

From Theory to Practice: How Pre-service Science Teachers Learn to Become Social Justice Educators

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Abstract: There is a movement within teacher education programs to prepare social justice educators equipped to disrupt systemic oppression and inequity. While studies have looked at how programs prepare teachers to teach for social justice, they tend to focus on teachers' beliefs and few examine teacher education programs as a whole. Urban teacher residency programs have emerged as hybrid spaces addressing the disconnect between campus courses and field experiences, attempting to support teachers applying theory to practice. This study follows a cohort of pre-service science teachers in an urban teacher residency program over the course of their 18-month teacher preparation program. We analyzed written artifacts collected throughout the year to examine the evolution of their definitions of and practices related to social justice. We present two contrasting case studies to highlight their divergent learning pathways and the specific residency program experiences that influenced their learning.

Introduction

How to effectively prepare the next generation of teachers with the knowledge, skills, and abilities to improve student learning and outcomes is a hotly contested policy issue. The stakes are particularly high for students in urban communities who have been historically underserved, impoverished, or marginalized, and the assignment of teachers with poor and/or limited training continues to be the norm (Goldhaber, Lavery, & Theobald, 2015). Deficit thinking continues to dominate the discourse for students in urban communities (Liou, Marsh, & Antrop-González, 2017, Ullucci & Howard, 2015). There is a movement to disrupt this deficit discourse within teacher education programs and to “prepare a teaching force capable of producing equitable learning opportunities and outcomes for diverse students in the context of enduring inequalities” (Cochran-Smith, Villegas, Abrams, Chavez-Moreno, Mills, & Stern, 2015, p. 114). Yet, teaching for social justice is a phrase that novice teachers may not know what it means (Lee, 2011), or may equate it with multicultural education (Mills & Ballantyne, 2016). In this paper, we examine an urban teacher residency context where the term social justice was used regularly and deliberately, but where even so the meaning could be difficult to nail down. We pay close attention to the voices of the pre-service teachers as they struggled with the concept and worked to put it into practice. We analyzed written artifacts, collected over the 18-month urban residency program, from secondary pre-service science teachers to understand how their participation in the residency program challenged, supported, and shaped the evolution of their complex understanding of what it means to practice social justice education.

We draw upon the work of Jurow, Tracy, Hotchkiss, and Kirshner (2012), which calls attention to and values the idea that pre-service teachers begin teacher preparation programs with different histories and experiences and thus respond differently to theories and pedagogies taught in university coursework. We view learning to become a social justice educator in the same manner, as an issue of teacher learning where the situated nature of learning shapes teachers' historically and culturally informed interpretations of theories and pedagogies emphasized in university coursework and applied in their student teaching placements. We use the idea of *situated sensemaking* (Rosebury & Puttick, 1998) to trace teachers' experiences in the residency program and examine their sensemaking as they 1) engage deeply with theories and pedagogies of social justice, 2) use tools and resources to facilitate making sense of these theories and pedagogies, and 3) enact and revise their practice relative to student experiences and responses.

Methods

This study asks two questions. What are pre-service teachers' ideas about what it means to be a social justice educator? How do pre-service teachers' experiences in an urban teacher residency program influence their ideas over time? In answering these questions, we aim to examine how pre-service teachers wrestled with understanding theories of social justice emphasized in the residency program and, more importantly, examine

how they enact those theories into their own teaching practice. Such an understanding will call attention to salient features of teacher education programs that promote teacher learning around issues of social justice and offer practical examples of how teachers make sense of theories of social justice relative to their teaching in urban science classrooms.

Study context

Inspiring Minds Through a Professional Alliance of Teachers (IMPACT) is an urban teacher residency program housed in the UCLA teacher education program. IMPACT prepares about 50 new secondary mathematics, secondary science, and elementary teachers each year. It situates pre-service teachers' learning from university coursework in the context of mentors' classrooms in small autonomous schools and urban communities. Within this program, secondary pre-service teachers are matched with a mentor and begin their student teaching on the first day of school and continue with the same mentor until the final day of school. Teachers spend three and a half days in the field and take courses during the remaining day and a half. The residency program employs a gradual release of responsibility model (Fisher & Frey, 2013), where teachers observe during the first few months of their student teaching, co-plan and co-teach during the next few months, and eventually take responsibility for two teaching periods from their mentor for the remaining months of the school year. After one year of coursework and student teaching, pre-service teachers obtain their preliminary teaching credential and find a teaching position within the program's partner local education agency (i.e., Los Angeles Unified School District). During this second year, teachers continue taking courses in IMPACT towards the completion of a master's in education degree.

