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Everyone Brings Something to the Table: A Culturally Sustaining Analysis of Teacher Candidates' Mixed Reality Teaching Simulations

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Abstract

Discussions of HBCU students' content knowledge have centered around developing high impact, asset-based approaches to learning (Williams et al, 2022). So, HBCU teacher preparation providers (TPPs) can also focus efforts on culturally sustaining approaches to developing candidates' content knowledge and researching how high impact practices, like teaching simulations, can help prepare candidates for classrooms. This exploratory case study uses critical cases (n=2); findings suggest candidates have a developing understanding of content, which forms a solid basis for increasing their knowledge. MRTSs are addressed as a potential high impact, culturally sustaining practice for building candidates' content knowledge. Further, HBCU TPPs can take more comprehensive approaches evaluating content knowledge and incorporating longitudinal studies to track candidates from program entry to graduation and into the teaching profession. HBCU TPPs are the focus of this study, but the implications may be useful for any TPP desiring to improve candidates' academic and professional outcomes.

Keywords: culturally sustaining pedagogy, HBCUs, mixed reality teaching simulations, teacher preparation

Everyone Brings Something to the Table: Demonstrations of Teacher Candidates' Content Knowledge in Mixed Reality Teaching Simulations

The need for culturally sustaining pedagogy (CSP) in teacher preparation is evidenced by several key indicators, including persistent racial, socioeconomic, and linguistic opportunity and academic achievement gaps in K-12 schools; racial and linguistic shifts in the U.S. K-12 public school student body; cultural disconnects between mostly white, female, middle-class educators and the more diverse students, families, and communities they serve; and the calls from researchers and communities of color for more equitable, inclusive learning environments (Irvin et al., 2024; NCES, 2024). Research studies attribute the opportunity and achievement gaps to various interconnected factors, including policy, systemic issues, socioeconomic status, school resources, physical and mental health concerns, language and cultural factors, teacher quality, and teacher shortages (Basch, 2011; Castro et al., 2015; Darling-Hammond, 2000; Florence et al., 2008; Gay, 2018; Jackson, 2020; Ladson-Billings, 1995; McLeod et al., 2012; Nichols & Berliner, 2007). Second, NCES data describes a more culturally and linguistically diverse public school student body that has grown from demographic shifts in the U.S. population and a teacher workforce that is largely white, female, and middle class (Irvin et al., 2024; NCES, 2024;

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USDOE, 2023). This means that teachers are likely to better understand the experiences and needs of privileged students while being less familiar with the experiences and needs of economically disadvantaged students from historically underserved communities (Irvin et al., 2024, NCES, 2024; USDOE, 2023). Finally, there is a growing body of research supporting use of asset-based pedagogies, like CSP, to increase student engagement, motivation, and achievement for all students, but especially for K-12 students from underrepresented groups in historically underserved communities (Delpit, 2003; Delpit, 2019; Gay, 2018; Ladson-Billings, 2022; Paris & Alim, 2017).

Given the conditions in U.S. education, it is critical to build a more diverse teacher workforce to better meet the needs of diverse K-12 learners. Teacher preparation programs (TPPs) on the strengths and assets of diverse learners; serve in the high-need schools in historically underserved communities; meet shortages in high-need areas, including special education and STEM education; positively affect K-12 students' socioemotional and academic outcomes, and persist in the profession (Blazar, 2021: Blazar, 2024; Egalite & Kisida, 2018; Milner, 2006). Implementing innovations, such as mixed reality teaching simulations (MRSTs), can support HBCU teacher candidates in effectively connecting theoretical knowledge to culturally sustaining teaching practices.

1.2 Aims of the Research

The purpose of this study is to explore how MRSTs can be leveraged as one way of taking an asset-based approach to better understanding HBCU teacher candidates' areas of strength and growth in content knowledge. To that end, the following research question will be addressed. Based on observation, assessment, and evaluation of teacher candidates' performance in MRTSs, how do HBCU teacher candidates demonstrate content knowledge? The findings are used to address implications for use of MRTSs as a high impact, culturally sustaining approach to building candidates' content knowledge and implications for culturally sustaining research that involves faculty and candidates as participant-observers.

