Where Novice Science Teachers of Color Stay and Flourish:

The Case of Mulberry School District

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In the past two decades, there has been progress in understanding factors related to the attrition of science teachers from the workforce, with implications for science education policy and research (Ingersoll & May, 2012; Ingersoll & Perda, 2010). Despite a growing body of research on the induction and mentoring of science teachers (e.g. Luft et al., 2011), there is less research focused on the question of the factors that influence science teachers to remain in a particular teaching position, or the profession generally. The main premise of this paper is that the question of what makes science teachers *stay* is important, and that its answer is not simply the converse of the reasons that influence teachers to leave.

In this paper we examine this issue by focusing on teacher retention within a single school district that is empirically one of the most successful in its state at retaining novice science teachers—and science teachers of color in particular—in order to better understand the factors that influence science teacher retention. The primary research question investigated here is: What factors influenced the high rate of retention of science teachers in this district from 2007-2017, and in what ways are those factors continuing to influence retention currently?

Theoretical Framework

To make sense of our data, we have chosen to theorize teacher retention by using an adapted version of the framework of job embeddedness (Holtom et al., 2006; Kiazad et al., 2015; Mitchell et al., 2001), which we have borrowed from the field of applied psychology and economics. This adapted theory, which we have termed teacher embeddedness (Larkin et al., 2022), offers new insights on meaningful support for novice teachers and is consistent with our aim to focus on why teachers stay, rather than why they leave (Lee et al., 2014).

As shown in Table 1, the main components of teacher embeddedness theory are fit, links, and assets, and are applied to two distinct domains: the organization and the community (Larkin et al., 2022). In our teacher embeddedness framework, the organization refers to the workplace of the school and district itself, and community refers to the local area surrounding the school. In our research, we seek evidence of fit, links, and assets in both these domains.

Table 1. Teacher embeddedness theory from Larkin et al., (2022), adapted from Mitchell et al. (2001) and Holtom, et al. (2006)

Component	Domain: Organization	Domain: Community
Fit	The comfort and compatibility of an individual with respect to the local educational context. This includes the degree to which the aspirations, career goals, values, culture, and worldview of the teacher are aligned with the environment of the local educational context in which an individual works.	The comfort and compatibility of an individual with respect to the community. This includes the degree to which the aspirations, career goals, values, culture, and worldview of the teacher are aligned with the environment of the local community in which an individual works.
Links	Personal relationships and connections made with colleagues, students, and others within the local educational context.	Personal relationships and connections made with individuals and groups within the community, which may include family, consumer, religious, and other social affiliations.
Assets	The sum of the tangible and intangible benefits from a job to an individual in terms of perceived material and psychological value. Such assets may include salary, workspace and materials, perquisites, established patterns of working, and support for professional growth.	The sum of the tangible and intangible benefits from a community to an individual in terms of perceived material and psychological value. Such assets may include housing, sense of place, established patterns of living, personal safety, favorable commutes to work, and other aspects of one's quality of life influenced by the community.

Fit refers to the comfort and compatibility of an individual to the organization and community, and includes the degree to which the goals, values, and worldviews of the employee are aligned with those in evidence in those domains (Holtom et al., 2006; Watson, 2018). It also includes the degree to which there are emotional attachments and aspirational commitments to these workplaces and settings. Simply put, new science teachers who may flourish in some environments might find it difficult to continue in others.

Links are formal and informal social connections and relationships. Within the workplace these links may be to colleagues and associated professionals. Within the local area, these links may include family, religious, and other social affiliations. Links with students and their families are also important and may span the boundary between organization and community. Certainly, such links may also influence a person's decision not to leave their place of employment (Mitchell et al., 2001). Links are often stronger when the district is familiar to a teacher. Reininger (2012) found that most young teachers in the United States live in close proximity to their hometowns, and Redding (2022) found that homegrown teachers from urban districts do tend to remain longer.

The third component of the teacher embeddedness framework, *assets*, refers to the tangible and intangible benefits from a job to an individual in terms of perceived material and psychological value. We describe as assets those things which would be sacrificed if an educator voluntarily left a position (Larkin et al., 2022).

