your job to help and encourage ALL students no matter what their circumstance is.” Erica put forward that students should not be inconvenienced in classrooms because their lack of access to resources and materials and gave an example of her field experience classroom where the teacher set up a class-wide supply system. These statements suggest that Erica conceptualizes inclusive classrooms as those where all students have equal access to resources, and all are encouraged to be academically successful. It is probable that she may have reached this understanding because she recently had a very similar experience in her field experience school. She also framed the problem as something that was not under control of the girls in the case scenario, but still caused trouble for them in class (see Table 3.7).

Table 3.7

Excerpts from Erica's Responses to the Prompts

Prompts	**Case Scenario: El Secreto de las Ninas**
What kind of challenges/ dilemmas/ problems do you observe that the students experienced in this case?	The students experienced discrimination and feelings as though they were not good enough by their teacher. When the students were vulnerable and shared their "secret" with the teacher, she still told them that they had to "earn" their materials, which hurt them because it was not their fault they weren't able to afford/obtain the materials. (preR_problem detection, CR)
Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case.	On the first day of school, we walked out to the buses and dropped off all the students, except for one. He wasn't in the line with us anymore, so my teacher went to the bus he was SUPPOSED to be on to make sure he was on and he wasn't. The bus driver had kicked him off because he was not on the list. After checking other buses, we were going in the school to try to find him and he was standing in the doorway. My teacher asked him what happened and he told us the bus driver wouldn't let him on because he had a different address than what was on my teacher's sheet. My teacher asked what his address was, and he gave it to her. It was different than what was on the sheet. She then asked him if he knew why she had the other email on file. As he began to explain, "That's where I'm staying right now..." the counselor cut in and let us know she had it taken care of. This student then had to go to the After School Program until the bus situation was figured out (which just happened this past Tuesday, so he has been doing this for 2 weeks now). My teacher let the parent know, and his mom had to borrow his grandma's car because she did not have one. (preR_personal connection)

Note. "PreR", "SR", "PR" and "CR" indicate pre-reflection, surface-level reflection, pedagogical reflection and critical reflection (Larrivee, 2008) respectively.

In case scenario #3 (mango), she focused on the pedagogical aspects of introducing new fruits and vegetables while creating a culturally responsive environment. She suggested "incorporating each student's home culture into class."

> One thing Kim [the student teacher] could have done is ask the students to write some fruits and vegetables that their families eat a lot, go over them, and then bring in the

> things from their homes that other students may not know about. This will give Kim an idea of what kind of foods the newer students from Central America eat without calling them out or alienating them for being different, but still allowing a way to bring their culture into the lesson.

Erica pointed out some cultural aspects of the case scenario and underscored an important aspect of ethnic diversity: “Even if all or the majority of the students are White, they may have different cultural beliefs or practices that could also go into what they eat.” By acknowledging this, Erica may want to eliminate stereotyping in her future classes. Her stance that all students from the same ethnicity do not necessarily share the same beliefs, values, and cultural practices might be grounded in her learning from her experience of working as a tutor and from the field experiences and how she perceived the problem in the case scenario:

> The student teacher [Kim] found that the students were not as interested as she thought they would be when introducing these new foods. They were excited when they were using fruits they knew, but once the unfamiliar objects were introduced, they did not want to participate. Kim may have overlooked the fact that even though most of the kids are white, they may still have cultural differences.

During the interview, she elaborated on her opinion that there can be diversity even within the same ethnic group by referring to her previous field experience:

> In my last placement that I was in, it was majority white students, but they all were so such different people and I feel like when most people think of diversity, they think like all different races, all different. Like things like that. But it's just like knowing the students' experiences is the biggest thing.

Erica led the in-class discussion and wrote a synthesis paper for the case scenario #4 (exhibit). Reflecting on this scenario (see Table 3.8), she emphasized the importance teachers' affirming diversity by stating, "When it comes to touchy subjects like religion and skin color, it is important to find a way to express the diversity in the classroom and show there are many different people thinking many different things and it is okay." Erica also offered some alternative instructional strategies that Amanda (the teacher in the scenario) could have applied to show different religious practices of people:

> She could have turned that into a lesson about how people practice different things and how they celebrate the dead (you could talk about funerals, mummification in order to preserve the body, and Dia de Los Muertos) to make it a cultural lesson.

Table 3.8

Excerpts from Erica's Responses to the Prompts

Prompts	**Case Scenario: Egyptian Exhibit**
What kind of challenges/dilemmas/problems do you observe that the students experienced in this case?	The biggest dilemma seemed to be when the conversation started to go towards religion. I think that she was very nervous about getting onto the topic of religion, so she steered away from it very quickly as most teachers would probably do. (pre-reflection_problem detection)
Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Lobster case.	This is not very similar to the experiences the people in the story, but I grew up going to a private school, so we had a lot of things that we were not allowed to do, talk about, etc. One of those things was Halloween. We weren't allowed to talk about it because it was a "Devil's holiday." I feel like this is similar because I was not allowed to talk about something that I was excited for. Although it was the school that had the problem, and not the parent (like in the case), it can still be disheartening for a student to not be allowed to do something or talk about something that they wanted to do. (pre-reflection_personal connection)

Her suggestion to make it a cultural lesson rather than a discussion about religion aligns with how she framed the problem (see Table 3.8). In her synthesis paper, she indicated the importance of letting students voice their opinion and make them heard in diverse classrooms: "Each student has been different places and have seen different things, so it is essential to give a space where the students feel comfortable sharing and hearing others." Her reflection about making a classroom inclusive for all different perspectives, values, and beliefs might derive from her own experience about not being allowed to talk about Halloween in class (see Table 3.8).

These findings show Erica may have been cognizant that not all students are the same, but all students should be supported to be successful regardless of their backgrounds. She also acknowledged there is diversity even within the same ethnic group. This viewpoint seems to have aligned with how she perceived diversity. She included a variety of factors, such as religion, transportation options, work times of parents, and dietary choices within it. Another aspect she emphasized to create inclusive and caring diverse classrooms was that all students should be able to voice their opinions in class.

Melanie. Melanie had been placed in diverse Pre-K and 4th grade classrooms, such as ESOL and special education classes. She stated that all of her field experiences were positive. She also worked at a summer camp where—she indicated—she learned how to plan different activities and lead students for two years. She was placed in a 3rd grade class for her field experience in the semester when the study was conducted.

It seems that her previous experience of planning different activities and perhaps her observations in her positive field experiences enabled her to focus on and propose alternative instructional and pedagogical strategies to solve the dilemmas in the case scenarios. For instance, she offered a small activity to avoid the problem the student teacher experienced while

introducing new cultures and to create a more positive experience for the students in the case scenario #3 (mango):

> I think Kim should have introduced the fruits first. She could have presented some information about the fruits, including where they are from and characteristics of them, then passed them around the class and let the students examine samples. This gives students information about the fruits and experiences with them before they dissect them.

In the same case scenario, she also emphasized that teachers should know who their students are and be mindful because it plays an important role while introducing new cultures in class: “Student's cultural backgrounds impact their experiences in school. The teacher should have been more familiar with student's experiences to avoid assumptions.” Similarly, she stated while reflecting on the case scenario #1 (lobster):

> It is important to understand your student's cultural experiences. Every student brings something different into the classroom and you can't assume the experiences they have or haven't had. Students will also have different opinions on the ethical treatment of animals in the classroom, which is influenced by past experiences, their family, and their cultural background. As a teacher, you need to be aware of your student's cultural background and experiences.

In addition to cultural aspects, Melanie also pointed out pedagogical strategies about the subject matter, science, in the case scenarios. For instance, a comment from her during the in-class discussion of the case scenario #1 (lobster) reveals that she reflected on the pedagogical strategies that Stan, the teacher in the case scenario, used in terms of science teaching: “It was a good way to just at least help them differentiate between like inferences and observations. And

so I think the first part of the lesson was really good and was probably very beneficial to students."

Although Melanie suggested instructional and pedagogical strategies to design better learning activities in the case scenarios #1 (lobster) and #3 (mango), those strategies do not address the needs of diverse students that may be caused by their cultural backgrounds. The reason for this might be that she simply described the problem or her previous experience without making any interpretations during the online reflection for these scenarios (see Table 3.9).

Table 3.9

Excerpts from Melanie's Responses to the Prompts

Prompt: Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Lobster case.	In school I participated in a few animal dissections. In fifth grade, my gifted class dissected a shark and in middle school I dissected a frog. Some students felt uncomfortable or grossed out by the dissections, but everyone agreed and understand that the animal was for educational purposes. There was no controversy over the ethics. (PreR_personal connection)
Prompt: What kind of challenges/dilemmas do you observe that the teacher experienced while introducing fruits and vegetables from different cultures in the scenario "Who Eats the Mango?"	The students did not want to engage in the lesson when these fruits and vegetables were introduced. They acted disgusted by these fruits. (PreR_problem detection)

Note. "PreR" indicates pre-reflection (Larrivee, 2008).

When it comes to case scenario #2 (shoebox), it seems she was able to analyze the problem more critically by seeing the unfairness in the situation. She indicated that her own teachers recognized not everybody could bring in materials due to their socioeconomic situations (see Table 3.10). Aligning with these, Melanie concluded from the case scenario:

> Teachers need to be aware that students come from different backgrounds and families. Not all students can afford to bring in extra supplies. Teachers should never make assumptions about student's cultural backgrounds, family life, or socioeconomic status. When extra supplies are required for a lesson, we need to have those supplies available for students who cannot get access to them, for any reason.

Table 3.10

Melanie's Responses to the Prompts in the case scenario #2 (shoebox)

Prompt: What kind of challenges/dilemmas do you observe that that the students experienced in this case?	The students were not able to bring in shoeboxes for the camera project. The girls live in a homeless shelter, their mother could not drive them to a shoe store, and they did not have money to buy one from their teacher. Their teacher seemed to be treating them *unfairly* because they could not get a shoe box. She wanted them to "earn" the shoebox. (PreR_problem detection, CR)
Prompt: Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case.	Throughout school I remember doing several projects that required me to bring in supplies to build things, such as an instrument in 3rd grade. I was fortunate to always have supplies to bring in and my family had enough money to buy them. However throughout my school years, I had several teachers say that if we were not able to bring in supplies because we couldn't afford them, we could talk to them in private and they would help us. (PreR_personal connection, SR)

Note. "PreR", "SR", "PR" and "CR" indicate pre-reflection, surface-level reflection, pedagogical reflection and critical reflection (Larrivee, 2008) respectively.

Melanie defined diversity in a broader sense. She referred to her learning that a teacher should not make assumptions about his/her students' cultural backgrounds and shared her views about diversity during the interview: "When we first think of diversity, we might think racial diversity or cultural diversity and their socioeconomic, but there's also diversity in the experiences your students have had, and diversity in what your students need in the classroom."

Melanie specifically emphasized that teachers need to be unbiased while reflecting on the case scenario #4 (exhibit) for which she led the in-class discussion and wrote a synthesis paper. In her synthesis paper, she stated, "It is important to not have bias in your teaching so that all students feel accepted and supported in your classroom, regardless of their beliefs. This also allows you to teach about multiculturalism from an accurate and unbiased standpoint." These statements suggest that being unbiased may have been Melanie's way of affirming diverse beliefs and values in classrooms. She also proposed some instructional strategies that Amanda could have used in class to show different religions or religious rituals to students:

> When Emily [the student] brought up her Christian beliefs, Amanda [the teacher in the scenario] could have shared how other beliefs compare to the Egyptian rituals, too. Instead of just nodding at Emily's comments, she could have used this opportunity to talk about other religions and how the Egyptian beliefs are similar and different. Students may have different religious beliefs in her class and it is important to talk about a variety of religions.

Except for the response above, Melanie's other responses during the reflection on this scenario focused on how conversations with kids can be emergent and that teachers cannot plan every second of their teaching. She even suggested Amanda ask Emily to prepare a short presentation about the exhibit to avoid the unfolding nature of the conversation. As seen,

Melanie's responses mostly highlight the difficulty of handling an on-spot conversation about religion is for a teacher rather than how to show there are different religions in the world.

These findings showcase the aspects of diverse classrooms Melanie attached importance to. She consistently highlighted that teachers need to know who their students are and be unbiased by not making any assumptions when they enter classrooms. She also pointed out that diversity can occur in students' cultural experiences. Melanie mostly focused on pedagogical strategies that could have been used to alleviate the problems given in the case scenarios.

Cross-Case Analysis

Cross-case analysis was implemented to come up with patterns based on the similarities and differences (Hatch, 2002) across the four cases. The findings from the cross-case analysis suggest that the four pre-service teachers reflected on the case scenarios pedagogically and critically most of the time. The case scenarios seem to have created a culture-embedded context for them and promoted their reflection along with the prompts. The patterns derived from the cross-case analysis suggest that when the pre-service teachers framed the problem by considering different aspects, such as its cultural and ethical implications, *and* if they had similar experiences before, it is more likely that critical reflection occurs.

How pre-service teachers framed problems encountered in diverse classrooms determined how deeply they engaged in reflection for CRT. The case scenarios in the present study included different cultural dilemmas that teachers could potentially encounter in real classrooms. The cross-case analysis revealed that the depth of reflection the four pre-service teachers engaged in was closely related to how they framed and perceived the problems or dilemmas within the scenarios. When they depicted the problem or dilemma given in the scenario without any elaboration, these pre-service teachers usually focused on instructional

aspects of the situation rather than a critical analysis of the given problem. However, when the prompt helped them see cultural implications of the problem, they often reached critical reflection to solve the problem in the cultural case scenario. For example, Melanie framed the issue as religion in case scenario #4 (exhibit) and summarized the problem (see Table 3.11). In contrast, Ashley analyzed the same problem by taking several aspects and the teacher's (in the case scenario) own beliefs into consideration as follows:

> Emily [the student] shared her belief in afterlife and how it was different from the Egyptians. Amanda [the teacher] nodded in agreement instead of commenting. A phrase that Amanda said that is from the Bible, "Ashes to ashes and dust to dust", sparked more religious discussion when Emily made the connection to God. Since Amelia is a Christian, she was proud of Emily and nodded her head. An African American student made the connection that white people must be created with sand by God because their skin is lighter, but the bell rang before any elaboration could take place. Amanda experienced dilemmas regarding religious conversation and race during Emily's sharing of her trip.

And, aligned with this deep analysis, Ashley seems to have engaged in in-depth reflection and offered some suggestions about how to facilitate a discussion about religion in diverse classrooms to affirm religion diversity:

> In a public school, different religions should be taught and understood, but one religion should not take more prominence over another. If Amanda [the teacher] had left out the Biblical verse, "Ashes to ashes. Dust to dust", she would not have confused her students about skin colors and race. She also would not have held one religion over another by sharing an example from a Christian Bible verse.

Focusing on the difficulty of handling such an on-spot discussion in class, Melanie highlighted some instructional strategies that would enable Amanda, the teacher in the case scenario, to know what Emily, the student, discussed in class beforehand:

> I think it would have been better to give Emily time to prepare what she wanted to share with the class. Amanda could have asked Emily to create a small presentation and Amanda could have previewed what she was going to present. This way the conversation would not have been so on-the-spot and maybe Amanda wouldn't have had to navigate so maybe difficult questions and topics.

The four pre-service teachers engaged in critical reflection more (see Table 3.11) when they defined the problem by considering multiple aspects, but this did not necessarily mean they were involved only in descriptive reflection when they provided a simple description of the problem. For instance, although Erica simply depicted what happened in case scenario #3 (mango) (see Table 3.11), it appears that she engaged in critical reflection but not as much as she did in pedagogical reflection. This may be explained with the three conjectures of the study: (a) reflection may not have been linear, (b) prompts may have provided effective scaffolding during reflection, and (c) salience of a problem in a case scenario may have altered depth of reflection.

First, reflection is not a linear but iterative process (Dewey, 1933; Kolb, 1984). It is a deliberate, complex, and intellectual process that yields learning (Dewey, 1933). During reflective thinking, lessons from previous experiences may activate deeper learning and inform decisions for following events (Colton & Sparks-Langer, 1993; Dewey, 1933). Teachers may engage in different reflective dimensions simultaneously (Larrivee, 2008). While they focus on teaching pedagogies reflecting within certain contexts, they may reflect more critically on other experiences or situations (Larrivee, 2008). This non-linearity of the reflection process may

explain the pattern that emerged in this study. For instance, while Erica focused on both pedagogical and critical aspects of diversity and culturally responsive teaching within the same context (case scenario #4- exhibit), she reflected more deeply and critically on case scenario #1 (lobster), which was given to her earlier (see Table 3.11).

Second, the findings of this study suggest that the prompts given during the online reflection on Qualtrics guided the four pre-service teachers throughout the reflection process effectively. For instance, Melanie seemed to have reached critical reflection in case scenario #3 (mango) although Melanie's response to the problem detection prompt included a simple depiction of what happened in the scenario: "The students did not want to engage in the lesson when these fruits and vegetables were introduced. They acted disgusted by these fruits." Later, some of her responses included in-depth reflection within the same case scenario. To exemplify, as a response to the prompt "Taking diversity in classrooms into consideration, how would you justify your recommendations/solutions you offered for the previous prompt?," she stated:

> Student's cultural backgrounds impact their experiences in school. The teacher should have been more familiar with student's experiences to avoid assumptions. I think allowing the students to try the fruits and teach them some background information on the fruits would clear up any misconceptions the students have about them.

It should be noted that the problem detection prompt "What kind of dilemmas/ challenges/ problems do you observe that the teacher experienced experience in this case scenario?" was the first prompt presented to the pre-service teachers for each case scenario. The problem detection prompt was designed with the aim of initiating a reflection process considering that an encounter with a problem or dilemma triggers reflection (e.g., Chitpin, Simon, & Galipeau, 2008; Dewey, 1933; Griffin, 2003; Mezirow, 1991). Problems and

challenges that result in puzzlement and uncertainty trigger points in the pre-reflective phase of the reflection process because they set out the problem to be reflected on (Dewey, 1933). After detecting the problem(s) in the case scenarios, the four pre-service teachers were guided by the prompts during their reflection process. The phases of the DATA (Describe-Analyze-Theorize-Act) reflection model (Smith et al., 2015) were adapted to design the prompts in the present study as *I detect the problem*, *I examine the context*, *I plan my culturally responsive teaching (CRT)*, and *I act*. Findings suggest that the prompts in the last three phases may have scaffolded the pre-service teachers to engage in in-depth reflection (see Table 3.11).

Even when they simply described the dilemma in the problem detection phase, it seems they were able to reflect on the case scenarios more deeply at some points in their responses to the prompts. For instance, although Ashley only depicted the problem in the case scenario #3 (mango) (see Table 3.11), her response to the prompt "What lessons do you think you can draw from this case in terms of teaching in multicultural classrooms and/or introducing different cultures in class?" seems to have included in-depth reflection:

> It is important to introduce and support different cultures in the classroom in all subject areas. Students should be given the opportunities to feel uncomfortable from exposure to different cultures in a supportive environment. Without this exposure to differences, the students will not be prepared for the world outside of the classroom or their immediate community.

Last, saliency of a problem in a case scenario may have affected how the problem was framed and how deep reflection was. For instance, Ashley, Erica, and Melanie indicated the case scenario #3 (mango) as the least useful because it was much more difficult to find the problem in this case scenario compared to the other case scenarios. It seems that this difficulty was reflected

in their responses to the problem detection prompt (see Table 3.11). They explained the problem descriptively and engaged in mostly pedagogical reflection in this case scenario rather than critical reflection.

Table 3.11

Problem Detection across the Cases

	Problem detection and framing in the case scenarios			
	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (mango)**	**Case scenario #4 (exhibit)**
Ashley	The teacher in this case experienced several challenges. First, two students left the room without asking or supervision which can be unsafe. Second, the idea of cooking an animal (lobster) caused sudden strong emotions, both negative and positive. Third, the teacher had to decide what to do next after this reaction to the lobster dying in order to be food. Should he go on with his lesson as planned and ignore the students' reactions? Should he consider another course of action? If so, what should it be?	The students, Cynthia and Jessica, experienced feeling isolated due to their socioeconomic status. For example, they were not able to bring in shoeboxes for a project because their family does not have a car or money to buy one.	The students did not want to participate in the activity after new fruits and vegetables from different cultures were introduced. Some were disgusted by the texture and the look of these plants. Others were taken aback by the presentation of the plants since many were messy to examine.	Emily shared her belief in afterlife and how it was different from the Egyptians. Amanda nodded in agreement instead of commenting. A phrase that Amelia said that is from the Bible, "Ashes to ashes and dust to dust", sparked more religious discussion when Emily made the connection to God. Since Amelia is a Christian she was proud of Emily and nodded her head. An African American student made the connection that white people must be created with sand by God because their skin is lighter. Amanda experienced dilemmas regarding religious conversation and race during Emily's sharing of her trip.
	PR: 4 CR:7	PR: 5 CR:7	PR: 7 CR:3	PR:5 CR:8
Elizabeth	Questions are raised about the ethical treatment of animals in the classroom. The biggest challenges are determining whether the *ethical* viewpoints	Homelessness and poverty are two major problems children faced in this scenario. Students were becoming disengaged in science class because they	The teacher had the challenge of her students being disengaged because they were not used to the fruit/ vegetables they were experimenting with.	Emily touched on some sensitive subjects such as religion in front of the entire class. She tried to steer the conversation away from religion. I think

	of students should alter lesson planning.	knew they couldn't afford to participate in certain experiments because of the poverty they lived in.	Kim assumes that her students are not familiar with different cultures because they are from a white, middle-class, suburban area. She assumes all of her students are the same.	by keeping religion out of class, teachers are protecting students' thoughts and opinions and respecting the difference of religions in your class (not trying to preach or support one over the other).
	PR:5 CR: 7	PR: 2 CR:7	PR: 3 CR:5	PR: 3 CR:5
Erica	Two of his students are clearly upset by what he is going to do. There is ethical some reason that they feel so strongly about cooking a living creature. He is also faced with how to deal with two groups of students who left the room. Stan will also have to face trying to decide if he should go along with his plans.	The students experienced discrimination and feelings as though they were not good enough by their teacher. When the students were vulnerable and shared their "secret" with the teacher, she still told them that they had to "earn" their materials, which hurt them because it was not their fault they weren't able to afford/obtain the materials.	The teacher found that the students were not as interested as she thought they would be when introducing these new foods. They were excited when they were using fruits they knew, but once the unfamiliar objects were introduced, they did not want to participate.	The biggest dilemma seemed to be when the conversation started to go towards religion. I think that she was very nervous about getting onto the topic of religion, so she steered away from it very quickly as most teachers would probably do.
	PR:5 CR:8	PR: 4 CR:7	PR: 6 CR:4	PR: 4 CR:5
Melanie	The teacher, Stan, upset two students by implying that they would be cooking the lobster he brought into class. At the end of the case, he has to decide whether cook the lobster, as he had planned, or choose not to.	The students were not able to bring in shoeboxes for the camera project. The girls live in a homeless shelter, their mother could not drive them to a shoe store, and they did not have money to buy one from their teacher. Their teacher seemed to be treating them unfairly because they could not get a shoe box. She wanted them to "earn" the shoebox.	The students did not want to engage in the lesson when these fruits and vegetables were introduced. They acted disgusted by these fruits.	The conversation turned to religious topics. Emily shared how her religious beliefs differed from what she saw at the Egyptian exhibit. Amanda felt a little uncomfortable by what Emily was talking about but tried to steer the conversation in a safe direction.
	PR:7 CR:.5	PR: 4 CR:6	PR: 7 CR:5	PR: 8 CR:4

Note. "PR" and "CR" indicate pedagogical reflection and critical reflection (Larrivee, 2008) respectively. Numbers represent the frequency of coding.

Previous cultural experiences of pre-service teachers shaped how they approached cultural dilemmas in classrooms through reflection. The second theme is that previous cultural experiences of pre-service teachers shape how they approach cultural dilemmas in classrooms through reflection. The pre-service teachers' responses to the prompt "Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case" during case scenario reflection and their sharing of previous experiences during in-class discussions and interviews enabled us to identify this theme in the cross-case analysis.

All the cases had field experiences in diverse classrooms previously. Their responses to the question "Have you ever taught or had field experience and/or student teaching in a diverse classroom?" in the "Getting to Know You" survey show that all cases had a broad definition of diverse classrooms before they started to reflect on the case scenarios. For instance, while Elizabeth included ESOL and special education classrooms, Ashley indicated that she had had students who were diverse in terms of their socioeconomic statuses. The factors they considered included in diversity seem to have been also influenced by both their own experience and the situations presented in the case scenarios. For instance, while Elizabeth emphasized linguistic diversity as she was placed in ESOL classes before, Erica suggested to include dietary choices within diversity perhaps due to her experience of her dad's venison cookout.

Although the four pre-service teachers had been placed in diverse classrooms before, they all had different experiences in those classrooms. In addition, they had various cultural experiences in their education before coming to the college. Both their experience of student-teaching in real classrooms and their cultural experiences in their personal lives seem to have played a critical role when reflecting on the case scenarios in this study. The findings suggest

that the pre-service teachers' previous experiences may have shaped how they view diversity in classrooms. For instance, Erica shared a story about her dad's explanation of venison cookout when she was a kid and how she was affected emotionally. According to her, it was similar to how the student felt in the case scenario #1 (lobster). After recalling this instance, Erica may have viewed dietary choices as a diversity element during the reflection on the same case scenario:

> I think my recommendations/solutions would be good options for a diverse group of students. The teacher is not considering dietary needs/choices or possibly religion of some students. He is thinking that all students are alright with eating animals, but that is not the case for everyone.

Another example is from Elizabeth's field experience class. During the in-class discussion of the case scenario #3 (mango), she told:

> Actually, I have a student who brings seaweed every day for lunch and she shows me. She's very proud of it and she's the one of outspoken girls that will tell you how it grows. To keep stereotyping out of class, I want to open up that discussion rather than just like, oh, kids are kids.

Aligned with this example, Elizabeth's reflection focused on not making assumptions about students' cultural background and not instilling the idea that new is weird:

> I wouldn't introduce a fruit as "exotic" or "unusual" because those words can make assumptions about the people who regularly eat these fruits. Introducing new things as a norm and a good thing can help students engage more with the new culture and eliminating the idea that new is weird or different can help students learn better without assumptions already in their head.

Ashley shared one of her experiences about how she approached her students' comments about religion (see Table 3.12) during the reflection on the case scenario #4 (exhibit):

> As a teacher, I have had students mention their religious beliefs in passing. For instance, a kindergarten student said, "God made the whole wide world", while we were discussing living things that grew. In these situations, I often do not know how to address these comments. Do I agree, put down, or ignore these proclamations of belief? In the past, I sometimes do what Amanda did, nodded and moved on past the comment, but is there a better way?

As seen, Ashley questioned how she should respond to this kind of utterances of her students. This inquiry about her past experience may have enabled her to see the importance of affirming religious diversity, as well:

> I should always be aware that my students have different religious beliefs and cultural backgrounds from each other and from me. Showing favoritism to one side or another by ignoring and nodding can lead to other students feeling alienated by me simply because I have not acknowledged everyone and their beliefs in the class.

Similarly, it seems Elizabeth and Erica came to the conclusion that having access to transportation is also a diversity element. During the in-class discussion of the case scenario #2 (shoebox), Elizabeth shared a story about how her own parents sometimes could not drive her in the past because they were both working. She added when her elder sister could not drive her to a store either, she occasionally could not bring materials to the class. Elizabeth may have made some interpretations from this experience. Considering the socioeconomic status of the two homeless girls in the case scenario #2 (shoebox), she proposed that lack of access to transportation can result in non-participation in certain activities in class. Erica had a recent

experience with one of her students in the field experience. The student's mom had to take his grandmother's car to pick up the student from school. Perhaps due to her learning from this experience through reflection, she analyzed the assumptions the teacher in the case scenario made critically: "The teacher is also assuming that they have a way to get to the store. Some students' parents may not have a car or the transportation to get them to the store."

These findings suggest that these preservice teachers' beliefs about teaching and attitudes towards students may have been the consequences of experiences gained over time (Larrivee, 2000; van Manen, 1991). Past experiences are also one of the key elements of teacher reflection (Larrivee, 2000, 2008) because teachers' understanding of past experiences shapes how they interpret situations in the present. While several researchers (e.g., Brookfield, 1995; Kolb, 1984; Mezirow, 1991) assert that reflective practice starts with one's own experience, they also highlight it is important to critically analyze and reformulate that experience for in-depth reflection in future situations. Teachers' filtering through their previous experiences also partly determines how they act in diverse classrooms (Larrivee, 2000; Whipp, 2003) because learning from previous experiences through reflection enable teachers to gain cultural competence (Ladson-Billings, 1995).

Being culturally competent may be beneficial for pre-service teachers who prepare for cross-cultural interactions in their future classrooms (Aikenhead, 1996; Gay, 2002). Their cultural competence may interact with how they approach cultural dilemmas in their future classrooms. To facilitate students' movement between home and school cultures, teachers first need to acknowledge their own assumptions, beliefs, and values (Jegede & Aikenhead, 1999). By doing so, they may become skillful cultural navigators and create inclusive classrooms through culturally responsive teaching (Ladson-Billings, 1995, 2014; Weinstein et al. 2003). The

four pre-service teachers in this study seemed to have made sense of their previous experiences and established connections between their experiences and the problems in the scenarios due to the guidance provided through prompts. It appears that particularly the prompt “Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the case scenario.” scaffolded the pre-service teachers to analyze and engage in critical interpretation from their similar experiences. As a result, the pre-service teachers may have developed a broader view of diversity by including different elements within it based on their previous experiences and the case scenario context. This whole process may help them to be cultural navigators (Jegede & Aikenhead, 1999) in the future.