The mission of both the UCLA teacher education program and IMPACT is to prepare teachers with the commitment, capacity, and resilience to work in the most underserved communities. The program works to develop teachers' capacity to challenge deficit thinking around the academic achievement of students from historically marginalized communities through humanizing pedagogy that involves respecting students through an asset-based teaching approach (Bartolome, 1994). Yosso (2005) defines this asset-based approach as a call for social justice teachers to use the knowledge and assets of students, families and their communities to inform their classroom teaching. By doing so, teachers dive deeply into what it means to be a social justice educator by reflecting on their multiple identities in relation to privilege and power. By understanding their positionality (i.e., reflecting on their own experiences relative to the experiences of their students), teachers form a deeper understanding around why practices that value students' voices, experiences, and histories are necessary for enacting humanizing pedagogy (Takacs, 2003). That is, teachers come to realize that in order to meet the needs of students in underserved communities, their students' voices, histories, and experiences must shape the way they approach their own teaching.

University coursework for this residency program is organized around a program developed teaching and learning framework that positions social justice values as the foundation for rigorous science teaching (see Nava, Park, Dockterman, Kawasaki, Schweig, Quartz, & Martinez, 2018). The framework contains four core dimensions of teaching quality with eleven aspects of teacher classroom practice. Briefly, the four core dimensions are: 1) teaching with academic rigor, 2) promoting content discourse, 3) ensuring equitable access to content, and 4) building a positive classroom ecology. Our own work has shown how this framework has supported novice teachers' development of an asset-based perspective of social justice (Kawasaki, Nava, & Francois, 2017) and encouraged teachers to come together as professional learning communities to provide feedback and promote productive content discourse (Nava, Park, & Kawasaki, 2015). Teachers also engage in a yearlong social foundations course that provides them with opportunities to wrestle with the historical and cultural factors (e.g., unequal distribution of power, addressing one's own power and privilege) that contribute to systemic inequity and oppression (Philip, 2013). These courses are intentionally designed to provide teachers with opportunities to reflect on how these theories and pedagogies translate into everyday teaching practice. To further encourage productive discourse, secondary math and science teachers take classes together as a cohort, which enables them to support each other's thinking about social justice in their student teaching placements. In combination with extensive field experiences in some of the most underserved schools and communities in the nation, these experiences create a fertile place for teachers to develop their ideas about what being a social justice educator means and how to enact that on a daily basis with their students.

Participants, data sources and analysis

In total, the secondary residency cohort included eight science and eight math teacher candidates. For this paper, we focused on the eight science pre-service teachers because we had complete data for each of them and felt that mapping these teachers' journeys through the program might provide some insight into how they conceptualized

social justice oriented science teaching and inform any programmatic refinements that might be needed to support their development. We analyzed five specific artifacts collected within the residency program: 1) statements of purpose from entrance applications, 2) quarterly reflections assigned before teachers' individual meetings with their faculty advisor, 3) philosophy of teaching papers written in the winter quarter, 4) community inquiry project reflections in the spring quarter, and 5) inquiry projects completed in the subsequent fall for their Master's in Education. These documents gave us multiple data points across an 18-month period in which teachers shared their ideas about what it meant to be a social justice educator. For example, teachers were asked to describe why they were interested in becoming a social justice educator, or in the case of the reflections and papers, how their ideas of being a social justice educator had changed over the past academic quarter.