Design of the Study

The case presented here is drawn from a larger national study investigating the 5-year science teacher retention rates in four U.S. states (New Jersey, North Carolina, Pennsylvania, and

Wisconsin).[1] This study has two distinct phases. In the first phase, researchers used publicly available staffing data from 2007-2018 to construct a 5-year retention map for six cohorts of novice science teachers in each state. This approach differs from sample-based retention studies because full data permitted mapping the career trajectories of each individual science teacher for a more comprehensive picture of teacher retention, mobility, and attrition. For example, in sample-based studies, the departure of a teacher at the end of one year might simply be categorized as attrition. In viewing a 6-year trajectory, we were better able to identify teachers who left a position in a given year not simply as attritted, but possibly as having transferred to a different district (mobility) or taken a year off and then returned (such as for parental leave.)

After analyzing individual teachers' career trajectories, we calculated the 5-year retention rate of newly hired science teachers in each cohort for the years 2007-2017 for each school district. This analysis informed the second phase of the research, in which five districts per state were identified for a more detailed case study on the factors influencing science teacher retention. In addition to higher-than-average rates of retention, we attempted to diversify our selection of districts by looking at factors such as school size, location within each state, type of community (urban, rural, suburban,) and relative wealth of the district. We also looked for districts that had hired (and retained) teachers of color and Noyce Scholarship recipients.[2] The district described here was one of those selected in the state of New Jersey, and both the town and school district are represented by the pseudonym of "Mulberry" in this paper.

Description of the District

[1] This material is based on work supported by the National Science Foundation under Grant #1758282. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

[2] The Noyce Teacher Scholarship Program is a National Science Foundation program designed to meet the need for well-prepared STEM teachers in the United States. Therefore, the retention of Noyce Scholarship recipients in the teaching profession is of understandably high interest.

The city of Mulberry, located in the densely populated corridor between Philadelphia and New York City, is one of many municipalities along that route with both urban and suburban characteristics. Approximately 20% of the population of Mulberry lives below the poverty line, though there are also concentrations of wealth within the stately historic neighborhoods of the city. The average income is lower than the state average, and Mulberry homes are less expensive than the US median. The city's economic diversity is mirrored by its racial, linguistic, and ethnic diversity, even as over 80% of the population (and over 90% of its students) identify as "Black." The census also notes that fewer than 5% of Mulberry's population identify as White. Like few other municipalities in the state, Mulberry is a place with thriving and diverse majority Black middle- and working-classes.

The school district of Mulberry currently operates about 20 schools, all of which qualify for federal Title I funds, and it serves approximately 10,000 students and employs approximately 800 teachers. In state reporting documents from the 2017-2018 school year, more than 75% of Mulberry's students were identified as economically disadvantaged. In the past two decades, there have been numerous consolidations and reorganizations of the district's schools and facilities. In the 1990s, the bankruptcy of a private liberal arts college within the Mulberry city limits eventually led to the property being purchased by the city, and ultimately renovated into what is now Mulberry High School, which is now the district's largest high school.

Two district magnet schools are located elsewhere in the city. Students may apply to Mulberry Arts High School, a performing arts magnet school beginning in sixth grade, or Mulberry Science High School, a STEM-focused magnet school, beginning in ninth grade. Both of these magnet schools were established after 2010. Students not enrolled in one of these magnet schools attend Mulberry High School.

Rationale for Selection

The Mulberry School District was selected for this study because it was able to retain 8 science teachers hired between 2007 and 2012 for a period of at least five years. This placed Mulberry within the top 10% of districts in New Jersey for its five-year retention rate, which was the first criterion of selection in our study. Given the larger aim of the study to better understand the varying contexts in which new science teachers work in the state, Mulberry had a number of other characteristics that influenced its selection. Mulberry offered a good opportunity to examine retention of teachers of color because it had the highest number of hired and retained novice science teachers of color in the state, both as a proportion of total teachers and in raw numbers. Mulberry was also one of the only schools meeting the main retention criteria in its region of the state. As a school district placed into the highest and lowest socioeconomic comparative category by the state, Mulberry also offered an opportunity to examine teacher retention in an environment where the majority of teachers retained where teachers of color.[3] It is notable that in a state where approximately 15% of teachers identify as teachers of color (non-White or non-Hispanic), data from 2017-18 shows that the vast majority of teachers and administrators working in Mulberry identify as Black or African American.

