

Lecture of Awardee 1

Understanding the Power of Teaching and Its Role (in) Justice¹

Deborah Loewenberg Ball²

1. Background

Before I begin the lecture, I'd like to say just a bit more about where I am. As I mentioned a moment ago, I am in Michigan. And here on the slide, you'll see where Michigan located in the United States as well as a map of Michigan itself. I also included a few photographs. You could get a glimpse of this diverse and beautiful land. What I really want to say is that I want to acknowledge that Michigan occupies the traditional and contemporary homelands of the three files of peoples: the Ojibwa, the Ottawa and the Potawatomi peoples. And I understand that as I stand on this land, I am part of the history of this United States that store lands from the indigenous people who are living here and remain occupied to this land to this day. I also appreciate that as I've learnt more about our history, I've come to appreciate the way in which the indigenous people on whose land I am standing, the use of the land as a teacher, from whom they've been learning since the beginning of time. The indigenous people on whose lands we stand remind us the power of the teaching from the lessons they have learnt from the land and from the water that surrounded. These powerfully shaped their past, their present and their future. I offer this landing acknowledgement here, even as I acknowledge my complexity and my white privilege. And I commit to not only give such landing acknowledgement which could be seen simply as performances but to link those to my own efforts that continue to in target to my own actions on on-going basis, learning from my mistakes, and find it useful to both my work and my personal life to contribute to dismantling oppression rather than contributing to its perpetuation. So we've often talked about the land we are standing and acknowledge whose land actually is. We also sometimes feel to acknowledge the world such as I am receiving today is actually the product of not just one person but of collective.

And I wanna pause to thank the many people who have been on this journey that I've been talking about today with me. They include former students, colleagues, mentors, teachers, my current doctoral and master students and the more than 1000 children who I have been so deeply privileged to teach over 45 years. Thank you all for your contributions to what I've been learning.

¹ This paper presents the transcription of Deborah Loewenberg Ball's Felix Klein Award Lecture at ICME-14 Congress.

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So, what we would begin? As I said couple of times, I am deeply honored and grateful at being awarded the Felix Klein Award for the International Commission Mathematics Instruction. The surprise I am hearing it and the humility that I was filled with when I thought about it. Let me to look back across the kind of unexpected arch of learning across the time in my professional and personal life. This lecture that I designed then is reflected to my continuing efforts to try to understand the part of society that I landed in as a brand-new teacher in an elementary school in an unusually racially culturally and linguistically diverse U.S school. I, identified as a white woman and as a Jew and I've been a daughter of a father who together with his family escaped from Nazi Germany. I later attended primary school in that country. And my identities have intersected over time in my every evolving perspective in the country I am living in the United States. Its history of enslavement of African peoples and the massacre of indigenous lands people, and the ways in which those stories are not only in the past but continue in our present in the various forms of oppression that characterized our country. This last year and half have only further highlighted the legacy of slavery and oppression that shaped my nation. My deep engagement with and wonder about teaching and how it is fundamentally tied to the role that plays in the context of systemic anti-black racism, sexism and other forms of structure of oppression characterized this arch of my learning on which I am still continuing and is expected to continue as long as I live. I took the occasion to try to look back and now and forward as I talk to you today. On this slide, here you can some pictures from my earliest years of teaching children, including a class of children who I taught at my second and third year as an elementary teacher. And some of the children I taught more recently. Give you a glimpse of this woman growing up through time through this amazing career of teaching.

And I chose to frame today's lecture to continue the journey I represented at ICME13 in Hamburg, Germany in which I was honored to give one of these invited lectures. At that Congress, I talked about something I called the Special Mathematics Work of Teaching and I reflected on how the history of my efforts to try to understand the role that teachers' mathematical understanding plays in their actual work had been both one of which I learnt a lot with my colleagues but also frustrated me in the ways in which despite of my effort to understand mathematics is dynamically part of the work of teaching. I found myself often just talking about the knowledge again or something static, and not as part of practice. And I tried to give lectures to engage all of you thinking the role of teaching, taking social cultural perspectives of that work, and trying to think that mathematics as a verb, as part of the work of teaching. Yet when I look back on that talk, I realized that there were still thing missing in my efforts to try to capture and explain how mathematics comes together with other aspects of the work in practice.

So, when I served this president of the American Education Research Association two years later, in 2018, I was still on the same journey that I had begun years earlier. I gave a lecture that year called *Just Dreams and Imperatives, the power of teaching in the struggle for public education*. And in this talk, I tried to surface the ways which

teaching is powerful, both for harm and for good. And I tried to think more about this notion and its power. I tried to think about how the larger system of oppression, the systematic oppression of racism, the structures of the inequity, how those actually found their way into the everyday micro moments of teaching. I used a video to try to show the connection between larger societal pattern of racism and everyday moments of teaching. And I used particular moments in video clip to think about the ways of which marginalization of black girls easily finds its way to perpetuate in classroom teaching but also the opportunities that exist in teaching to stand and disrupt those in the moment.