According to the Council for the Accreditation of Educator Preparation's Revised Standards for Initial-Licensure Preparation, teacher candidates must "know central concepts of their content area(s)" and "be able to apply the content in developing equitable and inclusive learning experiences for diverse P-12 students" (CAEP, 2021, p. 12; CCSSO, 2013). In addition, teacher candidates must be able to "apply their knowledge of content at the appropriate progression levels," which are "descriptions of graduated levels of sophistication of teaching practice" that preparation providers can use to improve instruction within their programs (CAEP, 2021, p. 12; CCSSO, 2013, p. 12). With extensive content knowledge at the appropriate progression level, teacher candidates will be better equipped to positively "impact diverse students' learning and development" as both aspiring and practicing (CAEP, 2021).

1.3. Culturally Sustaining Pedagogy

This study is situated in CSP, which "explicitly calls for schooling to be a site for sustaining—rather than eradicating—the cultural ways of being of communities of color" (Paris & Alim in Ferlazzo, 2017). In its resistance of biased, inequitable practices, CSP centers educational materials and practices on students' "dynamic community languages, valued practices, and knowledges;" encourages student and community agency that holds academic institutions accountable to students, families, and communities; links content and instruction to the local, state, national, and cultural communities; and develops "a capacity to contend with internalized oppressions" (Paris & Alim in Ferlazzo, 2017). Preparing culturally sustaining teachers in TPPs requires faculty to explicitly teach the principles of CSP to teacher candidates and provide opportunities for them to connect theory to practice by enacting CSP in K-12 school settings (Nash et al., 2021). Also, teacher preparation faculty must be culturally sustaining pedagogues who attend to student learning, the "intellectual growth students [experience] as a result of the experiences they have in the school, community, and classroom, especially with a skilled teacher" (Ladson-Billings, G., 2017, p. 17). The entry point to supporting Teacher candidates' learning is "[making] a careful assessment of what knowledge and skills students begin with and [build] from there"

(Ladson-Billings, G., 2017, p. 17). Using the NIET Aspiring Teacher Rubric and InTASC Model Core Teaching Standards to assess and evaluate teacher candidates' MRTS videos will allow for an asset-based perspective and standards-based suggestions for supporting candidates' growth.

1.4. Mixed Reality Teaching Simulations

While several MRTS studies pre-date 2016, the largest body of work has proliferated since then. As of 2021, about 50 of the nation's 1,200 TPPs have used MRTSs. Most of the results have been positive, suggesting that immersive, low-stakes simulation environments provide opportunities for teacher candidates to practice and improve high-impact pedagogical skills, including teaching children with special needs, using culturally and linguistically responsive methods to teach English learners, instructional planning, assessment, and classroom management (Budin, 2024). Furthermore, teacher candidates can achieve professional growth through practice, feedback, and reflection activities then apply this learning to new teaching environments, including mixed reality, role play with preservice peers, and field-based teaching assignments involving K-12 learners (Dalinger et al., 2020; Spitzman, 2022). The research also addresses challenges related to MRTSs, which include increased candidate anxiety when practicing in a lab setting with faculty and other peers present and the ways in which the simulation does not reflect a real-life classroom environment (Dalinger et al., 2020; Spitzman, 2022). While these MRTS studies take place in teacher preparation contexts, none of the studies to date are situated in an HBCU context (Ade-Ojo et al., 2022; Budin, 2024; Dalinger et al., 2020; Spitzman, 2022). Although some studies involve virtual K-12 students with special needs and English learners, the majority focus on classroom management. There seems to be a lack of studies that focus on leveraging the MRSTs to specifically assess and evaluate candidates' demonstration of content knowledge **(**Ade-Ojo et al., 2022; Budin, 2024; Dalinger et al., 2020; Spitzman, 2022). This exploratory case study is designed to begin addressing these gaps in the research.

