Case Study Activities to Explore Biases in Mathematics Education and Special Education

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Abstract

Using a case study and a series of activities given over the course of a semester, preservice teachers answered discussion based questions to uncover implicit biases. This study was done to help preservice teachers begin to talk about the impact of racial biases in special education. The case study is about a Black boy named Tay who engaged in a counting collections task in a kindergarten classroom. The responses were coded using the FAIR framework (Louie et al., 2021) in order to categorize the preservice teachers' noticings. Class discussions and practicum experiences occurred over the course of these activities to see how noticings would change based on these. Modifications for future studies are included to look further into how to guide preservice teachers to anti-deficit noticings.

Case Study Activities to Explore Biases in Mathematics Education and Special Education

When looking at students who are referred to special education, there are lots of reasons for this. There may be concerns of a learning disability, intellectual disability, other health impairment, and more. Students can also be referred to special education for behavioral challenges. There is a large number of Black boys being referred to special education for these "behavioral difficulties." Black boys are a majority when looking at special education classrooms for the general curriculum. The point of this study is to begin this discussion for preservice teachers before they start their career.

We want students to be in the least restrictive environment in school that will aid them in their success. The least restrictive environment is when a special education student should be able to learn next to their general education peers as much as possible. General education teachers have a big responsibility when referring a student to special education. They are the ones that start the referral process and are a big advocate for their students. If a student gets special education services when it is not needed, it can end up hurting them and their academic success. Special education takes general education students out of their class for extra support. If they don't need that support, they are missing valuable learning time. Teachers want to meet the needs of individual children and see students as individuals who will engage. The way that teachers interpret behaviors can be different. This is the reason why we need to educate general education teachers to help them frame how they view students in anti-deficit ways.

Literature Review

Identifying Students for Special Education

      According to recent studies, we have seen an overidentification of Black students as special education (Moldavan et al., 2023). When students are identified as a "behavior problem," this follows them throughout their school career. During a study by Katherine B. Boonstra (2021), it was observed that each of the students who had this label spent a significant amount of time outside of the learning environment. When students spend a significant amount of time outside of the classroom, this can negatively affect their learning. Any time inside of the classroom is valuable instructional time. At the end of the school year, each of these students was handed a red dot on their portfolio for their next teacher to see (Boonstra, 2021). Labeling a student as a "behavior problem" is giving their next teacher permission to have biases and use those biases to negatively affect their learning experience. Students should only be identified as special education if the concerns of the student are affecting his/her learning. Getting identified as needing special education services will change a student's school experience. For a lot of students, this is a great thing and helps the student tremendously with learning the grade level content. On the other hand, if students are being over-identified and don't need these services, it will end up hurting them and holding them back.

      During a study conducted by three mathematics education professors at various universities, it was found that there is evidence that preservice teachers (PTs) tend to over-diagnose students who look to have behavioral challenges as special education students (Moldavan et al., 2023). If PT's are able to learn about what overidentification is and the effects beforehand, they will be able to use this knowledge to their advantage when they begin their career. This study was able to put some numbers into play as well. Moldovan and colleagues

found that over half of their PT's use deficit framings to describe Tay's behavior. ABout 87% of those PT's used additional deficit words and phrases that were not found in the case itself. Some of these deficit phrases include: inability to grasp instruction or information, has a learning disability, and abnormal (Moldavan et al., 2023). These deficit words and phrases are problematic since Tay was chosen to depict a 5 year old boy who behaves typically when excited for a mathematics task. An additional layer of complexity is that Tay is a black boy. Implicit biases related to controlling Black bodies come to light in the responses of these PT's. The responses put Tay's behavior in a negative light and associated his confusion with his inability to understand, even though the other students in the class were feeling just like Tay. The PT's also saw Tay's cry for help on the assignment as a behavior problem rather than a resourceful tool. The inequitable noticing that occurred is why intervening with PT's is essential before they begin teaching.

Some teachers may look at students differently depending on their special education status and race. This statement from a recent study provides evidence of teachers using biases to look at students in a negative light: "Moreover, racialized and ableist discourses around guilt, innocence, dancer, and deservingness shaped how teachers interpreted and attributed student behavior and influenced the types of responses they deemed appropriate for different students" (Boonstra, 2021, p. 6). This overidentification is something that teachers have control over and can be improved upon.

Teacher Noticing

Teacher noticing is a trend that has been seen throughout many recent studies when looking at teacher biases. Noticing frameworks have three components: attending, interpreting, and responding. Racism is something that occurs daily and unfortunately, this could be inside the

classroom. Teachers must take notice of how their students are being racially minoritized and of their own racial identities (Shah & Coles, 2020). This can also be known as anti-deficit and deficit noticing. We need to remember that change can only occur within ourselves. "Labeling some teachers "deficit noticers" and others "anti-deficit noticers" is counterproductive" (Louie et al., 2021, p.11). So what are teachers noticing and why are they noticing it?

Teacher noticing is a good thing. We want for teachers to notice the way that they are using their biases in the classroom. Ignoring that there isn't anything wrong with the system is ineffective. The way that we help improve the experience that all students get in school is to make change within yourself and your classroom. The main framework that is being used to look at anti-deficit noticing right now is AIR (Attending-Interpreting-Responding) Louie and colleagues built on to the AIR framework, which is the original noticing framework, to make it the FAIR Framework. The F stands for framing, which is where the deficit framing comes into play.(Louie et al., 2021). Going through each step provides an effective way to view and handle anti-deficit noticing. This is why it is important to reach teachers before they get into the classroom. There is evidence that PT's are bringing biases into their first classroom without knowing it. Based on a study done with PT's, only 35% of PST's were aware that biases were affecting classrooms and were able to identify them (Moldavan et al., 2023). Being an "antiracist teacher" is a very important part of becoming a teacher. It is something that PT's need to be educated on before they enter the classroom (Shah & Coles, 2020).