In my lecture today, I am continuing this journey to try to understand what I called the “work of teaching” and today to foreground as I think about this mathematical work of teaching, how do I understand and how it intersects the power that the teaching has in the context of the society with its history of enslavement, of oppression and of racism. So, I ask three questions today. I continue my question of the work of teaching. What it is to *do* the ‘work of teaching’? What does it mean to foreground the ‘power’ of that work and why does it even matter? And finally I will ask what are continuing challenges in trying to understand this work of teaching and why should we care? So let’s begin.

2. Work of Teaching

What is it to do the ‘work of teaching’? It is worth appreciating that teaching is both incredibly common and also supremely complex. Here you see images of a couple of teachers. What you can see here, although you cannot hear anything or feel anything, as you can see mathematical content, you can see body, you can see looking at one another, you can see relationships, you can see gestures, you can see mathematical ideas, you can see representations, you can see space. There are so many things even it was still a photo that help you and remind you of the commonness of teaching, the things that all of us would teach and deal with all the time, and also the complexity of it.

So you would think about how common it is. I gathered a few data to show us and remind us about how common teaching is. Here are a few countries from around the world represented at this ICME Congress. And the numbers of teachers there are in each of your lands. You can see that there are many people who work in the role of teacher. And that in fact in all of these countries, teaching is the largest occupation. There are approximately 72.5 million teachers worldwide. So the part when I said it is common, we take it for granted that in every country we have adults who are willing to commit themselves to the next generation by fulfilling this occupation we called teaching.

It’s common, but it is also incredibly complex. This is the word that surfaces all the time in the literature. I think we do not always ask ourselves what does it mean when we are saying is complex. So let’s take a moment to pause and try to think when any of us says that, what do we actually mean? We will take a moment to watch this

short video segment from a classroom. I am showing you all this image of a classroom here. And I will just briefly explain what the children and the teacher are talking about. They are working on this mathematics problem (Fig. 1) which might be seen incredibly obvious to you. But it's worth understanding that as children begin to understand the representation we call Area Models that it is not all that simple to interpret them. Here the children are comparing two rectangles that made in fact to them look entirely the same. On the left you can see a rectangle divided into three parts and one of them is shaded to grey. And on the right, you see a rectangle that is also divided into three parts and one of them is shaded to grey. And the question asked them what fraction of each rectangle is shaded grey. If you set aside that you don't understand, then you might realize that for children, their answers to both of these might be one third. And indeed the problem constructed to surface what it is to look at Area Models, and the importance of equal areas and the notion of the whole. As you are watching this short video clip, I would like you to notice what do you pay attention to, and what do you think of the 'complexity of teaching'. What are your eyes drawn to? What are your ears drawn to? What do you notice? Try to ask yourself — to you, from your perspective, from your expertise and experiences, what seems to you to be complex here? So I show this short clip and these two questions that I would like you to be thinking about while I play it.

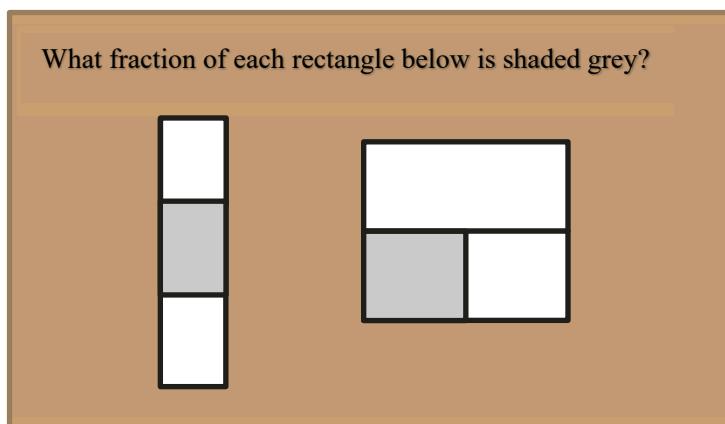


Fig. 1. The mathematics problem

(Video playing)

So take a moment and think about what is meant by "complex". What were you noticing? What were you thinking about? What were your eyes drawn? What were you hearing? What did you notice about space, about bodies, about language, about the mathematics? And what did you think about what it is meant to be called even in that very short segment "complex"? Let's think about that for a moment. Put yourself in the role of the person doing the work and being the teacher there. And you think about all the things that are to see, to understand, to sense, to think about the question like this "What does Antar mean by 'it's not a fraction'?" You might have to ask yourself