2. Methodology

Set at a public HBCU in the southern United States, this exploratory case study examines two critical cases of teacher candidates presenting instructional content in MRTSs to take an asset-based approach to assessing and evaluating their demonstration of content knowledge. This design is appropriate for developing understanding of which assets candidates demonstrate in content knowledge and using that understanding to develop implications for a high impact, culturally sustaining MRTSs programs and inform future research (Becker et al., 2005; Patton, 2014). While the initial findings in this study may not be generalizable, they do have value for informing larger scale research and more impactful teaching simulation activities **(**Becker et al., 2005; Patton, 2014**)**. The research was approved by the university's Institutional Review Board and candidate data used here with their express consent. Ten teacher candidates were enrolled in an English language arts teaching methods course and were required develop a lesson and teach five virtual students to understand and apply the term *classify* in a science context. All 10 candidates were Black female students who had completed at least 30 hours of general education coursework, earned a 2.50 grade point average or above, and were officially admitted to the TPP. Preliminary viewing of all 10 videos provided a general impression of which two might "yield the most information and have the greatest impact on the development of knowledge" for informing research and practice (Patton, 2014, p.276).

2.1 Data Collection. Each candidate completed an MRTS and saved the video recording for faculty

viewing. Data were analyzed using the Presenting Instructional Content (PIC) indicator of rubric for aspiring teachers adopted by the state's department of education. The rubric was designed to prepare teacher candidates in understanding and developing effective instructional practice (NIET, 2107). The PIC descriptors used include "evidence of extensive [candidate] content knowledge," "concise communication with essential information," and "no irrelevant, confusing, or nonessential information" (NIET, 2017). The observer looked for the following evidence to support the descriptors: student-friendly review of the learning objectives, review of essential vocabulary, explanation of the content,

modeling of performance expectations, and feedback to students. A standards-based rubric to analyze candidates' demonstration of content knowledge supported better understanding of the teacher candidates' starting point (strengths) for developing extensive content knowledge. Pairing the rubric with candidate progressions described in the InTASC standards and with CSP principles supported identifying learning activities that might be enacted through a MRTS to support candidates' increased ability to demonstrate content knowledge within a collaborative, equitable, affirming learning environment (Paris & Alim, 2014).

2.2 Data Analysis. To analyze the data, the researcher, who completed state-sponsored training on the ATR, fully viewed each of the two selected videos and generated scripted notes about what was observed. The goal of the notetaking was to provide direct quotes and descriptions of what the candidates and students did during each simulation. After scripting both videos, the observer deleted any potentially biased notes or observations. For example, when one candidate repeated an example, and the English learner indicated they understood the definition of the word *classify,* I wrote a note wondering if the student would have grasped the word meaning in a real-life teaching situation. This note and others like it were scrubbed from the scripts. Next, the observer reviewed the scripting notes with the rubric to identify where various aspects of content knowledge were evidenced. Quality evidence included visuals and statements used by candidates, including their responses to student questions. The observation data was assessed and evaluated using the PIC indicator then evaluated using InTASC learning progressions to determine the candidate's progression level of content knowledge.

2.3 Trustworthiness. To ensure trustworthiness, the researcher relied upon (1) the rubric for aspiring teachers, which is considered a valid reliable instrument for assessing and evaluating teacher candidates and which the researcher has been trained to use; (2) examples of PIC discussed during the training; (3) descriptions of standards progressions provided in InTASC Model Core Teaching Standards; (4) 96% agreement achieved from a peer faculty member's review of 22% (30 lines) of the scripted notes and how the researcher used the notes as evidence of descriptors; and (5) peer feedback from the peer faculty member's review of the findings (Amankwaa, 2016; Patton, 1999).

3. Findings

The PIC indicator of the ATR serves as the framework for evaluating the observation findings. In the simulations, evidence of candidate's content knowledge was demonstrated in the information they provided when (1) reviewing of the learning objective in student-friendly language, (2) reviewing essential vocabulary, and (3) modeling of performance expectations. These were areas of strength. Also, evidence of concise communication with essential information and no irrelevant, confusing, or nonessential information was assessed based on how the candidate's (4) provided feedback to students' responses. This was an area for growth.