The themes that emerged imply culturally responsive teaching is a dynamic and complex process in which several factors interact. How pre-service teachers perceive a cultural problem or dilemma in diverse classrooms and how they make interpretations from their previous experiences seem to interact with the reflection for culturally responsive teaching. This interaction may also indicate that cultural navigation (Aikenhead, 1996) in real, dynamic classroom settings can be challenging for pre-service teachers. Pre-service teachers need to be prepared to navigate through not only their own background and cultural experiences but also students’ home and school cultures through critical reflection. Support can help them achieve this in meaningful and authentic learning environments in teacher education programs.

Table 3.12

Previous Experience across the Cases

	Previous experience similar to the situation in the case scneario			
scenario	**#1 (lobster)**	**#2 (shoebox)**	**#3 (mango)**	**#4 (exhibit)**
Ashley	Her sister experienced a lobster cookout and could not eat it since then.*	As I become more aware of different socioeconomic statuses in my classrooms, I am starting to understand why expecting students to bring in supplies could have a negative effect in the classroom.	I often do not try new foods if they look or smell unappetizing.	A kindergarten student said, "God made the whole wide world", while we were discussing living things that grew. In these situations, I often do not know how to address these comments. Do I agree, put down, or ignore these proclamations of belief? In the past, I sometimes do what Amanda did, nodded and moved on past the comment, but is there a better way?
	PR: 4 CR:7	PR: 5 CR:7	PR: 7 CR:3	PR:5 CR:8
Elizabeth	At high school, her class were going to dissect a cat, but some of her friends felt uneasy. The teacher changed the activity and took them to the zoo.*	I have had classes where we were required to bring in materials. We would be asked to bring in any extra supplies we may have had to help a classmate who either couldn't afford it or forgot it, but they were never asked to compensate for the materials.	A student brought seaweed to her field experience class.*	Being a Christian, the only religious issue I have had in my classes have been students asking me about my faith (i.e. where do you go to church, do you read a Bible, etc). When these questions arise, I answer truthfully, but then steer the question away from religion in hopes of ensuring an appropriate conversation.
	PR:5 CR: 7	PR: 2 CR:7	PR: 3 CR:5	PR: 3 CR:5

Erica	Her story with her dad about cooking a venison.*	Her student's being kicked off the school bus because of the different address on the teacher's sheet.*	I had experiences where someone would want me to try something, but just from looking at it, I would not try it.	She was not allowed to talk about Halloween at school as it is "Devil's Day."*
	PR:5 CR:8	PR: 4 CR:7	PR: 6 CR:4	PR: 4 CR:5
Melanie	Description of her fifth-graders dissection of animals in a science class*	Her own experience as a student: Her teachers told them to ask help from them if they cannot afford buying materials.*	Her school provides snacks. Her students sometimes get excited when they see a different fruit, such as red plums.	I do not have any similar experience.
	PR:7 CR:.5	PR: 4 CR:6	PR: 7 CR:5	PR: 8 CR:4

Note. "PR" and "CR" indicate pedagogical and critical reflection (Larrivee, 2008). Numbers represent the frequency of coding. * indicates summaries of experiences.

General Discussion

Finding Summaries and Discussions

This multi-case qualitative study explored how cultural cases and prompts engaged pre-service teachers in reflection for culturally responsive teaching. This is the first phase of a series of design-based research studies. The ultimate goal of these studies is to create an adaptive digital scaffolding system for pre-service teachers' reflection-in-action for cultural responsiveness through artificial intelligence features such as natural language processing. This first-phase study focused on two goals: (1) testing the reflection prompts to set up a database from which the digital scaffolding tool presents effective prompts and (2) refining the case scenarios used in the digital scaffolding tool for the following phases of the study.

Here are the major findings from the study. First, the pre-service teachers see reflection as a process that occurs after the school day is complete. They all conceptualized reflection as thinking about what happened in class during the day retrospectively. This conceptualization is

aligned with the literature; most interventions have been designed to promote reflection-*on*-action in teacher education courses (Chen, 2012; Gordinier, Conway, & Journet, 2006; Harford & MacRuairc, 2008; Hatch, Shuttleworth, Jaffee, & Marri, 2016). The tools provided to pre-service teachers are journals, videotaping classes, and observation of experienced teachers, all of which are ways to reflect on previous experiences. Perhaps since they are mainly provided with the tools for reflection-*on*-action, pre-service teachers are more familiar with that type of reflection and conceptualize reflection in this way. However, some studies (e.g., Cavanagh & McMaster, 2015; Giaimo- Ballard & Hyatt, 2012) show that teachers and/or pre-service teachers should also be familiar with reflection-*in*-action, that is, reflecting during/in the moment of teaching. As teaching is quite dynamic, teachers should be able to respond well to instances as they are occurring in classrooms.

Another reason for pre-service teachers' unfamiliarity with reflection-in-action can be that they generally find it challenging. All of the four pre-service teachers in the present study also stated that reflecting in the moment of teaching is challenging because lots of things are going on during lessons in a classroom. Therefore, as they find it hard to reflect during the action of teaching, they may just avoid doing so, which may have led to their unfamiliarity with reflection-in-action. These findings, both from the current study and the literature, inform the design of iReflectNow for the second-phase study. It is possible to practice reflection-in-action with low risk of failure in iReflectNow since it is a digital environment. iReflectNow will also provide different scaffolding features other than prompts and case scenarios. In this way, reflection-in-action may seem less challenging to pre-service teachers as they will be scaffolded during reflection.

In the current study, the reflection prompts were given to the pre-service teachers in a linear order via Qualtrics as the goal was to examine how the prompts engaged them in reflection. Findings suggest that guided reflection via prompts can help pre-service teachers get involved in deep reflection. Since they usually lack teaching experience in real classroom settings, pre-service teachers can fail to notice what to reflect on (Cavanagh & McMaster, 2015). In this sense, it is important to detect the problem or dilemma that would trigger reflection (Chitpin, Simon, & Galipeau, 2008; Dewey, 1933; Griffin, 2003). In the current study, the first prompt presented to the pre-service teachers aimed to encourage them to find the problem or dilemma in a case scenario. It was found that how pre-service teachers frame the problem in the beginning of the reflection process interacts with the depth of their reflection during the whole process.

The case scenarios in this study provided culture-embedded contexts (Nieto, 1999) to the pre-service teachers where the case scenarios and their previous experience could be connected. Providing the case scenarios along with the prompts to pre-service teachers may have created a meaningful environment where they can practice CRT (Howard & Rodriguez-Minkoff, 2017; Ladson-Billings, 1995; Milner, 2011). In such an environment, it is probable for pre-service teachers to go beyond conceptualizing CRT through in-depth reflection (Coulson & Harvey, 2013; Howard & Rodriguez-Minkoff, 2017; Whipp, 2003).

Based on the nature of design-based research enabling a mutual interaction between theory and practice, this first iteration has also made contributions to literature on the theories behind the study series. The primary theoretical perspective for this study is cultural navigation (Jegede & Aikenhead, 1999). Cultural navigation is conceptualized as students' moving from home to school or from school to home cultures, and teachers usually provide support to students

during this process through cultural navigation (Gay, 2000; Jegede & Aikenhead, 1999). Although students' crossing cultures is often highlighted, the findings of this study may suggest that teachers themselves are also involved in cultural navigation from their previous cultural experiences to current classroom settings or vice versa through reflection. How they view diversity and how they frame a cultural challenge or dilemma encountered in classrooms are in interplay with cultural navigation. Findings suggest that when reflection is promoted during cultural navigation, teachers' viewpoints about diversity and their own cultural experiences come into play. This partially aligns with the teacher reflection frameworks, i.e. Colton & Sparks-Langer's teacher reflection (1993) and Larrivee's (2008) critical reflection frameworks.

The study findings may also expand on the framework created by Allen et al. (2017) that recognizes the importance of teachers' critical reflection for CRP. According to Allen and colleagues' framework (Allen et al., 2017), teacher candidates need critical reflection to gain cultural competence for an effective implementation of CRP in classrooms. The present study findings, where pre-service teachers were encouraged to practice critical reflection, may elaborate on what elements can be included in critical reflection and cultural competence. This study showed that pre-service teachers' own cultural experience influence their cultural competence, such as how they see diversity in classrooms. Another finding which may amplify the critical reflection aspect of Allen et al.'s (2017) framework is that when pre-service teachers frame problems encountered in classrooms by focusing on diversity-related aspects rather than just providing descriptions of problems, it is more probable for them to engage in critical reflection.

The study findings also suggest a few revisions in the case scenario content and the prompt design. In terms of the prompt design, the pre-service teachers commented on the

repetitive nature of prompts. This can be improved through a branching presentation of customized prompts. Branching prompts (Crowder, 1960) allow for some adaptiveness in the aimed reflection scaffolding for following iterations. Also, procedural scaffolding showing their reflection stage at the moment via visuals and templates (Lin, Hmelo, Kinzer, & Secules, 1999; Lai & Calandra, 2010) may be helpful during the reflection process.

The case scenarios were adapted from a book that was written by Tippins, Koballa, and Payne in 2002. During one of the in-class discussions, Elizabeth commented that mangos or avocados (in the case scenario #3) are not "different or unusual" fruits for most students nowadays. All the participants chose case scenario #2 (shoebox) as the most useful one by indicating that it is the most applicable case scenario to current classroom settings. Accordingly, case scenarios should be updated to make pre-service teachers' reflection process more authentic (Kagan, 1992; Moore-Russo & Wilsey, 2014). The focus of the case scenarios should also be kept on culturally responsive practices in classrooms to provide culture-embedded authentic practice units to pre-service teachers (Moje & Wade, 1997; Nieto, 1999). For example, the focus of one in-class discussion shifted from cooking a lobster, which is considered a cultural-ethical issue, to how the teacher should have handled the situation when the students fled the room in the case scenario #1 (lobster). This shift can be avoided by making cultural elements salient in the case scenarios.

Implications for Research and Practice in Teacher Education

This study used cultural case scenarios together with reflection prompts to provide authentic culture-embedded contexts (Nieto, 1999) to pre-service teachers because CRT is more about developing a mindset than following a set of to-do items (Ladson-Billings, 2009; Milner, 2011). The current study showcases that cultural case scenarios and prompts that engage pre-

service teachers in deep reflection and scaffolding towards critical reflection for CRT are possible. Teacher educators could benefit from such cultural case scenarios and prompts by using them in scaffolding their pre-service teachers' critical reflection for CRT. By designing longitudinal studies, researchers could investigate how pre-service teachers take their learning from case scenarios and reflective thinking into practice in real classroom settings. This study was conducted with early childhood pre-service teachers in a science methods course. In science methods courses, pre-service teachers' reflection could be studied with different foci. For instance, their reflection on differing scientific events, socio-scientific issues, and evolution could be investigated by designing appropriate case scenarios and prompts depending on the context. With the change of case scenario content, teacher education researchers could study to scaffold pre-service teachers in different subject areas such as math and language arts. Other potential future research could involve use of cultural case scenarios in demographically different teacher education classes by integrating different prompts.

Limitations

Data was collected from four pre-service teachers in a limited context. This multi-case research involved White female early childhood pre-service teachers at a public university in the southeastern region of the USA. The researchers did not have access to the four pre-service teachers' field experiences. Whether and how the pre-service teachers transferred their learning from the case scenario analysis into real classroom settings could not be observed.

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CHAPTER 4

iReflectNow: DIGITAL SCAFFOLDING FOR PRE-SERVICE TEACHERS' REFLECTION-IN-ACTION FOR CULTURALLY RESPONSIVE TEACHING[3]

[3] Umutlu, D. & Kim, C. To be submitted to *Instructional Science*.

Abstract

Critical reflection is necessary for culturally responsive teaching in diverse classrooms. Lacking teaching experience in real classrooms, pre-service teachers find critical reflection challenging and need to be supported to reflect critically. Pre-service teachers also need scaffolding to become skillful in reflection during teaching because reflection can be difficult in dynamic settings such as the classroom. In this second study of design-based research, iReflectNow, a digital learning environment that includes several scaffolding features, was implemented to promote pre-service teachers' in-depth and critical reflection for culturally responsive teaching in their future classrooms. Five early childhood pre-service teachers participated in this multi-case qualitative study. Four of them were While females, and one was Latina female. They analyzed four cultural case scenarios in iReflectNow using the embedded scaffolding features. Findings of the study suggest that (a) scaffolding triggers noticing of cultural aspects of dilemmas encountered in diverse classrooms during reflection and (b) depth of pre-service teachers' reflection for culturally responsive teaching interacts with different dimensions other than scaffolding, such as sharing reflections with peers and pre-service teachers' own previous cultural experiences.

Keywords: reflection-in-action, culturally responsive teaching, digital scaffolding, teacher education

Introduction

Racial and ethnic diversity is getting more evident in U.S. schools. Classrooms continue to become increasingly more diverse (Howard & Rodriguez-Minkoff, 2017). The National Center for Education Statistics (2015) also estimates that the number of White students will decrease gradually over the next decade. While the student population is getting diverse over time, the chronic achievement gap between White students and students of color persists (Howard & Rodriguez-Minkoff, 2017; Ladson-Billings, 2014; Mensah, 2011). Students of color still face disproportional discipline, excessive expulsions and suspensions, and placement in special education classes (Artiles, Kozleski, Trent, Osher, & Ortiz, 2010; Harry & Klingner, 2014). Some researchers argue these practices can be partially attributed to cultural miscommunications that occur in schools (Howard, 2010; Ladson-Billings, 2014). Due to differences in their cultural backgrounds, teachers might not be aware of beliefs, values, and cultural practices that diverse students can bring into classrooms (Howard & Rodriguez-Minkoff, 2017).

Culturally relevant pedagogy (CRP) is one of the approaches that can help teachers develop an understanding of their diverse students' needs (Ladson-Billings, 1995; Powell, Cantrell, Malo-Juvera, & Correll, 2016) to guide them to be successful learners. Considering the steady increase of diversity in classrooms, there will be a huge demand for culturally responsive teachers in the future. Yet, taking the stance that *all* learners can succeed and putting it into practice requires more than a set of guiding principles (Delpit, 2012; Milner, 2011). Several researchers (e.g. Banks & Banks, 2016; Howard; 2016, Ladson-Billings, 2014) seek meaningful pedagogical interventions to encourage teachers to create inclusive and caring classrooms. Rather than asking teachers to follow step-by-step guidelines, teacher educators need to create

authentic learning contexts to shape teachers' mindsets towards teaching in diverse classrooms through continuous reflection (Howard & Rodriguez-Minkoff, 2017; Milner, 2011; Souto-Manning & Mitchell, 2010). Pedagogical interventions that aim to develop such mindsets for prospective teachers need to be implemented in teacher education programs (Howard & Rodriguez-Minkoff, 2017; Sleeter, 2012).

Learning how to be culturally responsive can be challenging as it entails critical reflection (Aguirre & Zavala, 2013; Allen, Hancock, Starker-Glass, & Lewis, 2017). Critical reflection is also crucial for effective teaching (Larrivee, 2000; Oner & Adadan, 2011; Rodman, 2010). Critical reflection can be demanding especially for pre-service teachers, who might have little actual classroom experience because it involves critical questioning and self-reflection. Research in teacher education related to reflection (e.g., Beauchamp, 2015; Lane, Mcmaster, Adnum, & Cavanagh, 2014; Otienoh, 2011) indicates that pre-service teachers' reflection is usually descriptive with little critical thinking indicators.

While reflection may be challenging for pre-service teachers, several studies (e.g. Bean & Stevens, 2002; Blair, 2012; Etscheidt, Curran, & Sawyer, 2012; Whipp, 2003) indicate that scaffolding pre-service teachers' reflective skills helps them reach critical reflection. A number of scaffolding features such as prompts, visual displays, and templates (e.g. Hoban, 2000; Lai & Calandra, 2010; Rich & Hannafin, 2009) have been used in studies of teacher preparation and have indicated some success by providing prompts. That said, how pre-service teachers' learning should be scaffolded to become critical reflective thinkers for culturally responsive teaching has not been fully explored (Allen et al., 2017; Howard, 2010).

Another challenging aspect of reflection in teacher education programs is when the reflection occurs and the activities used to document reflection. Reflecting on previous

experiences and incidents is often emphasized via video-taped lessons, journals, and portfolios in teacher education (e.g., Chung & van Es, 2014; Oner & Adadan, 2011; Rhine & Bryant, 2007; Savage, 2016). While this type of reflection is important in pre-service teachers' development of teacher identity (Kagan, 1992), reflecting in the moment of teaching is equally essential due to the dynamic nature of teaching (Cavanagh & McMaster, 2015; Danielson, 2009; Giaimo- Ballard & Hyatt, 2012; Van Es & Sherin, 2002). Continuing research to explore prompts and strategies for pre-service teacher reflection, particularly in culturally responsive teaching, is needed to further our understanding of how to best support their on-going professional development.

The current study is the second iteration of design-based research series (Bakker, 2018). This series of studies aims to design, develop, and implement a purposefully-designed pedagogical intervention for pre-service teachers' reflection process for culturally responsive teaching (CRT) (Howard & Rodriguez-Minkoff, 2017; Moore-Russo & Wilsey, 2014). The intervention is a digital learning environment - iReflectNow - that involves adaptive scaffolding features to promote pre-service teachers' critical reflection in the moment of culturally responsive teaching. The overarching research question of the study is: How does pre-service teachers' reflection for culturally responsive teaching evolve during and after their use of iReflectNow?

Relevant Literature

Reflection in Teacher Education

In teacher education programs, teachers learn how to teach by reflecting on their experiences (Coulson & Harvey, 2013; Hollingsworth, 1989; Kagan, 1992). Although it is recognized that reflection plays an important role in teacher education, there is no one definition of reflection that is commonly accepted. Several useful typologies have been proposed to explore

depth and timing of teacher reflection and its elements (e.g., Griffiths & Tann, 1992; Hatton & Smith, 1995; Jay & Johnson, 2002; van Manen, 1991).

In terms of the depth, Larrivee's (2008) typology involves *pre-reflection*, *surface-level reflection*, *pedagogical reflection*, and *critical reflection*. Most pre-service teachers often do not go beyond simply describing their previous experiences (surface-level reflection) without scaffolding (Coulson & Harvey, 2013; Howard & Rodriguez-Minkoff, 2017; Larrivee, 2008; Moore-Russo & Wilsey, 2014; Whipp, 2003). Critical reflection is a purposeful learning process during which teachers and pre-service teachers learn to practice self-awareness, self- reflection, and self-inquiry for their own beliefs and assumptions (Larrivee, 2000; Oakley, Pegrum, & Johnston, 2014; Whipp, 2003). The primary goal of reflection is to help prospective teachers examine, assess, and interpret the relation between their teaching practice and the broader social and cultural context where it occurs through a critical lens (Hatton & Smith, 1995; Larrivee, 2000; Liu, 2015). In this aspect, going beyond the classrooms settings through reflection can be an arduous task for pre-service teachers, who have little or no teaching experience.

When reflection occurs, or its timing, is another important dimension of supporting reflection. Many typologies (Coulson & Harvey, 2013; Danielson, 2009; Schön, 1987; Wellington & Austin, 1996) aim to characterize types of reflection that occur before, during, or after an experience. In teacher education programs, reflection after teaching/reflection-on-action (Schön, 1987) has been practiced by analyzing video-taped classes, writing journals, and preparing portfolios (Blair, 2012; Harford & MacRuairc, 2008; Roberts, Maor, & Herrington, 2016). In the studies that use journals and portfolios as tools for reflection-on-action, it was found that when no prompts were provided that pre-service teachers' reflection remained descriptive (Cavanagh & McMaster, 2015). Prompts as scaffolding features that provide

guidance to pre-service teachers were found to promote deeper reflection (Cavanagh & McMaster, 2015; Gordinier, Conway, & Journet, 2006; Lai & Calandra, 2010). Although both reflection-on-action and reflection-in-action (Schön, 1987) need to be focused for effective reflection for future actions (Killion & Todnem, 1991; van Manen, 1991), there are a lack of empirical studies that focus on how pre-service teachers should be prepared for reflection-in-action, particularly for culturally responsive teaching.

Culturally Responsive Teaching

U.S. classrooms have steadily become more diverse in recent years. While the percentage of African American and Latino students is getting higher, the percentage of White students is expected to go down as low as 35% in the 2019-2020 school year (Howard & Rodriguez-Minkoff, 2017). The same trend is not seen in teacher population which is considerably less diverse (Brown-Jeffy & Cooper, 2011). This unbalance between student and teacher populations implies that there will be a substantial demand for a culturally responsive teacher workforce (Allen et al., 2017; Howard & Rodriguez-Minkoff, 2017).

CRT or CRP needs to be implemented for effective teaching in diverse classrooms (Gay, 2010; Ladson-Billlings, 1995, 2014; Irvine & Armento, 2001). Being culturally responsive means teachers' being unbiased and inclusive for students who do not share the same cultural background as that of the teachers. To create inclusive classrooms, other approaches have also been suggested. For instance, culturally sustaining pedagogy is a new approach that enables teachers to affirm and keep their students' existing cultures while aiming to extend their cultures to include other cultures' values, norms, and practices (Paris, 2012). Another approach is culturally situated schooling, whose goal is responding to student diversity in ways that encourage all students' learning and growth, rather than focusing on differences among students

(Meyer, Park, Bevan-Brown, & Savage, 2016). CRT claims that academic achievement of underserved students in the education system due to their diverse cultural backgrounds can be improved if a cultural synchronization between home and school life is provided (Irvine, 1990; Ladson-Billings, 1995). Several studies (e.g. Cammarota & Romero, 2009; Epstein, Mayorga, & Nelson, 2011; Howard, 2001; Lee, 2007) indicate that academic achievement of diverse students improves when CRT strategies are used in classrooms.

Reflection is an important aspect of CRT (Gay, 2010; Ladson-Billings, 1995, Rychly & Graves, 2012). Acknowledging his/her own values and assumptions that he/she brings to the classroom and recognizing and valuing other cultures that students bring are the necessary teacher characteristics for the effective application of CRP in classrooms (Aguirre & Zavala, 2013; Rychly & Graves, 2012). It is necessary for teachers to reflect on students' different cultures, values, and beliefs critically to become culturally responsive (Aguirre & Zavala, 2013; Allen et al., 2017; Howard, 2010). In addition to pedagogy and instruction, teachers need to incorporate several elements, such as teacher-student and student-student interactions in classrooms and communication with families (Powell et al., 2016) to create culturally responsive and caring classrooms.

In the upcoming decades, there will be a serious need for teacher preparation programs to support pre-service teachers to understand how culture impacts students' learning (Howard & Rodriguez-Minkoff, 2017). To address this need, both critical reflection and culturally responsive teaching need to be encouraged and reinforced in teacher education courses. Authentic learning environments should be designed in teacher education programs to help pre-service teachers go beyond the conceptualization of culturally responsive teaching and practice it

effectively through critical reflection in their future classrooms (Howard & Rodriguez-Minkoff, 2017; Milner, 2011; Sleeter, 2012).

Adaptive Digital Scaffolding

Scaffolding involves the use of instructional techniques to aid learners to solve a problem which is beyond their current skills as independently as possible (Belland, 2014; Pea, 2004; Saye & Brush, 2002; Sharma & Hannafin, 2007; Wood, Bruner, & Ross, 1976). Scaffolding is temporary; that is, when it is removed, learners should still be able to complete the task on their own (Belland, 2014; Lepper, Drake, & O'Donnell-Johnson, 1997; Reiser, 2004). Having different levels of knowledge and skills, learners may need different levels of support or guidance, and the amount of support can be optimized as learners make progress (Clark & Hannafin, 2012).

In 21st century classrooms, computers and software tools have become elements that scaffold learning (Azevedo & Hadwin, 2005; Belland, 2017). The key features of scaffolding are a shared goal between the learner and the supporter, dynamic assessment of the learner, customized support, and gradual removal of support (Belland, 2014; Puntambekar & Kolodner, 2005). Although digital scaffolding environments are found to be effective in creating a shared understanding of the goal to be attained, several researchers (e.g. Belland 2014; Kim & Hannafin, 2011) are skeptical about the quality of dynamic assessment of the learner, customized support, and gradual removal of support in these environments.

The quality of these features is determined by adaptiveness and dynamicity level of the digital scaffolding environments. Ensuring high levels of these in *controlled* intelligent tutoring systems which are adaptive instructional systems designed based on artificial intelligence methods (Spector & Ohrazda, 2004) is possible (Wood & Wood, 1996). In controlled intelligent

tutoring systems, the goal is to find the right solution to a problem such as an algebra problem whereas *explorative* systems are based on inquiry. Explorative systems show learners that there can be multiple right answers, so within these systems it is difficult to keep high levels of ongoing diagnosis, tailored assistance, and fading (Saye & Brush, 2002; Wood, 2001).

Shabo, Guzdial, and Stasko (1997) developed *Graphica*, a controlled intelligent tutoring system that combines a variety of scaffolding strategies for computer graphics learning. Graphica, which was designed using *branch programming*, uses different forms of multimedia infused with different levels of activities and scaffolding. For instance, different scaffolding features such as peer review, expert analysis, and library hints are integrated in the "Exercises" module. Shabo et al. (1997) found that while novice learners needed highly-structured activities that provide more support for them, expert learners indicated they preferred less-structured ones in Graphica.

For explorative digital environments, recent developments in the field of artificial intelligence such as natural language processing (NLP) seem promising. It is possible that dialogue-based intelligent tutoring systems can assess learners' responses via NLP (Litman, 2016) and can be designed to provide adaptive, human-like digital scaffolding. Processing the natural language may help reach the dynamicity needed for digital scaffolding. iSTART and W-PAL are two examples of intelligent systems designed to use NLP to process learners' written responses and provide immediate feedback for reading and writing respectively (Johnson, McCarthy, Kopp, Perret, & McNamara, 2017). These two systems provide adaptive feedback based on learners' responses, but they do not adapt instruction as learners progress.

In teacher education, research and development effort is needed to make pre-service teachers' practice of reflection-in-action viable. It is possible to benefit from adaptive digital

scaffolding environments that are based on NLP to enable pre-service teachers to practice reflection-in-action (Schön, 1987) without risk. This kind of learning environment design may facilitate practice of reflection-in-action in a simulated, authentic environment before real teaching (Howard & Rodriguez-Minkoff, 2017; Milner, 2011; Sleeter, 2012).

Research Purpose and Research Questions

Given the gaps and the needs in teacher education described above, the ultimate goal of this series of design-based research studies aims to design, develop, and implement an adaptive digital scaffolding environment that functions through NLP to improve pre-service teachers' reflection-in-action for CRT. Being the second iteration of the study series, the current study focuses on testing a prototype of iReflectNow developed and refined based on results from the first iteration. iReflectNow includes cultural case scenarios, prompts, hints, visuals, expert videos, and text-based annotations as metacognitive, conceptual and procedural scaffolding features during reflection. This study examined how pre-service teachers' reflection evolves when and after they engage in iReflectNow. The research questions were:

1. How does pre-service teachers' reflection for CRT evolve when and after they engage in iReflectNow and the related in-class activities?
2. How do the scaffolding features embedded in iReflectNow support pre-service teachers' reflection for CRT?

Theoretical Foundations

There is an achievement gap between White students and students of color in U.S. classrooms (NCES, 2015). Although a number of reforms including No Child Left Behind, and Common Core State Standards have been implemented in recent years, the achievement gap has remained persistent (Howard, 2010). The achievement gap can partially be explained by the

absence of *culture synchronization* (Irvine, 1990) between school and home cultures for minority students. That is, learning becomes a cross-cultural process for these students (Carter & Walker, 2010). Culturally responsive classrooms may facilitate this cross-cultural process. To create such classrooms, teachers need to be adept at cultural navigation between mainstreamed cultures and cultures of diverse students and guide students who navigate from their home cultures to school cultures or from their school cultures to home cultures (Aikenhead, 1996; Carter & Walker, 2010). Classroom culture should be responsive to students' home culture. Students' learning cannot be isolated from their cultural backgrounds (Gutiérrez & Rogoff, 2003; Lee, 2010).

Teachers tend to recognize the value of embracing diversity in their classrooms and implement CRT more effectively when they gain characteristics such as: being socioculturally conscious, affirming values and beliefs of students from diverse backgrounds, viewing themselves capable to make education more equitable, analyzing and seeing how learners build knowledge, being familiar with daily lives of students, and using students' prior knowledge to design instruction and materials to promote students' progress (Villegas & Lucas, 2002). In addition to having an understanding of their students' daily lives, teachers may need to gain some understanding of students' cultural practices (Gutiérrez & Rogoff, 2003). Based on this understanding, teachers should continuously monitor their own assumptions about students (Gutiérrez & Rogoff, 2003). Particularly, affirming diverse students' beliefs and values, knowing their daily lives, and refraining from making assumptions may help teachers navigate between students' home cultures and school cultures adeptly (Carter & Walker, 2010; Irvine, 1990; Santamaria, 2009). Teachers should also develop CRT strategies by taking students' cultural and ethnic backgrounds into consideration (Santamaria, 2009). An ability to develop the understanding and enact the strategies entails critical reflection (Larrivee, 2000, 2008).