“What is the mathematical point of this of what I’m doing?” You might be worrying about “How is Antar being positioned in front of the class?” You might be watching other children saying and wonder “Are those two children over on the side following this?” You might be wondering “Whom to call on?” or “How is Antar feeling about his contribution?” or many other questions that easily can be on your mind in that moment as you make the next move. You are wondering about whether to keep the class all altogether right now. You are wondering about whether you have to do something to position both Antar and Gabi. You might wonder whether giving her the sticky line is actually a good idea. You might be thinking about your own body and where you should be. You might be thinking about what do you say and do next. So many things could be in the space of work that you are doing. And all of these have to do with try to feel, see and hear what the children are doing and what the children are thinking, because the work you are doing are with them. It is not to them. It is with them. It’s about this mathematics. So keeping in mind the math, who the children are, how they positioned, their identities, what they might be feeling, all of these flowing around. And I think if that does illustrate what it means for something to be complex. I don’t know what would.

So when I keep using this phrase the “work of teaching”, what do I mean by? what am I actually trying to use it for, why do I use this phrase? As reflected back, it came to me that I’ve been thinking about this for a very long time and struggling with what it means to talk about the work that I and so many millions of other people do every day, take it for granted and yet so complex. I found small parts of different things that I had written even 20 or 30 years ago when I saw myself beginning to think about what does it mean and try to understand that work. I see that in an article I wrote in 1996 and later some work I did with my colleague David Cohen when we talked about the role of curriculum materials. I continued to try to zoom in as I thought about what role mathematics play is in the work of teaching and what kinds of mathematical reasoning are inside and are required in that work and later with my colleagues Mark Thames and Jail Phelps, we asked ourselves questions about what makes that kind of content knowledge special when we thought again about the work for dynamic. And with my colleague Frank Forzani, we thought about how we could name some of the aspects of that work. So why I am insisting on using this phrase of “work of teaching”? I asked myself that question at my ICME-13 lecture. What I said then was that I thought it was important to focus our attention to what teachers are actually doing and to distinguish that from other features of classrooms, like different instructional formats such as small group work, or classroom culture and norms, what students are doing, how the curriculum is designed. I don’t quite think about that way now, but I understand what I was asking at that point. And I do still feel that it’s crucial that we honor the effortful and deliberate nature of teaching, its complexity, it’s taken-for-grantedness, and not be invisible, so implicit, and taken for granted. But I am thinking I am still trying to figure out what does it mean to talk about the work and I no wonder think it is separated from what students are doing.

And so when I ask myself what do I mean by the “work of teaching”, I am

continuing to revisit and revise the definition. In some ways, it might be disappointing to you that I think that trying to figure out what do I mean by that is part of the ongoing inquiry of my work. I think it rests on trying to understand what is involved for teachers in their interactions with learners in context, and with more explicit learners of broader sociopolitical and historical environments in which that work takes place even in micro moments. I see this is the fundamentally both a deeply theoretical and practical question. And what I want to try to do together today is how can we better understand what I am calling the power of that work of teaching and the ways in which it either perpetuates or in fact can be used to disrupt injustice, racism, and oppression. So I am keeping in play this notion of mathematical work in the dynamic relational aspect, but I am trying to foreground more our ability to understand its power in the broader sociopolitical context of the work. And it is a hopeful question as well because in the end my dream is to begin to leverage its possibilities of that work of teaching is common, is on the presence to build a better world, a world that is more just.

3. The Power of the Work of Teaching

So my second question of this lecture is “what does it mean to foreground the ‘power’ of the work of teaching and why does that matter?” The first you could say that commonness and the complexity of teaching have powerful consequences for patterns of racism and oppression in our society.

I know that I don’t need to remind you of the many forms this takes as it taking in our current world and has taken place over time in our nation, in multiple world places around globe. I include a few images just to remind us of this larger systems of oppression, of the mass cultivation in United States and around the globe, of homeless people living in without safe shelters, the deep persistent ever brought economic inequity, the starve of indigenous lands from the people who occupied those land and occupied now by people who dominate them through oppressive ways of being, the battle of law enforcement and policing, unemployment and what the COVID-19 pandemic has reminded us this unbelievably vast deep disparities in health care and the health around the world. There are many other images that I couldn’t have given. But these seem perhaps to be large macro issues and you might be saying why we are talking about this right now? We are talking about it because I want to connect the dots between the systems of horror and hate and inequity and injustice and racism. I want to connect those to the commonness and complexity of this work we called teaching.