Looking at a study that was done on teacher noticing from the sociopolitical perspective, we see teacher noticing from one teacher's perspective and how it affected his teaching. "We found that Oscar's anti-deficit noticing involved: (1) framing students as full human beings who bring many resources to their learning, (2) framing mathematics learning as a creative

exploration of ideas, and (3) framing interactions and interpersonal relationships as integral to learning" (Louie et al., 2021, p. 7).

Looking at your students from a point of view that allows you to view them all as equals is so important. As previously mentioned, this was a way that shaped Oscar's noticing. He was able to view the differences that his students had as positive things that made them each unique (Louie et al., 2021). Having this perspective as a teacher can positively affect the way that students are viewed from everyone's point of view. The way that students are viewed and treated can be spread to many environments outside of the classroom.

Impact of Teachers' Biases

The impact of teacher biases extend far beyond the classroom. There is a pipeline of students who are impacted by teacher biases to the legal system and this is never something that a teacher wants for their students. Teachers are natural leaders in their everyday lives. They have lots of students looking to them for a majority of their school year. Not only can teachers' biases affect the people who the biases are against, but also the other students' view on their peers. "For instance, Black girls are suspended at six times the rate of their white peers, according to a recent report from the Office of Civil Rights. Likewise, more than one in four Black boys with disabilities are suspended compared with one in eight of their white counterparts" (Boonstra, 2021, p. 373). This statistic is evidence of how much of an impact teacher biases have on their students and discipline. There should not be that much of a discrepancy based on skin color. "There is abundant evidence that how children are punished in schools is partially determined by institutional and implicit racial biases, and that children at the intersections of multiple marginalized identities are uniquely impacted" (Boonstra, 2021, p. 373). There is implicit racial

bias at the teacher and the administration level. The disciplinary system is failing these students who are greatly affected by these statistics.

       The way that students are viewed at school is likely the way that they view themselves. Students should all have the same opportunity to make mistakes without having tremendous repercussions because of implicit racial bias. Not only does this take away from their self esteem, but it also takes away from essential learning experiences. "Teachers' deficit views of racially minoritized students are consequential because they can diminish the learning opportunities available to these students" (Shah & Coles, 2020, p. 1). The time that students are spending outside of the classroom because of small behaviors, could be time that they are in the classroom learning. The study conducted by Katherine B. Boonstra (2021) shows that there is a gap between how students are treated based on their race when it comes to certain behaviors: "Although Lilian demonstrated many of the same low-level misbehaviors as Da'Vone—speaking out of turn, transitioning slowly between tasks, and expressing frustration through tantrum-like behavior—Ms. Avery seemed to interpret her actions through a lens of individual development rather than threat or culpability" (Boonstra, 2021, p. 382). This shows that there is a clear line between these two students who should have been equals at the start.

Methodology

Participants

For this study, there are thirty participants. These are the number of participants who were present for all data collection and present for all class discussions. All participants are preservice teachers at East Carolina University in two sections of the same Mathematics Education course. There are two sections of this course taught by the same professor in which we collected data from. The participants who were absent for any part of the data collection have been removed from the final data analysis.

The participants self selected their demographics in a survey that was taken on the first day of the course. The demographics for the participants are as follows. Three participants aged nineteen, eighteen participants aged twenty, six participants aged twenty-one, two participants aged twenty two, and one participant aged twenty-eight. Two participants are Black, one participant is Hispanic/Latinx, twenty-five participants are White, one participant is Native American, and one participant is of more than one Race/Ethnicity. Twenty-eight participants are female, two are male. Twenty-five participants are studying elementary education, five are studying special education. All participants have had experience with children outside of the classroom.

Table 1

Demographics of PTs

Demographics	Number of Responses	Percentages
	n	%
Gender		
Female	28	93.55%
Male	2	6.45%
Race/Ethnicity		
Asian	0	0%
Black	2	6.45%
Hispanic/Latinx	1	3.23%
White	25	83.87%
Native American	1	3.23%
More than one Race/Ethnicity	1	3.23%
Area of Focus		
Elementary Education	25	83.87%
Special Education	5	16.13%

Case Description

This Case Study was created by Dr. Gonzalez based on first hand experiences. Tay is a 5-year-old Black boy in kindergarten. He attends his neighborhood elementary school in a large city. He has a very curious personality and is always wanting to learn new things and explore. His teacher, Ms. Caldwell, is in her second year of teaching and her teacher assistant, Mr. Thomas has been in that role for 12 years. Ms. Caldwell takes behavior in school very seriously. She wants for each of her students to have good behavior such as sitting still and listening to directions the first time they are given. Tay is a student that she gets frustrated with often. She believes that he is not focused on the task at hand and has too much energy. Tay will yell "Miss, miss. I don't understand and can't do it!" and then he will ask his classmates for guidance. Ms. Caldwell and Mr. Thomas will redirect Tay back to his seat in fear that his questions will interrupt his classmates' work.

Tay's attempts to follow directions to the teacher's standards is seen by Ms. Caldwell as not listening and being distracted. Ms. Caldwell talked negatively of Tay to Mr. Thomas. During a counting collections activity, Tay was singled out for not understanding the directions despite the rest of the class's confusion. This pushed Ms. Caldwell over the edge.