3. 1 Reviewing Learning Objectives and Essential Vocabulary

One of the two candidates, Brooklyn, reviewed the learning objectives in student-friendly language and with a visual aid. Brooklyn had students repeat the following two objectives: "I can identify living things" and "I can identify nonliving things." As she used an electronic tablet to display the statements, she read them to the students, who then repeated them back to her. During most of the lesson, students practiced classifying pictures as living or nonliving. Ava led a brief opening discussion about possible meanings of the word *classify*, but did not explicitly mention the objective of the lesson.

After having students provide their own possible definitions of classify, all three candidates provided appropriate definitions for the essential vocabulary, the term *classify.* For example, Ava said, "We group items together because they are similar." After having the virtual class view a video on vertebrates and invertebrates, Ava asked the students what two kinds of animals were discussed in the video. One student replied, animals "with a backbone and without a backbone." Then Ava explained that the scientific terms are "vertebrate and invertebrate." She did not clarify that vertebrate animals have a

backbone while invertebrate animals do not. When Brooklyn provided a definition of *classify* (to "organize things that are similar to each other in their own category"), she also provided a visual that included the definition. Brooklyn gave accurate scientific definitions and visuals for the categories used for classifying. She said that a living thing "grows, takes nutrients, and can reproduce" and that nonliving things are "not alive, cannot grow, cannot take in nutrients, or reproduce." Brooklyn also explained that reproduce means "to have offspring" or "a child."

3.2 Modeling Performance Expectations

At various points in a lesson, a candidate might model performance criteria for students. In the cases examined here, two of the three candidates used visuals to provide explanations and modeling examples, and one of the three candidates also used items from her environment as examples. Ava and Brooklyn used videos to convey the categories they were using and provide examples of how certain animals and other objects might be classified. Ava's video explained that worms, jellyfish, crabs, and spiders are all invertebrates, and that mammals, birds, and fish are all vertebrates. Brooklyn's slide deck provided examples of living and nonliving things. One slide showed people and a fruit tree, which were labeled as living, on one side and showed a car, umbrella, and hat labeled as nonliving on the other side. At a later point in the lesson, Brooklyn used items in her environment, including an ink pen, an empty water bottle, and herself. When showing the pen and bottle, Brooklyn reiterated the definition of a nonliving by saying it is "not alive, cannot grow, cannot take in nutrients, and cannot reproduce." When discussing herself as living, she said, "I am alive. I can reproduce." Overall, what the candidates presented and explained was understood by the virtual students.

3. 3 Providing Feedback on Students' Responses

Concise communication with essential information *and* no irrelevant, confusing, or nonessential information were evaluated based on how the candidates provided feedback to the virtual students' responses. While all three candidates provided mostly accurate information to students through their reviews of learning objectives and essential vocabulary and their modeling of performance expectations, the analysis revealed an area for growth in both candidates' use of "concise communication with essential information" with "no irrelevant, confusing, or nonessential information."

During her lesson, Brooklyn determined the virtual students, including the English learner, needed an additional example of how to classify, so she used students' birthdays as an example. However, the conversation seemed to become confusing since each virtual student had a different birthday month and one student introduced astrological signs into discussion. At that point, the student began to share his opinion about astrological signs just being a way for big box retailers to "sell different types of necklaces. After that Brooklyn was able to redirect the discussion by asking, "Are we staying on task?" It was unclear if the birthday example supported students' understanding because the simulation ended at that time.

Another example including potentially confusing information occurred during Brooklyn's examples from immediate environment. For example, when she discussed the ink pen and water bottle as nonliving things, she reminded students that neither item could grow, take in nutrients, or reproduce. However, in her rationale for classifying the objects as nonliving, she began to incorrectly refer to their ability to be used as relevant for classifying the items. Brooklyn underscored her explanations by adding that the pen could "only be used to write with" and the water bottle could be used in hydration. When she described herself as living, Brooklyn explained, "I am alive. I can reproduce. I cannot make my own food, but I can take in nutrients." This prompted one of the virtual students to ask, "Wait, you can't cook." Brooklyn responded by saying, "Let's stay on task, okay?" This example suggests that the candidate may have conflated the definitions of plant and animal with those of living and nonliving things, since animals are consumers of food from their environments while plants usually produce their own food. This interaction represents a point in the lesson where the candidate might have confused students and represents a missed opportunity to clarify the point for the virtual class.