And to do that, I’ll try to take you zoom in from the picture I just showed to you, back into the classrooms. I’ll show you images of some adults who are themselves the people who perpetuate in the systems. It’s people who make systems. Systems are not some abstract structure out there. They are made by people and they are perpetuated by people and they could be dismantled by people. Systems and people are connected. Here is a picture of real estate agent someone who sells homes, and there is nothing could be said about how the ways in which those people’s work contributes to the ongoing and incredible racial segregation in the United States. Here is the image of a police officer. Here is a physician. Here is somebody who works in voting counting

ballots in registration voters. And if you have seen some of the news from our country in the efforts, to try to deny voting rights to people who are so much deserved to be part of our electoral system. You could see the roles of these people playing in the electoral system is fundamentally important. Here is an image from the terrible day we saw in the Capital in the United States where rioters destroyed and attacked the Capital and the members of the government. And here you see a classroom. Let's pause for a moment and just remind ourselves that these adults in their various contributions to the systems in our country and in the countries all around the world. All of those adults were one time children. They were once third Graders or fourth Graders. They were in classrooms in all of our country. And in fact, even the people who teach in our countries were at one time children. So, if nothing else, if we will remember this, then when we notice hate, oppression and systems of racism, if we can remind ourselves that all the people who uphold and maintain those systems were one time children, it might begin to illuminate how teaching is powerful.

So I make some claims here. "Teaching is powerful" I argue. And what I mean by that is when it is done carefully and sensitively, students can thrive, learners can grow, they can learn mathematics, they can develop positive identities, they can learn to value other people and work across different and work collectively. The second thing I am going to assert is that teaching involves enormous discretion. And from there, I go on to say that how that discretion is exercised can either reinforce racialized and oppressive patterns of social, personal and epistemic injustice and harm, or it can disrupt those patterns.

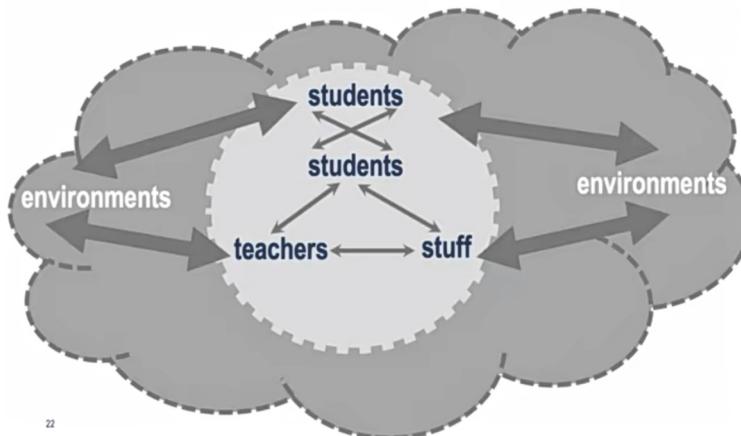


Fig. 2. The instructional diagram

Let me explain. With this diagram (Fig. 2) that's an adaption of something that David Cohen and I and Steve Rodin originally called this instructional triangle, I modified that for my 2018 AERA Presidential address, to make some changes highlighted some features of the work of teaching and its position in environments that I thought merited highlighting. So I wanna start by looking at the environments in this picture. And remember what I am trying to represent is the analysis inside the

classroom represents the inter-circle. So when I say environments, I am talking about some of the things we've already been discussing: anti-black racism, colonialism, the legacy of enslavement, Whites supremacy, housing policies of insurrection, school structure, teaching as an occupation, what families want from schools, the enormous health and wealth disparities, the curriculum, what particular committees think and believe about schooling, so many things are around the work of teaching and schools. The environment is also the arrow towards students remind us that students bring in enormous resources from their own lived experiences, from their families, from their cultures and from their communities. But they also bring bias from living and inherited from races to class and society. I am thinking about a very moving piece of research that I read over 25 years ago, by Timothy Grim Mill. He studies a classroom in which children were being helped to learn to write. And one of the things that was important in the classroom is that children could write about whatever they care about. It was deliberately in gender. They were invited to write about their ideas, their feeling to be creative. But what had not been taken account of by the teacher was all the ways in which the classroom is permeable from those outside environments. And these children lived in a various socially economically racially diverse community. What happened was the children wrote stories about other children in the class, reflecting the broad societal bias, prejudices and history of marginalization. The teacher had not realized by asking children to do what they could bring to the school, could bring inside the classroom, these forms of hate and bias. On the other hand, the ideas of cultural environment, culturally sustaining pedagogy advanced by so many scholars Gloria Ladson-Billings, Django Paris and many others required the class to be purist. So, if we want to take advantage of resources that children bring, from their own lived experiences that we don't want the classroom to be sealed off from the broader environments. So, it's a dilemma. So, the environments represent histories and present, family, community, culture and other ways of being interpreted. What were inside the classroom remind ourselves with this diagram that the students were interpreting and interacting with one another; they were interpreting and interacting with their teachers; their teachers were interpreting and interacting with them. And all of this happening around particular staff, it could be mathematics, it could be discussing something in current events, it could be discussing a world issue. But teachers and students are interacting together. And as they work, they are bringing in with them their experiences in their broader environment. The curriculum itself is influenced by the larger environment. In this country right now, there is enormous debates about the teaching of the U.S. history and the representation of White supremacy that has been raced in our history and has been targeted in our schools. So even the stuff is deeply influenced by the environments for better or for worse. So, what the diagram intends to show is that teaching, with students and teachers, is inside the classrooms that are deeply poised to the broader environments. And those broader environments include the histories, the