If teachers engage in critical reflection for CRT, they can provide a more supportive learning environment while providing a less challenging cultural navigation process (i.e., home culture to school culture) to students (Aguirre & Zavala, 2013; Allen et al., 2017; Aronson & Laughter, 2016). Yet, critical reflection is not an easy task for teachers because they need to question and critique both their own and students' beliefs, values, and assumptions (Larrivee, 2008; Liu, 2015; Whipp, 2003). That said, teachers can engage in in-depth, critical reflection through the support of scaffolds (Ajayi, 2011; Larrivee, 2000, 2008; Roskos, Vukelich, & Risko, 2001).

Another challenge for teachers is that CRT cannot be achieved by only following a set of rules as culture is dynamic, evolving, fluid, and context-bounded (Milner, 2011; Nieto, 1999; Pennycook, 2005). Thus, authentic, culture-embedded learning contexts for pre-service teachers are needed in teacher education programs (Nieto, 1999). iReflectNow was designed to create such an environment where pre-service teachers have the opportunity to navigate through different cultural contexts in authentic, cultural case scenarios. Scaffolding features embedded in iReflectNow include (a) cultural case scenarios to trigger pre-service teachers' reflection, (b) customized prompts to boost reflection, (c) a video about CRT and a tutorial about critical reflection to provide expert modeling and background information to pre-service teachers, and (d) hints, displays, and text-based annotations to guide pre-service teachers during the reflection process. The design of iReflectNow is explained in detail in the following section.

Design of iReflectNow

First iteration. The goal of the first iteration was to design the reflection prompts. Four cultural case scenarios (Tippins, Koballa, & Payne, 2002) were given, and the reflection prompts were presented to pre-service teachers in a linear order without any adaptation during the case

scenario analysis. The prompts were designed based on the adjusted DATA (Describe- Analyze-Theorize-Act) model of reflection (Smith, Barlow, Peters, & Skolits, 2015). The prompts were designed based on the adapted phases from this reflection model (Smith et al., 2015): (1) *I detect the dilemmas/challenges*, (2) *I examine the context*, (3) *I plan my culturally responsive teaching*, and (4) *I act*. These phases were not explicitly shown to the pre-service teachers in the first iteration since the primary goal of the first iteration was to design and test the prompts as scaffolding features.

Although the findings from this iteration suggested that pre-service teachers mostly engaged in deeper reflection such as pedagogical and critical reflection (Larrivee, 2008) when guided by the prompts, they indicated that they found the prompts repetitive. During the interviews in this iteration the four pre-service teachers were asked to define a reflective teacher, and all of them explained a teacher's reflection process as reflection-on-action (Schön, 1987), looking back at previous teaching experiences and reflecting on them. The participants also acknowledged that teaching was dynamic, so reflection during teaching was challenging and required practice.

Another finding from the first iteration was that pre-service teachers may have difficulty in noticing the problem upon which to reflect (Fletcher, 1997; Cavanagh & McMaster, 2015) when the dilemma or problem in a case scenario was not clearly presented. The findings also indicated that the focus of the case scenarios should be on cultural elements and the content of the case scenarios needs to be updated based on current classroom settings to provide culture-embedded authentic contexts (Nieto, 1999) and a meaningful reflection process (Moore-Russo & Wilsey, 2014) to pre-service teachers.

Second iteration. In this iteration, iReflectNow was developed as a digital scaffolding environment into which videos/tutorials, text-based annotations, prompts, hints, and displays were embedded as scaffolding features in addition to the revised cultural case scenarios (Tippins, Koballa, & Payne, 2002) and prompts from the first iteration. Its aim was to simulate the dynamicity of diverse classrooms through cultural case scenarios to enable pre-service teachers to practice reflection-in-action in their future classrooms. To attain this goal, three sections were designed to align with the scaffolding functions in iReflectNow: "What is Critical Reflection?", "What is Culturally Responsive Teaching?", and "Practice Scenarios" (see Figure 4.1).

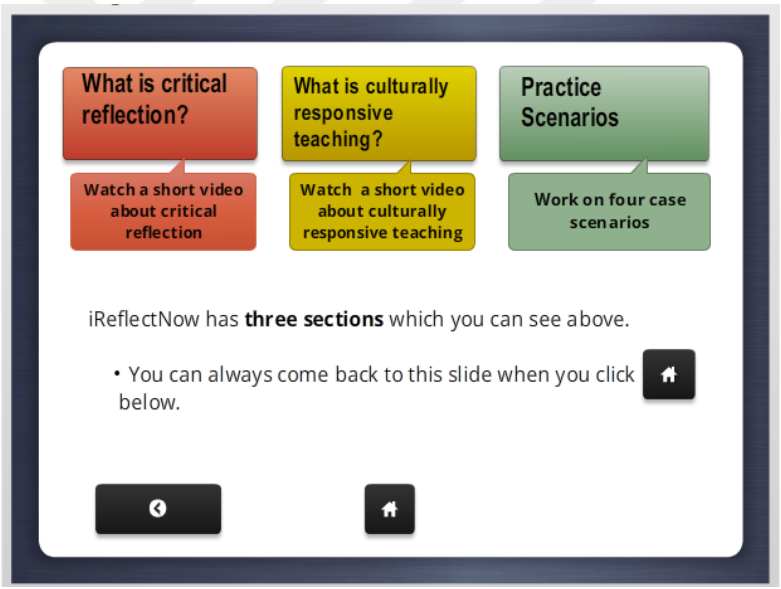

Figure 4.1. Screenshot of iReflectNow

Based on the design guidelines derived from a comprehensive literature review of teacher reflection, scaffolding, and CRT in Chapter 2 (Umutlu & Kim, under revision), three types of scaffolding were embedded in iReflectNow to enable pre-service teachers to reach deeper reflection for culturally responsive teaching: (1) *metacognitive* scaffolding via real-life cultural case scenarios and prompts, (2) *conceptual* scaffolding via expert modeling videos and tutorials, and (3) *procedural* scaffolding via displays, text-based annotations, and hints (see Table 4.1).

Table 4.1

Scaffolding Types Embedded in iReflectNow

Scaffolding type	**Goal of scaffolding/learning tasks**	**Scaffolding strategy**
Metacognitive	Pre-service teachers analyze the cases and detect the dilemmas or challenges.	Ill-structured cases
	Pre-service teachers are encouraged to reflect critically.	Prompts
Conceptual	Pre-service understand what is expected from them during critical reflection.	Tutorials about critical reflection
	Pre-service teachers get familiar with CRT.	Expert modeling videos of CRT
Procedural	Pre-service teachers are able to visualize their reflection process.	Displays during the case analysis (for reflection-in-action)
	Pre-service teachers stay focused on the cultural aspects of the case scenario.	Text-based annotations on the case scenarios
	Pre-service teachers make progress during their critical reflection about CRT.	Hints (presented during the case scenario analysis)

The iReflectNow design in this iteration was based on three design guidelines proposed in Chapter 2 (Umutlu & Kim, under revision) and the findings from the first iteration. The first design guideline focuses on activation of reflection process. Cultural case scenarios that include dilemmas and problems were used to encourage pre-service teachers to engage in the reflection process (Chitpin, Simon, & Galipeau, 2008; Dewey, 1933; Lundeberg, 1999). Based on the findings from the first iteration indicated above, the case scenarios #1, #3, and #4 (see Table 4.2) were revised to ensure authenticity and a focus on culture and diversity. For instance, the discussion about religion and skin color in the class was emphasized in the revised “Egyptian Exhibit” case scenario (see Appendix A for the full revised case scenarios).

Table 4.2

Summaries of the Revised Case Scenarios

The Day the Lobster Died ***Case scenario #1 (lobster)*** A fifth-grade teacher wanted to have a lobster cookout in class to wrap up the oceanography unit. It brought up the issue of how ethical cooking an animal is. Some of his students left the classroom immediately after he introduced the lobster as food.
El Secreto de las Ninas ***Case scenario #2 (shoebox)*** Cynthia and Jessica were homeless. For a project in their science class, their teacher wanted the students to bring empty shoeboxes. Cynthia and Jessica could not bring in shoeboxes, and they had to disengage themselves from the activity.
Who Eats the Rambutan? ***Case scenario #3 (rambutan)*** The student teacher, Kim, brought a variety of fruits to introduce different cultures to her third-grade students. Her students found these new fruits "gross" and didn't want to explore them. Kim's excitement turned into disappointment by the end of class.
The Egyptian Exhibit ***Case scenario #4 (exhibit)*** A first-grade teacher, Amanda, wanted Emily, one of her gifted students, to share her trip to an Egyptian Exhibit. The conversation turned out to be on how afterlife is considered in different religions. During this discussion about religion, an African-American student asked: "is that why your skin is so light because God made you out of sand?"

Prompts, an expert modeling video about CRT, and a tutorial about critical reflection were provided in iReflectNow to support pre-service teachers during their reflection (Sharma & Hannafin, 2007; Shin, Brush, & Glazewski, 2017; Wu & Looi, 2012). In the first iteration, the prompts had been designed according to Smith et al.'s (2015) reflection model. To increase their validity, the prompts were revised based on the literature about teaching in diverse classrooms

for the second iteration. In addition to the reflection model (Smith et al., 2015), several tenets of CRT, multicultural education, and teaching in diverse classrooms were addressed in the design of the prompts in the second iteration (see Table 4.3).

Parts of Banks and Banks' (2016) dimensions of multicultural education were integrated into the prompts to enhance pre-service teachers' understanding of CRT and encourage them to reflect critically. The dimensions suggested by Banks and Banks (2016, pp. 15-18) include: "(1) *content integration*, (2) *knowledge construction*, (3) *prejudice reduction*, (4) *equity pedagogy*, and (5) *empowering school culture and social structure*." Banks and Banks (2016) developed these dimensions to show teachers that multicultural education is not only about content integration, but also about various other factors beyond content.

The three tenets of culturally relevant pedagogy (Ladson-Billings, 1995, pp. 160-162) were also taken into consideration during the design of the revised prompts: "(1) *academic success*, (2) *cultural competence*, and (3) *critical consciousness*." As indicated by Ladson-Billings, culturally responsive teachers should aim for all students' academic success, develop cultural competence by being cognizant of several cultural elements that may be present in classrooms, and question consequences of their instructional practices that can go beyond classrooms settings.

Table 4.3

Revised Prompts for the Second Iteration

Aims	**Sample prompts**	**Research base**
Problem detection Cultural competence Equity pedagogy	Do you think cultural elements played an important role in the	Banks & Banks, 2016; Chitpin, Simon, & Galipeau,

	occurrence of these dilemmas/challenges?	2008; Griffin, 2003; Ladson-Billings, 1995
Context examination Content integration Academic success	Do you think Stan's instructional approaches were appropriate for the 5th grade students?	Banks & Banks, 2016; Ladson- Billings, 1995; Lundeberg, Levin, & Harrington, 1999; Smith et al., 2015
CRT planning Equity pedagogy Cultural competence	Do you think Stan's instruction was culturally responsive?	Aguirre & Zavala, 2013; Allen et al., 2017; Banks & Banks, 2016; Ladson-Billings, 1995
Act Knowledge construction Cultural competence Critical consciousness	In a diverse classroom, how would you introduce an animal as food that is accepted only in some cultures?	Banks & Banks, 2016; Kolb, 1984; Ladson- Billings, 1995; Smith et al., 2015

As mentioned earlier, the prompts in the first iteration were found to be repetitive. To avoid this repetitiveness and to increase the adaptiveness of iReflectNow, the reflection prompts were designed through *branching programming* (Crowder, 1960) in this iteration (see Table 4.4). Yes/no questions were added in between the open-ended prompts used in the first iteration. The goal of this redesign was to prevent participants from giving the same response to different prompts. For instance, the first prompt "What kind of challenges/ dilemmas do you observe that the teacher experienced in this case?" was followed by a yes/no question: "Do you think cultural

elements played a role in the occurrence of these dilemmas/challenges?" The response options were "Yes", "No", and "Not Sure." Each option presented another open-ended prompt to pre-service teachers (see Table 4.4). Based on the themes that emerged during the first iteration, the first two prompts about the problem detection and pre-service teachers' previous experience were kept the same for this iteration. These iterations based on linear and branching programming were needed to create a useful database for NLP in the future studies.

The video and tutorial provided in iReflectNow presented brief information about critical reflection and CRT. An 11-minute tutorial showed several aspects of critical reflection based on Larrivee's typology (2008), and a 5-minute CRT showcase video featured a culturally responsive school through teachers' narratives about how they apply CRT in their classrooms. The critical reflection tutorial video created by Denton (2014) was selected because it included introductory information to reflection dimensions with examples from teachers. The CRT showcase video (Public Consulting Group [PCG], 2012) demonstrated a school-wide implementation of CRT with classroom anecdotes. The content of the videos was aligned well with the scaffolding purpose of enabling expert modelling among pre-service teachers.

In the critical reflection tutorial, Larrivee's (2008) four types of reflection were described: first, in the pre-reflection, one example reflection entry from a teacher was shown. How the entry changed from one type to another type of reflection was also presented. In the CRT video, several teachers teaching different grades shared their CRT experiences, and related vignettes were included. The video was concluded with the summary of CRT principles that emphasize that classrooms should be welcoming to all students and students' cultures should be affirmed. The tutorial aimed to give background information about critical reflection to pre-

service teachers while the video was added to iReflectNow to provide expert modeling about CRT to them.

Table 4.4

Revisions for the Prompt Presentation

First iteration *(Sample Case Scenario: The Day the Lobster Died)*	**Second iteration**
a) Detect the dilemmas/challenges 1. What kind of challenges/dilemmas do you observe that the teacher experienced in this case? 2. Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Lobster case. **b) Examine the context** 3. In addition to giving the class opportunity to learn about lobsters, Stan thought it would be great experience to see and taste this "Down East" treat. Here, what are the teacher's assumptions about the students' cultural background? 4. What are your thoughts about the instructional approaches Stan used to introduce his grade 5 students to sociocultural practices common in another region of the country? **c) Plan your CRT action** 5. What could Stan have done differently to avoid the challenges/dilemmas in the case? 6. Taking diversity in classrooms into consideration, how would you justify the recommendations/solutions you described in the previous prompt? 7. In the case, Stan quickly reviewed his options. Should he continue with the class as planned? Should he run after the students who had fled the room? If you were Stan, what would you do at this point? Why? **8.** What lessons do you think you can draw from this case in terms of	**a) Detect the dilemmas/challenges** 1. What kind of challenges/dilemmas do you observe that the teacher experienced in this case? 2. Do you think cultural elements played an important role in the occurrence of these dilemmas/challenges? **Yes:** In addition to giving the class opportunity to learn about lobsters, Stan thought it would be great experience to see and taste this "Down East" treat. Here, what are the teacher's assumptions about the students' cultural background? **No:** What elements do you think played a role in the occurrence of these dilemmas/challenges? **Not sure:** What elements do you think played a role in the occurrence of these dilemmas/challenges? 3. Have you had similar experiences as a student, a teacher or a parent? Have your colleagues, friends, or relatives shared similar experiences with you? If so, describe how these experiences relate to the case scenario. **b) Examine the context** 4. Do you think Stan's instructional approaches were appropriate for the 5th grade students? **Yes:** Why do you think they were appropriate? **No:** Why do you think they weren't appropriate? **Not sure:** What do you think about Stan's instructional approaches? **c) Plan your CRT action** 5. Do you think Stan's instruction was culturally responsive?

teaching in diverse classrooms and/or introducing different cultures in class? **d) Act** 9. In what other ways, could the lesson have been designed to avoid or soften the issues raised by the introduction of an animal as food, which is considered as an edible animal in Asian cultures? 10. When Erin (a student) asked "What is its name?", Stan responded "We don't name our food, Erin." If you were Stan, how would you respond to that question?	**Yes:** Why do you think the instruction was culturally responsive? Please refer to the case scenario in your response. **No:** Why do you think the instruction was not culturally responsive? What do you think Stan could have done differently to avoid the challenges/dilemmas in the case? Please refer to the case scenario in your response. **Not sure:** How would you describe Stan's instruction? 6. If you were Stan, would you choose to continue with the class as planned? **Yes:** Why would you choose to continue the class as planned? **No:** Why would you choose not to continue the class as planned? What would you do instead? **Not sure:** If you continue with the class, what would you do so? And, if you choose not to continue, why would you do alternatively? 7. What lessons did you learn from this case in terms of teaching in diverse classrooms and/or introducing different cultures in class? **d) Act** 8. In a diverse classroom, how would you introduce an animal as food that is accepted only in some cultures? 9. Do you think introducing different cultures in class is challenging? **Yes:** Why is introducing different cultures in class challenging for you? **No:** Why isn't introducing different cultures in class challenging for you? **Not sure:** What do you think about introducing different cultures in class? 10. When Erin (a student) asked "What is its name?", Stan responded "We don't name our food, Erin." If you were Stan, would you respond to that question in the same way? **Yes:** Why do you think it is appropriate to respond in this way? **No:** Do you think the response is not appropriate? Why not? **Not sure:** If you were Stan, how would you respond to that question?

Another way to prevent pre-service teachers from giving the same responses to different prompts is to guide them via visuals and templates during the reflection and case scenario analysis processes (Davis & Linn, 2000; Lai & Calandra, 2010; Leelawong & Biswas, 2008; Naidoo, 2012; Nolan, 2008). In the second iteration, some visuals were added to iReflectNow as procedural scaffolding. For instance, the phases of the reflection model used to design the prompts were presented to pre-service teachers in iReflectNow in this iteration: (1) I detect the dilemmas/challenges, (2) I examine the context, (3) I plan CRT, and (4) I act (see Table 4.3 and Figure 4.2).

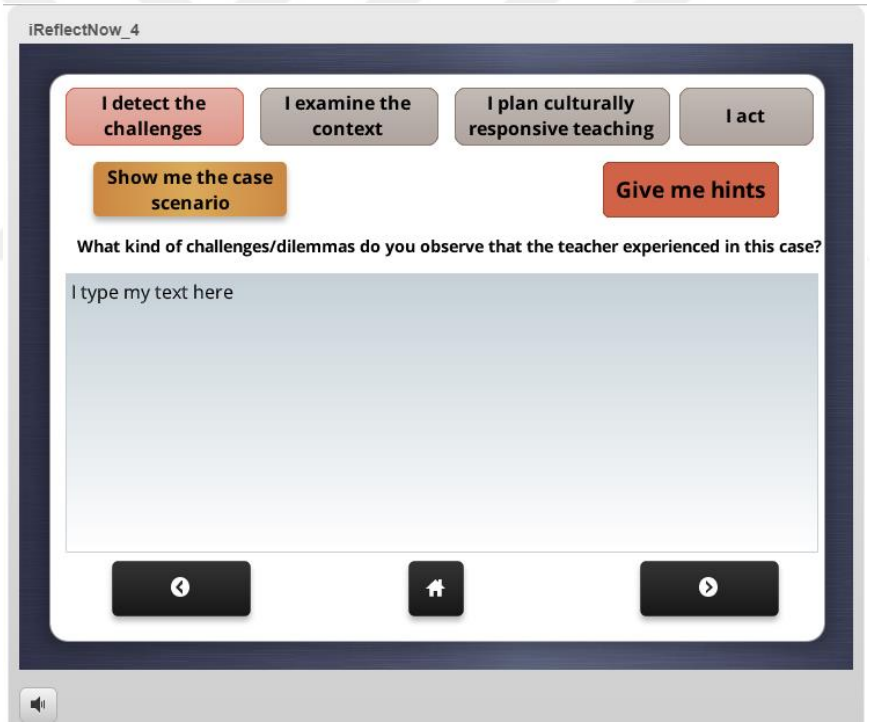

Figure 4.2. Screenshot of the reflection phases in iReflectNow

Sustaining deep reflection is also important to the process. To achieve this, textual annotations (Shin, Brush, & Glazewski, 2017), and hints (Belland, Glazewski, & Richardson, 2008; Oliver & Hannafin, 2000) about the case scenarios were embedded within iReflectNow (see Figure 4.3). The intended goal of adding these features into iReflectNow was to provide

support to enable pre-service teachers to detect the dilemma in a case scenario more easily and to stay focused on the cultural aspects of case scenarios. Table 4.5 shows the revisions made in the design of iReflectNow from the first to the second iteration.

Stan thought his idea to end oceanography unit with a "lobster cookout" deserved a self-congratulatory pat on the back. He knew that lobster was not readily available and that most of his students would not have had an opportunity to see or taste this "Down East" treat. He thought the activity would give the class an opportunity to learn not only about lobsters but also about how a marine animal can shape the economy, life, and identity of a region. It reflected the interdisciplinary approach to teaching he favored. He had searched his kitchen to find lobster artifacts collected over years – everything from a bib with the saying "The lobster you eat today spent the night in Casco Bay" to the mallets, shell cracker, and tiny forks for getting at the lobster claw meat. His enthusiasm was high enough to sustain the two-hour drive to Atlanta where he could buy live lobster.

Stan was a fifth-grade teacher in a small university town in southeastern United States. He was born and raised in New England and, before coming to this rural school, had taught in suburban school district outside of Boston for four years. He had come south to enroll in the graduate program of the nearby university. To establish residency, he had decided to teach in the local school system while taking evening classes. He had a master's degree in elementary education with an emphasis in science education.

Stan had started the lesson by showing the class a carefully wrapped box with ribbons and a bow saying, "I would like to make some observations about the box." He had placed the lobster in the box and wrapped it before the class arrived. He wanted to reinforce students' inquiry skills in making distinctions between observations and inferences. Stan believed that basic process skill of observing was central to teaching science at this level. He wanted students to be able to distinguish between observed and inferred information.

Student attention focused on the shoe size box wrapped in gift paper. Enthusiastic student responses followed one after another: "There is a toy present inside!" "It has a red ribbon around it!" "It is about the same size as a shoe box." "I can hear something moving inside!" Stan wrote the students' responses on board. After the class discussed differences between observations and inferences, whether anyone could now identify which statements on the board are observations. Students were quick to eliminate guesses and identify observations. Stan then asked them for some inferences about what might be in the box. To make it more challenging he told the class they could ask only questions that he could answer with a yes or no. "Is it a plant?" "No," Stan replied, "It is not a plant." The class excitement began to build after he answered "Yes" to "Is it an animal?" The next series of questions were wild inferences about what it could be based on the size of the box. Finally, a student asked, "Does it have a backbone?" "No, it doesn't, but it is a great question." Stan responded. He pleased with the level of questions that followed. After exhausting all of the students' questions, Stan slowly unwrapped the gift box, opened it, and held up the lobster. "Oh, it's a lobster! But I thought lobsters were red. This one is green!" one student exclaimed. "What's its name?" With a smile, Stan responded, "We don't name our food, Erin." The door slammed shut after the second student dashed from the room following Erin's lead. The door slammed shut after the second student dashed from the room following Erin's lead.

Teacher's rationale of designing this activity is presented.

This statement provides school **context** in terms of location.

Teacher's educational and professional background is

Teacher's beliefs and assumptions about teaching science are provided.

This is the moment the **dilemma** is presented.

Figure 4.3. A sample case with annotations

The hints included additional information about the dilemmas in the case scenarios. Sample hints for the case scenario #1 (the scenario in Figure 4.3) included "One of the main focuses of the scenario is ethical treatment of animals. The other one is about cultural practices"

and “While sea animals are considered as food items in some cultures, they are only animals in some other cultures.”

Table 4.5

Revisions made in iReflectNow

First Iteration	Second Iteration	Redesign Rationale
Original Case Scenarios	*How Case Scenarios have been revised*	In the 1st iteration, participants
1. The Day the Lobster Died	1. Shortened to keep the focus on the ethical treatment of animals	• focused more on the fleeing students rather than cultural and ethical aspects of treating a lobster as food
2. El Secreto de las Ninas	2. No revisions made	• found this scenario most applicable to today’s classroom settings
3. Who Eats the Mango?	3. The fruit names have been changed to make that fruits are unfamiliar to students more salient	• had difficulty in detecting the challenge about unfamiliar fruits in this scenario
4. The Egyptian Exhibit	4. Shortened to keep the focus on the religion and skin color discussion	• focused more on the phone conversation with the parent
Prompts were presented in a linear order	Prompts will be presented via branching programming	• In the 1st iteration, participants found the prompts repetitive • Increasing prompt adaptiveness is aimed via branching programming or presentation (Crowder, 1960)
No information about critical reflection and CRT was provided	Presentations and tutorials have been added to provide some information about critical reflection and CRT	• To enable pre-service teachers to see what is expected (Sharma & Hannafin, 2007; Shin et al., 2017)

No visual displays, templates, textual annotations, or hints were provided	Visual displays, templates, textual annotations, and hints have been added	• To provide procedural scaffolding during the reflection process (Lai & Calandra, 2010; Oliver& Hannafin, 2000; Shin et al., 2017)

Methods

Research Design

This study is the second iteration of an educational design-based research study series. In educational design-based research, an instructional intervention is developed and refined through iterations of data collection and analysis (Bakker, 2018; Bradley & Reinking, 2010). Findings from the first iteration (Chapter 3) informed how iReflectNow should be revised for this iteration (see Table 4.5). A case study research design (Yin, 2018) was employed in this study to provide an in-depth understanding of (1) how pre-service teachers' reflection evolved during and after using iReflectNow and (2) how they used scaffolding features embedded in iReflectNow. Multiple data sources such as written reflections, screen recordings, synthesis papers, and in-class case discussions were examined to identify patterns and themes that may inform how pre-service teachers' reflection for CRT can be scaffolded.

Context of the Study

iReflectNow was implemented in a teacher education course at a major public southeastern university in the United States. The course was a 3-credit required science methods one titled Science for Early Childhood and Elementary Education, which was the same course as the one in the pilot study. It was taught by the same instructor but in spring 2019 semester. The class met for 3 hours every week. The study lasted 9 weeks in total. The study started with the introduction of iReflectNow, followed by pre-service teachers completing and analysis of cultural case scenarios between the class sessions. Pre-service teachers were given the case

scenario #2 (see Table 4.2) in Week 2 and had time to analyze it in iReflectNow until the Week 4. In Week 4, the pre-service teachers had in-class case discussions on case scenario #2. There was also a group of case discussion leaders for each case scenario. Each case discussion leader submitted a synthesis paper to the course instructor after the in-class case discussion. Pre-service teachers were asked to integrate their learning from case scenarios with their own teaching beliefs and philosophies in their synthesis papers. Prompts, such as "If you taught a context similar to the one in the lobster case scenario, how would you design your last lesson to end the oceanography unit? Please refer to the case scenario and also consider the curriculum standards and students' engagement in the lesson" were given to the pre-service teachers to guide their synthesis paper writing. Evaluation rubrics for these activities and assignments were developed in collaboration with the course instructor. The written reflection responses in iReflectNow were considered reflection-in-action in this study as they occurred during the pre-service teachers' analysis of the cultural case scenarios. The pre-service teachers completed synthesis papers and case scenario discussions after they analyzed the case scenarios in iReflectNow.

Participants and Sampling

The Institutional Review Board (IRB) approved the study. On the first day of classes (week 1), the first author visited the class and introduced both the study and iReflectNow. All 25 female students in the science methods course agreed to participate in the study by signing the consent form. They were all in Block 3 (or semester 3) in their program when the study was conducted. Each block represents one semester in their major, and there are four blocks in total in their program (Early Childhood and Elementary Education). In Block 3, pre-service teachers usually start their field experiences after completing their observation and practicum experiences

in Blocks 1 and 2. All participants analyzed the four case scenarios (see Table 4.2) in iReflectNow.

Purposeful criterion sampling (Patton, 2002) was used to identify the cases among the participants for this qualitative multi-case study. Purposeful sampling is used in qualitative research as information received from participants enables the researcher to gain in-depth and insightful understanding of the research topic or phenomenon (Patton, 2002). Purposeful criterion sampling can be defined as selecting participants or "information-rich cases" based on specific criterion to reach in-depth understanding of the research problem (Patton, 2002, p. 230).

Cases for interviews were selected purposefully to reach out to key informants for the focus of inquiry within the context of the study (Maxwell, 2008). A combination of multiple criteria was used to select cases: (1) how they used the scaffolding features (case scenarios, prompts, videos, annotations, displays, and hints) in iReflectNow to examine how a variety of ways of scaffolding use may shape their reflection, (2) quality of their written reflections across the case scenarios to examine how their reflection occurred, (3) their own ethnic background and previous field experiences in diverse classes to see how these shape their reflection, and (4) how they participated in in-class discussions to explore how they reflect after completing each case scenario in iReflectNow. As a result, five cases were selected for this study: Anna, Beth, Hailey, Leslie, and Sarah. All names are pseudonyms. Table 4.6 shows each case according to the selection criteria; a more in-depth description of each participant is provided below.

Table 4.6

Selection Criteria for Each Case

	Selection Criteria			
Case	**Scaffolding Use**	**Reflection Quality**	**Background**	**Discussion Participation**
Anna	used all the scaffolding features.	In-depth reflection	White Pre-K and 1st grade	Active participation
Beth	did not view and use the hints across the case scenarios.	Surface-level reflection	White Pre-K and 1st grade	Active participation
Hailey	did not watch the videos across the case scenarios.	Surface-level reflection	White Pre-K and K	No participation
Leslie	used all the scaffolding features.	In-depth reflection	Latina Pre-K and 5th grade	Active participation
Sarah	did not view and use any of the scaffolding features.	Surface-level reflection	White Pre-K and 1st grade	Active participation

Anna was from the southeastern U.S. Anna indicated her previous placement was in a classroom of students from various backgrounds, socioeconomic status, races, religions, and perspectives. Anna was placed in a 5th-grade class for her field experience at School A at the time of the study.