Data Sources and Analysis Procedure

The research team interviewed 11 individuals in the district: including three administrators, two science teachers with less than 3 years of experience, and six science teachers with more than 3 years of experience. The primary goal of the site visit was to better understand the factors that may have influenced teacher retention during the focus period of the

[3] In New Jersey, a district factor group (DFG) is a state-determined designation that allows for districts with relatively similar socioeconomic indicators to be compared with one another. This terminology is unique to New Jersey and was originally created for the resolution of school finance litigation (Education Law Center, 2020) and is still in common use today as a shorthand way to characterize the socioeconomic differences between school districts in the state.

data (2007-2018) and to also investigate current practices around the mentoring and induction of new science teachers.

Interviews lasting 30-45 minutes were conducted virtually on the Zoom platform and were recorded, transcribed, and then analyzed using NVIVO12 software. All four members of the research team collaborated on the data collection and construction of the case narrative. Other data collected included publicly available district documents and documentation related to the mentoring and induction efforts provided by the Mulberry district.

All interviews were recorded and transcribed, and each was analyzed using NVIVO12 software. The four researchers, all of whom were present at the site visit and conducted the interviews, coded data independently before meeting to identify emerging themes related to the issues of interest to the case. All four members of the research team then collaborated on constructing the narrative of the case (Stake, 1995). Interviewees were offered a "member-check" opportunity to review and provide feedback on the written case, and participants confirmed the accuracy of the case as written.

Findings and Analysis

As a result of this site visit and subsequent data analysis, we posit five factors that likely influenced the high science teacher retention rate observed in the Mulberry Public School District. These are: (1) a competitive salary, (2) caring colleagues, (3) a culturally protected environment and community for teachers of color, (4) professional autonomy, and (5) opportunities for professional growth. We follow this with a discussion of these factors through the lens of the job embeddedness theoretical framework.

Factor #1: A competitive salary

Every teacher interviewed for this study mentioned the district's competitive pay scale, and a number of experienced teachers even noted that they had been persuaded to accept a position in Mulberry with a significant salary increase from a previous teaching job. One novice teacher argued that the stereotype of poorly paid teachers simply did not apply to Mulberry. In New Jersey, nearly all public-school districts are guided by salary tables negotiated between the school board and local teachers' union in determining teacher pay. Compensation is determined by two primary factors: years of experience, which are typically listed vertically as "steps" determined by years of experience and education, and education level, determined by degree and additional college credits. It is not uncommon for such contracts to stretch the amount of time beyond a single year to advance a step on the salary guide, and doing so is a time-tested method for keeping the salary lines in school budgets under control. Another common practice is to increase the number of steps in the guide and decrease the salary increment between them, so as to lengthen the amount of time it takes for any individual to reach the maximum on the salary guide. Within the bounds of the policy set by the local school board, a district may have substantial discretion in determining the starting step on the salary guide for any new teacher hired into the district. For example, it is possible for a teacher with some years of experience in a one school district to be placed on the initial salary step when they start in another. However, a new teacher with no experience may also be placed on a higher starting step as an incentive to accepting employment. Not only does such placement on the salary guide determine the teacher's initial salary, but it also establishes the amount of time needed for that teacher to reach the maximum on the salary guide. It is reasonable to conclude that having a salary that is unlikely to be matched elsewhere factored into teacher retention decisions.

The recent contracts negotiated between the Mulberry school board and Mulberry Teachers Union have been quite favorable to teachers, and our analysis showed that many teachers in Mulberry were paid a higher salary than their colleagues with similar teaching experience and education in neighboring suburban districts. For example, in the years 2017-2018, Mulberry's first-year teachers were making approximately $60,000 per year, about 10% over the state average. The salary guide in the 2010-2014 contract for example, contained 16 steps with ranges for teachers with a Bachelor's degree, a Master's degree, a Masters plus 15 credits, a Masters plus 30 credits, and a doctorate. Interestingly, the salary guides also included "half-steps" explicitly designed to place teachers at the time of hiring, giving district administrators an extra tool in providing salary incentives for new hires.