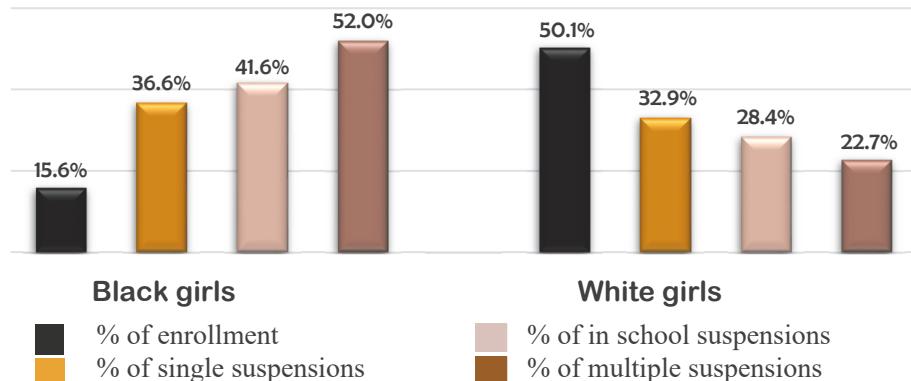
patterns of racism, the patterns of oppression marginalization. And they also include the resources and restraints of communities and people as they come together inside the school. There is no simple answer to this, because on one hand you could argue let us constrain the classroom so that those larger patterns can't sit it inside the dynamics between teachers and students, but obviously if we want children to do things that bring forth their expertise, their experiences, their communities, their language, we cannot seal classroom out from the broader environment.

So here is where I move to talk about discretion. In the video clip that I showed you a few minutes ago, we saw a few minutes of interactions between two children and their classmates over particular set of rectangles, involving area model diagrams. I don't expect you to read what's on the slide. But basically, what I've got here is a recording in writing of the things that were set in some of the body movements that were going on in the video. And what I am arguing based on my 2018 AERA lecture is that every one of those separate lines in this representation represents some moments with the teacher has discretion to do one thing or another. It could be a decision the teacher is making, it could be the way the teacher moves, all of these are discretionary. What do I mean by discretionary, I will show you what I mean in a moment. They cannot be dictated by some outside authority. They are things happen in the complex dynamic of teaching. So, for example, at the beginning of the video, we heard the teacher say "Who'd like to answer what you think about the second rectangle? We're now only going to be able to talk about this briefly. We probably won't finish it." There are so many ways a teacher could begin that part of the lesson, and neither the textbook, nor the school leader, nor the teacher education program can tell a teacher what to say exactly in that moment. There are many different ways a teacher could begin. A teacher could have said "what is the answer to the second rectangle." which would signal something very different about the work that children are being engaged and doing together. We also see a moment when the teacher sees that many children have their hands up and responds to the question what it is that Antar just said. As a teacher has to face a moment like who is going to be called on next? Who is going to speak next? That cannot be governed or dictated by some outside force. It is a discretionary space. When Antar is done with explaining, the teacher said "Antar, do you want to stay there or do you want to sit down?" He indicated like to sit down. She says, "Okay, Thank you very much. You did a good job of explaining your thinking." How to help a child exit from the front of a room has a lot of going on in it. How Antar might feel? How might he seem to his classmates? What different things could be said and done? So many possibilities exist. It's another discretionary moment. And what I am trying to demonstrate with this diagram is that in this two-minute and twenty-one seconds of video that I showed you, there were twenty-five such moments or discretionary spaces. In order to do the work of teaching, the teacher exercises judgement, acts from patterns that she already has, says things, does things, moves, all of these are products of how

she works in this discretionary space. And I hope you could see from this diagram that my argument is that teaching as I've argued elsewhere is dense with discretionary spaces. Almost like the real line is dense with numbers. Teaching is dense with discretionary spaces.