Counting collections encourages students to count the objects at hand in a way that they see best fit. Ms. Caldwell gave the class these directions: 1) grab a bag of objects from the bin in the middle of the carpet, 2) return to their seats to count the objects, and 3) make a written representation of the collection. Counting collections can be used to assess a student's understanding of the counting principles. These are counting sequence (saying the numbers in the correct order), one-to-one correspondence (assigning one number name to one object), and cardinality (knowing the the last number in the sequence is the total).

Tay was the first student out of his seat after Ms. Caldwell gave directions. He chose dinosaurs out of the bucket and took them back to his seat. He poured them out on his desk, but some fell on the floor and were kicked around by students moving back to their seats. Tay had to retrieve the dinosaurs and he was counting them as he was doing this. Ms. Caldwell saw Tay out of his seat and was immediately frustrated when he did not hear the last of her directions. Tay asked a peer for directions and he said "Draw a picture." Tay was not sure what this meant so he got Ms. Caldwell's attention. Ms. Caldwell stated that Tay was only playing and not even trying to follow directions. She then separated Tay from his classmates and was told to sit on the carpet and wait for the class to finish the activity. He was not allowed to finish. Tay pleaded with Ms. Caldwell and said that he wanted to know what to do. He stated that he had 14 dinosaurs in this hand. Ms. Caldwell was being called to help another student so she told Tay to please follow the directions she had given him. He then went and sat on the carpet upset and unsure of what to do.

Ms. Caldwell later told the assistant principal that Tay's behavior in the classroom had become a big problem and wanted him to be assessed for a learning disability.

Data Collection and Implementation

Data were collected at three different points across the semester using the same case about Tay and the counting collections task. Each data collection represented the preservice teachers' independent ideas prior to class discussions. For this study, I focused on only the preservice teachers who were present for all three data collections.

First Data Collection: Case Study Discussion Responses

Each participant was given Tay's case along with discussion questions to respond to independently. These responses were collected on week 3 of the course prior to the class discussion using a Google survey and took place before the preservice teachers went into the classroom for their semester practicum experience. The discussion questions the participants responded to are the following:

- Which counting principles did Tay demonstrate and what is your evidence?
- Did Ms. Caldwell miss an opportunity to assess Tay's understanding of the counting principles? If so, what opportunity was missed and how might you have responded?
- What is Tay's behavior when directions are given? What do you think Tay's intentions are when he exhibits this behavior?
- How is Ms. Caldwell interpreting Tay's behavior? What does she think Tay's intentions are when he behaves in particular ways?
- How would you describe Tay's behavior in relation to his age and developmental level?
- Does Ms. Caldwell have sufficient evidence to refer Tay for special education, why or why not? If not, what evidence is needed to support a referral for special education services?
- What implicit biases do you think Ms. Caldwell has? Do these implicit biases impact her instruction with Tay? How so?

After the participants responded to these questions independently, they then discussed their responses in small groups. The instructor walked around and asked questions to help the

participants consider different points of view during their discussions. Then the instructor led a whole group discussion to bring out the ideas of the small groups. The instructor blinded the participants' responses and put them into a Google sheet.

Second Data Collection: Flip the Script

After the whole group discussion, the participants were asked to consider the perspectives they heard from their classmates so they could "flip the script" by rewriting the ending of the Counting Collecting Case. The participants were given the case with the last two paragraphs in red font and were asked to rewrite these paragraphs as if they were the teacher in the story. They needed to write how they would respond to Tay picking up his dinosaurs from the floor and how Tay might respond to them as the teacher. Every participant completed the second activity and submitted their rewrites through Canvas. The instructor blinded the participants' responses and put them into a Google sheet.

Third Data Collection: Pivotal Moments

The third set of data that was collected in week 13 of the semester after their practicum experiences. The participants were asked to consider their experiences working with students during practicum and then were provided with the Counting Collections case again. They were asked to reread the case and find a pivotal moment (a precise point in time) that they feel like should change. Then they were asked to respond to the following questions:

- Decide on one pivotal moment with the case that you feel a different decision/action could have been made by the teacher, Tay, or other students that could have changed the outcome. What is that pivotal moment?
- Why do you feel like the decision/action needed to be changed?
- What do you think should have been done differently?
- How would this different decision/action change the outcome for Ms. Caldwell, Tay, and the other students in the class? Be specific.

The participants' responses were typed into a Google Survey. These responses were blinded by the instructor and put into Google Sheets.

Data Analysis

According to a study done about teacher noticing (Louie et al., 2021), there are three different kinds of noticings that you can have in mathematics teaching: mathematics, students, and interactions. Deficit noticings of mathematics are framed in the belief that learning mathematics is a universal and fixed concept. Anti-deficit noticings of mathematics are framed in the belief that each learner absorbs information differently and engages in mathematical tasks differently. Deficit noticings of students are framed in the belief that students are only mathematical receivers and categorize students according to a fixed mindset of ability. Anti-deficit noticings of students attend to their unique participation styles and allow students to be themselves while also leveraging their individuality as a resource for learning mathematics. Deficit noticings of interactions view the interactions between students as unnecessary and discourage collaboration among students. Anti-deficit noticings of interactions are based on a sociocultural theory of learning in which social interaction is essential to learn more about different thought processes for solving mathematical problems (Forman, 2003). I looked for evidence of deficit and anti-deficit noticings according to the FAIR Framework in participants' responses for the three activities.