To understand how teachers conceptualized social justice at the beginning and at the end of the program, the first step in our analysis was to examine the application statements and the Master's inquiry projects. Responses were analyzed thematically, by grouping similarly worded responses together and labeling them. These labeled groups were constructed independently by a researcher and then discussed and revised by a research team. The next step was to examine the quarterly written reflections and mid-year assignments (i.e., community inquiry project reflection, philosophy of teaching paper) to understand teachers' experiences in the residency program (e.g., coursework, readings, student teaching) and how those influenced their evolving ideas about social justice. In these written reflections and artifacts, we used the approach from Rosebury and Puttick (1998), in which we looked for language that related to the theories and pedagogies discussed in university coursework (e.g., course readings, language from the program's teaching and learning framework), the tools and resources made available to teachers (e.g., meetings with faculty advisors, discussions with cohort members), and how they related these ideas to student experiences (e.g., student teaching placement, discussions about students with their mentor). This allowed us to develop contrasting case studies to highlight the different ways that teachers made sense of their experiences in the residency program. In this paper, we highlight the sensemaking journeys of two teachers in the residency program, Cheryl and Nancy. We chose these two teachers to showcase because while both teachers were from communities of color and grew up in upper middle class neighborhoods, their experiences in the program represent the sensemaking divergence that can happen despite being in the same cohort, taking the same classes, and having similar experiences in their student teaching contexts. We place high value in this divergence because it honors the varying starting points, journeys, and ending points for teachers who are committed to becoming social justice educators.

Findings

We present these analyses through two contrasting case studies. The first, Cheryl, makes sense of her development as a social justice educator through a clear orientation towards learning about her students and embedding their stories into her lessons. Eventually her journey through the program leads to her root out deficit thinking by recognizing her own assumptions, privilege, and upbringing in relationship to the drastically different urban context where her students live and attend school. Then we share about Nancy, whose journey begins with a struggle to understand how to assimilate social justice into her everyday teaching and eventually comes to understand how the notion of being a good science teacher is an enactment of social justice. We begin with Cheryl.

Learning about students and examining positionality

Cheryl, a child of immigrants from Korea, grew up in a comfortable suburban environment. She spent a summer as a volunteer in rural Nicaragua and it was there that she discovered that for many, attending college was considered a luxury, and where she recognized that the same was true for many young people in the United States. "I want to fight against these inequalities," she wrote in her application. She came to the residency program with a commitment to help students see themselves as "stewards of this planet" and a broad goal of fighting inequality. Early passion for protecting the environment had given her the desire to "teach ... environmental science, to transform students' attitudes towards education, and to inspire them to be responsible, contributing members of society and of the world" (application statement). Cheryl's student teaching placement was at a large public comprehensive neighborhood school with a student population that was 91% Latino, 7% African American, 94% socioeconomically disadvantaged, 31% English language learners, and 14% students with disabilities. During her student teaching year, 18% of students scored proficient or advanced in state standardized science assessment.

As mentioned, Cheryl came to the residency program with a broad goal of fighting inequality. After beginning the program, she developed a much more personalized understanding of social justice that centered on cultural relevance, relationships with students, and fighting her own deficit thinking. In her first reflection,

she drew upon the summer social foundations course as she described how her vision for social justice was evolving.

I thought that there was a universal approach to being the best teacher, whether working in a high or low SES community. I'm learning that is not really the case. Teaching has to cater to the exact audience and students learn in different ways, but my teaching goal has evolved from a universal learning method. From ED406 [social foundations course] I learned that the best way of learning is influenced by their culture and environment (end of summer reflection).

Cheryl's first course in the residency program immediately shifted her thinking about social justice as she came to the realization that getting to know students' interests and experiences (i.e., "culture and environment") matter for student learning. The social foundations course introduced Cheryl to new ideas that moved her thinking away from a universal teaching approach to one that values the knowledge and ideas that students bring to the classroom.

During the fall quarter of her student teaching placement, Cheryl had transitioned from observing to co-planning and co-teaching with her mentor. In her fall reflection, she described how she approached her lesson planning by considering students' interests and experiences.

My vision for social justice is changing every day. I think about what my lessons mean for the kids. My first thought after writing out my lesson plans are "why should the students care"? This question requires me to think about how my lesson reaches the students and how the lesson culturally speaks to them (end of fall quarter reflection).