And how was this related to my argument about the power of teaching? Well, when you think about this diagram in the density of discretionary spaces, what I am saying is a discretionary space is where the interpretations, next moves, the comments or questions are not necessarily determined by the teacher-and not by a policy or a curriculum. These interpretations and actions that the teacher takes are learned by that teacher through her own firsthand experience as a child in school, through her professional training and through her experiences as a teacher in school. So, these things become absorbed by living in the broader society. They are not all highly ideally syncretic, yet they are also syncretic. They are also not all rational and planned. They are often habituated. They are often matters of habit of pattern because teaching is so complex that of course a great deal of work become routinized and it indeed a must. But what does it mean is that the use of the discretionary spaces has a lot of opening for either the dismantling in interruption of patterns of oppression that carry with us, in our bodies, in what we come to consume, or in the opportunity to disrupt these patterns of bias and oppression.

So, the question next has to do with how can we harness that power, that power of discretion in the work of teaching. So, to give you a concrete example of the way the larger systems and the micro moments interact, this is a brief diagram that I won't talk about it at length, but represents some very important research in the United States, about the disproportionate punishment of black girls compared to white girls in a nation school (Fig. 3). What the diagram basically shows is the large patterns of differential and much harsher punishment for the same infractions, committing the same offenses, or doing the same thing. You can see the black girls account for about half of the multiple suspension of the school whereas the white girls account for only one fifth for the same behaviors. So, what the researches are showing us is that these differential outcomes are related to teachers' judgements. They are the products to teachers' discretion and subjective judgements. So, you can say, so what we are going to do about that? We see these patterns. We do not want them to continue. Teacher education could work to disrupt the habits that the teachers come into teaching with, from their observations in classrooms going up, from their experiences, doing clinical works in schools. These patterns are embedded in normalized and oppressive patterns of practice. So, what could Teacher Education do? Well, here is an image of teacher screaming at the black girl. A white teacher is screaming at the black girl in a math classroom. This video showed the teacher behaving in one of the ways we see very unfortunately in the classroom. So, we can look at the Teacher Education to surface these patterns and to wipe them out through professional training. But teachers would need more than these patterns exist and more than commitment to be people who can work to combat racism and patterns of oppression in normalized practice. Teachers to do something about this



R. Epstein, J. Blake and T. Gonzalez (2017). *Girlhood Interrupted: The Erasure of Black Girls' Childhood*. Washington, DC: Georgetown Law Center on Poverty and Inequality

Fig. 3. About the disproportionate punishment of black girls compared to white girls in a nation school

would also have new habits. They would need knowledge, repertoires of possible ways of practicing and judgement. So, it's more than beliefs and knowledge, it's also changing habits of practice.

This what I am going to do today is the work of teaching: to learn and to manage that complexity and to be able to understand the broad and powerful role that it plays in justice in order to carry out that work the ways don't reproduce and perpetuate patterns of racism in oppression, patterns of anti-black racism, patterns of sexism, but to recognize these normalized practices, to see the relationships to the larger patterns in our societies and to find ways to do something different, for that we research among other things. But doing that kind of research is challenging: challenging to study the work of teaching, challenging to identify the ways that could be useful to this project of disrupting normalized patterns of racism, embedded in everyday common practice.

4. The Challenges for the Work of Teaching

So, the third question for my talk today is what are some of the continuing challenges for those of us who do research or for those of us who are practitioners in trying to understand the work of teaching? What are the challenges of trying to do that because indeed these are challenges in it? And why should we care? So, let's return to the classroom and revisit the video clip that I showed you earlier. Let's think about what are the challenges of trying to study the work that is going on in these minutes in the classroom?

(Video playing)

So this point we have one small segment of the lesson and the teacher and students are together beginning to try to figure out how best to distinguish between the first and second rectangle. Again, I am asking you this question about what are the challenges

of trying to study the work of teaching here. The work of teaching that involves the mathematics, the teacher, the students, the broader environments, and the ways which children bring different identities, histories and experiences from broader societies. How all those things come together? What does it mean to study the work of that complexity? So, I wanna show you one more thing goes on a few minutes later to continue our questioning about what is it the challenging about studying the work of teaching, what it is challenging by teaching, and what is it challenging by studying it? So just as the lesson is about the end, the children are about to leave the classroom and go to lunch. A girl named Kassie raises her hand and says "Antar is right. It's not equal". And she brings upon an idea that might be something that you are not expecting. Let's watch.