Beth was originally from the northwestern U.S. and had been living in the southeastern region for a long time by the time of the study. Beth indicated that she was in a school that was almost equal amounts of white, African American, and Hispanic students in her Block 1 placement. In Block 2, Beth indicated that about half of the students were Hispanic and able to

speak both English and Spanish. Beth was placed in a 3rd-grade class for her field experience at School B at the time of the study.

Hailey was from the southeastern U.S. Hailey indicated she had not been previously placed in diverse classrooms. Hailey also acknowledged that the science methods course was the first course she took relevant to her major. Hailey was placed in a 2nd-grade class for her field experience at School A at the time of the study.

Leslie was born in Central America and moved to the southwestern region of the U.S. at the age of six. Leslie shared that she recognized the value of being placed into diverse classrooms. Leslie indicated that her different field placements exposed her to a lot of diversity. Leslie was placed in a 2nd-grade class for her field experience at School A at the time of the study.

Sarah identified herself as a science nerd. In her Block 1 and 2 field experiences, Sarah indicated she was placed in classrooms that consisted of mainly diverse students. Sarah was placed in a 5th-grade class for her field experience at School C at the time of the study.

Data Collection Procedures

This study included multiple data sources: (1) "Getting to Know You" survey, (2) written reflections for the case scenarios, (3) screencasts of pre-service teachers' computers during their use of iReflectNow, (4) video recordings of the in-class case scenario discussions, (5) synthesis papers, and (6) interviews. Data collection for this study lasted 9 weeks (see Figure 4.4).

In Week 1, "Getting to Know You" surveys (see Appendix A) were given to participants to get information about them including their background and their previous field experiences in diverse classrooms (see Figure 4.4). Sample items in the survey include "Have you ever taught or had field experience and/or student teaching in a diverse classroom? If yes: Describe your

previous experience with teaching in a diverse classroom." and "Describe your experiences and background, i.e. your family structure, where you were born and grew up, parents' occupations." In Week 1, a 30-minute presentation was also given to the participants to introduce iReflectNow.

In this iteration, the length of the study was prolonged to create a more meaningful learning environment for reflection based on the course instructor/co-designer's recommendation. While the pre-service teachers were asked to reflect on the case scenarios every week in the first iteration, they were asked to use iReflectNow every other week and given two weeks to reflect on the case scenarios in this second iteration. Accordingly, participants' written responses to the prompts during the case analyses for each case were collected every other week via iReflectNow from Week 2 to Week 8 (see Figure 4.4).

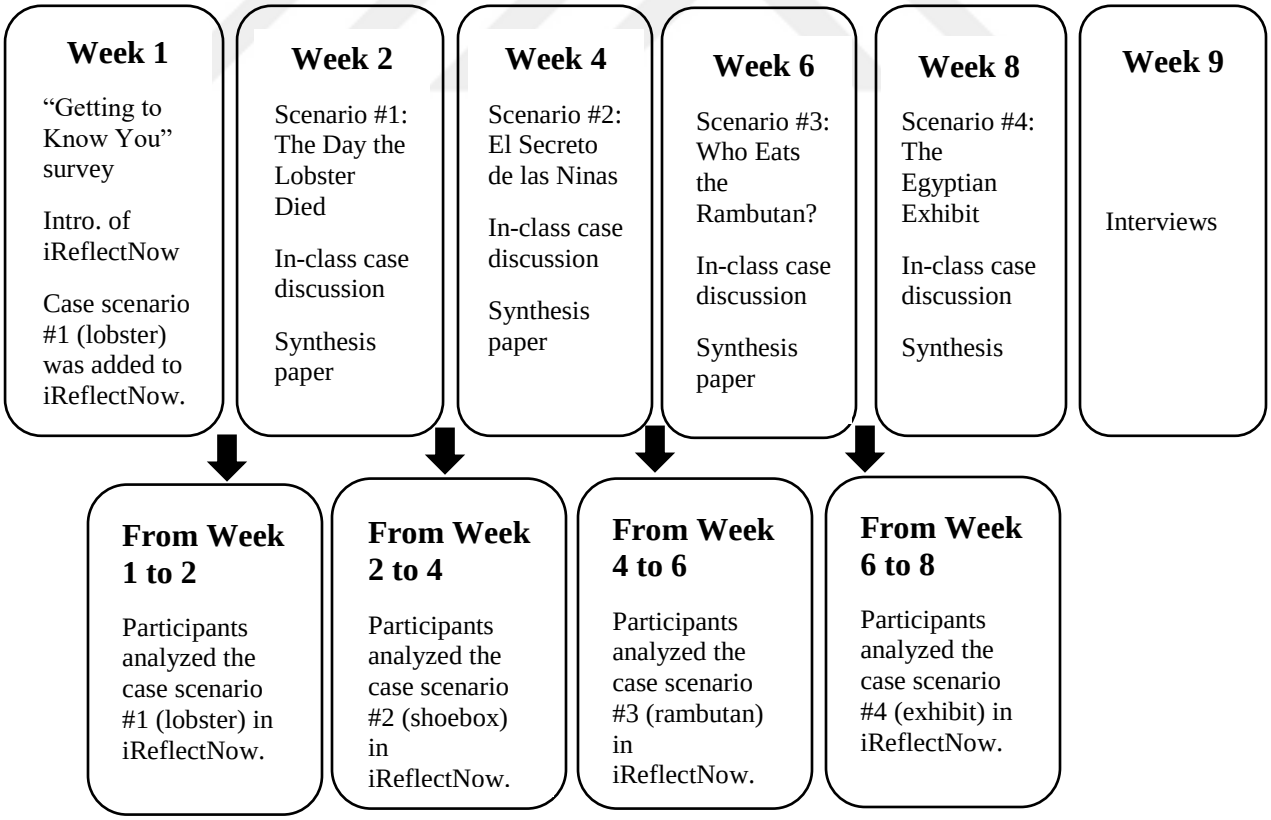

Figure 4.4. Data collection procedure of the study

Participants were also asked to record their computer screens via a screencast tool to keep track of the scaffolding features they used while analyzing the given case scenarios in iReflectNow. After being engaged in iReflectNow, each case discussion leader for that week's scenario was asked to write a synthesis paper and bring it to the class for case discussions in class. The prompts given for the synthesis paper were also revised and customized for each case scenario in this iteration (see Table 4.7). This revision was implemented based on the course instructor/co-designer's input to provide a more meaningful reflection process for participants while writing the paper.

Table 4.7

Revision of Synthesis Paper Prompts

Synthesis Paper Prompts	
First Iteration	**Second Iteration** *(Sample Case Scenario: The Day the Lobster Died)*
How do you think pedagogy, curriculum based on standards, and a teacher's own beliefs-values are connected to each other? Based on these three components, what is your teaching philosophy? Discuss it briefly.	If you taught a context similar to the one in the lobster case scenario, how could you design your lesson to end the oceanography unit? Please refer to the case scenario and also consider the curriculum standards and student engagement in the lesson.
How would you envision yourself providing inclusive and meaningful learning environments in your future classes with learners who have different needs?	What do you think about the (dis)connection between Stan's pedagogy and his own beliefs and values about science teaching? In your response, please also discuss your teaching philosophy briefly regarding your beliefs and values about science teaching.

If you experienced a dilemma similar to the one of the cases we have discussed so far, how would you balance your accountability (that is, your following of the curriculum and standards strictly) and your students' welfare (that is, they enjoy the activities you prepare for the class)?	How would you envision yourself teaching in diverse classrooms in the future?

During the Weeks 2-8, the in-class case discussions were video-recorded. In Week 9, the participants were invited to attend semi-structured, artifact-based 30-minute interviews (see Table 4.8). The interviews were intended to gain a more in-depth understanding (Edwards & Holland, 2013; Turner III, 2010) of pre-service teachers' reflection processes for CRT and to find insightful answers to the research questions.

Table 4.8

Interview Questions

Questions on pre-service teachers' learning to reflect
1. Tell me about your learning experience in iReflectNow.
2. What did you learn from the case analyses in iReflectNow?
2.1. What did you learn about yourself as a future teacher from the case analyses and discussions?
3. How did taking the prompts during the case analysis in iReflectNow work for you? (Please refer to the responses you provided in iReflectNow.)
3.1. Which prompt(s) do you think is the most useful? Why?
3.2. Which prompt(s) do you think is the least useful? Why
4. What is your take-away from your learning experience in iReflectNow?
Questions on pre-service teachers' use of the scaffolding tools
5. What do you think about the sections about critical reflection and CRP in iReflectNow? Tell me about your learning from those sections.
5.1. How do you think they interacted with your case analyses and reflection process?
6. What do you think about the visuals provided in iReflectNow?
6.1. How do you think they interacted with your reflection process?
7. What do you think about the annotations in the case scenarios in iReflectNow?
7.1. How did the information provided via the annotations work for your case analyses?

7.2. How do you think they interacted with your reflection process?
8. What do you think about the hints given during the case analyses in iReflectNow?
8.1. How did the information provided via the hints work for your case analyses?
8.2. How do you think they interacted with your reflection process?
9. Which tool (e.g. tutorials about critical reflection and CRT, prompts, visuals) do you think was the most useful during your reflection process?
9.1. You mostly used _____ scaffolding tool. Why did you prefer it mostly?
Questions on pre-service teachers' reflection for CRT
10. In one of your responses, you mentioned that …….? Why do you think …..?
10.1. If you could go back to your response and change it, what would you do?
11. Would you describe yourself as a teacher in your future classroom with diverse cultures?
12. What does "being culturally responsive in teaching" mean to you?
13. What impact do you think reflection has on becoming a culturally responsive teacher?

Note. These are semi-structured questions. Some questions were not asked depending on responses. Some different follow-up questions were asked.

During the second iteration, the interview questions were designed to gain insights about how pre-service teachers used the scaffolding features in iReflectNow, how their learning to reflect occurred in iReflectNow, and how their reflection evolved when and after they used iReflectNow (see Table 4.8). The first author brought participants' written reflections created in iReflectNow to the interviews and asked related questions such as: (1) "In one of your responses, you mentioned that …….?," (2) Why do you think …..?," and (3) "Which prompt(s) do you think is the most useful? Why?" Table 4.9 shows which instrument yielded data for each research question.

Written reflections were used as data to explore how the pre-service teachers' reflection evolved *when* they analyzed the case scenarios in iReflectNow whereas case scenario discussions and synthesis papers were examined to see how their reflection evolved *after* they completed analysis of the case scenarios in iReflectNow. As described earlier, this also aligns with how these reflections were regarded in this study in terms of timing of reflection. The pre-service teachers were scaffolded to engage in reflection-in-action while providing reflective responses to

the prompts (written reflections) in iReflectNow. They were asked to reflect on the case scenarios in the discussions and synthesis papers.

Table 4.9

Data Matrix

Research Question	Data source
1. How does pre-service teachers' reflection for CRT evolve when and after they engage in iReflectNow and the related in-class activities?	Written reflections Videos of in-class case discussions Synthesis papers Interviews
2. How do the scaffolding features embedded in iReflectNow support the evolution of pre-service teachers' reflection about culturally responsive teaching?	Written reflections Screencasts (Log data) Interviews

Data Analysis

Before the analysis, the first author transcribed all the videos of in-class discussions and interviews. Data was coded using *QSR NVivo* software (version 12). A combination of thematic analysis (Braun & Clarke, 2006) and content analysis (Mayring, 2000) was employed to examine the patterns and themes that emerged from the dataset, with the exception of surveys and screencasts. The first author completed two cycles of coding (Saldaña, 2013). First, initial coding (Saldaña, 2013; Thornberg & Charmaz, 2014), which is open-ended approach to data, was conducted to examine all emergent patterns within the data. In this initial coding, the first author implemented *in-vivo* and *gerund coding* (Saldaña, 2013), coding the data by using the actual

words uttered by the participants. A hybrid approach was employed for the data analysis of this study. This cycle generated 112 codes.

In the second cycle, the first author used focused coding (Saldaña, 2013), coding the data by taking the research questions of the study into consideration to identify "thematic or conceptual similarity" (Saldaña, 2013, p. 209) across the coded data in the first cycle. This cycle yielded 73 codes through refinement of the codes from the first cycle. The first author created a codebook of the study and shared it along with the NVivo file with two researchers. One of the researchers is a full professor with expertise in qualitative research and regularly teaches qualitative research methods, and the other researcher is an associate professor with extensive research experience using both qualitative, quantitative, and mixed methods in the fields of teacher education and learning technologies and design. After reviewing the codes and the coding scheme, the first author initially discussed and refined the codes with the full professor and then with the associate professor independently and reached a consensus (see Appendix H for the Audit Trail). As a follow-up to this consensus, the first author updated the codebook and changed some coding based on the updated codebook which included the agreed-upon codes and the coding scheme (see Appendix I). Following this, both researchers reviewed the updated codebook again.

"Getting to Know You" surveys were analyzed descriptively. Out of 25 pre-service teachers, 14 participants recorded their screens during their use of iReflectNow. Log data from screencasts indicating which scaffolding tools participants used in iReflectNow in each case scenario and how much time they spent on each case scenario were also analyzed descriptively. Table 4.10 shows the data analysis of the study.

Table 4.10

Data Analysis

Data Source	Data Analysis Method
"Getting to Know You" surveys	Descriptive analysis
Written reflections, synthesis papers, videos of in-class discussions, interviews	Thematic analysis & Content analysis
Screencasts	Descriptive analysis of iReflectNow log data

Credibility/Trustworthiness. A codebook that mainly included data-driven codes was created. The codebook was generated to ensure that the qualitative data analysis was systematic. To minimize the first author's subjectivity as a researcher and as the designer of iReflectNow, researcher triangulation (Creswell, 2007) was employed. The first author worked with the two professors in coding qualitative data. Thick descriptions during data analysis (Patton, 2002) were also used to address trustworthiness. Thick descriptions were created to allow readers to see participants' actual statements to support interpretations made.

Findings and Discussions

Both *within-case and cross-case analytic strategies* (Ayres, Kavanaugh, & Knafl, 2003) were employed to examine the patterns emerging from the data and determine themes and subthemes. As the research questions focused on evolution of pre-service teachers' reflection for CRT and how they used scaffolds in iReflectNow, comparisons within each case and across the cases (Ayres et al., 2003) were made to see how their reflection changed through scaffolding. The findings below include data from "Getting to Know You" surveys, their written reflections in iReflectNow, in-class case discussions, synthesis papers, descriptive log data from the

screencasts, and interviews. First, findings from within case analyses for both research questions and then cross-case analysis are presented.

Within-Case Analysis

How the pre-service teachers' reflection evolved was examined in terms of depth of their reflections. Previous research shows that in-depth, critical reflection is needed for effective implementation of CRT in classrooms (Allen et al., 2017; Howard, 2010). CRT aspects the pre-service teachers identified in their reflections were examined in the data. In-depth, critical reflection is defined as teachers' examining and questioning consequences of their teaching practices beyond the classroom settings and in broader contexts (Larrivee, 2000, 2008; van Manen, 1991). Within the context of this study, depth refers to whether the pre-service teachers identified the CRT aspects that were not explicit in the case scenarios and in the prompts. During their reflection processes supported through several scaffolding features in iReflectNow, the five pre-service teachers referred to different CRT aspects of the given dilemmas and challenges in the case scenarios. Table 4.11 shows the CRT aspect that emerged from the pre-service teachers' written reflections in iReflectNow, synthesis papers, or in-class discussions were explicitly presented in the case scenarios or made salient via the prompts.

Table 4.11

Explicit CRT Aspects

Case scenario	Explicit CRT aspect
#1 (lobster)	*Students' feelings matter:* "Pandemonium broke loose as some students hooted, hollered, and laughed while others sat in stunned silence." (From the case scenario)
#2 (shoebox)	*No tolerance for stereotyping:* "Do you think the girls' utterances such as "I also don't like it when boys think that they are better than me"

	and "..when we complain about science in school, people think we don't like it because we are girls.." (Tippins, Koballa, & Payne, 2002, p. 148) include cultural implications? Yes: How would you handle this kind of gender-based stereotyping in your future classrooms?" (one of the prompts for the case scenario)
#3 (rambutan)	*Introducing new cultures by making connections:* At this point in the lesson (after introducing and removing the familiar fruits and vegetables from the table), Kim introduced some new and different plant parts and challenged them to identify them as fruits or vegetables. Kim had brought longan, rambutan, papaya, fennel, and collard greens. She showed these edible plant parts to the students and asked for group volunteers to explore these new and strange-looking specimens.
#4 (exhibit)	*Teachers' need to be unbiased and neutral:* One of the prompts given for this case scenario "Were Amanda's (the teacher) beliefs evident in her discussion with the children?" made this CRT aspect explicit.

Anna. Anna's reflection was in-depth across the case scenarios in that she identified both implicit and explicit aspects of CRT in all the case scenarios. That is, her reflection remained the same across all case scenarios (see Figure 4.5). Screencasts indicated that Anna used all the scaffolding features embedded into iReflectNow and she responded to the prompts fully. Anna watched the videos about CRT and critical reflection, viewed and used text-based annotations, hints, and displays in her reflections. The data indicate that her use of multiple scaffolding features aligns with the nature of her reflection. Anna also actively participated in the in-class case scenario discussions.

As described earlier, each case discussion leader was assigned to write a synthesis paper about one of the case scenarios. Anna wrote her synthesis paper about the case scenario #1 (lobster). As indicated in her "Getting to Know You" survey, Anna hoped to provide love and consistency for each student in her future classrooms. In the survey, she also stated, "I was

placed in diverse classrooms of students from various backgrounds, socioeconomic statuses, races, religions, and perspectives for my previous field experiences."

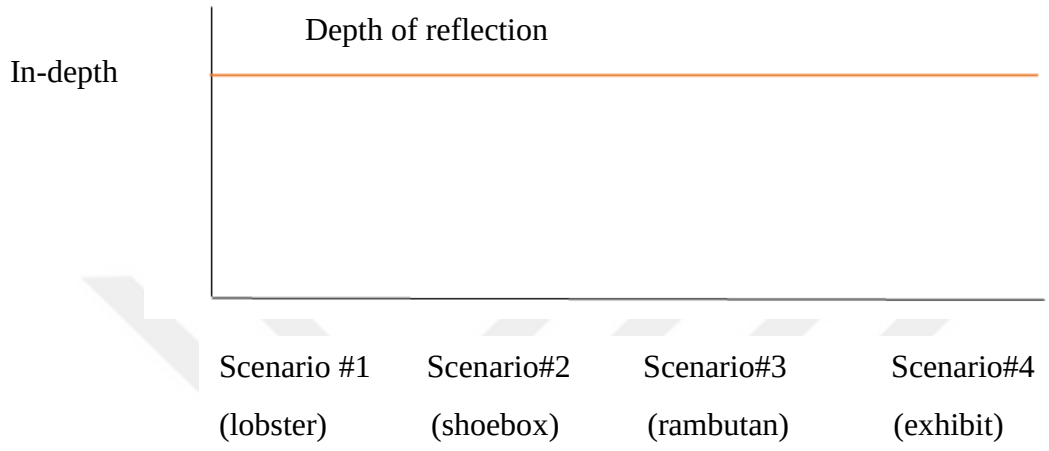

Figure 4.5. Evolution of Anna's reflection

In-depth reflection across all the case scenarios. Anna reflected on the CRT aspects that were not only salient but also implicit in the case scenarios. Implicit CRT aspects were ones not presented in the case scenarios and via the prompts. The aspects she identified, such as ethical concerns about the lobster cookout in the case scenario #1 (lobster), ensuring equal access to learning in the case scenario #2 (shoebox), affirming and valuing diversity in the case scenario #3, and teachers' acknowledging their own values and beliefs in the case scenario #4 (exhibit) were implicit CRT aspects (see Table 4.12).

Table 4.12

Aspects of CRT Anna Identified

	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (rambutan)**	**Case scenario #4 (exhibit)**
Teachers should know their students	✓	✓	✓	✓

Teachers should not make any assumptions	✓	✓	✓	✓
Students' feelings matter	✓	✓	✓	✓
Teaching strategies to create culturally responsive classrooms (specific to the given scenarios)	✓	✓	✓	✓
Ethical concerns occur*	✓			
Equity for all		✓		
Equal access to learning for all*		✓		
No tolerance for stereotyping		✓		
Introducing new cultures by making connections			✓	
Affirming and *valuing* diversity*			✓	
Affirming diversity			✓	✓
Teachers should first acknowledge their own beliefs and values*				✓
Teachers need to be unbiased and neutral				✓

Note. * indicates implicit CRT aspects which were not salient in the case scenarios and were not made salient via the prompts.

As indicated above, Anna identified both implicit and explicit CRT aspects in the case scenarios. In the case scenario #2 (shoebox), for instance, two homeless girls could not do the camera activity in a science class because they could not bring empty shoeboxes to the class. Anna commented in iReflectNow on how to provide *equity for all*, an explicit aspect, in classrooms by stating: "It's important to strive for equity in classroom and the first step is recognizing the inequality and injustices that affect our children. We cannot ask the same thing from each and every one of them and expect the same result" as a response to the prompt, "What lessons do you think you can draw from this case in terms of teaching diverse students?"

In the case scenario #4 (exhibit) where a religious conversation occurred, Anna stated that teachers should be unbiased by acknowledging their own beliefs and values to create inclusive and culturally responsive classrooms. She responded as “Not sure” to the prompt “Were Amanda’s beliefs evident in her discussion with the children?” In her response to the next prompt “What do you think about Amanda’s responses in her discussion with the children?” she referred to Amanda’s (the teacher in the case scenario) nod and critiqued her approach. Anna stated, “Throughout the conversation, Amanda did not overtly express her own personal beliefs and opinions to the students, but she also did not respond in a way that showed she did not align with the Christian upbringing of Emily [the student].” Anna further commented on Amanda’s (the teacher in the case scenario) nod in her response and stated that teachers need to be cognizant of their own beliefs, as well: “Rather than addressing the topics or steering the conversation in a more relevant direction, she simply nodded. This could have sent very many mixed signals to her students regarding her personal beliefs in relation to Emily's beliefs.”

While equity for all was an explicit aspect in the case scenario #2 (shoebox), teachers’ acknowledging their own beliefs in the case scenario #4 (exhibit) was not. Anna’s identifying both implicit and explicit aspects may suggest that her reflections were in-depth.

Thorough use of scaffolding aligned with the nature of reflection. Anna viewed and used all the scaffolding features (videos, prompts, annotations, hints, and displays) in iReflectNow. As described earlier, she responded to the prompts fully. During the interview, Anna acknowledged that the prompts helped her not only to narrow down into specific topics, but also to take different perspectives into account. She also indicated during the interview, “The case scenarios in iReflectNow showed me examples from real classrooms.” Anna’s screen casts show that she watched the video about CRT and the tutorial about critical reflection only before

starting to analyze the case scenario #1 (lobster). During the interview, she stated she had not needed to watch them again for each scenario as the videos were the same for all the case scenarios. Table 4.13 shows which scaffolding features Anna used for each scenario.

Table 4.13

Scaffolding Features Anna Used for Each Case Scenario

Scaffolding features	**Scenario #1 (lobster)**	**Scenario #2 (shoebox)**	**Scenario #3 (rambutan)**	**Scenario #4 (exhibit)**
Prompts	✓	✓	✓	✓
Videos	✓	-	-	-
Annotations	✓	✓	✓	✓
Hints	-	✓	✓	✓

For instance, prior to the case scenario #1 (lobster), Anna watched the videos about critical reflection and CRT that were embedded into iReflectNow as scaffolding features. In the video about critical reflection, it was described as reflection beyond the classroom settings. The video about CRT shows that culturally responsive classrooms should be safe, welcoming, and caring for all students. Anna commented on ethical aspects of the lobster cookout and how important students' feelings are in their learning in her reflection in iReflectNow. Anna continued to point out potential affective consequences of the lobster cookout in her synthesis paper, "It is quite possible that Stan's personal pedagogy emphasizes hands-on learning and exploration, but the message this scenario sent to the students was not culturally responsive and could be seen as offensive and emotionally distressing to many of his students." In the in-class case scenario discussion, Anna further acknowledged that every student deals with their emotions differently:

> A lot of kids deal with their emotions differently. That could have been emotionally distressing for more than just those two kids. Um, they just didn't show it the same way. So that's why I liked just stopping the situation first and asking, “How do you feel like who's comfortable with this?”

Anna’s emphasis on the affective aspects of learning and ethical issues in the case scenario #1 (lobster) (see Table 4.12) suggests that the videos highlighted the need to see not only explicit aspects but also implicit aspects of CRT and helped her engage in in-depth reflection. This also aligns with Anna’s comment on the videos provided in iReflectNow during the interview. She stated that the videos showed her what critical reflection and CRT looked like. Anna’s reflections provide evidence that the videos were a useful scaffold for her reflection.

Beth. Beth’s reflection remained the same across all the case scenarios. Her reflection was surface-level across the case scenarios (see Figure 4.6). That is, she did not identify any implicit CRT aspects in any of the case scenarios. Screencast of her use of iReflectNow indicated that Beth used all the scaffolding features except hints. She responded to all the prompts for almost all case scenarios, and her responses were short, usually three to four sentences. Beth watched the videos and viewed and used annotations and displays in her reflections. Her consistent avoidance of hints seems associated with her surface-level reflection.

Recordings of the class discussions indicated that Beth actively participated in the in-class discussions for each case scenario. As one of the case discussion leaders, Beth wrote a synthesis paper for the case scenario #4 (exhibit). In the “Getting to Know You” survey, Beth reported that she had been placed in diverse classrooms in her previous field experiences, stating “Being placed in diverse classrooms for her field experiences was a great opportunity for her professional development as a future teacher.”

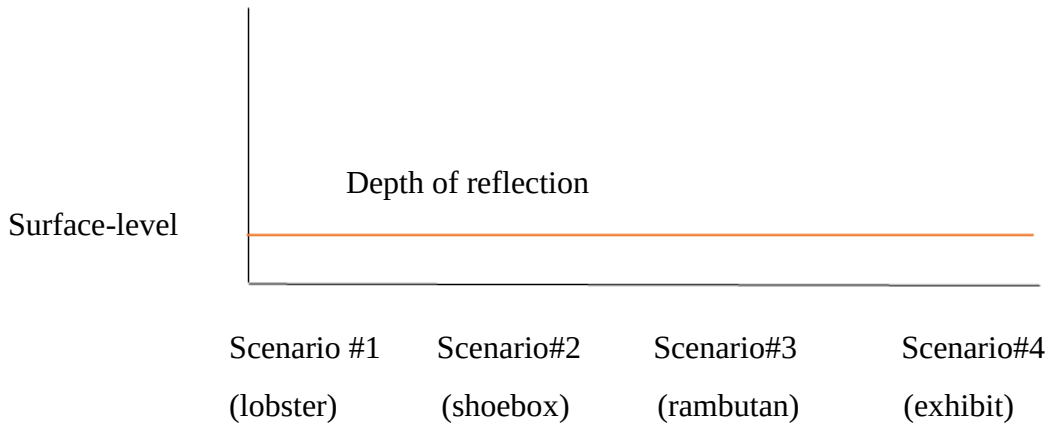

Figure 4.6. Evolution of Beth's reflection

Surface-level reflection across all the case scenarios. Beth's reflection remained the same. That is, it was not deep in that she did not identify any implicit CRT aspects in the case scenarios. Table 4.14 shows CRT aspects Beth commented on in her reflection on each scenario. Analysis of the data indicate that none of them were implicit. This further illustrates that Beth was not engaged in in-depth, critical reflection while analyzing the case scenarios.

Table 4.14

Aspects of CRT Beth Identified

	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (rambutan)**	**Case scenario #4 (exhibit)**
Teachers should know their students	✓	✓	✓	✓
Teachers should not make any assumptions	✓	✓	✓	✓
Making students' voices heard	✓	✓	✓	✓
Teaching strategies to create culturally responsive classrooms (specific to the given scenarios)	✓	✓	✓	✓

Students' feelings matter	✓			
Equity for all		✓		
No tolerance for stereotyping		✓		
Introducing new cultures by making connections			✓	
Teachers need to be unbiased and neutral				✓

Note. None of these were implicit CRT aspects which were not salient in the case scenarios and were not made salient via the prompts.

As an illustration, in the case scenario #3 (rambutan), Beth focused on the challenge the student teacher in the case scenario experienced and suggested that *different cultures should be introduced with some background information about those cultures*. For example, Beth responded to the prompt "In what other ways, could the lesson have been designed to avoid or soften the students' negative reaction to new fruits and vegetables?" in iReflectNow:

> I think if the teacher provided more background to the activity and about each of the fruits before introducing her students to them, that they would have been more open and willing to participate in the observation activity. By kind of throwing her students into the activity with fruits that were completely foreign to them, they immediately formed a judgement of "disgusting" or "gross."

She further commented on giving background information about different cultures during the case scenario discussion:

> Giving students background or talking about cultural differences and the different kinds of fruits and vegetables and things that are growing in different areas of the world I think would make them more open to trying something or at least even observing it or whatever instead of just shutting down.

As another example, in the case scenario #4 (exhibit), Beth asserted that *teachers should be neutral and unbiased* for effective CRT in addition to knowing their students. In iReflectNow, she responded "No" to the prompt "Were Amanda's [the teacher in the case scenario] responses to the religious questions and responses of the children appropriate?" As a response to the following prompt "Why do you think they were not appropriate?" she explained, "The fact that the teacher nodded in agreement when Emily referenced Christian beliefs is inappropriate. Teachers are not employed at state-funded public schools to relay their beliefs to students, it is their job to objectively educate those in their classroom." In her synthesis paper, she added, "It is important to be careful the ways in which you steer a conversation in class. While there is nothing wrong with talking about religion, and some standards address the topic, it is also important to keep the conversation objective."