Cheryl's earnest effort to design her lessons relative to students' experiences and to think about how they might respond during class instruction was influenced by her desire to enact the theories she learned in the summer into her fall student teaching responsibilities.

During the winter, Cheryl attached a theoretical label to her evolving understanding of embedding students' experiences and interests into her lesson planning.

Culturally Responsive Teaching (CRT) begins with me truly getting to know the students...view[ing] the student as who they are both at home and at school...taking to an account of the student's cultural background, their families, and their academic potential...The holistic cultural knowledge of a student can only become useful when the teacher activates that knowledge within the curriculum...An analysis of the student's household can greatly impact the teaching of a social justice educator (philosophy of teaching paper, winter quarter).

As she was exposed to new ideas and theories in her coursework and experiences with students in her student teaching placement, her understanding of social justice became more complex. Into the winter quarter, Cheryl's understanding of social justice expanded beyond just getting to know students' interests and experiences to include understanding their culture, home, and histories.

Cheryl enacted this expanded understanding of social justice in her community inquiry project, where she organized a schoolwide basketball tournament. She described how this tournament was an opportunity to build community within the school by removing behavior or academic restrictions on who could participate to reach as much of the student body as possible. She reflected on this experience as another way to build meaningful relationships with students.

I want to take my experiences from the community inquiry project to enhance my relationships within the school community...I hope to expand further than formal interviews with administrators and families. I would like to have both formal and informal meetings with community members. Through these meetings, I hope to gain understanding to the community's needs. I would like to work with community members on a project that community members feel is pertinent to the community's needs (community inquiry project reflection, spring quarter).

Her desire to get to know her students expanded to an interest to understand the needs within the community.

Finally, in her first teaching assignment as teacher of record, Cheryl's understanding of the importance of understanding her students' interests, histories, and experiences relative to her own (i.e., positionality) became concrete as she came to intimately know her students and their community. She described this learning in her Master's inquiry project.

The first lesson I learned as a first-year teacher in an urban environment was that the environment I grew up in was very different from my students. The streets I grew up on were isolated from any commercial areas. They were filled with parks, homes, swimming pools, and any kind of nature that could fill in the gaps. The streets my students know are beautiful and colorful in a very different way. Their streets are covered in artistic murals with colorful and vintage urban buildings...I need to continue to examine my own identity as well as engage in discussions that help me to get to know my students more... I had to learn to come to terms with this difference in our childhood environments. Not only were our childhood environments physically different, but I realized that the teaching styles I grew up with that worked for me may not necessarily work for my students (Master's inquiry project, fall quarter, year 2).

Cheryl seemed to be faced with the stark discrepancies between her own experiences and the experiences of her students. Rather than take a deficit perspective on the features and experiences that her students' community lacked, she found new beauty and value in these differences. Cheryl's willingness to consider other teaching approaches given this new perspective depicts the intersection of social justice theories and practice, where Cheryl's approach to teaching is being influenced by the theories emphasized in her coursework (e.g., see community cultural wealth, Yosso, 2005). The residency program gave Cheryl the means to develop her own vision of social justice education in response to her sensemaking journey through readings from university coursework, interactions with students, and other experiences in the residency program. Where she had initially focused broadly on global citizenship, her ideas became more complex and involved into self-critical thinking about classroom practice relative to her students' interests, experiences, histories, cultures and families.

Social justice educators enact rigorous science teaching

Nancy, a child of immigrants from Iran and Egypt, grew up in an affluent community. Her draw towards teaching came from volunteering with a mentorship program for a local urban high school during her college years. She eventually took on a leadership position within the group and attributes this experience as her most valuable lesson on education, that "there are very real and systematic barriers to education that create unequal access to it, and that all comes with historical, political, economic and racial baggage" (application statement). Her commitment was solidified as she drew connections between her own experiences with microaggressions and racism as a Muslim and the struggles with systemic inequity and oppression of the African American students she mentored. Nancy came to the residency program wanting to "empower my students to think critically...to realize their ability to transform their communities through their own education" (application statement). Nancy's student teaching placement was a large environmental and science policy magnet school with a student population that was 70% Latino, 24% Asian, 1% African American, 70% socioeconomically disadvantaged, 17% English language learners, and 15% students with disabilities. During her student teaching year, 44% of students scored proficient or advanced in state standardized science assessment.