From our interviews, it does appear that the Mulberry school district used these tools available to them in order to recruit and hire science teachers and recognized the value of prior experience by compensating teachers accordingly. One novice science teacher stated how important it was to be compensated for the college credits she earned prior to her teaching career that would not have been recognized in the other districts where she applied because they were not explicitly connected to her teaching degree:

> I love that they pay well. They gave me an additional five thousand or something and other places didn't care that they just focus on the science experience, so I actually started off my first year, making more money than people who were teaching for like five years. I mean they give you money for extra education, I like that. That's important.

Novice and retained teachers alike mentioned that Mulberry placed teachers on their salary scale in ways that accurately reflected the experience they brought to teaching. One teacher with

16 years of experience, with his most recent six years in Mulberry, expressed how Mulberry valued his prior experience, a welcome change from the previous district. He noted that Mulberry raised his salary very generously, every year:

> Mulberry has a very good pay scale, not an asymptote. Basically, in the amount of time I've been over here, my pay has gone up a tremendous amount. Now that doesn't really affect how I do my job because I still do the same job, you know, to the same level of care that I always try to do. I like to think I have a level of professionalism that comes from all other jobs that I worked before I became a teacher. But pay matters to you and that is a good thing.

Given the number of science teachers who come to the profession as a second career after working in scientific fields (e.g. Navy et al., 2021), such an orientation to valuing prior experience and education in setting teacher salaries seems particularly important.

We posed the question to several interviewees—teachers and administration alike— as to how Mulberry had been able to maintain such a strong salary for its teachers over the years. The explanation that emerged from the interviews was that Mulberry had a very active teachers union that was regularly engaged in a broad range of issues. One administrator stated, "The union that we have for the teachers is very strong, I will say from my own personal experience, I feel like they stand up for teachers, they fight for their teachers." This sentiment was echoed by a number of people, and the relationship between teachers union and district was often characterized in terms of partnership.[4] The administrators often referred to the teachers' contract in our interviews in such a way as to make it clear that the contract was a living document, and familiarity with its details an essential part of their jobs.

Of course, school districts must have funding in order to be able to pay teachers, and it should be noted that Mulberry was one of the so-called "Abbott districts" in New Jersey. Abbott districts are those have been awarded special funding from the landmark New Jersey Supreme Court case of *Abbott v. Burke* in 1985 in order to mitigate long-standing funding inequities in those districts (Education Law Center, 2020). Given that salaries are typically about two-thirds of school budgets (Odden & Picus, 2000), this additional state funding is clearly a factor in ensuring that the Mulberry School District is able to sustain competitive salaries for its teachers and administrators.

Factor #2: Caring colleagues

The teachers interviewed for this project reported uniformly that their schools were good places to work, and made reference to their colleagues, administrators, and members of the Mulberry community as key reasons in making this so. Even with two decades of almost continual changes in district-level administrators and school facilities, this district culture was perceived by novice and experienced teachers alike as an important factor in retention.

Many of the teachers we interviewed at Mulberry stated that most of their administrators were caring, and that this was reflected in the school culture. Some of the experienced teachers we interviewed came from neighboring urban school districts seeking better pay and/or working conditions, and noted that the culture of their school and district was a factor in their own retention. For instance, one teacher said, "Whether it's a birthday, or a recent family tragedy during the pandemic. Folks are beyond supportive." He also mentioned, "I really feel like there is a sense of care. You see somebody expressing a concern and it's addressed within a day, versus somebody expressing a concern and it takes you a year."

Nearly all of the teachers mentioned the importance of having supportive colleagues in deciding to remain in the district. One teacher who talked about why she had remained in Mulberry emphasized the way in which colleagues eased the isolation of teaching:

> You know, for a few reasons, I would say, probably at the top it has been my colleagues. We have a set of colleagues here that is very supportive, very welcoming, very encouraging. It just really makes you feel right at home. But my colleagues would be my top reason. I mean I don't feel like I'm in my classroom alone, sometimes teaching can be an isolating kind of endeavor but right next door, I know I can always knock.