Analysis of Beth's responses indicated that she included only explicit CRT aspects. This may indicate that her reflection was surface-level in that she only identified the explicit CRT aspects within the case scenarios.

Partial use of scaffolding aligned with surface-level reflection. Screencasts indicated that Beth viewed and used all the scaffolding features except hints during her case scenario analyses in iReflectNow. In the case scenarios #1 (lobster) and #3 (rambutan), she did not report any similar experience while responding to the prompt "Have you had similar experiences as a student, teacher or parent?" During the interview, she reported that the prompts helped her get a better understanding of the scenarios. Beth consistently did not view the hints. She reported at the interview, "It just became a habit to go back to the whole scenario rather than viewing pieces of information via the hints." She mentioned that it was easier for her when she analyzed the

scenario holistically. Table 4.15 exhibits the scaffolding features Beth used for each case scenario.

Table 4.15

Scaffolding Features Beth Used for Each Case Scenario

Scaffolding features	**Scenario #1 (lobster)**	**Scenario #2 (shoebox)**	**Scenario #3 (rambutan)**	**Scenario #4 (exhibit)**
Prompts	✓	✓	✓	✓
Videos	✓	-	-	-
Annotations	✓	✓	✓	✓
Hints	-	-	-	-

As an example, in the case scenario #2 (shoebox), Beth asserted that knowing students is crucial for teachers. Beth detected the assumptions the teacher in the case scenario made during her reflection in iReflectNow as a response to the prompt "What are the teacher's assumptions about the students' cultural background?":

> The teacher is assuming that the students 1. live with their mom and dad, 2. that their parents would be able to take them to a store to get a free shoebox, or 3. are able to afford to bring in $0.50 to purchase a shoebox from her.

Beth viewed the annotations while reading this case scenario. The annotation was "In addition to being homeless, several other elements come into play" for the sentences below from the case scenario:

> [One of the homeless girls said] Where are we going to get a shoebox? My mother cannot take me to the shoe store! She doesn't even have a car, and she cannot speak English that well, and she has to watch my baby brother. And then we are also like, where are we

going to get the fifty cents? So the next day we went to school without our shoeboxes and without fifty cents.

This may suggest that the annotation showed her explicit CRT aspects (teachers' knowing students and not making assumptions about them) within the case scenario #2 (shoebox). It appears that Beth did not go beyond those explicit aspects and engaged in surface-level reflection.

Hailey. Hailey engaged in surface-level reflection in all of the case scenarios. That is, her reflection remained the same across the case scenarios (see Figure 4.7). Screencasts indicated that Hailey used all the scaffolding features except videos in iReflectNow. Her partial use of scaffolding features is aligned with the nature of her reflection. This was also reinforced by the recordings of class discussions that showed that Hailey never participated in the in-class case scenario discussions that occurred every other week although she was present in the class.

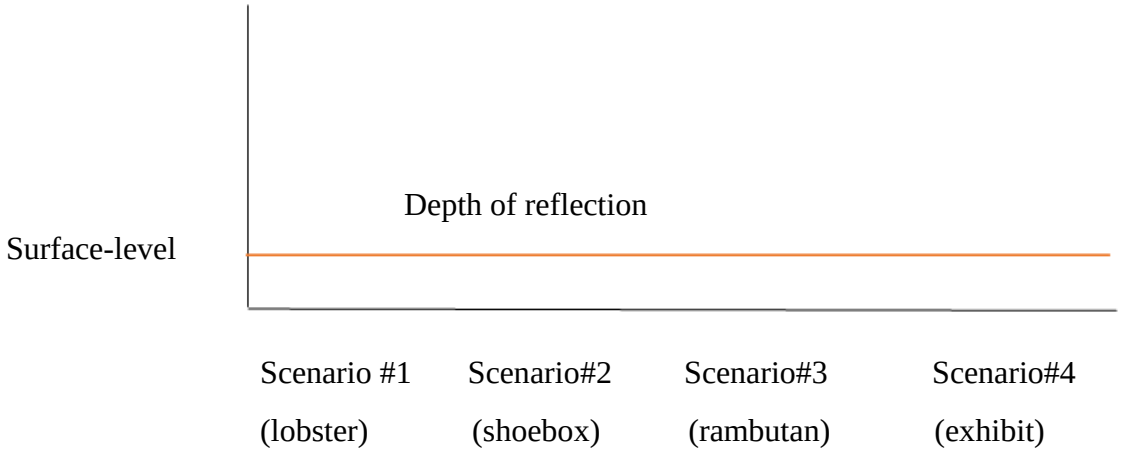

Figure 4.7. Evolution of Hailey's reflection

Hailey wrote a synthesis paper for the case scenario #3 (rambutan). She usually provided full, long responses to all the prompts except the one about her similar, previous experiences during the analyses of all case scenarios. As Hailey stated in the survey, she was not placed in

diverse classrooms in her previous field experiences. She also mentioned in the interview that she did not have a chance to observe CRT in her field experience classes.

Surface-level reflection across the case scenarios. Hailey's reflection remained the same across all the case scenarios. Her reflection on all the case scenarios was surface-level in that she commented on the CRT aspects that were explicit within the case scenarios. The CRT aspects she commented on are listed in Table 4.16 and are all explicit aspects in the case scenarios.

Table 4.16

Aspects of CRT Hailey Identified

	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (rambutan)**	**Case scenario #4 (exhibit)**
Teachers should know their students	✓	✓	✓	✓
Teachers should not make any assumptions	✓	✓	✓	✓
Teaching strategies to create culturally responsive classrooms (specific to the given scenarios)	✓	✓	✓	✓
Making students' voices heard	✓			
Equity for all		✓		
No tolerance for stereotyping		✓		
Introducing new cultures by making connections			✓	
Affirming diversity			✓	

Teachers need to be unbiased and neutral	✓

Note. None of these were implicit CRT aspects which were not salient in the case scenarios and were not made salient via the prompts.

The surface-level of Hailey's reflections were evident in her responses. For instance, in her response to the prompt "What do you think Stan could have done differently to avoid the challenges/dilemmas in the case?" in the case scenario #1 (lobster), one way to avoid assumptions Hailey suggested in iReflectNow was to *allow students to voice their thoughts*: "Stan [the teacher in the case scenario] could have taken a poll of his students and asked who wanted to watch the lobster cookout and eat it." When it comes to the case scenario #3 (rambutan), Hailey mainly focused on how Kim (the student teacher in the case scenario) introduced the new fruits and vegetables to students and critiqued her approach. For instance, Hailey responded as "No" to the prompt "Do you think the instructional approaches Kim used to introduce her 3rd grade students to new plants grown and eaten in different cultures were appropriate?" As a response to the following prompt "Why do you think they weren't appropriate?" she suggested that *new cultures should be introduced through making connections*. She commented on Kim's (the student teacher) instructional approaches:

> Her [Kim's] instructional strategies were inappropriate because Kim introduced the fruits and vegetables from different cultures as different from the rest. Therefore, the kids knew that these types of fruits and vegetables were not the same as the ones we eat in our culture. Kim should have woven the fruits and vegetables from other cultures into the foods from our culture, so the unfamiliar items were not presented as different.

Allowing students to voice their thoughts and introducing new cultures through making connections were both explicit aspects of CRT in the case scenarios #1 (lobster) and #3 (rambutan) respectively. This may suggest that Hailey engaged in surface-level reflection.

Partial use of scaffolding aligned with the surface-level reflection. Hailey viewed and used all the scaffolding features except videos. She responded to all the prompts except one fully in all the case scenarios. She did not report any similar previous experience as a response to the prompt "Have you had similar experiences as a student, teacher or parent?" in any of her reflections on the case scenarios. During the interview, she commented that the prompts enabled her to understand the scenarios better. Table 4.17 shows which scaffolding features Hailey used in each case scenario.

Table 4.17

Scaffolding Features Hailey Used for Each Case Scenario

Scaffolding features	**Scenario #1 (lobster)**	**Scenario #2 (shoebox)**	**Scenario #3 (rambutan)**	**Scenario #4 (exhibit)**
Prompts	✓	✓	✓	✓
Videos	-	-	-	-
Annotations	✓	✓	✓	✓
Hints	✓	-	✓	✓

For example, in her reflection on the case scenario #1 (lobster), Hailey commented, "Stan [the teacher in the case scenario] should have asked his students first if they were vegetarians or allergic, or if killing animals went against their beliefs or religions and taken into consideration that some of his students do not eat animals and care deeply about protecting animals" in iReflectNow as a response to the prompt "What are the teacher's assumptions about the students'

cultural background?" Before responding to this prompt, Hailey viewed the hints and it seems that she used information from one of the hints in her response. The hint stated, "Students' different cultural practices, values, and beliefs should be taken into consideration while designing class activities."

Another example of her surface-level reflection is found in Hailey's response to the prompt "What lessons do you think you can draw from this case in terms of teaching diverse students?" in the case scenario #2 (shoebox) in iReflectNow, Hailey underscored that knowing students is crucial for teachers in diverse classrooms:

> As teachers, we need to know all of our students' background information such as where they live and who they live with because this is very important information when it comes to assignments that may cost money or during parents' or grandparents' day.

Hailey viewed all the annotations in the case scenario #2 (shoebox). It seems that she used the information from one of the annotations in responding to the prompts. The annotation stated, "In addition to being homeless, several other elements come into play" for the sentences below in the case scenario:

> [One of the homeless girls said] Where are we going to get a shoebox? My mother cannot take me to the shoe store! She doesn't even have a car, and she cannot speak English that well, and she has to watch my baby brother. And then we are also like, where are we going to get the fifty cents? So the next day we went to school without our shoeboxes and without fifty cents.

Hailey elaborated on this particular aspect of CRT in her synthesis paper, "being culturally diverse is more than just learning about different cultures, it is also about taking into account different beliefs, geographical backgrounds, religion, and socioeconomic status."

Her responses above and her statement in the synthesis paper suggests that hints and annotations in iReflectNow helped with her reflection process. This also overlaps with what she reported about the annotations and hints during the interview. Hailey said that the hints helped her to get a better understanding of the scenarios and build up more solid arguments. She further reported that the annotations gave her additional information and different standpoints about the scenarios.

Leslie. Leslie reflected deeply on all the case scenarios. The depth of her reflection did not change from the case scenario #1 (lobster) to the case scenario #4 (exhibit) (see Figure 4.8). She engaged in in-depth reflection by identifying both explicit and implicit CRT aspects in all of the case scenarios. Leslie used all the scaffolding features in iReflectNow. She responded fully to all the prompts in all case scenarios. She watched the videos, and viewed and used annotations, hints, and displays. It appears that her use of multiple scaffolding features overlaps with the nature of her reflection on all the case scenarios. Recordings of the class discussions indicated that Leslie actively participated in the in-class case scenario discussions. Leslie wrote a synthesis paper for the case scenario #2 (shoebox).

It is notable that Leslie was the only non-White case in this study. Although she was Latina, she reported in the survey that she came to North America at the age of six, and later acknowledged during the interview, “I was so lucky that I had not experienced any challenges similar to the ones in the case scenarios due to my diverse cultural background.”

Leslie was placed in Pre-K and 5th-grade classrooms for her field experiences. As she stated in the “Getting to Know You” survey, she recognized the value of being placed into diverse classrooms. She reported, “My different field placements exposed me to lots of diversity,

and I very much enjoyed getting to know the children and embracing the challenges that come with having to differentiate and also addressing needs of all your students."

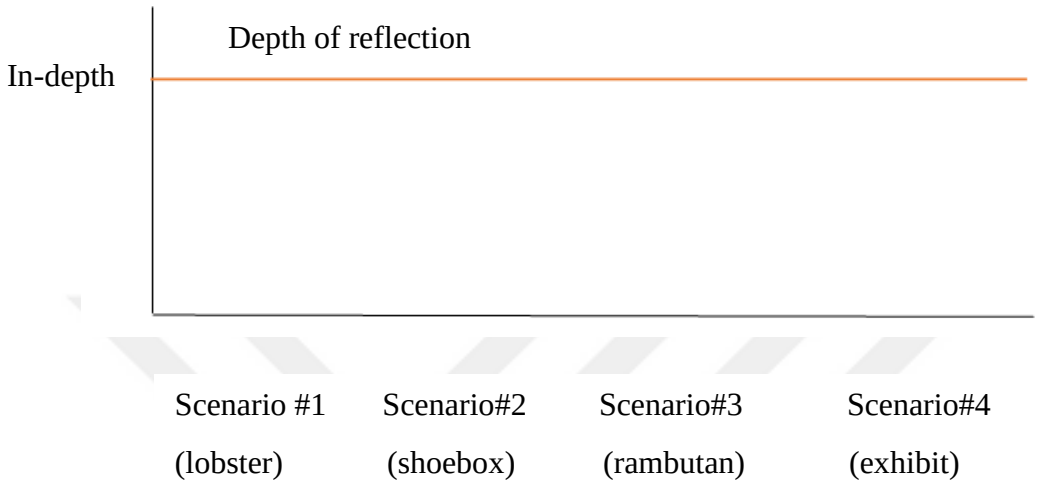

Figure 4.8. Evolution of Leslie's reflection

In-depth reflection from the case scenario #1 (lobster) to the case scenario #4 (exhibit). The depth of Leslie's reflection did not change from one case scenario to another. Leslie engaged in in-depth reflection. Table 4.18 displays that she commented on four CRT aspects (knowing students, not making assumptions about them, students' feelings matter, and making students' voices heard) across all the case scenarios. In addition to these, she identified specific aspects depending on the case scenario context. The aspects she identified included both the CRT aspects that were explicit in the case scenarios and those that were implicit. Aspects such as equal access to learning for all and teachers' acknowledging their own values and beliefs were not explicit in the case scenarios (see Table 4.18).

Table 4.18

Aspects of CRT Leslie Identified

	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (rambutan)**	**Case scenario #4 (exhibit)**
Teachers should know their students	✓	✓	✓	✓
Teachers should not make any assumptions	✓	✓	✓	✓
Teaching strategies to create culturally responsive classrooms (specific to the given scenarios)	✓	✓	✓	✓
Students' feelings matter	✓	✓	✓	✓
Making students' voices heard	✓	✓	✓	✓
Ethical concerns occur*	✓			
Equity for all		✓		
Equal access to learning for all*		✓		
No tolerance for stereotyping		✓		
Introducing new cultures by making connections			✓	
Affirming and *valuing* diversity*			✓	
Affirming diversity			✓	✓
Teachers should first acknowledge their own beliefs and values*				✓
Teachers need to be unbiased and neutral				✓

Note. * indicates implicit CRT aspects which were not salient in the case scenarios and were not made salient via the prompts.

There are several examples of Leslie's explicit and implicit responses. For example, in her response to the prompt "What do you think Stan could have done differently to avoid the challenges/ dilemmas in the case?," she implied that the lobster cookout might lead to *emotional discomfort* and referred to the *ethical issues of the lobster cookout* in the case scenario #1 (lobster). Leslie stated in her reflection in iReflectNow, "There is the issue of animal cruelty and the fact that he is cooking it in front of them. Students may not be emotionally ready to watch that." During the in-class discussion of the case scenario #1 (lobster), Leslie also referred to *making students' voices heard* by suggesting that Stan (the teacher in the case scenario) could have asked his students how they felt about the lobster cookout:

> He [Stan, the teacher in the case scenario] clearly did not realize that something like this could have happened. And so something I would suggest is kind of just stopping what's going on, and just asking the students to open up for discussion. Why did you feel this way? Like I'm just working on getting to know them I guess a little bit more and then also asking them, okay so we're going to not do this activity, but I want to do an activity with you guys and would ask "What is something you would like to do? What is something that you still want to know about this unit? What was something that you loved about this unit that you want to explore more?" and then really take what they want. And I would even do it on the board and write down what they say and then use that to plan a whole new activity and give some ownership to them to cater to them and what their interests.

Another example can be found in the case scenario #4 (exhibit) when Leslie commented on Amanda's (the teacher in the case scenario) attitude as a response to the prompt "What lessons do you think you can draw from this case in terms of teaching in multicultural

classrooms and/or introducing different cultures and sensitive topics in class?" In her reflection in iReflectNow, Leslie suggested teachers should *be cognizant of their own beliefs and values*:

> It is possible that her [Amanda's] nodding came off to the students as nodding in agreeance which would have then made it clear that she agreed with Emily. I have learnt the importance of watching out for my biases and not let them cloud my judgement when I am teaching.

Her responses above included CRT aspects that were both implicit and explicit. This may suggest that Leslie engaged in in-depth reflection in all the case scenarios because she detected some implicit aspects of the given dilemmas that might be both beyond the given situations and relevant to effective CRT.

Thorough use of scaffolding aligned with the nature of reflection. Leslie viewed and used all the scaffolding features in iReflectNow. She responded fully to all the prompts in all of the case scenarios. During the interview, she reported that she got a better understanding of the scenarios through the prompts as the prompts showed her different perspectives about the case scenarios. Leslie added that she found the sequence of the prompts helpful, and the way the questions flowed enabled her to analyze the case scenario more deeply each time. Table 4.19 shows the scaffolding features Leslie used.

Table 4.19

Scaffolding Features Leslie Used for Each Case Scenario

Scaffolding features	**Scenario #1 (lobster)***	**Scenario #2 (shoebox)**	**Scenario #3 (rambutan)**	**Scenario #4 (exhibit)**
Prompts	✓	✓	✓	✓
Videos	-	✓	-	-

Annotations	-	✓	✓	✓
Hints	-	✓	✓	-

Note. * means that Leslie did not record her use of iReflectNow fully although she responded to all the prompts fully in the case scenario #1 (lobster).

In her reflection on the case scenario #2 (shoebox), for instance, Leslie highlighted that there should be *equity for all*. As a response to the prompt "How is the teacher's stance in the case scenario?" Leslie explained in her written reflection in iReflectNow: "It was not fair that she linked having access to shoeboxes with being responsible and taking charge of your education."

It appears that Leslie built her response above upon one of the annotations she viewed. The sentence the annotation highlighted was "She [the teacher in the case scenario] then told us that we are getting older now, and we have to learn to become more responsible for our own education." The annotation was "The teacher relates bringing materials to class to being responsible." After reading the sentence and viewing the annotation, it seems that Leslie concluded that the teacher's action was not fair and added it into her response above. She referred to this attitude of the teacher during the in-class discussion of the case scenario #2 (shoebox) and how it might have affected the two girls emotionally and their engagement in science learning: "It's a circumstance that's just out of their control. The teacher is demanding them to do and it's just sad because it's completely alienating them from the teacher, from the activity and from the subject altogether." She also elaborated on this in her synthesis paper:

> When it comes to science in particular, we know that schools oftentimes provide little to no budget for materials and supplies- especially at the elementary level. This can be problematic because you end up with scenarios such as the one we have just read about, where you are linking a student's success or opportunity to succeed to what they may or

> may not have access to at home. Shoebox means success, no shoebox means failure. This is not fair to the students and can end up harming their motivation and their sense of community in the classroom.

In her reflection on the case scenario #2 (shoebox), Leslie also highlighted that *equal access to learning should be ensured* in diverse classrooms. To illustrate, Leslie suggested that the teacher could have simply provided boxes to all students as a response to the prompt "In what other ways, could the camera activity have been designed?" Before responding to the prompt about the teacher's assumptions in the case scenario #2 (shoebox), she viewed the hints. She may have used the hint "Cynthia and Jessica's story raises questions about what exactly access to science in school really means, especially for poor, immigrant girls" and integrated it into her response about the assumptions. It seems that annotations and hints helped her engage in in-depth. This also aligns with what Leslie stated about annotations and hints in iReflectNow during the interview: "Hints helped me start thinking about the scenarios better. I considered annotations as checkpoints, and they prepared me for the prompts." In her synthesis paper, Leslie also highlighted that providing equal access to learning is one of the duties of a culturally responsive teacher:

> I believe that science education should be fun and inviting. It should peak students' interests, it should spark their curiosity, and it should teach them to wonder and ask "why?" It's something that we should teach students to love and enjoy and explore, and that's what's so sad about this case scenario. That the students are potentially missing out on a world of possibility all because they don't have access to what their peers do. And this is where the role and responsibility of a culturally responsive teacher comes in. It is our duty to make sure that this doesn't ever happen in our classrooms and that we can

pride ourselves in saying that we strive to provide equal access to learning for all our students.

Sarah. Sarah's reflections were surface-level across the case scenarios. That is, depth of reflection remained the same from the case #1 (lobster) to the case scenario #4 (exhibit) (see Figure 4.9). Screencasts indicated that Sarah did not view or use any of the scaffolding features except prompts. Sarah provided responses to all the prompts except the second prompt "Have you had similar experiences as a student, teacher or parent?" for all the case scenarios in iReflectNow. Her responses were mostly short and repetitive; that is, Sarah gave exactly the same responses to different prompts while analyzing a case scenario in iReflectNow.

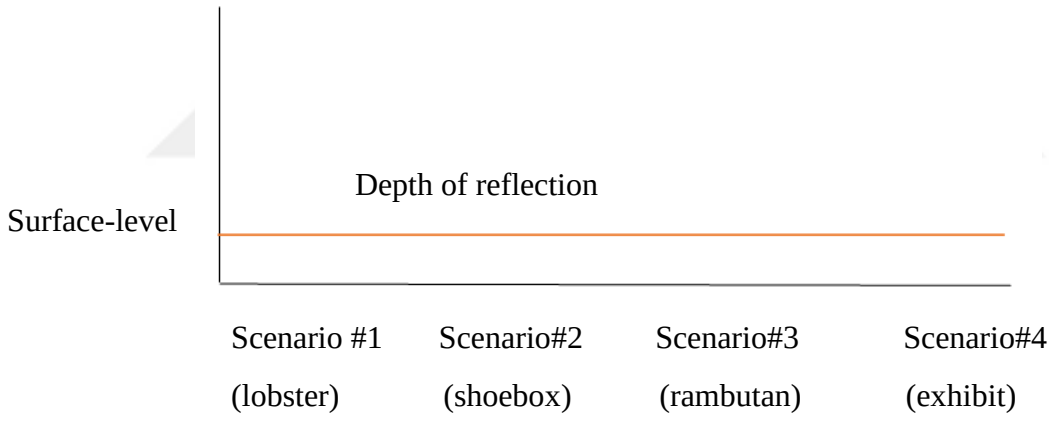

Figure 4.9. Evolution of Sarah's Reflection

She reported in the "Getting to Know You" survey that she was placed in diverse classrooms in her previous field experiences. She described those classrooms as "consisting of mainly minority children" in the survey. She was an active participant in the in-class case scenario discussions and wrote her synthesis paper on the case scenario #4 (exhibit).

Surface-level reflection across all the case scenarios. Sarah engaged in surface-level reflection from the case scenario #1 (lobster) to #4 (exhibit). That is, the depth of Sarah's reflection remained the same across the case scenarios. She commented on the CRT aspects that

were explicit in the case scenarios. The CRT aspects shown in Table 4.20 for Sarah are all explicit within the case scenarios.

Table 4.20

Aspects of CRT Sarah Identified

	Case scenario #1 (lobster)	**Case scenario #2 (shoebox)**	**Case scenario #3 (rambutan)**	**Case scenario #4 (exhibit)**
Teachers should know their students	✓	✓	✓	✓
Teachers should not make any assumptions	✓	✓	✓	✓
Teaching strategies to create culturally responsive classrooms (specific to the given scenarios)	✓	✓	✓	✓
Students' feelings matter	✓			
Equity for all		✓		
No tolerance for stereotyping		✓		
Introducing new cultures by making connections			✓	
Affirming diversity				✓

Note. None of these were implicit CRT aspects which were not salient in the case scenarios and were not made salient via the prompts.

Examples from the data support Sarah's surface-level responses. For example, in case scenario #1 (lobster), Sarah said "No" to the prompt "Do you think Stan's [the teacher in the case scenario] instructional approaches were appropriate for the 5th grade students?" in iReflectNow. In her response to the following prompt "Why do you think they weren't appropriate?" Sarah stated that potential *affective consequences* of classroom activities should be considered by teachers particularly while doing an activity which students are not familiar with:

> Regardless of students' food preferences, I don't think that cooking a lobster in front of children is a good idea. These children are used to seeing their food dead and neatly cut up for them in grocery stores and watching someone kill the live lobster and cook it would be disturbing for most children.

During the in-class discussion of this case scenario (#1 lobster), Sarah suggested alternative instructional strategies to mitigate students' negative reactions to the lobster cookout. She proposed that Stan (the teacher in the case scenario) could have continued only with the inference activity and removed the lobster cookout from his lesson plan:

> I think the best thing he could've done was like take the inference section of his lesson and continue with that. So like half the kids come and look at it, maybe let them name it so that it kind of calms nerves and let them talk about observations versus inferences. Like what can we make, what can we observe about this lobster? Like what are some of the parts, color, shape, like stuff like that. I think you can still continue the science lesson without the like murder aspect.

For the case scenario #3 (rambutan), Sarah acknowledged the importance of introducing new cultures for effective CRT. She also suggested that *different cultures should be introduced with some background information* about those cultures. For example, she suggested preparing a video that shows people eat those fruits and how they play a role in the culture of the area in other parts of the world as a response to the prompt "In what other ways, could the lesson have been designed to avoid or soften the students' negative reaction to new fruits and vegetables?"

In her synthesis paper for the case scenario #4 (exhibit), Sarah emphasized that diversity should be affirmed by referring to different religious beliefs or ideas every student may have.

She suggested instilling growth mindset and showing students that it is okay to have different beliefs were two of the ways to tackle topics like religion:

> I always want to leave my students with the question of "what more can we learn about this topic?" because I believe that if we approach all our learning with a growth and learning mindset, then this makes conversations about topics like religion easier to tackle. If we begin each lesson with the mindset that we can disagree and it be okay in the end, then when I make a statement like, "That is what you believe, and that is your right to believe that. But does everyone have to believe what you believe?" It makes the conversation easier to have with students while covering my bases as well.

While Sarah underlining the importance of acknowledging diversity, she did not see Amanda's (the teacher in the case scenario) nod as evidence of her own beliefs in the case scenario #4 (exhibit). For instance, she responded "No" to the prompt "Were Amanda's beliefs evident in her discussion with the children?" in the case scenario #4 (exhibit) in iReflectNow. In her response to the following prompt "How do you think they were not evident in the discussion?" she commented on Amanda's (the teacher) nod, "She [Amanda] did nothing except nodding her head and kept asking questions. I don't see how that is a bias." It seems that she did not think that the nod could be misinterpreted especially during a religious discussion in a diverse classroom. Sarah did not connect this to teachers' being objective while the other pre-service teachers did. These responses and her statements during the in-class case discussions and her synthesis paper included the CRT aspects that were obvious in the case scenarios. That is, she did not go beyond what was given to her in the case scenarios or via the prompts and hold broader perspectives during her reflections. She sometimes failed to analyze some explicit CRT aspects in the case scenarios, such as the teacher's bias in the case scenario #4 (exhibit) and to

take into account that the situation occurred in a diverse classroom. This may suggest that Sarah engaged in surface-level reflection.

Almost no use of scaffolding aligned with the surface-level reflection. Sarah only used prompts as a scaffolding feature in iReflectNow. Her surface-level reflection is aligned with her use of almost none of the scaffolding features. During the interview, Sarah reported she did not watch the videos deliberately because she thought she had enough knowledge about critical reflection and CRT. Sarah also reported that she intentionally did not view the hints because she thought she did not need the information provided via the hints. Due to a technical problem, Sarah could not view the annotations in the first case scenario, and then she gave up trying to click on them.

Cross-Case Analysis

A cross-case analysis was conducted to indicate overarching themes from the five cases, resulting in two overall themes: (1) noticing of cultural aspects of the dilemmas occurred during reflection despite no evolution in the depth of reflection and (2) scaffolding helps, but several other elements interact in the reflection process for CRT. Each theme is discussed in the following sub-sections.

Noticing cultural aspects of the dilemmas occurred during reflection despite no evolution in the depth of reflection. As indicated in the individual cases, all five of the pre-service teachers' reflection remained the same across the case scenarios. Reflections of Anna and Leslie were in-depth from the case scenario #1 (lobster) to the case scenario #4 (exhibit) whereas reflections of Beth, Hailey, and Sarah were surface-level across the four case scenarios.

The data indicate that Anna and Leslie reflected more deeply compared to Beth, Hailey, and Sarah. Anna and Leslie analyzed dilemmas and context of the case scenarios more critically

and touched upon both implicit and explicit aspects of CRT in their reflections on the case scenarios. Reflections of Beth, Hailey, and Sarah, on the other hand, were surface-level. The aspects they commented on in their reflections were salient within the case scenarios and were made explicit via the prompts. For instance, Beth, Hailey, or Sarah did not refer to the potential ethical issues of the lobster cookout or that teachers should first acknowledge their own beliefs and attitudes during their reflections on the case scenarios #1 (lobster) and #4 (exhibit). These aspects required the pre-service teachers to see the implications of the dilemmas in the case scenarios beyond the given contexts since these were the salient CRT aspects which could be easily identified in the case scenarios.

Although Beth, Hailey, and Sarah did not refer to the implicit CRT aspects in each case scenario, the CRT elements they highlighted show that they noticed the potential culture or diversity related dilemmas and challenges within classroom settings. That is, the aspects they highlighted during their reflection processes were limited to the given classroom contexts in the case scenarios. They *noticed* the CRT-relevant aspects only within the given contexts during their reflection.