The instructor and I created a coding chart on the Google Sheets to look for evidence of how the participants noticed the mathematics, student, and interactions. A code of 0 meant there was no evidence of either anti-deficit or deficit noticings. A code of 1 meant there was evidence of deficit noticings, and we highlighted the evidence within the participant's response by changing the font color. A code of 2 meant there was evidence of anti-deficit noticings, and we

highlighted that evidence within the participant's response by changing the font color. Evidence of mathematics noticings were changed to blue font, student noticings were changed to purple font, and interactions noticings were changed to red font. We coded the first 4 participants together and then split up the data evenly to finish the coding. We also had a column in the Google Sheets to type in notes we had while coding the data. After we each coded our parts, we then checked over each other's coding to come to an agreement. Responses that we did not agree on were then discussed until we agreed. Table 1 shows the types of evidence we found in the participants' responses.

Table 1: Evidence from the Participants' Responses of the FAIR Framework

	Anti-Deficit Noticings	**Deficit Noticings**
Mathematics	● Demonstrated counting principles ● One-to-one correspondence ● Cardinality ● He was able to keep track	● Tay could have made mistakes in counting ● Tay did not complete the assignment
Students	● Willing to learn ● Excited ● Eager ● Trying to gain understanding ● Intentions are positive ● Wants clarification ● Seeking teachers' approval ● Wants to do the right thing	● Distracted ● Never pays attention ● Disruptive ● Impatient ● Does not listen ● Doesn't know how to contain his energy ● Tay should be working with a partner ● Goofs around ● Needs extra help
Interactions	● Ask a desk buddy ● Him to help his classmates ● Working with partner ● Peer discussions ● Help our classmates	● By himself ● Only teacher supporting students

The codes (0, 1, or 2) for mathematics, students, and interactions were then totaled for each activity and analyzed for changes over time. Eight participants were identified that used deficit noticings during the first activity, and I decided to report on their data set during the next two activities. These participants are ones that I felt we could see the most shift in noticing since they started with a deficit view. Through the class discussions and practicum experiences, their shift in noticing, or lack thereof, would be worth noting.

Findings

The findings are divided into the three assignments given to preservice teachers over the course of a semester. These assignments are *Case Study Discussion Responses*, *Flip the Script*, and *Pivotal Moments*.

Activity 1: Case Study Discussion Responses

When looking at the responses for Tay's demonstration of counting principles, n=30 (100%) of responses stated that he demonstrated one-to-one correspondence, n=25 (83.33%) stated that he demonstrated cardinality, and n=14 (46.66%) stated that he demonstrated understanding of the number sequence. But there were n=4 (13.33%) of participants who used deficit noticings about mathematics when they wrote that Tay would have to recount his collection at his desk even though they state that he already counted his collection correctly. This demonstrates that they think there is one correct way to participate in the activity, which is at the desk.

When asked to evaluate Tay's behavior and intentions, n=15 (50%) used a deficit noticing of Tay as a student and n=15 (50%) used an anti-deficit noticing of Tay as a student. Tay's intentions were not to act out, but to gain understanding of the assignment and concept. This behavior is not out of the ordinary for a child his age. An example of an anti-deficit noticing of Tay as a student is: "He also enjoys asking questions in order to understand things better." Another participant wrote: "He's actually eager and excited to learn, he just isn't the best at expressing his confusion yet (which is to be expected because of his age)." The participants who had deficit noticings of Tay as a student described him as "distracted," "never pays attention," "disruptive," and "impatient." One participant demonstrated deficit noticings of Tay as a student when she wrote: "Tay seems to be an excited and ambitious learner, but he struggles with solving

problems he does know how to do on his own. Tay may not know that he is being rude by yelling out in the middle of class since he is so young." This participant views Tay's questions as rudeness instead of as a way of seeking help to work on the task.

However, all responses stated that Ms. Caldwell missed an opportunity to assess Tay's learning and n=8 (25.81%) state that Ms. Caldwell has implicit racial biases. An anti-deficit noticing of Tay as a student stated by a PT is "She [Ms. Caldwell] is expecting all students to act the same when given a task and that cannot always happen." PT's were asked if they would seek further action for a special education diagnosis for Tay, n=6 (19.35%) of responses said they would.

When looking at interactions, there were n=5 (16.67%) participants who used an anti-deficit noticing of interactions and n=1 (3.33%) participant who used a deficit noticing of interactions. There were a significant number n=24 (80%) of participants who did not note any interactions in their answers. An anti-deficit view is suggesting that Tay works with a partner. This shows that the participant views working with a partner as beneficial to students because they are able to learn from each other. The deficit view states that interactions between students are disruptive and not productive to learning.

For the case study discussion responses, the different kinds of deficit and anti-deficit noticings were taken into account. They are mathematics, students, and interactions. Codes that were looked for are as follows; words with negative connotations, and words similar to "distracted/sidetracked" and "eager/excited". An example of a deficit noticing that a preservice teacher from the study stated of Tay as a learner, is "It seems like Tay gets distracted very easily and wants to learn but doesn't want to sit still. When directions are given, he is disruptive and yelling across the room for help. I think his intentions when exhibiting his behavior is wanting to

learn and do the activity with the rest of the class, but I think if Ms. Caldwell had Tay work with a partner, or maybe just her, it would benefit him more." An example of an anti-deficit noticing that a preservice teacher from the study stated of Tay as a student is: "Tay gets really excited and shows a lot of energy when given directions. I think Tay is just enthusiastic and wants to do the work he is assigned but since he gets loud or is disruptive Ms. Caldwell sees that as Tay acting out."