Another retained teacher mentioned her appreciation to the colleagues who had started during the same year as her. She noted that the group of teachers had not only remained in the district, but in the same school.

Other teachers pointed specifically to the collegiality within the Mulberry science department across the three high schools. “Everyone gets along in my department,” one experienced teacher said. Another teacher described the supportive environment for teachers in the science department:

> All my colleagues here have been warm and welcoming but even within the science department, we have our own. For lack of a better word, we also have our own culture of support and care. Colleagues who remind me of that spiritual nourishment to me honestly. That's how I got through, you know I could knock on someone else's door, come across the hallway and share a burden, share a challenge, share a concern or question and you know connect with them and it’s kind of like the intangible thing that helps you get through.

What was notable about the descriptions of support were that they extended beyond personal concern for well-being into direct pedagogical support as an extension of that care:

> Our department, especially in science, we have a lot of other teachers that also play a role in supporting new teachers, in addition to mentors. One of our science teachers, she's one of our great engineering teachers and she just loves, you know, to spend a lot of her time [with] new science teachers in the district.

All the novice teachers we interviewed reported feeling appreciated, valued, and supported by their administration. One novice teacher pointed the collegiality of the teachers and administrators to be his main reason of staying in the district: "The teamwork between the administrators and the teachers, I think that has been a strong point for me."

Teachers at Mulberry also commented on the support they had received individually from district science supervisors, both past and present. Several teachers spoke highly of a past supervisor, who had an open door policy and was very concerned with making sure teachers had the resources they needed, practices that a newer supervisor continued.

Factor #3: A culturally protected environment and community for teachers of color

As we analyzed the data for this case, it became more and more obvious that an important aspect of this culture was that the Mulberry district offered a degree of refuge to the teachers of color who worked there. In summarizing the shared features of racially segregated schools in the U.S. South in the early 20th century, Siddle Walker (2000) made the following observation:

> Many of the schools' characteristics appear to have been a direct response to the challenges they faced and intimately connected to the oppressive circumstances

> in which they operated. In their world, there was a clear "enemy"—racism. As such, the schools operated with a well-defined purpose for African American uplift that was shared by teachers, principal, and community members. All the training and modeling by teachers and principal were aimed at helping themselves and their students overcome that enemy. The curriculum and extracurricular activities were other avenues to support the same goal. Even parents supported the goal, as they provided for the schools what the schools could not provide for themselves— financial support. In this world, all worked together to achieve the common goal of educating students to function and achieve in a world where the odds were stacked against them. (p. 276)

Educational historians have noted that despite being extremely under-resourced, racially segregated schools have historically served as centers of black teaching excellence (Acosta et al., 2018; Foster, 1997). In many ways, the working conditions for teachers in Mulberry—over 60% of whom were Black— was reminiscent of the environment of uplift and support often found in Historically Black Colleges and Universities (HBCUs) (Albritton, 2012; Crewe, 2017). When presented with this idea, one Mulberry administrator said, “I totally feel what you're saying, like absolutely a hundred percent”, and recounted an event where Mulberry graduates had returned to discuss their college experiences:

> The kids were talking about their experiences once they went to college— and some went to, like NYU, and some went to Howard. And so they said when they left and when some would go to like those HBCUs, they said it was almost like a continuation of where they came from. They're like “Oh I'm used to this! This is what we're doing!” But the ones that went to non-

> HBCUs, they said that they had to kind of see the world differently, because it was like, “Wow.” The feeling, the unity, the togetherness, it wasn’t there for them…. the school district is definitely connected with the community, in a sense, it's not like a separation, you know?