Noticing is an important component of reflection. Experienced teachers intentionally pay attention to elements and details of their lessons, reflect on them, and use them to inform their future practice skillfully (Averill, Anderson, & Drake, 2015). CRT entails noticing in the moment of teaching, making decisions, and adjusting the lesson during teaching (Averill et al., 2015). Lacking teaching experience in real classrooms, pre-service teachers are usually less likely to detect instances to reflect on during a lesson (Cavanagh & McMaster, 2015; Stockero & Van Zoest, 2013). Previous studies show that pre-service teachers' ability to notice and reflect on

them can be enhanced with structured guidance (e.g. Barnhart & van Es, 2015; Jacobs, Lamb, & Phillip, 2010).

Findings from these studies overlap with the theme that emerged from this study. It can be inferred that noticing occurred depending on the amount of scaffolding used. To illustrate, Anna and Leslie, who used all the scaffolding features in iReflectNow, identified both explicit and implicit CRT aspects, and engaged in in-depth reflection. Beth and Hailey avoided using hints and videos respectively and referred to only explicit CRT aspects shown in the scenarios or made noticeable via the prompts. Using only the prompts, Sarah sometimes failed to notice explicit aspects. For example, all the pre-service teachers except Sarah noticed Amanda's (the teacher in the case scenario) nod during the religious discussion in the case scenario #4 (exhibit) and considered as an indicator of the teacher's bias. Although Sarah mentioned the teacher's nod in her response, it was not followed by in-depth reflection. Sarah only stated that she did not see it as bias.

Based on noticing of the CRT aspects, reflection patterns of all the cases also indicate some key elements of CRT. For instance, the five pre-service teachers suggested teachers should know their students and never make assumptions about them regardless of the context of the given case scenarios. They acknowledged the importance of these two aspects of CRT in the case scenario #1 (lobster) and then always referred back to and emphasized them in the following scenarios. This reflection pattern may suggest that teachers' effective and skillful cultural navigation and border-crossing starts when they know their students and avoid making assumptions about them.

It is aligned with the findings of previous studies in the literatures of CRT and teacher education. Several researchers (e.g., Carter & Walker, 2010; Ladson-Billings, 1995; Santamaria,

2009; Villegas & Lucas, 2002) assert that teachers should be cognizant of what they do in their daily lives and from which cultural backgrounds they come to both affirm diversity in classrooms and address cultural needs of students. Teachers are responsible of facilitating cultural transition of diverse students. Diverse students usually navigate from their home to school cultures or vice versa (Aikenhead, 1996; Carter & Walker, 2010). Knowing their students enables teachers to abstain from making any assumptions about their students' cultural backgrounds and previous cultural experiences (Gutiérrez & Rogoff, 2003; Ladson-Billings, 2014; Powell et al., 2016). By avoiding assumptions, teachers may become capable of creating caring and welcoming classrooms which are culturally responsive for all learners (Delpit, 2012; Weinstein, Curran, & Tomlinson-Clarke, 2003). This may also show that iReflectNow might have provided an authentic learning environment to the five pre-service teachers through the cultural case scenarios (Lundeberg, 1999) since they could consistently recognize the importance of these two steps for effective cultural navigation during CRT as they engaged in reflection in iReflectNow and the follow-up activities.

The five pre-service teachers also pinpointed several elements that can be needed for effective cultural navigation during their reflection on the case scenarios. For instance, they recognized the importance of affirming diversity, knowing students, and avoiding stereotyping in diverse classrooms. Additionally, all of them but Sarah mentioned that teachers' being fair, being unbiased, and letting students voice their ideas play crucial role for culturally responsive teaching. The pre-service teachers recommended some potential teaching strategies, such as giving more choices to students during activities, providing relevant content, and offering individualized instruction for effective CRT. These elements can be categorized into three

groups: (a) atmosphere of a culturally responsive classroom, (b) teacher characteristics/attitudes for effective CRT, and (c) instructional aspects of CRT.

Although all of the CRT aspects indicated above were explicit ones in the case scenarios or made explicit via the prompts, most of the pre-service teachers became aware of these when they engaged in iReflectNow. Their reflections on these aspects are aligned with the findings of previous studies (e.g. Cammarota & Romero, 2009; Epstein, Mayorga, & Nelson, 2011; Santamaria, 2009; Streets, 2011). For effective CRT, pre-service teachers need to know the context in which they will practice and their students' cultural backgrounds to navigate through borders of school and home cultures competently (Hollins & Oliver, 1999). They should do so between their own and students' school and home cultures. As teaching is a contextual act, several factors come into play during teaching particularly in diverse classrooms (Pewewardy, 1999). Teachers should not only have certain characteristics but also be knowledgeable about how to implement appropriate instructional strategies to teach in culturally responsive manners and create caring classrooms for every student (Achinstein & Ogawa, 2012). It can be concluded that effective CRT should include most of the elements the five pre-service teachers identified during their reflections (Powell et al., 2016).

Scaffolding helps, but several other elements interact in the reflection process for CRT. Based on the literature-driven design guidelines in Chapter 2, three types of scaffolding were embedded into iReflectNow: (1) metacognitive scaffolding through cultural case scenarios to trigger reflection, (2) conceptual scaffolding through prompts and videos or tutorials about CRT and critical reflection to promote reflection, and (3) procedural scaffolding through annotations, hints, and displays to maintain reflection. This suggests that scaffolding features in iReflectNow were designed to complement each other in the reflection process.

In this study, not all the pre-service teachers used all the scaffolding features. The scaffolding features and the display of the features may have impacted the results of the study. Table 4.21 shows which scaffolding features each pre-service teacher used per case scenario in iReflectNow, the depth of their reflections, and how much time they spent on the analysis of each case scenario. In addition to the scaffolding features in Table 4.21, displays were also provided on the top of the screen in iReflectNow. The displays included a step-by-step template for the pre-service teachers' reflection processes. They showed each step in the reflection process, such as "I detect the challenges/dilemmas" and "I examine the context." While Anna, Hailey, and Leslie reported at the interviews that displays enabled them to focus on what the prompts asked, Beth reported that the displays were helpful in terms of time management as they showed her progress. Sarah did not comment on the displays. Further examination of the scaffolds and display are needed in future research.

Table 4.21

Log Data from Screen Recordings

	Anna				**Beth**				**Hailey**				**Leslie**				**Sarah**			
Scenario # / **Scaffolds**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Prompts	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Videos	✓	-	-	-	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-
Annotations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	-	-	-	-
Hints	-	✓	✓	✓	-	-	-	-	✓	-	✓	✓	-	✓	-	-	-	-	-	-

Quality of reflection	In-depth	Surface-level	Surface-level	In-depth	Surface-level
Time spent (in minutes)	68 72 58 58	30 23 25 23	65 60 40 35	20* 68 50 45	37 31 28 25

Note. ✓ indicates that the participants used the scaffolding feature while - shows they did not do so. * Leslie did not record the case scenario #1 fully although she completed all the prompts.

It is notable that while no evolution of reflection was indicated in the data, findings of this study do show evidence that the depth of the pre-service teachers' reflections differ. While Anna and Leslie reflected more deeply, Beth, Hailey, and Sarah engaged in surface-level reflection. The *implicit* CRT aspects Anna and Leslie commented on were not provided explicitly only in the case scenarios and the prompts. They were hinted via annotations and hints. This might explain why Sarah engaged in surface-level reflection as she only responded to the prompts, but did not use videos, annotations, and hints. However, when it comes to Beth and Hailey, it is not possible to explain their surface-level by their use of scaffolding features. Like Anna and Leslie, Beth used videos and annotations, and Hailey used hints and annotations (see Table 4.21). In addition, Anna and Leslie did not use all the scaffolding features in each case scenario in iReflectNow. The cases of Anna and Leslie are notable in that they did use all the scaffolding features and were consistent with in-depth reflection across all four cases. Their in-depth reflection across the case scenarios may indicate that (1) Anna and Leslie were already reflective thinkers before they started using iReflectNow, and/or (2) the depth of reflection for CRT is shaped not only by types of scaffolding provided but also other elements, as elaborated in the previous section, explain reflection for CRT.

These five cases were selected based on a combination of multiple criteria, so different aspects might have determined depth of their reflections for CRT. For instance, Anna and Leslie

used all the scaffolding features (prompts, videos, hints, and annotations) provided in iReflectNow, had their previous field experiences in diverse classrooms and similar experiences to the given case scenarios, and actively shared their reflections with their peers during the in-class case discussions. Similarly, Beth actively participated in the in-class case discussions. Yet, Beth consistently did not view the hints during her reflections on the case scenarios in iReflectNow, and although she had previous experience in diverse classrooms, Beth did not report any experiences similar to the ones in the case scenarios #1(lobster) and #3 (rambutan).

In contrast, Hailey did not watch the videos about CRT and critical reflection in iReflectNow. Additionally, she did not participate in the in-class discussions and did not have field experiences in diverse classrooms and any experiences similar to the case scenarios. When it comes to Sarah, it can be seen that she did not use any of the scaffolding features in iReflectNow but shared her reflections with her peers during the in-class case discussions. Although Sarah had experiences in diverse classrooms, she did not have experiences similar to the ones given in the case scenarios.

The interaction of these various elements may suggest that reflection as a whole process includes several dimensions and in-depth reflection for CRT could be reached if all these factors were present in the reflection process. For instance, previous experiences particularly in diverse classrooms and any previous experience that is relevant to the encountered dilemma play a key role for in-depth reflection for effective CRT (Akiba, 2011; Larrivee, 2000). Additionally, the quality of reflection increases when it is shared with peers, colleagues, or mentors because others can see what the person who is active in the reflection process cannot see (Aronson, 2011; Blair, 2012; Chen, 2012; Rhine & Bryant, 2007). It can be concluded that in addition to use of purposefully-designed scaffolds, previous field experiences in diverse learning environments and

having similar cultural experiences, and sharing reflections with peers during discussions may facilitate and enhance pre-service teachers' reflection process and help them to engage in in-depth reflection for effective CRT.

The findings show that there might be other elements that shape pre-service teachers' reflection process in addition to scaffolding. Yet, the findings also suggest use of scaffolding may enhance engagement in reflection. The five pre-service teachers recorded their computer screens while they were using iReflectNow. These screen recordings showed the amount of time they spent for each case scenario in iReflectNow. As can be seen in Table 4.21, while Anna, Hailey, and Leslie spent about one hour on each case scenario, Beth and Sarah spent about 30 minutes on each case scenario. The amount of time they spent in iReflectNow for each scenario aligns with which scaffolding features they used, and how. This descriptive log data indicates that the more scaffolding features they used, the longer they were engaged in reflection in iReflectNow. Hailey was an exceptional case.

Along these lines, the quality of reflection differs across the five pre-service teachers. For instance, Anna and Leslie provided richer reflection responses to the prompts in iReflectNow and identified more beyond-the-classroom, implicit elements of CRT. Yet, reflections of Beth, Hailey, and Sarah were limited within the context of classrooms in the case scenarios. Even sometimes, Sarah just provided the same responses to different prompts and sometimes pointed out the same aspects across the case scenarios. Unlike Beth and Sarah, Hailey spent about one hour for each case scenario in iReflectNow, yet still her reflections were surface-level. This might have been because she had no previous experience in diverse classrooms and did not watch the videos presenting background information about CRT and critical reflection. It is

possible that she found the case scenario analysis and reflection experiences challenging and spent more time in iReflectNow.

Findings of the previous studies (e.g. Blomberg, Sherin, Renkl, Glogger, & Seidel, 2014; Cavanagh & McMaster, 2015; Gelfuso & Dennis, 2014; Valli, 1997) on scaffolding teacher reflection are consistent with this pattern that emerged from the pre-service teachers' use of scaffolding features. The previous studies indicate that pre-service teachers could reflect more deeply when supported effectively during the process. Although duration of engagement in reflection and the variety of the scaffolding features the pre-service teachers used seem associated in this study, there is no consistent finding about use of which scaffolding feature yielded deeper reflection. To illustrate, reflections of both Anna and Leslie were in-depth, but their most-used scaffolds were different. Anna used the hints most whereas Leslie preferred to view the annotations.

Overall Discussion

Being the second iteration of design-based research study series, this study investigated the intersection among reflection of teachers, CRT, and scaffolding. One of the key tenets of design-based research is that theory and practice inform each other bilaterally (Bradley & Reinking, 2010). Design of this iteration was informed by findings of the first iteration: (a) how pre-service teachers view a dilemma encountered in diverse classrooms and (b) whether they have previous experience similar to that dilemma seem to have determined the depth of their reflection for CRT in the future. This iteration provided diagnostic information to refine design of scaffolding features in iReflectNow.

The overall findings in this study do not show evolution of the pre-service teachers' reflection across the four case scenarios. There are three possible explanations for this: (1) the

research design as well as design of scaffolding and scenarios led to a lack of capturing needed data, (2) the scaffolding embedded in iReflectNow was not customized enough to yield noticeable growth in the pre-service teachers' reflection, and (3) evolution of reflection for CRT cannot be explained with only scaffolding via iReflectNow but there are other elements that shape reflection. Design-related conjectures are discussed to provide additional insights.

One consideration for the finding related to lack of evolution in reflection relates to research design; mixed methods designs could have been implemented. A reflection questionnaire before and after iReflectNow could have been given to the pre-service teachers. Quantitative results from the surveys could have been interpreted with qualitative data. Another design feature of iReflectNow that may have impacted the results relates to the allowable length of reflection responses. Within iReflectNow, there was no threshold for the length of responses to the prompts. For instance, while Anna and Leslie usually wrote one full paragraph as a response to each prompt, responses of Beth, Hailey, and Sarah were shorter. Data collection was limited in this sense and may have impacted results related to evolution of reflection.

The lack of data related to evolution in reflection informs further refinements of iReflectNow. Evolution of reflection was not observed perhaps because scaffolding was not designed in a way that could make noticeable changes in the pre-service teachers' reflection. As previously indicated, this study was the second iteration of a design-based research study series. As iReflectNow was designed for this iteration, this study involved its first testing. It is possible that scaffolding features were not personalized enough to promote individual reflection for CRT.

In Chapter 2, three design guidelines were proposed to provide metacognitive, conceptual, and procedural scaffolding. While case scenarios have the purpose of triggering reflection, boosting reflection was aimed through prompts and videos. Hints, annotations, and

displays were embedded into iReflectNow to provide procedural support to pre-service teachers during the reflection process. In this iteration, not all the pre-service teachers used all the scaffolding features. The design guidelines could be kept the same for the following iteration, and sampling criteria could be that participants use all the scaffolding features. In this way, all the design guidelines could be tested and examined. Some modifications could be done in the application of design guidelines. For instance, all the hints for a case scenario were presented together in this iteration. Hints could be presented one-by-one based on the prompt that appears on the screen. This would provide the data of which hint is used for a specific prompt and whether that hint is useful or not. Additionally, the CRT and critical reflection videos were only presented in the beginning of iReflectNow in this iteration. Embedding a button like "Watch the videos again" above each prompt is likely to encourage pre-service teachers to view videos for each case scenario in the following iterations.

Implications for Research and Practice in Teacher Education

The results of study provide several implications for research and practice. First, the findings of this study suggest that depth of reflection for CRT is likely to be shaped by different dimensions other than scaffolding, such as pre-service teachers' peer discussions and previous cultural experiences. Further, these data provide some evidence that the dimensions interact with each other during reflection. The complexity of reflection is well-documented in the literature (Colton & Sparks-Langer, 1993; Larrivee, 2000; Yost, Sentner, & Forlenza-Bailey, 2000). Teacher educators could create meaningful learning environments to include all of these dimensions to prepare pre-service teachers for effective CRT in the future, enabling more in-depth reflection that may impact practice for pre-service teachers. Although not all the cases in this study involved in in-depth, critical reflection across the case scenarios, their responses in

iReflectNow show that they became aware of potential cultural dilemmas and challenges in their future classes. In this sense, iReflectNow could be used as a tool to trigger pre-service teachers' awareness of diversity in classrooms and scaffolds growth of a CRT mindset through reflection in teacher education programs (Allen et al., 2017; Sleeter, 2012).

There are several implications for future research beyond what has been previously discussed in the context of the next iteration of iReflectNow. For example, iReflectNow could be expanded both in terms of the number and context of the case scenarios. This may enable more varied interactions, and thus more varied reflections. Similarly, iReflectNow could be implemented in different subject areas with different groups of pre-service teachers. Case scenarios could be changed, and iReflectNow could be used to scaffold reflection on different topics, such as ethics in classrooms or teaching evaluations.

Observations of actual classroom practice could enhance data collection. For example, the field experience classes of pre-service teachers who engage in iReflectNow could be observed to examine how they put CRT through reflection into practice. Given the differences often indicated in research related to espoused versus enacted practice (Osterman & Kottkamp, 2015), this data may prove insightful.

Finally, additional reflection scaffolds such as giving instant feedback (Belland, Burdo, & Gu, 2015) during reflection and providing discussion boards to let pre-service teachers share their reflection with their peers (Blair, 2012; Rhine & Bryant, 2007) could be added to iReflectNow. How these scaffolding features would relate to evolution of pre-service teachers' reflection could be investigated.

Limitations

In addition to the aforementioned design limitations, there are other limitations to this study. First, developing reflective thinking skills and reaching critical reflection take time and require practice. Thus, nine weeks may not be enough time to see how pre-service teachers' reflection evolved although there were multiple data sources. Second, the contexts of the given case scenarios were limited, so they do not include all the potential dilemmas pre-service teachers would encounter in real classrooms. Third, when it comes to the use of iReflectNow, some pre-service teachers might have experienced the *novelty effect* (Clark, 1983) in the beginning of the study, thus impacting the results. That is, when learners engage in a new multimedia environment, it can seem unfamiliar to them, and this results in learners' increased attention and effort (Clark, 1983). Yet, the novelty effect may have withered as the participants got used to iReflectNow over eight weeks (the time they spent using iReflectNow during the study). Finally, there were two technical limitations in the study: (1) Screen recording stopped while Leslie was analyzing the first case scenario #1 (lobster), and (2) Text-based annotations did not pop-up on Sarah's computer although iReflectNow was designed and tested to be compatible with all types of browsers.

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CHAPTER 5

CONCLUSION

Being an educational Design-Based Research (DBR) study series, this dissertation research aimed to investigate how pre-service teachers' reflection for culturally responsive teaching (CRT) could be scaffolded. Two aspects of teacher reflection were focused on: its depth and timing. Teachers need to reflect critically for culturally responsive teaching (Aguirre & Zavala, 2013; Aronson & Laughter, 2016). To become culturally responsive, teachers need to be skillful cultural navigators between their own cultures and their students' cultures (Carter & Walker, 2010). This navigation may require validating and valuing the cultures students bring into classrooms. For this to happen, teachers should question the consequences of their actions and attitudes beyond classroom settings through critical reflection (Allen, Hancock, Starker-Glass, & Lewis, 2017; Larrivee, 2008).

Although it is necessary for teachers to reflect critically for culturally responsive teaching, the depth of teachers' reflections usually remain at the descriptive level (Beauchamp, 2015; Lane, Mcmaster, Adnum, & Cavanagh, 2014). As most pre-service teachers lack teaching experience in real classrooms, they are in need of support for effective culturally responsive teaching in the future through critical reflection (Blair, 2012; Etscheidt, Curran, & Sawyer, 2012). Therefore, critical reflection should be particularly encouraged in teacher education courses.

The second aspect of teacher reflection is its timing; that is, when it occurs. Usually reflection-on-action (Schön, 1987) has been reinforced in teacher education programs through

portfolios, journals, and video-taped class analysis (e.g. Oakely, Pegrum, & Johnston, 2014; Rich & Hannafin, 2009). Yet, teaching is dynamic (Coulson & Harvey, 2013), and being culturally responsive during teaching is an additional challenge because culture is also in constant change. Pre-service teachers should practice reflection-in-action to prepare for such dynamic classroom environments. These two aspects of reflection, depth and timing, formed the basis of the scaffolding design in this dissertation research.

To address the aforementioned needs in teacher education programs, an interactive computer-based scaffolding tool named iReflectNow was designed and developed based on three literature-driven guidelines elaborated in Chapter 2. The comprehensive literature review included teacher reflection, culturally responsive teaching, and computer-based scaffolding. Aligned with the three guidelines, several scaffolding features were integrated into iReflectNow. Scaffolding features include: (a) cultural case scenarios to trigger reflection, (b) prompts to boost in-depth reflection, (c) expert videos and tutorials to provide modelling and information about critical reflection and culturally responsive teaching, (d) visuals to provide procedural support, and (e) annotations and hints to present conceptual and contextual information.

One of the main goals of iReflectNow was to simulate the dynamicity of teaching and reflection during teaching. It is important to give instant and meaningful reflection prompts to pre-service teachers to ensure a dynamic and adaptive computer-based scaffolding environment. Within this dissertation research, an exploratory pilot study was conducted to test the reflection prompts created based on the literature and to form a corpus of useful and appropriate prompts that can be used in future studies. As the goal was to test only the prompts as a scaffolding feature, iReflectNow was not implemented in the pilot study.

The pilot study was a qualitative multi-case study with four cases who were all White female pre-service early childhood teachers in a Science for Early Childhood and Elementary Education undergraduate-level course in fall 2018. Four cultural case scenarios along with relevant reflection prompts were given to the participants to trigger their reflection and to scaffold them to engage in in-depth reflection. The four pre-service teachers also completed other relevant class activities, such as in-class case discussions and synthesis papers weekly for four weeks. In the fifth week of the study, they were interviewed. Hybrid thematic analysis (Swain, 2018) was employed to analyze the data. Both deductive and inductive codes were generated, and two themes were identified. Findings of the study suggest how pre-service teachers perceive/frame a cultural problem in diverse classrooms and how they make interpretations from their previous experiences interplay with culturally responsive teaching. Guided reflection via prompts can help involve pre-service teachers in deep reflection. Cultural case scenarios in this study provided culture-embedded contexts to the pre-service teachers and helped them make connections between the case scenarios and their previous experience.

Findings from this study also indicated that some revisions for three of the case scenarios and prompts were needed. Two case scenarios were shortened to keep the focus on the cultural dilemmas, and one case scenario was revised to make the dilemma more obvious to pre-service teachers. The pre-service teachers found the prompts repetitive in this pilot study. In the following study, some yes/no question prompts were added in-between the open-ended prompts to avoid pre-service teachers providing the same response for different prompts.

iReflectNow was developed and refined based on the findings from the pilot study. The main dissertation study was conducted in the same undergraduate course Science for Early Childhood and Elementary Education, in spring 2019 taught by the same course instructor. It was

a multi-case qualitative study with five cases. Except one case who was Latina female, all of the cases were White female pre-service early childhood teachers. The five pre-service teachers reflected on four cultural case scenarios through the prompts in iReflectNow for eight weeks. During their reflection process, they had access to the scaffolding features—videos and tutorials, annotations, hints, and visuals—for each case scenario in iReflectNow. They also participated in whole-class discussions for each scenario, wrote a synthesis paper about one scenario, and recorded their computer screens during their use of iReflectNow. After completion of all these activities, each participant was interviewed. Thematic analysis (Braun & Clarke, 2006) was conducted on this dataset via two cycles of coding. The study findings suggest: (a) there was no evolution of pre-service teachers' reflection during and after using iReflectNow and (b) the depth of their reflection was shaped by not only the use of scaffolding in iReflectNow but also their previous cultural experiences similar to the given dilemmas as well as shared reflections with other pre-service teachers.

iReflectNow offers a unique approach towards pre-service teachers' practice of reflection in teacher education programs. Still revisions and refinement are needed in iReflectNow to provide adaptive, customized scaffolding to prepare pre-service teachers to teach culturally responsively through critical reflection in their future classes. Further research needs to be done to improve the design and implementation of iReflectNow.

Limitations of the Studies and Future Research Directions

The DBR studies in this dissertation had the goal of encouraging pre-service teachers to become critical reflective thinkers in order to engage in effective culturally responsive teaching in their future classes. More studies using iReflectNow are needed. First, sampling was limited in terms of participants' ethnicity and gender in both studies. Nearly all participants were White

females, and only one was Hispanic female. Future research may be conducted in more heterogeneous contexts which include male pre-service teachers from different ethnic backgrounds and non-White females.

Second, although pre-service teachers' noticing the cultural aspects in the dilemmas in the case scenarios through reflection occurred, no evolution of reflection was observed in the main dissertation study. Revisions in the design of iReflectNow should be considered in further iterations. For instance, prompts may require further customization. Additionally, not all the pre-service teachers used all the scaffolding features embedded into iReflectNow, although a short training about how to use iReflectNow was offered to the participants prior to the study. In future iterations, participants could be encouraged to use all available scaffolding features. The goal of the training was to introduce the interface to the participants so they could navigate through iReflectNow easily during their reflection. Yet, redesign of the training is needed. In future studies, a more comprehensive training that also explains why several scaffolding features are offered in iReflectNow may be provided to participants. Different research designs such as a microgenetic method (Siegler & Crowley, 1991) could also be implemented to explore evolution of reflection in future studies.

Third, the presentation mode of the case scenarios was different in the two studies. In the pilot study, printed copies of the case scenarios were given to the participants. Some students might have taken notes, highlighted and/or underlined parts of the scenario texts. In the dissertation study, all the case scenarios were presented online via iReflectNow. None of the aforementioned options—notes, highlighting, underlining—were provided to participants in iReflectNow. Although some of the participants might have taken notes on a piece of paper,

redesign of iReflectNow is needed to address this. Tools for notetaking, text highlighting and/or underlining could be embedded into iReflectNow in future studies.

Fourth, 14 screen recordings were collected. However, it was not possible to determine whether the participants recorded their screens on their first login. That is, they may have viewed all the annotations and hints for a case scenario before starting to record their screen, and then, while recording they did not view the scaffolds. Therefore, the descriptive log data could be misleading. The infrastructure of iReflectNow could be improved to keep track of which scaffolds participants click and how many times they log into iReflectNow before screen recording for further research.

Fifth, observing how the participants put what they learned about culturally responsive teaching through reflection into practice in their field experience classes was not viable because their field experiences started after the study was over in each of the semesters (fall 2018 and spring 2019). The participants were not asked to design culturally responsive lessons in either of the studies. Future studies might generate high-quality data if participants were asked to design such lessons and their implementations in field experience classes could be observed.

Finally, some participants had some technical issues in the main dissertation study. As a free screen recording tool was used, participants had to keep the video files on their own computers. Four participants ran out of storage and could not record the whole process. Another issue is that although iReflectNow was developed to be compatible with all computer and browser types, some participants could not view the annotations. A cloud-based screen recording tool could be used, and a “Report a problem” button could be added to iReflectNow to take immediate action to resolve issues in future studies.

Implications for Research and Practice

The ultimate goal of this dissertation research is to make pre-service teachers' practice of reflection-in-action for CRT viable in teacher education programs via computer-based scaffolding environments. Findings from this research contribute to the design of such environments to prepare pre-service teachers to teach effectively in their future diverse classrooms. Implications for research and practice are discussed below.

This research offers a unique approach about how to scaffold pre-service teachers' reflection for their future culturally responsive teaching. In previous studies, reflection-on-action was focused through use of portfolios, journals, and video-taped classes (Freese, 2006; Lai & Calandra, 2007; Roberts, Maor, & Herrington, 2016). iReflectNow aims to simulate a dynamic, authentic teaching environment through cultural case scenarios and provide scaffolding via customized prompts, text-based annotations, hints, and displays to promote reflection-in-action (Schön, 1987) in a computer-based environment. iReflectNow could be made accessible to teacher educators for further implementation in practical settings, such as teacher education programs and professional development of in-service teachers.

Although iReflectNow was not implemented in the pilot study, both studies generated a corpus of usable reflection prompts and a database of potential responses. Further iterations of these DBR studies could be built upon this compilation to retrieve meaningful prompts based on participants' responses. This could be done by processing the natural language human beings use (Fan, Luo, Menekse, Litman, & Wang, 2017) because iReflectNow is an explorative, flexible learning environment (Wood & Wood, 1996). That is, participants' reflective responses could not be predicted, so prompts should be customized instantly.

Refinements of iReflectNow to give human-like support via computers may inform further research and practice about how artificial intelligence applications could be adapted in educational settings. There are three potential uses of natural language processing in education (Litman, 2016): (1) for assessment of language skills such as reading, writing, or speaking, (2) in dialogue-based intelligent tutoring systems to assess learner's response, and (3) for educational data mining by teachers to develop course materials and by researchers to create empirical databases. The second one is closely related to providing adaptive, human-like computer-based scaffolding.

A further step in research on iReflectNow could be redesigning it as a more intelligent and interactive environment (Park & Lee, 2008) similar to real, dynamic classrooms. In addition to customized prompts, the content of other scaffolding features, e.g. hints, annotations, and displays, could be tailored based on participants' responses. Future studies could be designed using this fully adaptive iReflectNow to investigate how it helps pre-service teachers during their reflection for CRT. It is also possible to conduct studies with in-service teachers to see how use of iReflectNow impacts their reflective practice in real classrooms.

Another aspect for further research might be implementing eye-tracking technologies (Was, Sansosti, & Morris, 2017) during participants' use of iReflectNow. This could yield more accurate data of how scaffolding features on iReflectNow are used. Aligned with this, different research designs could be chosen in future studies. For instance, the log data generated via eye-tracking might be quantified and different mixed method designs (Creswell & Plano-Clark, 2018) could be used.