Activity 2: Flip the Script

In activity two, participants were asked to rewrite the second half of this case study in which Tay was removed from the learning setting. They rewrote the case at the point where Ms. Caldwell told Tay that he had to go sit on the carpet and was not able to finish the activity with the rest of the class. Each participant rewrote this story in a way that they deemed appropriate. As stated previously, n=7 (23.33%) of responses evaluating Tay's behavior and intentions used deficit noticing of Tay as a student in the first activity. For the purposes of this study, I chose to focus on analyzing these seven PTs to find how their noticings may change due to practicum experiences and classroom discussions. Out of these, n=4 (57.14%) of PT's continued to use deficit noticing of students in their responses and n=2 (28.57%) changed their perspectives and used anti-deficit noticings. There was one response, n=1 (14.29%), who did not have evidence of deficit or anti-deficit noticing of students. An example of a response that used deficit noticing of Tay as a student in the first activity and changed to an anti-deficit noticing of Tay as a student in the second activity, is as follows. This participant's first activity response was, "Tay seems to miss out on hearing directions because he is distracted by various things. The teacher should have Tay working with another student and further assess." This participant's second activity response was, "Instead of becoming angry with him and not giving him a chance to show me his

counting, I want to see how much he knows and work from there. Since it was evident that Tay knew how to count, I needed to only explain that he needed to record his method of counting. This was much more productive and beneficial for both myself and Tay." This was a very important shift in viewpoint. The focus for the first activity was looking at something wrong with Tay and what the teacher could do in response to his misbehaving. This participant's focus has now shifted to something that can change within Ms. Caldwell to help Tay be more successful and what she can do to support him. There were other responses that reflected this same change between activities. These responses that had new insights stated that if Ms. Caldwell had noticed Tay's intentions behind his behavior, she would have seen that he demonstrated two counting principles which was the objective for this activity. They rewrote Ms. Caldwell's behavior in how she saw Tay's behavior.

When looking at anti-deficit noticings of mathematics, n=7 (85.71%) continued to use this language. An example of this would be "Since it is clear Tay has an understanding of all three counting principles, I would not go and meet with the assistant principal. Tay is completely on track for his age and learning level." This response changed the script from the point of Tay and Ms. Caldwell's first interaction. When looking at deficit noticings of mathematics, n=0 (0%) continued to use this language. There was no evidence of a deficit view of mathematics within the seven. There was one response, n=1 (14.29%), who did not have evidence of deficit or anti-deficit noticing of mathematics.

When looking at anti-deficit noticings of interactions, n=3 (42.86%) of responses used this language. An example of this is "I would maybe get him to help other classmates who are having trouble." This is telling us that this participant is seeing the benefit of having students work together and learn from each other. When looking at other findings, n=0 (0%) of

participants used deficit noticing language when looking at interactions and n=4 (57.14%) of responses used neither deficit or anti-deficit language in their answer.

There were also three PT's who were absent from the class discussion about Tay. These participants were not included in the seven responses being followed. It was evident that these responses were not present during discussion. There was not much change from their *Case Study Discussion* response, to this assignment. They used the same language and did not have any new insights into the case.

Activity 3: Pivotal Moments

The participants were asked to identify a pivotal moment within the case that they would change in order to change the outcome, and rewrite the case from that point. This activity differs from the second activity because the participants were asked to select a pivotal moment instead of being given one. I continued to track the progression of the seven PSTs, and their deficit and anti-deficit noticings of Tay as a student. This activity was based solely on a pivotal moment within Ms. Caldwell's actions. Tay and Ms. Caldwell were the only people from the case study that were involved in the third activity. Common responses for this activity included wanting to change Ms. Caldwell's behavior rather than Tay's. They stated that a change needed to happen within Ms. Caldwell in order for her to be able to have an anti-deficit view of Tay as a student. This is something that the teacher can control and change on her own.

There were seven preservice teachers who used deficit noticing of Tay as a student in the first activity. These responses were followed and evaluated in the second activity and into activity three. When looking at mathematics, n=1 (14.29%) of responses used deficit language, n=1 (14.29%) of participants used anti-deficit language, and n=5 (71.43%) did not show evidence of deficit or anti-deficit viewings. The deficit response said that Tay was not paying

attention so he was not able to complete the assignment. This is implying that his behavior is affecting his learning. The anti-deficit response stated that he was demonstrating his counting when he was picking up his dinosaurs.

When looking at deficit and anti-deficit views of Tay as a student, n=3 (42.86%) used deficit noticing and n=4 (57.14%) used anti-deficit noticing. An example of a deficit view of Tay as a student is "She knows that Tay is active in the classroom and would work better in a different environment." This is still saying that Tay's behavior was not appropriate. An example of an anti-deficit view of Tay as a student is "There are many actions that are described later in the story, and I feel they are all based on Ms. Caldwell's opinion of Tay. She views his high energy negatively and assumes he is off task when he is talking to his friends." This response is implying that Ms. Caldwell may have some implicit biases.

These three participants continued to have deficit noticings of Tay as a student because their responses contained negative connotations towards Tay's behavior. They continued to use language such as "inevitably confused", "she knows Tay is active", and "considering Tay has a learning disability". These responses have progressed over the course of the semester to continue with the identification for special education.

When looking at interactions, n=1 (14.29%) of responses used anti-deficit language, n=2 (28.57%) of responses used deficit language, and n=4 (57.14%) of responses did not show evidence for either noticing. The anti-deficit response stated that Tay's conversations with friends are often on task. Tay asked his peer what the assignment was because he was trying to learn. A deficit response stated that Tay was distracting other students by asking them questions.