(Video playing)

So, we stop there and again the class is almost over. Here is this new idea that's coming up. We have almost 30 children in this class. I think by looking at them you can see that there are overwhelming black children. You could also see it is a diverse class of people with different backgrounds and undoubtedly you could understand they bring in different intersectionality and identity. This is a math class in which they were working on this particular concept. Time is running short. And we see the teacher say many different things, for example, asking Kassie to name the child whose idea was – that was Antar; asking her to elaborate idea; not having her to come to the board at that moment. So many different things are going on. And earlier the clips we saw twice, we see the ways in which the teacher moved from Antar's contribution through Gabriella, to Gabi, and what went on. It's all those different places. We have to watch many times to appreciate the different things that might be to see, to name, to study, to analyze.

These moments that I am showing you are filled with discretionary spaces. Each of these is related to reinforcing or disrupting patterns of racism and harm. So, what are some of discretionary spaces and risks? We could name many of them in the video that I showed you. But let's just consider a few. We have Antar and things around Antar's position. We have Gabi and what she has done. And we have Kassie now as well. And we have all the other children in the class. There was the question that we want to try to understand that the researchers bring in enormous theoretical power and empirical power in studying. For example, how were these three different black children, Antar, Gabi and Kassie, positioned in front of their classmates? How were they being positioned as contributing or not as understanding or lacking understanding? Are their brilliance and their humanities be seen? Is it a hard question that yet being central? So there are especially spaces of work on the way which children experience and the work of teaching play out. Another thing we could ask and try to study is what's being signals about being and doing mathematics, both what and who? And what kinds of things are those signals? What are other children in the class besides those who are the main players in the video we saw? What are they learning about the black children

about who gets to be smart in math and what does it mean to be smart? What's happening with math? What's happening to children's understanding of equal areas? There are so many different things being managed in this work of teaching and in each of these different questions I am naming and many more, there are discretionary spaces whatever gets said or done has consequences. It has matters for questions of reproducing and perpetuating patterns of how particular children get positioned, how Antar as black boy gets positioned; how Kassie gets positioned as black girl, or Gabi or the rest of the class see what's happening with the math. These are all spaces of discretion. And through them, what is the enormous power to either reproduce or to disrupt patterns of racism.

So, when we are thinking about practicing justice and practicing in justice, we have to understand more about the work of teaching which is challenging. I name now particular moments in the video clip in which these spaces arise and I invite you to think about the many kinds of questions we talked about earlier that are flowing through the work of teaching in any given moment about what to do next, where to be. Many of these are unconscious. They are habitual. They are part of striving, complex demanding interaction between the teacher and students in mathematics and in these larger settings. There is so much research that helps to drive and situate this work of teaching in the discretionary spaces. There are racial narratives about the ability and struggling learners. There are patterns of black girls. Lots of research on this. There is research about area models in fractions. There is research on what patterns are about being and do mathematics while black. I could name many other kinds of research, including misconception research, research on errors, all of these things are part of what can be studied about and is studies about the classrooms, still they could help us think about exactly what to do as you with your body do this work of interacting with children in real time. And here are lies in the power of discretionary spaces. As we begin to learn how to elaborate these discretionary spaces, they are moments and places to bring and bear the knowledge together with the practices in learning habits of action that can be powerful, for not perpetuate patterns of oppression.

So, standing back for a moment. What are the challenges in trying to do this kind of research and this kind of study of the work of teaching in justice? I will name just five and make a few comments about each of these. I hope it begins a conversation for us as a community interested in challenging, patterns of racism and oppression, in understanding the work of teaching, in finding ways to honor its complexity, and yet make its commonness able to be used in powerfully good ways for children in our countries.

So, the first challenge is combing the embodied nature of the work and the relational nature of the work with the cognitive and knowledge entailments. Some of my earlier work, I and my colleagues tried to study mathematics work, and it's super important and matters. But there's also the meaning towards the child, the use of tone and voice, the ways in which the teacher stands in the room or where children are

positioned. We see children at the board and we see the teacher off camera. These are part of the body of work of teaching. And one example of our challenges our researchers, and I know many of you are working on this is finding ways to represent that work, with video, with transcript, and with so many other kinds of presentations that don't vertically cut off parts of the work of teaching. I found myself in recent years more and more frustrated with even very imaginative use of transcript for the way in which it either goes so far away from the work or seems to translate so much about the work into language. And language is really important in the work of teaching. But so many things are also not about language, about relationships. How do you transcribe relationships? How do we move about the spaces of the room? So, there is a challenge for us: how we bring together the multi-model nature of the work of teaching and find ways to represent it and analyze it.