Administrators claimed that teachers of color felt comfortable in this school district and community because of its distinctive culture. One administrator remarked, “It's probably one of the most unique urban settings that you'll ever come to.” Another teacher noted:” I was kind of afraid to work in a district where there's more White kids because I feel like the parents are… [trails off]. Well, the thing is, I don't really have much experience with White people or other races, which is not really good at all.” Interviewees noted that the school leadership reflected the student population, and one administrator observed that such an administrative demographic profile was somewhat unusual:

> In districts where the students are predominantly African American, the top-level administration rarely reflects the population. In [Mulberry] it does, and I think that makes us unique…. How did that happen? I'm not sure, it's just always been that way since I've been here. It’s one of the reasons that drew me to the district in the first place.

Another administrator spoke about the diversity of culture in the leadership of Mulberry, noting that the district had a large number of both women and men of color who had earned a doctorate. One interviewee described growing up in Mulberry with a mother who was also an administrator in the district:

> You know, my mom was a black woman in the 1980s becoming an

> administrator... [Mulberry] had different administrators of color, not just all White males or White females. White, Black, Spanish or you know what I mean? So, I don't feel the administration—especially growing up—was one-sided.

One administrator described a well-worn pathway from attending schools in Mulberry to returning to teach there:

> It is encouraged. We have several people who grew up here who teach. My best friend and his department supervisor were born and raised in [Mulberry]. There are a couple people in the department who attended [Mulberry] schools and are now in leadership in [Mulberry] from coaches to teachers.

One novice teacher even discussed how she referenced this pathway to offer motivation to her students when she was teaching:

> I graduated from the [Mulberry] school district in 2006. I went to [Mulberry] Middle and that's where I learned how to swim, so I was able to really connect with my kids, my students, you know because I'm like this is where I learned how to swim guys, like, and I'm here ….You can actually become anything you want to be, look at me, I became a teacher! You know everything that you're doing or going through, you know I went through it, I've been there, … I love teaching in the district I grew up in. It's surprising, a lot of schools who are in you know a lot of districts that are supposed to be better, I think we're doing a fantastic job with our students. So having been able to be involved in the development of the district and encourage students and children who look like me to further their education and dreams; it's amazing and I love it.

Teachers also noted the involvement of students' families in the schools. The district runs a "parent university" program to help connect students' families to the curriculum in the classroom. One teacher compared Mulberry to his previous urban district: "Whether it's a positive interaction or negative interaction, you know, like the parents complaining about something, it's always clear that the parents value the teachers more."

One final aspect of the culturally sustaining environment concerns the role that the city of Mulberry played with respect fostering close relationships to the schools. One administrator noted that the city regularly planned events—such as the planting of community gardens or reading events, and communicated with the schools in order to better involve teachers, students, and families. This administrator continued:

> Whatever the city may be putting together, they're like, "tell the kids! Come on, tell the teachers to bring them over!" In the spring, we had the families come in. Even if your kid didn't even go to school, come back we're planting gardens right there's a community garden across the street from [school]. And the city did that, so that's just one way like just to get the parents involved because anybody could grow, they have their own little spot they're like "Oh, this is Miss Wilson's vegetable patch that everybody was invited to be a part of." From elementary all the way to high school, the teachers were invited to go in and bring the kids in…It's just something that's a part of the culture.

We wish to be careful in our claims here—the perceived sense of caring and community on the part of the science teachers and administrators we spoke with may say very little about how the school climate was perceived by those we did not interview, including students, other teachers, families, and community members. Nonetheless, it is difficult to avoid concluding that the

work environment for novice science teachers of color in the Mulberry School District offered a measure of cultural affirmation and protection that would likely be more difficult for these teachers to find in other area school districts, particularly in those that were predominantly White.

Factor #4: Professional autonomy and support

One consistent response from teachers and administrators alike in nearly every interview was that teachers were not "micromanaged" in Mulberry. The teachers stated that they felt trusted by their school district, and correspondingly, had latitude to teach as they saw fit in their classrooms. One retained teacher said:

> I'm allowed to teach what I teach in the manner that I feel that I need to teach my subjects. I don't really have people telling me, you need to teach this a certain way, you know I have flexibility. I feel like I know what I'm doing, and that flexibility is very important to me because you know there's a lot of other parts of the job. At least the flexibility to at the end teach the way that you want is worth quite a bit. I still have the freedom to act as a teaching professional.