Subset's Data Over Time

      The seven participants that are being followed are ones that used deficit noticings of Tay as a student in the first activity. Pseudonyms are used for the participants. These responses changed over the course of the semester. Table 2 shows the progression of the subset's responses over the semester.

Table 2: Subset's data analysis

Pseudonyms	Case Study Analysis	Flip the Script	Pivotal Moments
Debra	Mathematics: Anti-deficit Noticings Students: Deficit Noticing	Mathematics: Anti-deficit Noticings Students: Anti-deficit Noticings	Students: Anti-deficit Noticings
Sara	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Students: Anti-deficit Noticings
Sophie	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Students: Deficit Noticings
Mark	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Mathematics: Anti-deficit Noticings Students: Anti-deficit Noticings	Students: Anti-deficit Noticings
Molly	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Mathematics: Anti-deficit Noticings Students: Anti-deficit Noticings	Students: Deficit Noticings
Hayley	Mathematics: Anti-deficit Noticings	Mathematics: Not enough information	Students: no response

	Students: Deficit Noticings	Students: Anti-deficit Noticings	
Annie	Mathematics: Deficit Noticings Students: Deficit Noticings	Mathematics: Anti-deficit Noticings Students: Anti-deficit Noticings	Students: Anti-deficit Noticings
Laci	Mathematics: Anti-deficit Noticings Students: Deficit Noticings	Mathematics: Deficit Noticings Students: Deficit Noticings	Students: Deficit Noticings

PSTs did not include any instances of student to student interactions when they rewrote parts of the case. They focused on either Ms. Caldwell or Tay.

When looking at Tay's behavior, one response for the first activity stated: "Tay seems to miss out on hearing directions because he becomes distracted by various things. The teacher should have Tay working with another student and further assess." This same participant changed their perspective in the second activity and stated "Instead of becoming angry with him and not giving him a chance to show me his counting, I want to see how much he knows and work from there. Since it was evident that Tay knew how to count, I needed only to explain that he needed to record his method of counting. This was much more productive and beneficial for both Tay and myself." Then in the third activity, they stated "This different decision would have caused Ms. Caldwell to see that Tay means well and that he actually listens more than she realizes. This also may have prevented her referral to special education." The suggestion for a referral in the first activity response was gone back on in the final response. This participant showed a change from deficit view of mathematics and students, to anti-deficit view of mathematics and students. Similar changes happened in n=5 (62.5%) of the seven participants

that were being tracked. Three (37.5%) of the participants' views did not change over the course of the semester. They had a deficit view of mathematics and students from the first activity to the third.

Shifts in Noticings

Laci moved from anti-deficit noticings of Tay as a student and mathematics in the first activity, to deficit noticings in the second activity. The first response stated that Ms. Caldwell missed a learning opportunity in the first activity. They also said that Tay did not have bad intentions by writing: "I do not think his intentions are bad, I think he has every intention in completing the task." Another statement they made says: "She feels as though he is trying to goof off and play, while in reality Tay was trying to count the dinosaurs but was confused on the directions." These are anti-deficit noticings of both mathematics and students. This participant looked at Tay as an individual learner and reflected on his actions with an intent to learn in the first activity. Laci then stated in the second activity that "Tay's behavior in the classroom has begun to get out of hand." This shows a deficit view of Tay as a student.

Another participant had similar noticings from the first activity to the second when looking at noticings of Tay as a student. They stated that Ms. Caldwell had missed a learning opportunity for Tay. Their response to Ms. Caldwell's reaction is: "Ms. Caldwell is interpreting Tay's behavior as him being disruptive and not paying attention in class. I do think that she believes Tays intentions when he behaves in this manner is to simply disrupt the class or to just go talk to his friends. She is not taking the time to try to understand what Tay is doing and why he is doing it." In the second activity, this participant's noticings shifts from anti-deficit to deficit. They are still seeing Tay as a student who needs extra attention, "Tay was very excited and enthusiastic to continue and jumped up to grab some colors. Ms. Caldwell responded to

Tay's actions with, "I'm glad you are excited to start the task, but let's take a second to think about what you are going to do for your written representation, then I want you to slowly get back up and nicely go grab some markers to do your representation okay." Though the teacher interprets Tay's behavior as excitement, she still sees it as negatively affecting the classroom environment.

In both of these cases, we do not have enough information to determine if the deficit noticings of Tay and his mathematics continued into the third activity. These participants focused solely on Ms. Caldwell in the last activity so we are not able to see Tay.

Discussion

Mathematics Noticings

The first activity, *Case Study Responses,* gave the preservice teachers an opportunity to get their initial thoughts down about the case study. When looking at mathematical noticings, deficit noticings say that learning mathematics is universal and fixed. Where the anti-deficit noticings say that each student will absorb the information differently. Through the questions that the preservice teachers answered, we were able to look and see what kind of noticings the teachers had. A majority of the participants used anti-deficit noticings of Tay's mathematical understanding when he counted the dinosaurs as he picked them up from the ground. 83% said that Tay demonstrated cardinality which is a majority. This anti-deficit view may be because the class is just learning about the counting principles and the different ways students can demonstrate their understanding of these principles.