Similarly, as Ava continued with her lesson, she explained that similar items are grouped together but added that items might also be grouped together because "they're different." This addition to the explanation of how things are grouped was not accurate, not relevant to the classifying tasks that were modeled or completed during the lesson, and potentially confusing for the students. She described students being grouped by their grade level as an example of classifying, and one of the virtual students asked if classifying was like having different players on different soccer teams. Ava asked the English learner if she understood the meaning of classify, and the virtual student responded by asking, "What is classify?" Ava reiterated the definition of the term as well as the example of grouping students by grade. The student then asked if classify is "grouping same things together?" Despite Ava's potentially confusing addition to the definition of *classify* (when she referenced grouping things together because they are the same or different), the English learner seemed to grasp the appropriate definition. It is difficult to know if a classroom of real children would have experienced the same outcome.

For Ava, the structure of the guided practice may have precluded discovery of any of the the virtual students' or Ava's misconceptions. During the guided practice, Ava provided the students with several lists of three items. The students had to provide a category name for each list. For example, Ava listed "dog, fish, cat." The students were expected to (and did) categorize the set as animals. Another set ("apple, banana, kiwi") was categorized as plants. The categorizing of sets was a simple activity that did not require extensive discussion; this may have resulted in there being fewer misconceptions or opportunities to practice more complex examples of classifying.

4. Discussion

Here, these findings are evaluated within the context of the ATR and based on the progressions for InTASC Standard 4 Content Knowledge to address the following research question: Based on observation, assessment, and evaluation of teacher candidates' performance in MRTSs, how do HBCU teacher candidates demonstrate "extensive teacher content knowledge? The candidates demonstrated content knowledge by reviewing learning objectives, providing mostly accurate definitions of essential vocabulary, and using visuals to model performance expectations. The lesson objectives were explicitly shared by one of the two candidates, and both lessons were based on virtual students defining and applying the term classify in a life science context. Both candidates provided students with correct definitions of the key term and accurately modeled their learning expectations with videos, slide shows, and other verbal explanations. How the candidates addressed students' responses revealed their areas for growth in content knowledge. Both candidates provided non-essential information that had potential to be more confusing to real-life students.

Collectively, this evidence suggests that the teacher candidates' content knowledge is D*eveloping* (2 out of 5) since their presentation of content "*sometimes* includes evidence of extensive teacher content knowledge," *sometimes* includes "concise communication with essential information," and *sometimes* includes "irrelevant, confusing, or nonessential information" (NIET, 2107). Upon completion of the one-year teacher residency, candidates are expected to perform at or above the *proficient* level (3 out of 5), which would require candidates to continuously achieve mastery of content knowledge to thoughtfully and effectively develop student-centered learning activities and assessments. A comparison of the candidates' content knowledge and related practices to the InTASC progressions for Standard 4 Content Knowledge places Brooklyn and Ava at the first of three progression levels. At Level 1, they can "accurately and effectively" communicate content and anticipate some "common misconceptions" (CCSSO, 2013, p. 25). Evidence of advancement to the second progression level includes candidates proactively seeking to deepen their content knowledge and their ability to engage diverse learners in building deeper knowledge and critical thinking (p. 25).