This research is significant as it aims to prepare pre-service teachers to teach culturally responsively through in-depth, critical reflection in their future classrooms. Implementing

culturally responsive teaching properly is an urgent need in the US education system. According to the National Center for Education Statistics (NCES, 2019) the percentage of White teachers was 80% whereas it was 7% for African American and 9% for Hispanic teachers in the school year 2015-16. The percentage of African American, Asian, and Hispanic students in public schools has been steadily increasing since 2000 (Howard & Rodriguez-Minkoff, 2017). NCES (2019) also show that the gap between teacher and student populations is rapidly getting wider. Eliminating this gap could be possible by encouraging pre-service teachers to gain a CRT mindset (Milner, 2011; Souto-Manning & Mitchell, 2010). Considering this, the quality of teacher education programs gains even more importance. In this sense, designs like iReflectNow become promising in enhancing pre-service teachers' reflection for effective CRT.

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APPENDICES

Appendix A

"Getting to Know You" Survey

Please complete this exercise as accurately as possible. It should take you 15 minutes or less to complete it.

1. Full name: _____
2. Age: _____
3. Gender:
    a. Male
    b. Female
    c. Other
    d. Prefer not to answer
4. Race:
    a. White
    b. Black
    c. Latino
    d. Asian
    e. Native American
    f. Multiracial
    g. Prefer not to answer

5. What grade level are you placed in for your Block 3 field experience? What levels have you been placed in for previous field experiences?

6. What are some adjectives that best describe you?

7. What would you like me to know about you?

8. Tell me about your experiences and background, i.e. your family structure, where you were born and grew up, parents' occupations.

9. Describe a memorable experience (positive or negative) that you have had with science.

10. What is your understanding of what it means to learn? What is your understanding of what it means to teach?

11. Have you ever taught or had field experience and/or student teaching in a diverse classroom?

    a. Yes

    b. No

If yes: Describe your previous experience with teaching in a diverse classroom.

12. Describe any other experiences you have had outside of a school setting. What did you learn from this experience(s)?

13. On a scale of 1-10, first select your degree of confidence with respect to teaching science at the elementary level and type it down to the box below, and then explain your selection in the same box.

1	2	3	4	5	6	7	8	9	10
Not very confident									Highly confident

Explain your selection.

Appendix B

Prompts for Cases

Case 1: The Day the Lobster Died

This case involves various dilemmas related to ethics and different sociocultural contexts. In this activity, you will focus on sociocultural dilemmas that emerge during a science lesson on oceanography.

a) I detect the dilemmas/challenges

3. **What kind of challenges/dilemmas do you observe that the teacher experienced in this case?**
   Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Lobster case.

b) I examine the context

5. In addition to giving the class opportunity to learn about lobsters, Stan thought it would be great experience to see and taste this "Down East" treat. Here, what are the teacher's assumptions about the students' cultural background?
6. What are your thoughts about the instructional approaches Stan used to introduce his grade 5 students to sociocultural practices common in another region of the country?

c) I plan my CRT action

7. **What could Stan have done differently to avoid the challenges/dilemmas in the case?**
8. **Taking diversity in classrooms into consideration,** how would you justify the recommendations/solutions you described in the previous prompt?
9. In the case, Stan quickly reviewed his options. Should he continue with the class as planned? Should he run after the students who had fled the room? If you were Stan, what would you do at this point? Why?
10. **What lessons do you think you can draw from this case in terms of teaching in diverse classrooms and/or introducing different cultures in class?**

d) I act

11. In what other ways, could the lesson have been designed to avoid or soften the issues raised by the introduction of an animal as food, which is considered as an edible animal in Asian cultures?
12. When Erin (a student) asked "What is its name?", Stan responded "We don't name our food, Erin." If you were Stan, how would you respond to that question?

Case 2: El Secreto de las Ninas

You should consider "culture" in a broader sense for this case. A person's culture may be influenced by his socioeconomic status, family structure, gender, language, religion.

a) I detect the dilemmas/challenges

1. **What kind of challenges/dilemmas/problems do you observe that the students experienced in this case?**
2. **Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the El Secreto de las Ninas case.**

b) I examine the context

3. In the case, the teacher said to the class "If you don't have a shoebox, you can ask your mother or an older brother or sister to take you to a discount shoe store and ask for a shoebox. For those of you who cannot get your own shoebox, you can bring in fifty cents and buy one from me." Here, what are the teacher's assumptions about the students' cultural background?
4. What are the cultural holes that the teacher overlooked in this case? How are they reflected in the teacher's attitudes and instruction?
5. To what extent does the teacher have the stance that all students can succeed regardless of their culture, race, religion, gender, and socioeconomic status?

c) I plan my CRT action

6. **What could the teacher have done to avoid the girls' disengagement from the project?**
7. **Taking diversity in classrooms into consideration, how would you justify your recommendations/solutions you offered for the previous prompt?**
8. What do you think about the girls' utterances such as "I also don't like it when boys think that they are better than me" and "..when we complain about science in school, people think we don't like it because we are girls.." How would you handle this kind of gender-based stereotyping in your future classrooms?
9. **What lessons do you think you can draw from this case in terms of teaching diverse students?**

d) I act

10. In what other ways, could the camera activity have been designed to minimize the challenge in the scenario?

Case 3: Who Eats the Mango?

This is a case experienced by a student teacher, Kim, who wanted to expose students to plants grown and eaten in diverse cultures.

a) I detect the dilemmas/challenges

- **What kind of challenges/dilemmas do you observe that the teacher experienced while introducing fruits and vegetables from different cultures in this case?**
- **Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Mango case.**

b) I examine the context

- The case occurs at a school which is in predominantly white, middle-class, suburban area in the Northeast, and it is just beginning to experience some diversity from recent Central American immigration. Kim brought some new and different plants to the class. Here, what are the teacher's assumptions about the students' cultural background?
- What are your thoughts about the instructional approaches Kim used to introduce her 3rd grade students to new plants grown and eaten in different cultures?

c) I plan my CRT action

- **What could Kim have done to avoid the challenge/dilemma/problem(s) in the case?**
- **Taking diversity in classrooms into consideration, how would you justify your recommendations/solutions you offered for the previous prompt?**
- What strategies might Kim have tried to engage her students in dissecting the strange plant parts?
- **What lessons do you think you can draw from this case in terms of teaching in multicultural classrooms and/or introducing different cultures in class?**

d) I act

- What are the cultural holes that Kim overlooked in this lesson plan?
  In what other ways, could the lesson have been designed to avoid or soften the students' negative reaction to new fruits and vegetables?

Case 4: Egyptian Exhibit

You should consider "culture" in a broader sense for this case. A person's culture may be influenced by his socioeconomic status, family structure, gender, language, religion.

a) I detect the dilemmas/challenges

1. **What kind of dilemmas do you observe that the teacher, Amanda, experienced while Emily was sharing her experience from her trip?**
2. **Have you had similar experiences as a student, teacher or parent? Have colleagues, friends or relatives shared similar experiences with you? If so, describe how these experiences relate to the Egyptian Exhibit case.**

b) I examine the context

3. As Amanda taught Emily's sharing about the mummies as a teachable moment, she let Emily give some more information to the class. Considering that it was a first-grade class, what is your opinion about Amanda's decision?
4. How do you find the teacher's facilitation during the discussion in terms of showing the students that people might have different religious beliefs?

c) I plan my CRT action

5. **How could Amanda have led the discussion better to avoid the students' confusion and/or misconceptualization in the case?**
6. **Taking diversity in classrooms into consideration, how could you justify your recommendations/solutions you offered for the previous prompt?**
7. If you were Amanda (the teacher), how would you respond to the student's question about the skin color?
8. **What lessons do you think you can draw from this case in terms of teaching in multicultural classrooms and/or introducing different cultures in class?**

d) I act

9. What could Amanda have done differently to embrace beliefs of all the students who might have different religious beliefs and family life/structure?
10. In what other ways, can mummies and afterlife be introduced to first-graders?

Appendix C

Case Scenarios

Case 1: *The Day the Lobster Died*

Stan noticed the sudden change on Erin's face. Her expression registered shock, as if she had just become aware of the awful truth. He would never forget the panic in her eyes. He stood transfixed as Erin's emotions plummeted from engaged curiosity to anxiety, then fear. Her chair crushed to the floor as she ran to the classroom door and out into the hall. 'Oh no! You're going to kill it!' she shrieked in disbelief. Stan stood motionless in front of the class. A look of astonishment swept over him as soon as another student ran from the room in tears. Pandemonium broke loose as some students hooted, hollered, and laughed while others sat in stunned silence.

Stan thought his idea to end oceanography unit with a "lobster cookout" deserved a self-congratulatory pat on the back. He knew that lobster was not readily available and that most of his students would not have had an opportunity to see or taste this "Down East" treat. He thought the activity would give the class an opportunity to learn not only about lobsters but also about how a marine animal can shape the economy, life, and identity of a region. It reflected the interdisciplinary approach to teaching he favored. He had searched his kitchen to find lobster artifacts collected over years – everything from a bib with the saying "The lobster you eat today spent the night in Casco Bay" to the mallets, shell cracker, and tiny forks for getting at the lobster claw meat. His enthusiasm was high enough to sustain the two-hour drive to Atlanta where he could buy live lobster.

Stan was a fifth-grade teacher in a small university town in southeastern United States. He was born and raised in New England and, before coming to this rural school, had taught in suburban school district outside of Boston for four years. He had come south to enroll in the graduate program of the nearby university. To establish residency, he had decided to teach in the local school system while taking evening classes.

He had a master's degree in elementary education with an emphasis in science education. Stan had started the lesson by showing the class a carefully wrapped box with

ribbons and a bow saying, “I would like to make some observations about the box.” He had placed the lobster in the box and wrapped it before the class arrived. He wanted to reinforce students’ inquiry skills in making distinctions between observations and inferences. Stan believed that basic process skill of observing was central to teaching science at this level. He wanted students to be able to distinguish between observed and inferred information.

Student attention focused on the shoe size box wrapped in gift paper. Enthusiastic student responses followed one after another: “There is a toy present inside!” “It has a red ribbon around it!” “It is about the same size as a shoe box.” “I can hear something moving inside!” Stan wrote the students’ responses on board. After the class discussed differences between observations and inferences, whether anyone could now identify which statements on the board are observations. Students were quick to eliminate guesses and identify observations. Stan then asked them for some inferences about what might be in the box. To make it more challenging he told the class they could ask only questions that he could answer with a yes or no. “Is it a plant?” “No,” Stan replied, “It is not a plant.” The class excitement began to build after he answered “Yes” to “Is it an animal?” The next series of questions were wild inferences about what it could be based on the size of the box. Finally a student asked, “Does it have a backbone?” “No, it doesn’t, but it is a great question.” Stan responded. He pleased with the level of questions that followed. After exhausting all of the students’ questions, Stan slowly unwrapped the gift box, opened it, and held up the lobster. “Oh, it’s a lobster! But I thought lobsters were red. This one is green!” one student exclaimed. “What’s its name!” With a smile, Stan responded, “We don’t name our food, Erin.”

The door slammed shut after the second student dashed from the room following Erin’s lead. The loud sound snapped Stan out of his stunned silence and brought a momentary lull to the classroom commotion triggered by Erin’s exit. This, he thought, cannot be happening. “All right, enough! His voice commended attention with volume and a somewhat businesslike tone. As things in the room calmed down, Stan quickly reviewed his options. Should he continue with the class as planned? Should he run after the students who had fled the room? “I want you to take out your paper and pens and write a thank you

letter to Mrs. Carson." Emily Carson, a marine biologist with the university, had visited the class the day before.

This task bought Stan the time to follow the two students who had run from the room. He found them both in the hall crying. Erin sobbed inconsolably. Gretchen appeared more composed. Stan suggested that Gretchen accompany Erin to the restroom and return with her to the classroom after they settled down. Stan reentered the classroom and was relieved to see that the students were diligently working on their letters. The water in the lobster pot, hidden out of sight in the back of the room, boiled. Okay Stan, he thought to himself, what now?

Case 2: El Secreto de Las Ninas

My name is Cynthia. I am nine years old. I am in the fourth grade. I have lived with my family in Austin, Texas, for five years. Before moving to Austin, I lived in Mexico. Most of my family still lives in Mexico, but some of my family lives here in Texas with me. Right now, my family lives in a homeless shelter. We have lived here for one year. Although I have lots of friends to play with here, I don't like living here when it gets dark outside. It is not safe. I also do not like it when boys think they are better than me or when they think I cannot do all of the same things as them!

My name is Jessica, and I am eight years old. Cynthia is my best friend. I also go to school in Austin, Texas. My parents are originally from Mexico, but from a different part of Mexico than Cynthia's family. I live in the same homeless shelter as Cynthia. Our families moved into the shelter at about the same time. I really like spending time over at my friends' places, but I don't like when people fight, especially when people fight in my face! I also don't like it when boys try to show me up. I can run as fast as any of the boys around here! I also don't like going outside at night because it is not safe around here!

My name is Angie and I am a science teacher educator in the same city where Cynthia and Jessica live. I have known Jessica and Cynthia since the beginning of the school year (it is now December) because I teach and do research at the shelter where they live. We came to write this story together because these two girls were always particularly active and interested in our after-school science program, and I was interested to learn more about why. well, I certainly got more than I bargained for when the direction of our writing was not about why they liked science but why they did not like the science!

We want to tell about learning science in school. Actually, when Angie asked us to write this story with her, we did not want to do it at first because it was about science in our school. The truth is, we really do not like science. Our favorite subjects are math and reading.

We called our story *El Secreto de las Ninas* because the we do not like science is that we are not used to science! Sometimes when we complain about science in school, people think we don't like it because we ae girls, and that is not true. They tell us we can be anything we want to be. We know that, sort of. We are just as god as boys, we just don't want to explain our reasons. It is our secret.

I told the girls that I thought their secret was interesting but that I was not sure exactly what they meant. What did it mean to be used to something, anyway? Did it mean that their schoolteacher never teaches science at all, and so they were not used to teach science? Finally, I wondered, did it mean that they were not used to the language or the skills the teacher required them to use? I asked the girls to explain their secret to me.

Okay. Let us tell you a story about what happened in school to show you what we mean.

Our teacher told us we were going to start a unit on movie making. We both thought this would be really cool because we love to go see the movies! One of the first activities we were going to do was make a shoebox camera. We would make this camera out of a shoebox, and it would take real pictures. And then we would be able to keep the camera and take whatever pictures we wanted! At the beginning, we were really excited about this project because neither of us have ever owned a camera before. We remember only one time when we were able to use a disposable camera because Cynthia's mother bought her one from the store for her birthday.

The day before we were to start the camera project, our teacher asked each student to bring in an empty shoebox. Well, where are we going to get empty shoeboxes? I told my teacher I didn't have an empty shoebox, so then she said to the whole class, "If you don't have a shoebox, you can ask your mother or an older brother or sister to take you to a discount shoe store and ask for a shoebox. They will give you one for free." Then she said, "For those of you who cannot get your own shoebox, you can bring in fifty cents and buy one from me." She then told us that we are getting older now, and we have to learn to become more responsible for our own education. well, we are still like, where are we going to get a shoebox? My mother cannot take me to the shoe store! She doesn't even have a car, and she cannot speak English that well,

and she has to watch my baby brother. And then we are also like, where are we going to get the fifty cents? So the next day we went to school without our shoeboxes and without fifty cents.

Your story so far reminds me of how easy it is to link what children are able to bring to school with them (whether it be cultural capital, material items, or feelings of power or belonging) to their "success" in science class. In other words, it seems that your teacher is tying your own ability to succeed in her class (or at least to develop positive feelings of belonging in science) to the kinds of things you might have access to at home. Did she understand how your situations at home affected how you might be able to participate in school science? What happened next?

Well, at the beginning of the day, the teacher collected the shoeboxes. A couple of other students in the class did not have shoeboxes or money either. Our teacher gave the class a lecture about being responsible. So we told her in private right before recess that our mothers could not take us to the store and we did not have any money, and that is why we did not have a shoebox. She asked us why we didn't tell her earlier. She also told us it was okay and that she understood. she told us we could help clean the erasers during recess to "earn" the shoebox and that it would be "our secret." Well, we both decided to go to recess because we were mad at her, and we didn't want to share a secret with her. When it came time for science, our teacher said nothing to us but gave us shoeboxes anyway so we could make our camera. But we were the last ones to get shoeboxes, and they were ugly. By that time, we did not want to make cameras anymore, and we just sat there and poked our boxes.

Case 3: *Who Eats the Mango?*

It is late fall, and I am observing my student teacher Kim as she develops a lesson on fruits and vegetables with our third grade students in an affluent, predominantly white suburban neighborhood in the Northeast. In this particular classroom, the students have been studying, examining, classifying, and planning seeds for several days. They have made germination bags and have manipulated variables to determine the optimal conditions for seed growth. They have also explored the seeds of the deciduous and coniferous tress outside their school building. The science table in the corner of this sunny classroom is covered with different samples of seeds in various stages. There are different bean seeds in labelled dishes, some pumpkin seeds germinating in moist plastic bags, and lima bean plants at later stages that have been placed in pots of soil. There are many types of acorns, and "poly-noses" of maple trees with their seeds at

their ends. Several types of pine cones are on display. It feels as though this science table has a direct connection to these students' local environment.

As a science teacher educator, I encourage the pre-service teachers with whom I work to help their children make connections between their science experiences and everyday life. I also challenge my students to engage elementary children in diverse learning experiences that encourage the children's own understanding of diversity. Therefore, when Kim panned her lesson on fruits and vegetables as part of this seed-to-plant unit, I encouraged her to seek out fruits and vegetables that are not commonly grown, cooked, or eaten locally. This activity supports my belief that science curriculum can serve as a mirror and a window, a metaphor adapted from Emily Style (1988).

The children were instructed to bring one fruit and one vegetable to explore in class. Kim explained that they were going to examine parts of plants that we eat. It was apparent that the children were excited about the assignment. When they entered the classroom, they rushed to their tables. Then each child had an opportunity to describe the plant parts he or she had brought to share with the class. The array of fruits and vegetables included apples; pears; bananas; oranges; tomatoes; grapes; cucumbers; acorn squash; celery; lettuce, green, yellow and red bell peppers; and cauliflower. The students used plastic knives to examine their specimens carefully, and Kim challenged them to determine which of these plant parts had seeds. Working in small groups, the children made two piles of edible plant parts: those with seeds and those without seeds. Kim coached them as they struggled to determine whether the dots inside the banana were actually seeds. "What do you think?" asked Kim. "If they aren't seeds, then what could they be?"

The pile of fruits was growing at each table with plant parts that the students were used to referring to as "fruits." The fruit pile included the peppers, cucumbers, tomatoes, and squash, in addition to the more conventional fruits – the apples, pears, bananas, and oranges. "If the plant parts have seeds," announced Kim, "do you know what scientists call them?" The children shout out "Fruits!" and then started giggling that a tomato cannot be a fruit. Kim went on to explain that scientifically, the plant parts with seeds are called fruits. She then asked the students to describe the vegetable pile. "What part of the plant is celery? The lettuce? The carrot, the cauliflower?" The students began to identify the stem for the celery, the leaf for the lettuce, the root for the carrot, and the flower of the plant for the cauliflower florets. They learned that these

different plant parts are collectively called vegetables. Confident in this new-found knowledge, Ramon said to Kim, “I can’t wait to tell my parents that the tomato is really a fruit.”

At this point in the lesson, Kim introduced some new and different plant parts and challenged them to identify them as fruits or vegetables. Kim had brought persimmon, avocado, mango, papaya, fennel, and collard greens. She showed these edible plant parts to the students and asked for group volunteers to explore these new and strange-looking specimens. “Oooh,” Keith shouted as he touched the rough surface of the persimmon, “this feels gross.” Ignoring Keith’s comment, Kim encouraged groups to examine the unusual plant parts. She held up a papaya, then a mango, then the fennel – no volunteers! Kim began to panic as she realized that her students did not want to explore strange and unfamiliar plant parts.

Struggling with the curriculum as window into other worlds, Kim was disappointed by the students’ reluctance to extend their initial discoveries. She wanted the students to classify the unusual plant parts as either fruit or a vegetable and then to examine these plants and learn where they are grown and eaten. Frustrated, Kim held up a mango. “Let’s look at this plant part,” she said. The students watched as she peeled and sliced the fruit in half and revealed a yellow pulp. Making a mess, Kim separated the pulp. The sound effects during this exploration revealed the students’ disgust for this new fruit, which not one student was willing to taste. “Who eats a mango?” asked Kim. “Where do you think it grows?”

There were no answers, and Kim’s desire to expose the students plant parts from other cultures was thwarted by a class who experienced “different” as threatening or “disgusting.”

Case 4: *The Egyptian Exhibit*

It was the last ten minutes of the school day. My first-grade class had just come in from the playground. It was that time of the day when everyone is ready to gather his or her things and prepare to go home. Emily came in from her enrichment class with an armload of stuff that she had made as part of an integrated science and social studies unit about Egypt. “Can I show the class what I made and tell them about my trip to see the mummies?” she asked as the other children were gathering their bookbags.

“Sure.” I replied, and I called for class’s attention. I was pleased that Emily wanted to talk about her trip and saw her request to share as a way of allowing her to bond with the class.

“Emily has some things that she’d like to share with everyone.” I announced. “Her enrichment class took a trip to a museum last week. They have been learning about the Nile River and desert

habitat in the country of Egypt. Emily, tell us about some of the things that you saw at the museum."

"Well, we saw a cartouche."

"Explain to the class what a cartouche is." I interrupted.

"It's a tablet that has some really old writing on it." She explained.

"Does the writing look like our writing?" I probed.

"No." She replied. "It looks like little pictures. They called them hieroglyphics."

"Very good. That's a hard word to remember. What else did you see?" I urged.

"We saw mummies!" she said with delight.

By the very awed expressions on the faces of her classmates, I knew that she had their undivided attention.

"What did the mummies look like?" I asked.

"Well, they were all wrapped up, kinda like in a swaddling cloth." She described.

"Were they dead?" asked another child in the room.

"Yeah" giggled Emily.

The rest of the class oohed and ahhed again, as if on cue. Thinking at this point that the discussion was turning into a perfect teachable moment. I decided to facilitate the discussion so that Emily would give the class a little more information.

"So the mummies were wrapped in cloth." I said.

"Yes." She replied. "But don't ask me to tell them about what they did with their brains."

I could tell by her tone that she really did want me to ask. So I said, "Explain to the class how the ancient Egyptians made the mummies, Emily." I wanted the class to understand more about the preservation of the body.

"After the person died," she explained, "they would take out all of his insides and put stuff inside of him."

"Go ahead and tell them how they removed the person's brain." I encouraged.

"They stuck the wire up the person's nose and pulled the brains out!" she exclaimed. The class responded with the appropriate, but not unexpected, gasps and noises of disgust.

"Well, Emily, why did the ancient Egyptians do all of this to the person's body after they were dead?" I asked.

Emily looked at me blankly, and since we were short on time, I explained to the class that these techniques made the body last longer." You know, after you are dead for a while, your body and skin dry out, and all that is left are your bones." I told them. I reminded the class that we had touched on this subject back at Halloween when someone had asked me about skeletons.

"Emily, did you see anything else that would have been buries with the mummies? I asked.

"Yes, we saw some pottery and some jewelry and statues and stuff," she replied.

"Why did they bury those things with the person who had died?" I questioned.

"Because they thought that the person who had died would need those things. They believed in an afterlife, but not like we believe in an afterlife," she explained.

I know that we were beginning to tread on some shaky ground. Emily had been exposed to a very fundamentalist Christian upbringing. Her strong beliefs and intolerance of those who believed differently had been a source of difficulty in many of her social relationships. Instead of commenting about the belief in an afterlife, I just nodded my head in agreement and pushed the conversation along.

"So the ancient Egyptians believed that preserving the body was important. They believed that doing these things would keep the body from turning to bones as quickly."

"Yes. On some of the mummies, you could still see some of their skin and hair. It was all brown," she responded, crinkling up her nose.

"Yes, their techniques did work very well," I agreed, "but eventually the mummies would turn to bones. And a very long time after that, the bones would just turn to dust. That is why sometimes you go to a funeral, you might hear someone say, "Ashes to ashes and dust to dust."

"Yeah." Emily's eyes lit up, "because God made us from dust, and we turn into dust when we die."

The Christian in me felt a little proud of her for making the connection, but I decided that the most appropriate response was just to nod my head.

"Oh, Mrs. Neff," Timara, an African American student exclaimed, "is that why your skin is so light, because God made you out of sand?"

The light in Timara's eye was just as bright. I somehow got the feeling that a really big question had just been answered for her. I tried to hide my amusement. I had just begun a brief explanation of how our skin color actually had a lot to do with the places from which our ancestors came when the bell (rather fortunately) saved me. It was time for everyone to leave.

Emily looked very pleased with herself, and I felt good about the experience. The other children had seemed very interested, and although I knew we had touched on some sensitive issues relating to religion and science. I felt that I had not overstepped any boundaries and had provided Emily with an opportunity to shine. I decided that this might be a good experience to share with her parents. I liked them. Her mother and father were both well educated, and each had a pretty clear Picture of their child. They understood that Emily was strong-minded and had been very concerned about the difficulties she was having in class. I also thought that they would be proud of the way she had discussed and related her own beliefs in relationship to what she had seen at the museum.

That night, I phoned Emily's mother and related to her the story of the discussion that Emily had led earlier in the day. As I was wrapping up my tale, I noticed that Emily's mother was not amused by the story as I. She chuckled a bit, but then her voice took on a decidedly different tone. "I've been meaning to talk to you about Emily's enrichment class," she began. "She hates it. And quite frankly, my husband and I were very upset when we saw some of the things that she brought home today. Did you realize that they have been studying about the various gods that the Egyptians believed in, and that the enrichment teacher has been making them memorize what each god stood for? I just don't see any need for young children to be exposed to that information. When we signed the permission slip for her to go on the field trip to the museum, we thought that it was to see the art museum. If we had known what kind of exhibit they were going to see, we'd never have let her go."

My heart dropped to my stomach. I was stunned. I was totally unprepared for that type of reaction. With every complaint, I felt myself become angrier. I sincerely believed that I was doing my best to respect her family's beliefs and to encourage Emily to feel free to express her beliefs as well. I was overcome by the feeling that, because I, too, had a daughter who went on this field trip and because I was a Christian. Emily's mother expected me to agree with her. The best response I could muster was to advise her to speak to the enrichment teacher about her concerns. At this point, all I could think about was how to end this discussion. I made an excuse and ended the telephone conversation as quickly as I could.

Appendix D

Synthesis Paper

Your synthesis paper should be approximately 2 pages, single-spaced in length. It should address the questions below:

- How do you think pedagogy, curriculum based on standards, and a teacher's own beliefs-values are connected to each other? Based on these three components, what is your teaching philosophy? (Discuss it briefly.)
- How would you envision yourself providing inclusive and meaningful learning environments in your future classes with learners who have different needs?
- If you experienced a dilemma similar to the one of the cases we have discussed so far, how would you balance your accountability (that is, your following of the curriculum and standards strictly) and your students' welfare (that is, they enjoy the activities you prepare for the class)?

Appendix E

Interview Protocol

Interview Questions
Goal: Exploring pre-service teachers' perspectives about reflection
1. How do you describe yourself as a teacher in your future classroom with diverse cultures? How do you envision yourself as a teacher in your future classroom which might be multicultural? 2. How do you describe a reflective teacher? What do you think a reflective teacher is like? 3. What role do you think a teacher's reflection plays in his or her teaching? 4. What do you think could make it difficult for a teacher to be reflective while teaching?
Goal: Exploring pre-service teachers' perspectives about diversity and CRT
5. How do you define "diversity"? 6. What does "being culturally responsive in teaching" mean to you? 7. How important do you think being culturally responsive in teaching is? Why do you think so? 8. What kind of cultural elements would you focus on while planning your future lessons? 9. What impact do you think reflection has on becoming a culturally responsive teacher? 10. What concerns do you have, if you have any, around diversity and/or science teaching?
Goal: Exploring pre-service teachers' experience during the case analysis
11. What did you learn from the case analyses? 12. What did you learn about yourself as a future teacher from the case analyses and discussions? 13. Which case scenario(s) do you think is the most useful? 14. Which case scenario(s) do you think is the most useful?
Goal: Exploring pre-service teachers' experience of using the reflection prompts
15. How did taking the prompts online work for you? 16. Which prompt(s) do you think is the most useful? 17. Which prompt(s) do you think is the least useful?