In coding the data for this case study, we chose to designate responses such as the above with the label of professional autonomy, which is closely related (but slightly more expansive) to the notion of classroom autonomy in the literature. For example, Ingersoll et al. (2016) describe classroom autonomy as related to certain key issues: "selecting textbooks and other instructional materials; choosing content, topics, and skills to be taught; evaluating and grading students; selecting teaching techniques; determining the amount of homework to be assigned; and disciplining students," (p. 46). To this list we add the respect and trust accorded to teachers in their relationships with administrators, and thus view the classroom autonomy as a subset of a

wider professional autonomy granted to teachers. A number of retained teachers in Mulberry stated that such professional autonomy was crucial to their retention in the district, and many reported feeling a sense of freedom and flexibility in their teaching.

One retained teacher stated that the commitment on the part of his school to ensure that each teacher had their own classroom was an important aspect of this autonomy. "Teachers basically have the luxury of being in one room all day," he said, "and when there's not any classes being run, we can actually stay in the room." He was very aware that this was not the case in many other schools. Indeed, another teacher noted that (prior to the district's COVID related move to block scheduling) she taught four classes and had two "prep" periods each day, which provided her with adequate time to tend to administrative tasks, planning, and lab setup.

Factor #5: Opportunities and support for professional growth

In many ways, the professional autonomy extended to teachers in Mulberry described above was closely related to the district's support for professional growth. In discussing what lessons Mulberry as a district might offer to educators generally, one novice teacher emphasized the extent to which the administration supported and valued teachers:

> [My school] gives me a lot of support. If you need help with this there's somebody for that. There's somebody to help you move you to the next level. And specifically, the principal and assistant principal here are very positive, very approachable individuals. [The principal] is always motivating the students and the staff, and he looks for the positive. He doesn't just focus on the negative… People have to be positive; they have to show appreciation and I like [how here at

> this school they] really appreciate their staff. The staff work hard, and they are thanked for it. I like that they celebrate the staff here.

The science teachers in Mulberry who we spoke with uniformly described a range of opportunities to grow professionally and felt supported by their district in this effort. These opportunities included leading professional development sessions, applying for funds to support further education, mentoring novice teachers, applying for administrative or supervisory positions, and joining the leadership of the local teacher's union. While it may be the case that such activities may exist in other districts, what seemed unique is the way that teachers described begin actively encouraged to avail themselves to these opportunities. Multiple people noted that administrators not only encouraged them to grow professionally, but also provided resources to achieve their goals. The science supervisor noted that one way science teachers are supported is through district support for them to attend the annual state science convention.

Teacher-led professional development appeared to be a regular occurrence in the Mulberry district. One retained teacher noted that the Mulberry district offered him the opportunity to facilitate programs and mentor student teachers/novice teachers, contrasting this with his previous district that discouraged his desire to advance his career. He described this district support during his first few years as a mentor:

> It has been an opportunity for growth, I mean I've had the opportunity to facilitate different programs, like the project SEED program from the American Chemical Society, which is set aside for students who come from low economic backgrounds to give them research experience. I remember talking to an administrator in another school district, who said she would not have given me the chance to do that because I didn't have enough experience in her eyes, I don't

> know why she told me that as if I work for her anyway, but just to hear that, like. You know some places would block you from these opportunities, whereas here for the most part they welcome ideas here. I get to try the things that I generally want to try.

Rather than the broad and general efforts critiqued in the literature (e.g. Darling-Hammond et al., 2017), in Mulberry, professional development appeared to be more likely to be tailored to individual teachers' needs. One novice teacher described being supported by the district in taking a four-day summer workshop for teaching an Advanced Placement science course. Another novice teacher noted that professional development in the district was often long-term and included feedback on its implementation, and pointed to the recent efforts to support teachers in using video technology to teach remotely during the pandemic:

> There was rigorous training on technology, so from the time we were taught the technology being offered at [Mulberry], they also gave us feedback weekly on how we were doing with the students. That immediate feedback was very good. Even now, we are using the same tools… I know I have almost 45 hours of training.

Such attention to teacher professional growth reflected the investment of the Mulberry district as a support system that values teachers and their career as professionals who contribute to the community.