From an asset-based perspective, the candidates have opportunities to increase their content knowledge and address their own misconceptions, practice anticipating and addressing student misconceptions, and collaborate with program faculty to ensure they ultimately exceed the proficient level of PIC on the

state-adopted to better ensure their ability to positively "impact diverse students' learning and development" (CAEP, 2022). Increasing candidates' capacity to demonstrate content knowledge is, however, one aspect of preparing teachers who are adept at culturally relevant pedagogy. The TPPs culture, coursework, assessments, and teaching experiences must be aligned to prepare candidates to create and sustain more equitable, inclusive learning environments that address opportunity and academic achievement gaps and that collaboratively connect with diverse learners, their families, and their communities (Allen et al., 2017). Also, if broader assessment schemes suggest similar within-program performance regarding candidates' content knowledge, that would reveal a greater need for a more effective MRTS program. Thus, the following sections discuss implications for leveraging MRTSs as a high impact, culturally sustaining practice and implications for future research.

5. Implications

5.1 Implications for High Impact, Culturally Sustaining MRTSs in HBCU TPPs

Together, extensive content knowledge and the ability to effectively communicate that knowledge to diverse students represent a single component of what well-prepared, culturally sustaining teachers should know and be able to do. Within the HBCU context, faculty are frequently tasked addressing college students' content area knowledge and skills gaps, which are frequently the result of education opportunity gaps that persist from underserved K-12 schooling (Price & Viceisza, 2023). Because MRTSs can be used for "prioritizing relevant and relatable educational experiences" and "incorporating aspects of students' identities," the simulations represent a potentially high impact, culturally sustaining practice for meeting HBCU TPPs' need to build candidates' content knowledge and skills in conjunction pedagogical knowledge and skills and professional dispositions (Williams et al., 2022, p. 1078; Spitzman et al., 2022). MRTSs can provide candidates with (1) relevant educational experiences for connecting theory to practice; (2) immediate feedback and reflection to improve practice and increase self-awareness and self-efficacy; and (3) access to a variety of teaching situations for addressing different content areas and experimenting with various teaching and classroom management strategies (Dalinger et al., 2020; Spitzman, 2022; Williams et al., 2022).

In addition to relevancy, a more relational MRTS experience might have greater positive impacts on candidates' content knowledge in a collaborative, reflective laboratory environment (Dalinger et al., 2020; Spitzman et al., 2022). MRTSs would involve a candidate doing the simulation with a small audience of peers and at least one faculty member. As a safe, inclusive space, the lab would serve to (1) foster relationships among teacher candidates and program faculty through (2) collaboration, peer feedback, and reflective discussion characterized by active listening and empathy. The lab experience would include collaborative development of protocols for discussions, feedback, and reflections and training in observing the simulations and identifying the evidence of the indicators to be discussed. While this study is concerned with content knowledge, lab experiences might address any teacher knowledge and skills that can be demonstrated through simulations. Also, research suggests the benefits of a laboratory simulation experience with peers might outweigh candidates' apprehension at having a live audience (Dalinger et al., 2020; Spitzman, 2022; Williams et al., 2022). These benefits include learning from receiving feedback from peers and observing peers and using real-time feedback from faculty and peers to make teaching adjustments mid-simulation (Dalinger et al., 2020; Spitzman, 2022; Williams et al., 2022).

To extend MRSTs into a culturally sustaining practice, it is critical to integrate "culturally affirming approaches that prioritize culturally relevant knowledge, cultural validation, and cultural humanization" that are "aligned with students' lived experiences" (Williams et al., 2022, p. 1078). Educational materials and practice should be centered around students' "dynamic community languages, valued practices, and knowledges;" encourage student agency; link content and instruction to the local, state, national, and cultural communities; and develops "a capacity to contend with internalized oppressions" (Ferlazzo & Paris, 2015). Candidates must have opportunities to make personal and cultural connections to content

knowledge and support their growth as teachers who understand that content is dynamic, culturally situated, and potentially biased (CCSSO, 2013). TPP faculty can "sustain [candidates]' cultural backgrounds by offering course materials that validate aspects of students' identities;" this might involve coaching candidates in identifying and selecting culturally affirming, relevant, and sustaining learning materials for developing culturally sustaining lesson plans and teaching materials for simulations and real-world teaching experiences (Williams et al., 2022, p. 1078). Understanding dynamic, cultural, and potentially biased nature of content knowledge is necessary for candidates to recognize the need for continuous professional development to ensure they stay informed about new ideas and evolving perspectives within the field, can guide themselves and students in critical analysis and deepening understanding of various perspectives, and consistently take effective measures to address and mitigate bias (CCSSO, 2013). To support development of candidates' "capacity to contend with internalized oppressions," a high impact simulation program will also provide adequate opportunities for candidates to critically investigate their experiences and biases and interrupt any internalized oppressions that have resulted from previous life experiences and personal biases (Ferlazzo & Paris, 2015).