Appendix F

Codebook of the Pilot Study

Category	Code	Explanation	Sample Excerpt
Pre-reflection	Pre-reflection_problem detection	Framing the problem given in the scenario	"The students experienced discrimination and feelings as though they were not good enough by their teacher. When the student were vulnerable and shared their "secret" with the teacher, she still told them that th had to "earn" their materials, which hurt them because it was not their fault they weren't able to afford/obtain the materials. (Case scenario #2 (shoebox); Erica- online reflection)
	Pre-reflection_personal connection	Establishing a link between personal experience and the given situation	"Being a Christian, the only religious issue I have had in my classes have been students asking me about my faith (i.e. where do you go to church, do you read a Bible, etc). When these questions arise, I answer truthfully, but then steer the question away from religion in hopes of ensuring an appropriate conversation." (Case scenario #4 (exhibit); Elizabeth- online reflection)
Descriptive reflection	Surface-level reflection	Description of a situation or problem without any critical analysis	"The students did not want to engage in the lesson when these fruits and vegetables were introduced. They acted disgusted by these fruits." (Case scenario #3 (mango); Melanie- online reflection)
Pedagogical reflection	Pedagogical reflection_CRP	Reflection about culturally responsive pedagogical and instructional strategies	"I think she could have turned that into a lesson about how people practice different things and how they celebrate the dead (you could talk about funerals, mummification in order to preserve the body, and Dia de Los Muertos) to make it a cultural lesson." (Case scenario #4 (exhibit); Erica- online reflection)
	Pedagogical reflection_instructional strategies	Reflection about instructional practices for quality learning	"She might have also tried having a whole mango and then showing a mango previously dissected to avoid the mess. After the students became comfortable with the idea of looking at new, oddly shaped plants, the teacher could have let them try dissecting on

			their own." (Case scenario #3 (mango); Ashley- online reflection)
Critical reflection	Critical reflection_equity focused	In-depth reflection to bring equity into classroom	"When extra supplies are required for a lesson, we [teachers] need to have those supplies available for students who cannot get access to them, for any reason." (Case scenario #2 (shoebox); Melanie- online reflection)
	Critical reflection_affirming diversity	In-depth reflection to recognize and value diversity in class	"Not every student will experience or eat the same kinds of things." (Case scenario #3 (mango); Erica- online reflection)
	Critical reflection_ethical issues	In-depth reflection to critically analyze ethical implications of instructional practices in class	"Cleaning erasers has been used as a form of punishment for bad behavior. It's just kind of a gray, ethical area." (Case scenario #2 (shoebox); Ashley - in-class discussion)
	Critical reflection_CRP focused	In-depth reflection to gain culturally responsiveness and cultural competence to apply into instruction	"There's kind of a gap between students' experiences and interests and what they learn at school and so maybe they just don't feel as connected or interested in what they're learning." (Melanie - interview)
Views of diversity	Broad definition of diversity_Family	Acknowledging that family background, structure, home life are a part of diversity	"The teacher assumes that there is not a father present in the family or that each student has a stereotypical family structure (dad, mom, siblings). This may not be the case all the time." (Case scenario #2 (shoebox); Ashley- online reflection)
	Broad definition of diversity_Socioeconomic status	Acknowledging that socioeconomic status is a part of diversity	"She [the teacher] does not have the idea that all students can succeed, because these girls' socioeconomic status prohibits them from succeeding on a task for her class." (Case scenario #2 (shoebox); Elizabeth- online reflection)
	Broad definition of diversity_Gender	Acknowledging that gender is a part of diversity	"I would also stay away from categorizing the class by gender in the first place because some students may not fit the binary genders and feel excluded if I set up my classroom that way." (Case scenario #2 (shoebox); Ashley- online reflection)

	Broad definition of diversity_Religion	Acknowledging that religion is a part of diversity	“I should always be aware that my students have different religious beliefs and cultural backgrounds from each other and from me. Showing favoritism to one side or another by ignoring and nodding can lead to other students feeling alienated by me simply because I have not acknowledged everyone and their beliefs in the class.” (Case scenario #4 (exhibit); Ashley- online reflection)
	Broad definition of diversity_Dietary choices	Acknowledging that dietary choices are a part of diversity	“The teacher did not consider dietary needs/choices or possibly religion of some students.” (Case scenario #1 (lobster); Erica- online reflection)
CRP/CRT strategies for caring and inclusive classrooms	Knowing who your students are_not making assumptions about them	Teachers’ being aware of backgrounds of students and not overlooking their cultural experiences	“I think a lesson I can draw from this case is to never make assumptions about student's cultural backgrounds, family life, or socioeconomic status.” (Case scenario #2 (shoebox); Melanie- online reflection)
	Voicing students’ opinions	Teachers’ being open to students’ ideas for inclusive classrooms	“When he finds the students that left, he should have a discussion with them that explains his reasons for the lesson and also allow them to voice their concerns and opinions.” (Case scenario #1 (lobster); Ashley- online reflection)
	Teachers’ being unbiased	Teachers’ not having any bias about students’ ideas, beliefs, values	“Keeping a teacher’s beliefs, whether religious, political, etc., separate from the curriculum creates a neutral environment. It is important to not to have bias in your teaching so that all students feel accepted and supported in your classroom, regardless of their beliefs.” (Case scenario #4 (exhibit); Melanie- synthesis paper)

Appendix G

Revised Case Scenarios

Case 1: *The Day the Lobster Died**

*(*The case scenario has been shortened to keep the focus on the cookout of the lobster.)*

Stan noticed the sudden change on Erin's face. Her expression registered shock, as if she had just become aware of the awful truth. He would never forget the panic in her eyes. He stood transfixed as Erin's emotions plummeted from engaged curiosity to anxiety, then fear. Her chair crushed to the floor as she ran to the classroom door and out into the hall. 'Oh no! You're going to kill it!' she shrieked in disbelief. Stan stood motionless in front of the class. A look of astonishment swept over him as soon as another student ran from the room in tears. Pandemonium broke loose as some students hooted, hollered, and laughed while others sat in stunned silence.

Stan thought his idea to end oceanography unit with a "lobster cookout" deserved a self-congratulatory pat on the back. He knew that lobster was not readily available and that most of his students would not have had an opportunity to see or taste this "Down East" treat. He thought the activity would give the class an opportunity to learn not only about lobsters but also about how a marine animal can shape the economy, life, and identity of a region. It reflected the interdisciplinary approach to teaching he favored. He had searched his kitchen to find lobster artifacts collected over years – everything from a bib with the saying "The lobster you eat today spent the night in Casco Bay" to the mallets, shell cracker, and tiny forks for getting at the lobster claw meat. His enthusiasm was high enough to sustain the two-hour drive to Atlanta where he could buy live lobster.

Stan was a fifth-grade teacher in a small university town in southeastern United States. He was born and raised in New England and, before coming to this rural school, had taught in suburban school district outside of Boston for four years. He had come south to enroll in the graduate program of the nearby university. To establish residency, he had decided to teach in the local school system while taking evening classes.

He had a master's degree in elementary education with an emphasis in science education. Stan had started the lesson by showing the class a carefully wrapped box with ribbons and a bow saying, "I would like to make some observations about the box." He had placed the lobster in the box and wrapped it before the class arrived. He wanted to reinforce students' inquiry skills in making distinctions between observations and inferences. Stan believed that basic process skill of observing was central to teaching science at this level. He wanted students to be able to distinguish between observed and inferred information.

Student attention focused on the shoe size box wrapped in gift paper. Enthusiastic student responses followed one after another: “There is a toy present inside!” “It has a red ribbon around it!” “It is about the same size as a shoe box.” “I can hear something moving inside!” Stan wrote the students’ responses on board. After the class discussed differences between observations and inferences, whether anyone could now identify which statements on the board are observations. Students were quick to eliminate guesses and identify observations. Stan then asked them for some inferences about what might be in the box. To make it more challenging he told the class they could ask only questions that he could answer with a yes or no. “Is it a plant?” “No,” Stan replied, “It is not a plant.” The class excitement began to build after he answered “Yes” to “Is it an animal?” The next series of questions were wild inferences about what it could be based on the size of the box. Finally, a student asked, “Does it have a backbone?” “No, it doesn’t, but it is a great question.” Stan responded. He pleased with the level of questions that followed. After exhausting all of the students’ questions, Stan slowly unwrapped the gift box, opened it, and held up the lobster. “Oh, it’s a lobster! But I thought lobsters were red. This one is green!” one student exclaimed. “What’s its name!” With a smile, Stan responded, “We don’t name our food, Erin.” The door slammed shut after the second student dashed from the room following Erin’s lead.

Case 2: *El Secreto de Las Ninas*

(No revisions on this case have been made since the participants indicated this scenario was the most applicable one to today’s classroom contexts.)

My name is Cynthia. I am nine years old. I am in the fourth grade. I have lived with my family in Austin, Teas, for five years. Before moving to Austin, I lived in Mexico. Most of my family still lives in Mexico, but some of my family lives here in Texas with me. Right now, my family lives in a homeless shelter. We have lived here for one year. Although I have lots of friends to play with here, I don’t like living here when it gets dark outside. It is not safe. I also do not like it when boys think they are better than me or when they think I cannot d all of the same things as them!

My name is Jessica, and I am eight years old. Cynthia is my best friend. I also go to school in Austin, Texas. My parents are originally from Mexico, but from a different part of Mexico than Cynthia’s family. I live in the same homeless shelter as Cynthia. Our families moved into the shelter at about the same time. I really like spending time over at my friends’ places, but I don’t like when people fight, especially when people fight in my face! I also don’t like it when boys try to show me up. I can run as fast as any of the boys around here! I also don’t like going outside at night because it is not safe around here!

My name is Angie and I am a science teacher educator in the same city where Cynthia and Jessica live I have known Jessica and Cynthia since the beginning of the school year (it is now December) because I teach and do research at the shelter where they live. We came to write this story together because these two girls were always particularly active and interested in our

after-school science program, and I was interested to learn more about why. well, I certainly got more than I bargained for when the direction of our writing was not about why they liked science but why they did not like the science!

We want to tell about learning science in school. Actually, when Angie asked us to write this story with her, we did not want to do it at first because it was about science in our school. The truth is, we really do not like science. Our favorite subjects are math and reading.

We called our story *El Secreto de las Ninas* because the we do not like science is that we are not used to science! Sometimes when we complain about science in school, people think we don't like it because we ae girls, and that is not true. They tell us we can be anything we want to be. We know that, sort of. We are just as god as boys, we just don't want to explain our reasons. It is our secret.

I told the girls that I thought their secret was interesting but that I was not sure exactly what they meant. What did it mean to be used to something, anyway? Did it mean that their schoolteacher never teaches science at all, and so they were not used to teach science? Finally, I wondered, did it mean that they were not used to the language or the skills the teacher required them to use? I asked the girls to explain their secret to me.

Okay. Let us tell you a story about what happened in school to show you what we mean. Our teacher told us we were going to start a unit on movie making. We both thought this would be really cool because we love to go to see the movies! One of the first activities we were going to do was make a shoebox camera. We would make this camera out of a shoebox, and it would take real pictures. And then we would be able to keep the camera and take whatever pictures of us have ever owned a camera before. We remember only one time when we were able to use a disposable camera because Cynthia's mother bought her one from the store for her birthday.

The day before we were to start the camera project, our teacher asked each student to bring in an empty shoebox. Well, where are we going to get empty shoeboxes? I told my teacher I didn't have an empty shoebox, so then she said to the whole class, "If you don't have a shoebox, you can ask your mother or an older brother or sister to take you to a discount shoe store and ask for a shoebox. They will give you one for free." Then she said, "For those of you who cannot get your own shoebox, you can bring in fifty cents and buy one from me." She then told us that we are getting older now, and we have to learn to become more responsible for our own education. well, we are still like, where are we going to get a shoebox? My mother cannot take me to the shoe store! She doesn't even have a car, and she cannot speak English that well, and she has to watch my baby brother. And then we are also like, where are we going to get the fifty cents? So the next day we went to school without our shoeboxes and without fifty cents.

Your story so far reminds me of how easy it is to link what children are able to bring to school with them (whether it be cultural capital, material items, or feelings of power or belonging) to their "success" in science class. In other words, it seems that your teacher is tying your own ability to succeed in her class (or at least to develop positive feelings of belonging in science) to the kinds of things you might have access to at home. Did she understand how your

situations at home affected how you might be able to participate in school science? What happened next?

Well, at the beginning of the day, the teacher collected the shoeboxes. A couple of other students in the class did not have shoeboxes or money either. Our teacher gave the class a lecture about being responsible. So we told her in private right before recess that our mothers could not take us to the store and we did not have any money, and that is why we did not have a shoebox. She asked us why we didn't tell her earlier. She also told us it was okay and that she understood. She told us we could help clean the erasers during recess to "earn" the shoebox and that it would be "our secret." Well, we both decided to go to recess because we were mad at her, and we didn't want to share a secret with her. When it came time for science, our teacher said nothing to us but gave us shoeboxes anyway so we could make our camera. But we were the last ones to get shoeboxes, and they were ugly. By that time, we did not want to make cameras anymore, and we just sat there and poked our boxes.

Case 3: *Who Eats the Rambutan?**

("Avacado" and "mango" have been changed to "longan" and "rambutan" to make students' unfamiliarity with the fruits in the case scenario more salient.)*

It is late fall, and I am observing my student teacher Kim as she develops a lesson on fruits and vegetables with our third-grade students in an affluent, predominantly white suburban neighborhood in the Northeast. In this particular classroom, the students have been studying, examining, classifying, and planning seeds for several days. They have made germination bags and have manipulated variables to determine the optimal conditions for seed growth. They have also explored the seeds of the deciduous and coniferous tress outside their school building. The science table in the corner of this sunny classroom is covered with different samples of seeds in various stages. There are different bean seeds in labelled dishes, some pumpkin seeds germinating in moist plastic bags, and lima bean plants at later stages that have been placed in pots of soil. There are many types of acorns, and "poly-noses" of maple trees with their seeds at their ends. Several types of pine cones are on display. It feels as though this science table has a direct connection to these students' local environment.

As a science teacher educator, I encourage the pre-service teachers with whom I work to help their children make connections between their science experiences and everyday life. I also challenge my students to engage elementary children in diverse learning experiences that encourage the children's own understanding of diversity. Therefore, when Kim panned her lesson on fruits and vegetables as part of this seed-to-plant unit, I encouraged her to seek out fruits and vegetables that are not commonly grown, cooked, or eaten locally. This activity supports my belief that science curriculum can serve as a mirror and a window, a metaphor adapted from Emily Style (1988).

The children were instructed to bring one fruit and one vegetable to explore in class. Kim explained that they were going to examine parts of plants that we eat. It was apparent that the children were excited about the assignment. When they entered the classroom, they rushed to

their tables. Then each child had an opportunity to describe the plant parts he or she had brought to share with the class. The array of fruits and vegetables included apples; pears; bananas; oranges; tomatoes; grapes; cucumbers; acorn squash; celery; lettuce, green, yellow and red bell peppers; and cauliflower. The students used plastic knives to examine their specimens carefully, and Kim challenged them to determine which of these plant parts had seeds. Working in small groups, the children made two piles of edible plant parts: those with seeds and those without seeds. Kim coached them as they struggled to determine whether the dots inside the banana were actually seeds. "What do you think?" asked Kim. "If they aren't seeds, then what could they be?"

The pile of fruits was growing at each table with plant parts that the students were used to referring to as "fruits." The fruit pile included the peppers, cucumbers, tomatoes, and squash, in addition to the more conventional fruits – the apples, pears, bananas, and oranges. "If the plant parts have seeds," announced Kim, "do you know what scientists call them?" The children shout out "Fruits!" and then started giggling that a tomato cannot be a fruit. Kim went on to explain that scientifically, the plant parts with seeds are called fruits. She then asked the students to describe the vegetable pile. "What part of the plant is celery? The lettuce? The carrot, the cauliflower?" The students began to identify the stem for the celery, the leaf for the lettuce, the root for the carrot, and the flower of the plant for the cauliflower florets. They learned that these different plant parts are collectively called vegetables. Confident in this new-found knowledge, Ramon said to Kim, "I can't wait to tell my parents that the tomato is really a fruit."

At this point in the lesson, Kim introduced some new and different plant parts and challenged them to identify them as fruits or vegetables. Kim had brought longan, rambutan, papaya, fennel, and collard greens. She showed these edible plant parts to the students and asked for group volunteers to explore these new and strange-looking specimens. "Oooh," Keith shouted as he touched the rough surface of the longan, "this feels gross." Ignoring Keith's comment, Kim encouraged groups to examine the unusual plant parts. She held up a papaya, then a rambutan, then the fennel – no volunteers! Kim began to panic as she realized that her students did not want to explore strange and unfamiliar plant parts.

Struggling with the curriculum as window into other worlds, Kim was disappointed by the students' reluctance to extend their initial discoveries. She wanted the students to classify the unusual plant parts as either fruit or a vegetable and then to examine these plants and learn where they are grown and eaten. Frustrated, Kim held up a rambutan. "Let's look at this plant part," she said. The students watched as she peeled and sliced the fruit in half and revealed a whitish pulp. Making a mess, Kim separated the pulp. The sound effects during this exploration revealed the students' disgust for this new fruit, which not one student was willing to taste. "Who eats a rambutan?" asked Kim. "Where do you think it grows?"

There were no answers, and Kim's desire to expose the students plant parts from other cultures was thwarted by a class who experienced "different" as threatening or "disgusting."

Case 4: *The Egyptian Exhibit**

*(*The case scenario has been shortened to keep the focus on the discussion of skin color and religion)*

It was the last ten minutes of the school day. My first-grade class had just come in from the playground. It was that time of the day when everyone is ready to gather his or her things and prepare to go home. Emily came in from her enrichment class with an armload of stuff that she had made as part of an integrated science and social studies unit about Egypt. "Can I show the class what I made and tell them about my trip to see the mummies?" she asked as the other children were gathering their bookbags.

"Sure." I replied, and I called for class's attention. I was pleased that Emily wanted to talk about her trip and saw her request to share as a way of allowing her to bond with the class.

"Emily has some things that she'd like to share with everyone." I announced. "Her enrichment class took a trip to a museum last week. They have been learning about the Nile River and desert habitat in the country of Egypt. Emily, tell us about some of the things that you saw at the museum."

"Well, we saw a cartouche."

"Explain to the class what a cartouche is." I interrupted.

"It's a tablet that has some really old writing on it." She explained.

"Does the writing look like our writing?" I probed.

"No." She replied. "It looks like little pictures. They called them hieroglyphics."

"Very good. That's a hard word to remember. What else did you see?" I urged.

"We saw mummies!" she said with delight.

By the very awed expressions on the faces of her classmates, I knew that she had their undivided attention.

"What did the mummies look like?" I asked.

"Well, they were all wrapped up, kinda like in a swaddling cloth." She described.

"Were they dead?" asked another child in the room.

"Yeah" giggled Emily.

The rest of the class oohed and ahhed again, as if on cue. Thinking at this point that the discussion was turning into a perfect teachable moment. I decided to facilitate the discussion so that Emily would give the class a little more information.

"So the mummies were wrapped in cloth." I said.

"Yes." She replied. "But don't ask me to tell them about what they did with their brains."

I could tell by her tone that she really did want me to ask. So I said, "Explain to the class how the ancient Egyptians made the mummies, Emily." I wanted the class to understand more about the preservation of the body.

"After the person died," she explained, "they would take out all of his insides and put stuff inside of him."

"Go ahead and tell them how they removed the person's brain." I encouraged.

"They stuck the wire up the person's nose and pulled the brains out!" she exclaimed. The class responded with the appropriate, but not unexpected, gasps and noises of disgust.
"Well, Emily, why did the ancient Egyptians do all of this to the person's body after they were dead?" I asked.

Emily looked at me blankly, and since we were short on time, I explained to the class that these techniques made the body last longer." You know, after you are dead for a while, your body and skin dry out, and all that is left are your bones." I told them. I reminded the class that we had touched on this subject back at Halloween when someone had asked me about skeletons.
"Emily, did you see anything else that would have been buried with the mummies? I asked.
"Yes, we saw some pottery and some jewelry and statues and stuff," she replied.
"Why did they bury those things with the person who had died?" I questioned.
"Because they thought that the person who had died would need those things. They believed in an afterlife, but not like we believe in an afterlife," she explained.

I know that we were beginning to tread on some shaky ground. Emily had been exposed to a very fundamentalist Christian upbringing. Her strong beliefs and intolerance of those who believed differently had been a source of difficulty in many of her social relationships. Instead of commenting about the belief in an afterlife, I just nodded my head in agreement and pushed the conversation along.
"So the ancient Egyptians believed that preserving the body was important. They believed that doing these things would keep the body from turning to bones as quickly."
"Yes. On some of the mummies, you could still see some of their skin and hair. It was all brown," she responded, crinkling up her nose.
"Yes, their techniques did work very well," I agreed, "but eventually the mummies would turn to bones. And a very long time after that, the bones would just turn to dust. That is why sometimes you go to a funeral, you might hear someone say, "Ashes to ashes and dust to dust."
"Yeah." Emily's eyes lit up, "because God made us from dust, and we turn into dust when we die."

The Christian in me felt a little proud of her for making the connection, but I decided that the most appropriate response was just to nod my head.
"Oh, Mrs. Neff," Timara, an African American student exclaimed, "is that why your skin is so light, because God made you out of sand?"

The light in Timara's eye was just as bright. I somehow got the feeling that a really big question had just been answered for her. I tried to hide my amusement. I had just begun a brief explanation of how our skin color actually had a lot to do with the places from which our ancestors came when the bell (rather fortunately) saved me. It was time for everyone to leave. Emily looked very pleased with herself, and I felt good about the experience. The other children had seemed very interested, and although I knew we had touched on some sensitive issues relating to religion and science. I felt that I had not overstepped any boundaries and had provided Emily with an opportunity to shine. I decided that this might be a good experience to share with her parents. I liked them. Her mother and father were both well educated, and each had a pretty

clear Picture of their child. They understood that Emily was strong-minded and had been very concerned about the difficulties she was having in class. I also thought that they would be proud of the way she had discussed and related her own beliefs in relationship to what she had seen at the museum.

That night, I phoned Emily's mother and related to her the story of the discussion that Emily had led earlier in the day. As I was wrapping up my tale, I noticed that Emily's mother was not amused by the story as I. She chuckled a bit, but then her voice took on a decidedly different tone. "I've been meaning to talk to you about Emily's enrichment class," she began. "She hates it. And quite frankly, my husband and I were very upset when we saw some of the things that she brought home today. Did you realize that they have been studying about the various gods that the Egyptians believed in, and that the enrichment teacher has been making them memorize what each god stood for? I just don't see any need for young children to be exposed to that information. When we signed the permission slip for her to go on the field trip to the museum, we thought that it was to see the art museum. If we had known what kind of exhibit they were going to see, we'd never have let her go."

Appendix H

Audit Trail

1. After the data collection was completed on March 5th, the first author transcribed the in-class discussions and interviews.
2. The first author organized the dataset and created the cases on NVivo (Version 12).
3. After reading the written reflections and transcripts several times, the first author conducted initial coding to explore the data and familiarize herself with the data. 112 codes were generated.
4. In the second cycle, focused coding was implemented. The 112 codes were refined, and this cycle yielded revised 73 codes (including sub-codes).
5. The first author created codebook of the study including the codes and the coding scheme and shared it with a full professor who has expertise in qualitative research and regularly teaches qualitative research methods.
6. After the professor's review, the first author met with the professor to discuss the codes and the coding scheme. Based on their consensus, the first author updated and refined the codes.
7. The first author shared the updated coding scheme and the codes along with the NVivo file with an associate professor who has an extensive research experience in the fields of teacher education and instructional technology.
8. The first author and the associate professor went through all the codes one by one together. Following this, the first author refined the codes more, created three categories, and shared the updated NVivo file with the associate professor again.
9. The associate professor reviewed the updated file again and met with the first author to discuss the codes.
10. After some revisions in the coding and in the wording at the meeting, they reached a consensus. The first author finalized the coding and codebook of the study.
11. Finally, both professors reviewed this finalized version of the codebook.

Appendix I

Codebook of the Main Study

Category	Code	Description	Sample Excerpt
	acknowledging and valuing diversity	To create a culturally responsive classroom, diversity students should be acknowledged and valued.	I look forward to having my own classroom where I can foster a space in which all of my students feel at home and can reach their full potential. To create this environment, I will ensure that they understand that diversity should not only be acknowledged but valued and appreciated. **(Anna, synthesis paper)**
	being cognizant of ethical elements	Both teachers and students should be aware that ethical issues emerge in diverse classrooms.	There is also the issue of animal cruelty and the fact that he is cooking the lobster in front of them. **(Leslie, scenario #1)**
Atmosphere of (how to create) a culturally responsive classroom	creating equity for all	Equity for all should exist in culturally responsive classrooms.	It's important to strive for equity in classroom and the first step is recognizing the inequality and injustices that affect our children. We cannot ask the same thing from each and every one of them and expect the same result. **(Anna, scenario #2)**
	ensuring equal access to learning	Students should not lack access to learning due to their backgrounds.	To ensure all students' access to science learning, I think that the teacher could have done a couple of different things. First, if she wanted to continue on with the shoe box camera activity as originally planned, she could have done a school-wide shoe box drive. **(Anna, scenario #2)**
	ensuring that students feel welcomed and valued	Every single student should feel valued and welcomed in culturally responsive classrooms.	If I have a student who comes from, say India for example, where they worship cows instead of eating them, and he/she wants to share that, I would allow and encourage it. Not only so that the other students can be exposed to something new, but so that the

			student feels welcomed and respected. **(Leslie, scenario #1)**
	helping students get knowledgeable about other cultures	Students should become familiar with other cultures	I would begin by telling my class that we all come from different backgrounds and cultures. This means that we may not all believe the same things or have the same feelings about topics. I would also ask them to put on their empathy hat and to be good listeners and respectful as we go into this subject. **(Leslie, scenario #1)**
	showing no tolerance for any stereotyping	There should be no stereotyping based on gender, socioeconomic status, religion, etc.	In my own classroom, I want to ensure that all of my students feel capable of pursing any and all subjects and know that their potential is not restricted by their gender, race, class. **(Anna, scenario #2)**
Instructional aspects of culturally responsive teaching	Alternative teaching strategies offered for the teachers in the case scenarios	Culturally responsive teaching (CRT) strategies to resolve the dilemmas in the case scenarios	The camera activity could have been designed by having the students make the shoeboxes in class. The teacher could bring in pieces of cardboard and the students could assemble the shoeboxes by gluing the cardboard pieces together. **(Hailey, scenario #2)**
	Being prepared - lesson planning	Teachers should always be prepared and plan their lessons carefully in diverse classrooms.	You have to prepare for students to react negatively to every new experience. I think that asking students what they want to do is also important, especially as a new cultural experience, because if they are scared or feel forced into it, they are more likely to disengage. **(Sarah, scenario #4)**
	CRT activity examples	Some general CRT activity ideas	It is my goal to be culturally diverse in all subjects by incorporating, for example, real life scenarios in math problems and reading culturally diverse books during reading. **(Hailey, synthesis paper)**
	Giving control-autonomy to students for their own learning	To make students included, some autonomy should be given to them.	If they were given the responsibility of making the big decisions that go into a lesson, I believe that they would be more invested in the activity and eager to participate because of the work they put into it. **(Anna, scenario #3)**
	Individualized instruction for equitable classroom	To address needs of students, individualized	Instruction and interaction with students should be

		instruction should be provided.	individualized and catered to meet their personal needs when trying to foster and equitable learning environment for all. **(Anna, scenario #2)**
	Offering more choices for classroom activities	To make lesson more responsive, some options can be offered during activities.	Another way to make this lesson have less harsh reactions would be by offering students more choice in the activity. For example, not every student has to touch the plant parts and cut them apart. Some students could write down or even draw their observations as other students take on the more hands-on approach. **(Anna, scenario #3)**
	Providing relevant, appropriate content	Culturally relevant content should be presented to students.	I think that first graders would really enjoy learning about the pyramids that the ancient Egyptians built. This would relate to mummies and the afterlife because the pyramids were essentially designed to protect the bodies of the deceased and help guide them into life after death. **(Anna, scenario #4)**
	Using students' funds of knowledge	What students bring into classes should be used for activity and lesson designing.	Amanda should have opened up the floor for students to discuss their own ideas about why Egyptian mummies were buried with things like pottery and jewelry. By allowing students to converse as a whole group it gives them the chance to bring their cultural and religious capital into the classroom. **(Beth, scenario #4)**
		To be culturally responsive, teachers should:	The teacher may simply have relied too heavily on her assumptions as a White educated adult, and overlooked the situation. **(Leslie, scenario #2)**
	Teachers' acknowledging their own beliefs and values	first acknowledge their own beliefs.	
	Affirming diversity	affirm the diversity students bring.	She [the teacher in the scenario] could have said that not everyone believes that, and that it's okay to believe differently in the classroom. **(Sarah, scenario #4)**
	Being fair to all students	be fair to all students in a classroom.	Shoebox means success, no shoebox means failure. This is not fair to the students and can end up harming their motivation and their sense of community in

			the classroom. **(Leslie, scenario #2)**
	Being unbiased, neutral, objective	not impose their own beliefs on students.	I am there to objectively educate them about the various standards that are required to be taught by the state in which I am teaching. It is okay for teachers to answer questions but to indicate clearly their religious beliefs is not something that I think teachers need to do, unless employed by a private school founded by a religious group. **(Beth, synthesis paper)**
	Communicating with families	be involved in constant communication with families.	I think it is also important, when planning a lesson like Stan's, that I should run the ideas past parents and students to see how they feel about the way in which I teach it. **(Beth, scenario #1)**
	Needing to know students	know who their students are.	If I had known that most students had never eaten lobster and probably had never seen one in real life, I would try to think about my lesson from their perspective and analyze the task for relevance. If my lesson doesn't reach my kids then I have failed the lesson. The biggest take-away for me is to know my kids and to know their culture. **(Sarah, scenario #1)**
	Recognizing affective aspects of student learning	be cognizant that students' emotions may influence their learning.	The teacher should have thought about the emotional distress that killing a lobster in class could place on fifth graders. **(Anna, scenario #1)**
	Voicing students' opinions	always let their students voice their opinions	I would maybe change the way Kim [the student teacher in the scenario] responded. Instead of just ignoring the comment I would maybe talk about what the words gross and different mean. Then I would open up a discussion about how things might feel different from what we are used to, but that doesn't exactly mean that they are "gross." **(Beth, scenario #3)**