The second challenge is the one I won't talk about it at length, but about the importance of building theoretical and more general knowledge about teaching, and building inside while contextualizing the work and centering identities. So, for an example, I have not told you anything about the community where the classroom is, I have not told you very much about the children's identities, have not told you what time of the year it is, and yet there were some general things we've been able to talk about and think about. What does it look like to do this work with integrity where we are centered that very important contextual dimensions of the work, because it is contingent and decontextualized. We are also building theoretical knowledge. What are the responsibilities that we have to be honest about where we do this work? How are we accounting for differences? We are also looking for theories.

A third challenge is how we bring together the work that intends to be systematic, creative work on structure, racism, on macro-structures together with micro-interactions. Too often in our history on the work of teaching, we look at micro-interactions or we look at cognition, or we look at larger structures, or we look at patterns. But in fact, these things are interplaying in the work of teaching, and how can we do better to link together larger patterns of microsystems, macrosystems together with the moments and the spaces. What are the ways to do with that integrated?

A fourth challenge is how to distinguish more responsibilities between prescription and detail. There's been a kind of allergy in our field about breaking down the work of teaching in the ways that many colleagues have named decomposing practices. And it means that it has been critiqued for foreseeing to describe teaching and prescriptive ways as though one did these technical prescriptive moves that teaching would work. And yet, when we believe teaching to be vague, without ways of actually breaking it down and understanding it, we leave it to be at mercy of people doing this out of their old idiosyncrasy, their experiences of patterns in our society. We don't help with the work. It is so complex, begin to have texture, begin to have detail. How do we learn to distinguish between the should(s) and the description? A few years ago, at ICME-13, Ester Enright and I, together with other colleagues, worked on the work of questioning

and teaching. And one of the things we argued is questioning is one of the most important things that teachers learn to do and yet we lack so much detail about the different ways that questions to get asked, awarded and acted. There are so many things to understand, yet we leave question asking to be very vaguely understood idea. How do we learn to look in detail and yet understand the contingent use of that detail? Analysis still remains something that has to be deliberated about with discretion.

And finally, how do we learn to represent the work of teaching in a usable discourse of practice? Some very fine work attends and is devoted to building theories and yet won't help those of us who work with teachers to help them learn to do the work. What are some of the language demands of learning to name and identify teaching in ways that are theoretically deep that are the product of analysis and yet are usable for practice? Is that an impossible goal or one to which we could aspire? And these are just some of the possible ways that we need to continue to confront challenges of work of teaching. Because when I look back across the arch of my work as a teacher, a scholar and a practitioner of teaching, I find that it is been a struggle in our field to honor the work of teaching and to represent it is not displacing work on learners or learning, or work on structures, or bias or oppression or on classroom environments, but to find ways to understand that the work of teaching is done in the context of all of that and to honor that is one form of important research that we so much need if we want to be able to leverage the work of teaching, to disrupt rather than let it simply perpetuate patterns of oppression.

And there are a few other things we need to contend more deliberately as we face challenges of studying teaching. One of those is that too often we neglect to say more about where we do this work and we need to vary that where we the work matters. We need to talk more about time of day, and time of year. All of us who have taught to know that there is a big difference between Thursday afternoon at four o'clock and Monday morning at eight. There is big difference between October and June. And these differences might look different in different parts of the world that they matter. So, in addition to thinking about whom we studying and where we are doing it, and how we blend together, some of the things I discussed in last slide, we need to think about how we don't leave out these very important parts of context of the work of teaching. Things that teachers are thinking about all the time and so rarely part of our research accounts. In fact, we very rarely, too often neglect to say anything about the identities of the children except sort of to describe them. It's not part of our analysis. And finally, and maybe most important to all, we need to diversify the research community if what we want to do is to understand how schooling is experienced, how the work is done. We need the perspectives and experiences, and expertise of broader range of people. The experience on our doctoral programs, the experience on our conferences, the experiences on so many spaces we understand that it's a matter of justice and the study of justice, to have a much more diverse research community. And all the work we can do together to understand how that would improve, not only who gets to do the work,

but also what we collectively come to understand.

Because this in fact, this project is really to understand the work of teaching and its role in justice. It's a collective work. It's not a work of any one person, it not a work of somebody getting the Felix Klein Award. It's an agenda that matters for our future and the world. Teaching is powerful. It demands diversity and who 'we' is when we say 'we'. And this will necessarily broaden what we as scholars come to consider evidence, what we think of the objects of studying are, and what we value. And this would mean confronting some of the patterns of epistemology, ontology, and axiology that are shaped our research community.

(Transcribed by Bo Yang, Xiaoli Lu and Yan Zhu)