In contrast to Cheryl, Nancy's journey through the program began with an initial struggle to make connections between the theories of social justice emphasized in the residency program and her everyday classroom teaching. Through specific experiences in the program, she developed the sense that social justice educators enact rigorous science teaching. Nancy began with an admission that it was not clear to her how theories of social justice and everyday teaching merged together.

I think I have an easier time understanding how I can implement social justice in individual conversations with my students rather than how I can implement it into science content...I'm still trying to comprehend the different places to include social justice, [but] have not reached a synthesis stage (i.e., teaching NGSS with a social justice framework) (end of summer reflection).

This reflection was written after the summer social foundations course, which emphasizes critical theories and pedagogies that center social justice teaching around the assets and community cultural wealth (see Yosso, 2005) that students bring to the classroom. Nancy's admission that she struggled to see how she could enact

social justice in building relationships was a reasonable response to the emphasis in the course around getting to know students. During her fall reflection, she described getting to know students in this way.

It was surprising for me to realize how much I think about my students outside of school. I already care about them so much and watching them give up or go through struggles genuinely hurts me as well...teaching for social justice is a long process and is never full finished. Now I don't see social justice teaching as a fixed goal...but rather a process of teaching that I must constantly engage with and use. I also want to learn more about the community, and be more of a learner from my students in that sense (end of fall quarter reflection).

Nancy began co-teaching with her guiding teacher during the fall quarter and realized the challenge of enacting theories of social justice in the classroom. Her resolution seemed to be to continue to listen to students and understand how to best support them despite their own frustrations and struggles.

In the winter quarter, the methods course incorporated two instructional rounds where teachers video record their teaching and engage in peer feedback. The *promoting content discourse* dimension from the teaching and learning framework is emphasized in the methods course and instructional rounds during the winter quarter. During this quarter, it seemed that Nancy was beginning to develop a sense of how to reconcile her early struggles of separating social justice and teaching science.

Whereas I first saw a silent classroom with all eyes on the teacher as the epitome of excellent teaching, my views have since dramatically changed. I now see discussions between teachers and students, and amongst students engaged in content discussions, as the epitome of excellent teaching...I have also seen how important family and community is to my students, and it has helped me to see the necessity of involving my students' families and community into my teaching practice. For example, a field trip to the Los Angeles River where students collected data on species and water samples was very exciting for my students, as many of them live nearby the LA River, but understandably have never really explored it from a "scientific lens" (philosophy of teaching paper, winter quarter)

By learning about the importance of content discourse in student learning, Nancy found a way to enact the theories of social justice that she struggled with during summer and fall. Nancy seemed to be making the connection, emphasized in the program, that excellent science teaching is an imperative part of being a social justice educator. Also, Nancy started on her community inquiry project during the winter quarter, which highlighted ways that she could further connect social justice theories to her own classroom teaching (e.g., studying the LA River). In her community inquiry project reflection in the spring, she expanded on the idea of how to use local scientific phenomena in her science teaching and how that served as an act of social justice.

I feel that the community is vibrant, with lots of rich celebration of Latin American culture. The [project] has taught me to view the community with an asset-based mentality as opposed to a deficit mentality. As a science teacher, I would like to explore the ways in which my students might tap into community resources to "do science". This could range from studying and documenting urban wildlife and green spaces, to examining the prevalence of certain diseases and the availability/accessibility of health care. In this way, I hope to develop a more culturally relevant and culturally responsive curriculum for my students (community inquiry project reflection, spring quarter).

Nancy, like Cheryl, learned to name the theories and pedagogies of social justice she was trying to enact. Nancy's understanding of social justice seemed to be getting clearer as she was able to identify some concrete and actionable ideas to use in her teaching. Nancy reiterated her growing appreciation of the community and how she could leverage this in her teaching as well as the importance of content discourse as the epitome of good science teaching.