In the second activity, *Flip the Script*, a majority of the preservice teachers are still using the anti-deficit noticing when looking at Tay's mathematics. This tells us that they are seeing Tay's actions as trying to learn instead of acting out. There are students who understand math and make the connections between concepts. Teachers can sometimes label students as being "good" at math or "bad" at math. We see this a little bit in the deficit noticings of the responses. Because Tay is not sitting at his seat working on his math silently, does not mean that he is not understanding the concepts. This framework is something that all preservice teachers and current teachers should be exposed to in order to see students as individuals. It is important for teachers to see students as individuals because all students learn differently and process information differently. If teachers are able to see that, then they will be able to invite all students' learning

styles to help them all be successful. This is especially important for inclusive classrooms because there will be more of a variety of learning techniques and styles.

In the final activity, *Pivotal Moments*, a majority of students (n=5) did not mention anything about interactions. This is because of the way that the activity was presented. It can be inferred that the preservice teachers did not intentionally leave out this information, but it was not a clear point for them to make in the activity directions. With that being said, there was one response who used deficit noticing and one who used anti-deficit noticing. These participants saw mathematical noticings as an important part of the case study.

Student Noticings

The first activity, *Case Study Responses,* gave us some information how the preservice teachers viewed Tay as a student when they first looked at the case study. We were able to see if they first saw Tay as acting out the way that Ms. Caldwell did, or did they see him as a student who is ready to learn. We saw both of these in the responses but a great majority of preservice teachers used anti-deficit noticing. This shows us that most of these preservice teachers are already looking through the anti-deficit lens. Every student is going to have different needs and is going to express themselves differently. This is not wrong or acting out, it is just a difference in personality. Knowing that a majority of these preservice teachers saw that at the beginning of the semester is very encouraging.

In the second activity, *Flip the Script,* about a third of the responses that were being followed changed their noticings from deficit to anti-deficit. This tells us that they made new discoveries within the case that allowed them to see it differently. The class discussions and exposure to real students through practicum experiences helped them see this case in a new way. They saw that Tay did not show a need to be removed from the learning environment. He was

not trying to act out, he was just trying to clean up his mess. Discussion and collaboration between preservice teachers can really make a difference according to these findings. Teachers can greatly benefit from learning from one another.

In the final activity, *Pivotal Moments,* we now have only three of the seven preservice teachers still using deficing noticings for Tay as a student. This means that only a very small percentage did not gain new information from class discussions and practicum experiences. This directly relates to the debate about Tay being identified for special education or not. It is very dangerous for the system for teachers to look at student's the way that Ms. Caldwell has looked at Tay. Identifying a student for special education when they do not need to be can be detrimental to their educational career. We want students to be in the least restrictive environment at school for their success. Good and accurate data should be used when identifying a student for special education so that we can take deficit noticings out of the picture completely.

Interaction Noticings

In the first activity, *Case Study Responses,* a great majority of the preservice teachers did not discuss anything about student interactions. It is important for students to interact with each other for learning. Just as the preservice teachers can learn by interacting with each other, students are the same way. This is seen in the subset's data over time. For example, Sara had deficit noticings of Tay as a student in her first and second activity responses, and anti-deficit noticings of Tay as a student in her final activity response. This shows that she had a shift in thinking after she had the opportunity to discuss this with her classmates. Another example of this is that Debra used deficit noticings of Tay as a student in her first response and had anti-deficit noticings of Tay as a student in her last two activity responses. This shows that what she learned through classroom discussions has stuck with her and caused a permanent shift.

There was overall a lack of attention to the importance of students learning from each other in the first activity.

In the second activity, *Flip the Script*, there were more responses who noticed the interactions between students and the significance. We now have 42.86% of responses using anti-deficit noticings of student interactions. Responses stated that Tay was asking his peer for instructions so that he could further understand the activity.

In the third activity, *Pivotal Moments*, there was an increase in deficit noticings of interactions from the second activity. There were three responses who discussed interaction noticings in both the second and this activities. In the second activity, they all used anti-deficit noticings. In the third activity, two of the responses used deficit noticings. This tells us that these activities did not lead the preservice teachers to see the importance of interactions between students to be beneficial to their learning.

Shifts in Noticings

When looking at the participants who went from anti-deficit noticings to deficit noticings, this is something that needs to be evaluated. The reason behind this happening is important in determining how to shift PST's noticings. The participants may have written about what they thought the reader wanted them to say in the first activity rather than what they really thought. As they moved to the second activity, their true thoughts came up because it was a more specific and detailed assignment. We were looking for the connotation that their words had. This shows that these participants did not benefit from the class discussions.

Data Changes Over Time

After looking at all of the data that was collected over the course of the three activities, we were able to go back and specifically code each response individually. We coded them into

categories of anti-deficit and deficit views of mathematics, students, and interactions. The participants' own words were used as the codes. Codes were based on definitions of these noticings from the study mentioned previously that focused on different teacher noticings (Louie et al., 2021). Each response was read in its entirety in order to get the full picture of the participants noticings.

When looking at mathematical noticings over time, there was not a significant shift across the three activities. This is due to the fact that 86.66% of participants used anti-deficit noticing in the first activity therefore, there was not much to shift. This number stayed about the same for the second activity, 83.33%. During the third activity, this number went down to 23.33% but this is because there were 60% of responses who did not discuss mathematical noticing. The third activity prompt did not specifically ask for a mathematical finding which leads me to believe that this is why there were little mentions of this. When looking at deficit noticings, there were 13.33% of participants who used deficit noticings of mathematics. There was a participant who stated that Tay demonstrated all counting principles but also said that they would have Tay redo the assignment at his desk by himself. This shows that they have a very narrow view of how to engage in this task.