Discussion

One of the highlights from this study is the quality of support, professionalism, and collaboration received by the teachers of color in the science department at Mulberry school district. Using the teacher embeddedness framework, we found that perspective offered by

viewing retention through the lenses of fit, links, and assets offered specific insights to the retention of science teachers in the Mulberry School District. We describe each component below in both organizational and community domains.

Fit. Within the organization of the Mulberry School District, there appeared to be careful attention to ensuring a good fit between novice science teachers and the district. Perhaps most notable was simply the district's efforts to recruit and hire teachers of color into the district. As noted above, the attention to fostering a culturally safe environment for teachers and students alike communicated an aspect of this fit to novice teachers. To the teachers coming from non-teaching careers in science or from other districts, the welcoming atmosphere demonstrated by the sharing of resources and the shared goals of high-quality science instruction sent a similar message of belonging.

As is true in many places, there was often little distinction between school organization and local community on the part of those who both lived and worked in Mulberry. Within the community, it is likely that many of the cultural compatibilities described as applying to the school were also experienced by teachers. One hypothesis that emerged for us as a research team is that the high-level of community involvement by the caregivers of Mulberry students may have offered teachers greater opportunities for engagement than might exist elsewhere.

Links. Within each school, it was clear that Mulberry science teachers had formed numerous and strong links with other teachers and administrators in their schools. Though these links were less evident at the level of the district as a whole, it was clear from their descriptions of mutual support that relationships extended beyond the professional to the personal. The size of the district also appeared to foster the generation of such links as people moved into administrative positions in other buildings—the district was large enough for such opportunities

to exist in sufficient numbers but also small enough such that such links could be meaningfully sustained over time. The local teachers' union appeared to be an important source of links within the organization as well.

Many teachers have mentioned that they lived or attended to school in Mulberry city, which clearly offered opportunities to develop links with the community. One administrator even noted that her walk to work in the morning offered opportunities to interact with community leaders, and their general accessibility was notable. Mulberry teachers and administrators shared evidence of their participation in the community in a variety of ways. Community activities, such as the "rain garden" constructed by the local parks department, intentionally cultivated the participation of teachers and their students.

Assets. Salary was clearly as one of the more important factors for teacher retention in Mulberry, and teachers appreciated being compensated above the rate of neighboring districts. Teachers reported feeling well-resourced to teach science, and adequate space for teaching science—teachers had their own classrooms—was important to them as well. Support for teacher professional growth was also highly valued.

Unlike some metropolitan areas (e.g. Rios, 2023), teacher housing for Mulberry teachers was available within or in close proximity to the district. The combination of affordable housing and ample pay made continued teaching in Mulberry an attractive prospect.

Conclusion

Our study of teacher retention in the Mulberry School District found five factors that appeared to influence science teacher retention: competitive salary, caring colleagues, a culturally protected environment and community for teachers of color, professional autonomy,

and opportunities for professional growth. While the notion of "job satisfaction" was critiqued in the early job embeddedness literature for its theoretical imprecision, it is clear that taken together, these five factors paint a picture of science teachers who are indeed satisfied with their jobs in Mulberry. The advantage of the teacher embeddedness framework is that it highlights the reasons for this satisfaction in a manner that offers implications for how other districts might increase the likelihood for their own teacher retention.

The compensation for Mulberry's teachers retention was not only adequate, but was made possible by an active teacher's union. The overall climate of respect for the work of teachers in the district was unambiguous, and was evident in the collegiality among science teachers within and across schools. The professional autonomy and opportunities for professional growth afforded to teachers is further evidence of this support for the work of teachers. The culturally protected environment and community for teachers of color had an equity focus driven by the goal of educating students of color to exist and excel and achieve in the world. Hiring administrators of color was important to this effort, as was hiring school staff that know and belong to the community.

Examining teacher retention through the lens of teacher embeddedness and attending to both the organizational and community domains provides a more nuanced understanding of why teachers remain in their positions and in the profession. Teacher embeddedness also suggests what efforts might support the further retention of teachers in a broad range of school and district contexts.

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