5. 2 Implications for Future Research

These implications for future research involve more comprehensive assessment and evaluation of candidates' content knowledge, investigating the extent to which a culturally sustaining MRTS program might support candidates' growth, and designing culturally sustaining research for this work. Future research should involve broader assessment and evaluation of HBCU teacher candidates' content knowledge to develop a baseline of their areas of strength and areas for growth. These program evaluation activities, which are typically completed semesterly and/or annually as part of a TPP's data-driven improvement efforts, might include teacher licensure examination scores and information about content knowledge demonstrated by candidates in their lesson planning, presenting instructional content, and assessment. Additional data might also be collected through candidate focus groups to better understand how their pre-college learning experiences contributed to their content knowledge (CAEP, 2022). A mixed methods approach to data collection, analysis, and integration will extend research beyond (1) measurement of candidates' content knowledge and into a greater understanding of (2) candidate and faculty perceptions of the simulations and other learning activities as well as (3) the extent to which the activities are culturally sustaining (Plano Clark & Ivankova, 2015). Additional research efforts might include larger sample sizes, ideally include entire cohorts or course enrollment, and longitudinal research that tracks candidates through and beyond TPPs and identifies potential relationships between candidate's demonstration of content knowledge and their effectiveness as practicing teachers.

Finally, a culturally sustaining approach is needed to research teaching simulations as a high impact, culturally sustaining practice. This type of approach "requires numbers *and* stories that, taken together, have the potential to move us toward sustained equity and justice" through "use of local knowledge and wisdom to inform research methodologies and instruments (e.g., focus group questions, surveys)" as well as interpretation of findings and, in mixed methods studies, integration of findings (Pasque & Alexander, 2022, p. 3; Teachers College, 2023). At a practical level in TPP, a culturally sustaining research approach might include participatory action research that would position both faculty and candidates as participants-researchers whose experiences, expertise, and perspectives are valued.

5. 3 Limitations of the Study

The limitations of this exploratory study are related to the critical case sampling that can result in a greater probability of sampling bias and lower generalizability, the limited data collected from observations of MRTSs, and observation of simulations over real-life teaching experiences. Despite these limitations, the findings from this study can inform future research and practices in teacher preparation (Becker et al., 2005; Patton, 2014).

6. Conclusion

For HBCUs, discussions of students' content knowledge have centered around developing high impact, asset-based approaches to supporting students in developing content knowledge (Williams et al, 2022). Considering this, HBCU TPPs should focus their efforts on culturally sustaining approaches to understanding candidates' strengths and areas for growth in content knowledge and to researching how practices, like MRTSs, can be understood and developed to support candidates in building on strengths to increase their content knowledge and on professional development approaches to addressing the dynamic, culturally situated, and potentially biased nature of content knowledge (CAEP, 2021; Toldson et al., 2022). This study begins to address the overall issue by using MRTSs to ascertain candidates' content knowledge. The findings suggest that the pre-residency candidates had a developing understanding of content, which provided a solid basis for increasing knowledge and understanding and addressing students' misconceptions. Based on the findings, MRTSs were addressed as a potential high impact, culturally sustaining practice for building candidates' content knowledge and awareness of the nature of suck knowledge. To more fully gauge candidates' content knowledge, HBCU TPPs can take a more comprehensive approach to data collection and analysis, incorporate longitudinal studies track candidates from program entry to graduation and into the teaching profession. While HBCU TPPs and their candidates' content knowledge are the focus of this study, the implications may be useful for any TPP desiring to better understand teacher candidates' areas of strength and growth.

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