Student noticings had more of a shift than mathematical noticings. In this first activity, the deficit and anti-deficit view of Tay as a student was split 50% and 50%. In the second activity, the deficit view had gone down to 26.66%. This is a big change and shows that the participants' viewpoints had changed. The third activity had a 26.67% of deficit view. This is a significant data point because it shows that they had taken what they learned from class discussions and practicum experiences and applied it to these activities. Another important point to make is that from the second to third activity, there were more students who demonstrated

student noticings. The second activity had 33.33% of participants not demonstrating student noticing and the third activity had only 10%. This demonstrated that the participants felt that viewing Tay as a student was an important part of the case study.

Lastly, we looked at interaction deficit and anti-deficit noticings. This noticing had the greatest percentage of participants who did not mention this kind of noticing. With that being said, the amount of participants who did not discuss interactions went down from 80% to 56.66% from activity one to activity two. This shows us that some of the participants are beginning to notice the importance of student interaction. The number of participants who used deficit noticing did go up with each activity but this is due to the fact that more participants are mentioning interaction noticings.

Modifications to Future Assignments

Activity 1: Case Study Responses

There were six questions asked on the first activity. We found that some questions led us to be able to see clearly if the participants had an anti-deficit view or a deficit view. We also found questions that did not benefit our study that need to be changed moving forward. The first question that was asked on the Case Study Responses were "When Tay told Ms. Caldwell that he had 14 dinosaurs, she continued to ask him to put his collections back in the bag and go sit on the carpet. Did Ms. Caldwell miss an opportunity to assess Tay's understanding of the counting principles? If so, what opportunity was missed and how might you have responded?" This is a good question to assess if the participants have a deficit or anti deficit view of mathematics. We will keep this question moving forward. The second question is "When Tay told Ms. Caldwell that he had 14 dinosaurs, she continued to ask him to put his collections back in the bag and go sit on the carpet. Did Ms. Caldwell miss an opportunity to assess Tay's understanding of the

counting principles? If so, what opportunity was missed and how might you have responded?" This is another question that helped assess the participants' view of mathematics and is one that we will keep moving forward. The next two questions are "What is Tay's behavior when directions are given? What do you think Tay's intentions are when he exhibits this behavior?" and "How would you describe Tay's behavior in relation to his age and developmental level?" These questions helped us determine the participants' view on Tay as a student. These are more open ended than the first two which helps us get a better view of the participants' biases. We will keep these questions for future studies. A next question asks if what Ms. Caldwell is saying about Tay is sufficient evidence for him to be referred to special education for services. This question helped us understand where the participants stood relating to Tay and his behavior.

A question that we feel did not benefit our study is "How is Ms. Caldwell interpreting Tay's behavior? What does she think Tay's intentions are when he behaves in particular ways?" This question does not seem to be helpful for understanding how the PTs make sense of the teacher's instructional decisions. They seem to restate what is in the story. This question should be removed for future studies. I believe that there is enough information gained from other questions that this one is not needed. There was not much evidence within the discussion responses about interactions. We want to modify the case study and add a more detailed interaction between Tay and another student. There will then be a discussion question asked specifically about interactions: "Describe the interaction Tay had with a classmate. Should Tay have these types of interactions with his classmates? Why or why not?"

Activity 2: Flip the Script

This activity asked students to rewrite the case from a point that was chosen for them. Even though this was beneficial for us to see the preservice teachers noticings in all three

categories, we have decided to take this activity out and replace it with the pivotal moments activity. Here they would choose a pivotal moment within the case and rewrite it in a way that would alter the outcome of the case.

Activity 3: Pivotal Moments

This activity is going to be moved to activity 2 and will be replaced by a new activity. The participants are going to be asked to rewrite the case study from Tay's point of view. This is what will be given to the preservice teachers: "Consider the case from Tay's point of view. How would Tay change the case so that he feels supported in his learning? Rewrite the counting collections part of the case from Tay's point of view, and include his thoughts and his interactions with his classmates and teachers." We believe that this will give us more information on their noticings of mathematics, students, and interactions.

References

Boonstra, K. E. (2021). Constructing "behavior problems": Race, disability, and everyday discipline practices in the figured world of kindergarten. *Anthropology & Education Quarterly, 52*(4), 373-390.

Copur-Gencturk, Y., Cimpian, J. R., Lubienski, S. T., & Thacker, I. (2020). Teachers' bias against the mathematical ability of female, Black, and Hispanic students. *Educational Researcher*, *49*, 30–43.

Forman, E. A. (2003). A sociocultural approach to mathematics reform: Speaking, inscribing, and doing mathematics within communities of practice. In J. Kilpatrick, W. G. Martin, & D. Schifter (Eds.), *A research companion to Principles and Standards for School Mathematics* (pp. 333-352). Reston, VA: NCTM.

Kavanagh, K. M., Thacker, E. S., Williams, M. C., Merritt, J. D., Bodle, A., & Jaffee, A. T. (2021). Disrupting microaggressions in P-16 classrooms: A facilitated workshop approach using critical case analysis. *Multicultural Perspectives, 23*(4), 232-240.

Louie, N., Adiredja, A. P., & Jessup, N. (2021). Teacher noticing from a sociopolitical perspective: the FAIR framework for anti-deficit noticing. *ZDM Mathematics Education, 53*, 95-107.

Moldavan, A. M., Gonzalez, M., & George-Puskar, A. (2023). *Framing mathematical competence and behavior of a Black male in a kindergarten classroom.* American Educational Research Association Annual Meeting, Chicago, IL.