I now see...students engaged in content discussions, as the epitome of excellent teaching...I want students to recognize that when they work together, they will be amazed at how much they can think of and solve without me as a teacher being the ultimate dispenser of knowledge...it takes effective collaboration and building off of one another's ideas to lead

them to those great solutions. I rarely experienced the benefits of effective collaboration throughout most of my time as a student, but I became fascinated with the importance of collaboration when learning about sociocultural learning theory...students must be given opportunities to share their ideas and thoughts constructively with one another in order to develop solutions to the issues that matter to them (Master's inquiry project, fall quarter, year 2).

The residency program gave Nancy, like Cheryl, the opportunity to struggle through and make sense of how to enact theories of social justice into her classroom teaching. Initially this was a struggle for Nancy, who admittedly did not see how these theories unfold in the classroom aside from individual interactions with students. Over time and through experiences in the residency program, she developed a sense of how rigorous science teaching that promoted content discourse and collaboration was itself an essential part of being a social justice educator and concrete way to enact social justice theories in her everyday teaching.

Conclusions and implications

Our study sought to examine how novice science teachers develop into social-justice oriented teachers and how the opportunities within an urban teacher residency program supported their development. Although Cheryl and Nancy brought different life experiences to the program and gave their own versions of social justice education, the key insights from their journeys were that socially just science education required rigorous and equitable teaching on the one hand and caring relationships with students on the other. We found that these ideas were developed through 1) deep engagement in content (e.g., coursework reading, discussions, written reflections), 2) engagement with tools and resources (e.g., quarterly debriefing with faculty advisors), and 3) enactment and revision of one's own understanding through interactions with students (e.g., lesson planning and teaching in student teaching placements). Cheryl and Nancy came to the residency program with similar experiences working with children in their undergraduate studies and similar initial ideas about social justice. Yet, their experiences in the residency program depicts the situated sensemaking that occurs in these programs as teachers wrestle with complex ideas, such as race and poverty, and attempt to enact theories and pedagogies aimed at disrupting systemic oppression and inequity. We argue that there is value in the different understandings, enactments, and journeys that teachers take as they are built from their own experiences, histories, and interests and in response to the urban contexts in which they teach.

The IMPACT urban teacher residency program is a teacher education program established to provide low-income urban schools districts with high quality, highly prepared, and committed teachers. The secondary teachers who enroll in this residency program know a lot about their placement classrooms in advance: they will focus on STEM in classrooms populated by minority and low-income students, many of whom are also English Language Learners and come from immigrant communities. The incoming pre-service teachers, who themselves come from various racial, ethnic, and socioeconomic backgrounds, chose this program with this foreknowledge in concert with a commitment to social justice education, even though the definitions of what counts as social justice might vary widely between applicants. As these two case studies reveal, the applicants came to their residency program to become teachers to "make a difference," be role models to students, empower their students to learn, teach STEM, and increase minority participation in STEM fields. In ways both general and specific, at the outset of their teacher preparation program, they saw themselves already connected to their future students and saw their mission as teachers to engage their students within a larger community of practice, a community of practitioners working together in a project towards social justice. All participants saw social justice education as a life-long process and results from this study suggest that the journey can take unexpected and divergent pathways as teachers learn and enact these theories and pedagogies of social justice relative to their own experiences, histories, and interests and the students in their classrooms. These findings shed light onto the multiple meanings of "social justice" in education and can help inform future research about how programs can effectively prepare and support the diverse needs of aspiring social justice educators.

Current science, technology, engineering, and mathematics (STEM) policy in the United States calls for teachers to ensure equitable access to rigorous STEM instruction for historically underserved communities (Next Generation Science Standards, NGSS Lead States, 2014; Common Core State Standards for Math, CCSSO, 2010; National Education Technology Plan, Office of Educational Technology, 2017). These recent STEM policy reforms seem to have sparked an increased interest among learning scientists to study and understand teacher learning from the perspective of learning science theoretical and methodological frameworks. With equity as a central idea within each of these policy reforms, it is imperative that we understand how teachers learn to become a social justice oriented STEM teachers in order to shape professional learning for pre-service and in-service teachers around the intersections of content, theory, and practice.

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