Job Embeddedness and Professional Support:

A Case Study of Science Teacher Retention in One District

Douglas Larkin, Montclair State University

Liz Carletta, Montclair State University

Suzanne Poole Patzelt, Montclair State University

Khadija Ahmed, Center for Research and Evaluation on Education & Human Services

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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 a scarcity of research focused on the converse question of the factors that influence teachers to remain in the profession. We argue that this 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, 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 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. Existing models of worker retention in organizational theory invoke two factors: job alternatives (including the capacity to leave) and job satisfaction (Holtom et al., 2006), yet have been shown to have limited

predictive and explanatory power (Mitchell et al., 2001), even as these existing models continue to be widely used in public discussions about teacher retention. In regard to teacher retention, studies that deploy job alternative & satisfaction models frequently do so within supply and demand frameworks (e.g. Geiger & Pivovarova, 2018; Guarino et al., 2006) because individual teachers are the units of analysis and may be viewed as interchangeable units of labor. Although this perspective adequately attends to large-scale issues of teaching position turnover and teacher mobility, critics of this theory suggest it neglects "the role of relationships, social capital, and social networks in recruitment and retention" (e.g. Baker-Doyle, 2010, p. 4).

Job embeddedness is comprised of three overlapping components: *fit*, *links,* and *sacrifice*, and each is applied to both the organization and the community (see Table 1). The first component, *fit,* refers to the comfort and compatibility of an individual into both the organization and environment, and includes the degree to which the goals, values, and worldviews of the employee are aligned with those in the workplace and the community (Holtom et al., 2006; Watson, 2018). The second component, *links*, refers to connections beyond the job itself, including family, religious, and other social affiliations, suggesting that commitments to these other links may also influence a person's decision to remain at their place of employment (Mitchell et al., 2001). The final component, *sacrifice,* refers not only to the ease or difficulty of breaking the links described above, but in the "the perceived cost of material or psychological benefits that are forfeited by organizational departure," (Holtom et al., 2006, p. 320). Certainly, salary is one material benefit to be considered in assessing potential sacrifice. Across various forms of employment, other elements of sacrifice may include such things as the discontinuation of relationships, years' worth of institutional knowledge for navigating the organization, an

office with one's name on it, or other perquisites of the job. For teachers, sacrifice may also include the sense of leaving students behind.

Table 1. Job Embeddedness theory adapted from Mitchell et al. (2001) and Holtom, et al. (2006)

Domain	**Component**	**Definition**
Organization	Fit	The comfort and compatibility of an individual into the organization. Includes the degree to which the goals, values, and worldviews of the employee are aligned with those of the workplace.
	Links	Personal relationships and connections made within the organization that extend beyond the boundaries of the job itself, which may include family, religious, and other social affiliations.
	Sacrifice	The perceived cost of material or psychological benefits that are forfeited by organizational departure, which may include salary, workplace space and materials, job perquisites, established patterns of working, and the dissolution of organizational links.
Community	Fit	The comfort and compatibility of an individual into the community. Includes the degree to which the goals, values, and worldviews of the employee are aligned with those of the community.
	Links	Personal relationships and connections made within the community that extend beyond the boundaries of the job itself, which may include family, religious, and other social affiliations.
	Sacrifice	The perceived cost of material or psychological benefits that are forfeited by community departure, which may include housing, sense of place, established patterns of living, and the dissolution of community links.

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 attrited, 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 2007-2012 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

[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.

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.

Description of the District

The Aspen School District is located in one of the less-densely populated regions of New Jersey, and consists of a single high school fed by four middle and elementary schools.[3] The Aspen School District receives students from a number of surrounding municipalities across an area of over 150 square miles. The district serves approximately 3,000 students and employs over 200 full-time teachers. The high school is split into two separate buildings on a single sprawling campus, one for 9th and 10th graders, and the other for 11th and 12th graders. Most teachers have classes located in only one building, though some are required by their schedules to move between them during the school day. There are approximately 30 high school-level science teachers in the district, a number that has remained relatively constant over the past decade. Despite its somewhat rural character, the Aspen School District is located in a county that ranks among the top 1% in median household income for all counties in the United States. The student population at Aspen High School is over 80% White, with fewer than 10% of students receiving free or reduced-price lunch. Fewer than 3% are categorized as English language learners. Aspen is part of New Jersey's Interdistrict Public School Choice Program, and as such accepts a small number of students each year from other districts.

Rationale for Selection

[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.

[3] The district name is presented as a pseudonym for purposes of confidentiality. The names and position titles are similarly obscured in this case, and also in the larger study, in order to preserve internal confidentiality as well.

The Aspen School District was selected for this study because it was able to retain 10 of the 13 science teachers it hired between 2007 and 2012 for a period of at least five years. This placed Aspen 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, Aspen had a number of other characteristics that influenced its selection. As a regional school district serving only high school students, Aspen offered a good opportunity to examine retention in a district with a single school where all the science teachers in the district could regularly interact. Aspen 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 socioeconomic comparative category by the state, Aspen also offered an opportunity to examine teacher retention in an environment that was well-resourced.[4] Finally, in contrast to many of the other case study sites for this research, Aspen had not hired any teachers of color during the time period under consideration, and thus we felt it could serve as a point of comparison in the cross-case analysis planned later in the study. In the 2016-2017 data, the most recent available to include race/ethnicity data, 14 of the total 301 certificated staff in the district (4.7%) did not identify as White. Two of those 14 however, were science teachers.

Data Sources and Analysis Procedure

[4] 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. The DFG designation "A" has the lowest household incomes and tax base, through increasing socioeconomic levels "B," "CD," "DE," "FG," "GH," with district "I" as the highest. Aspen is in the "I" district factor group.

The research team interviewed 18 individuals in the district, including administrators, novice science teachers, mentor science teachers, retained science teachers, and the induction program coordinator. 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 data (2007-2018) and to also investigate current practices around the mentoring and induction of new science teachers.

Data were collected on a single-day, in-person site visit, which was facilitated in cooperation with the administration. Administrators and the induction coordinator were individually interviewed, and groups of novice teachers, mentor teachers, and veteran teachers were interviewed in focus groups. Other data collected included publicly available district documents and documentation related to the mentoring and induction efforts provided by the Aspen district induction coordinator.

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).

Findings and Analysis

As a result of this site visit and subsequent data analysis, we posit four factors that likely influenced the high science teacher retention rate observed in the district. These are (1) collaborative and supportive colleagues/department identity, (2) school culture, students, and community, (3) hiring and induction practices, and (4) sufficient resources. We follow this with a discussion of these factors through the lens of the job embeddedness theoretical framework.

Factor #1: Collaborative and Supportive Colleagues/Department Identity

Every person interviewed during the site visit commented on the collaborative and supportive nature of their science department colleagues. Those who had been in the district for over a decade noted that this was not a recent development, and that the science department within the school had historically been cohesive and cooperative as a unit.

In recent years, new science teachers to the district arrived to find themselves being given access to a shared Google Drive folder containing all of the curricular resources needed to start teaching immediately, a technological extension of earlier practices of shared curricular materials among science teachers in the district. Aspen's science teachers were not expected to develop a course from scratch or struggle with wondering what exactly to teach or how to teach it. Importantly, these were not scripted lessons or prescribed curriculum; Aspen's science teachers have always had autonomy in how to teach their lessons. Teachers supported each other through formal and informal partnerships. One veteran teacher noted "the people that I work with in my department are a huge reason why I stay."

In our discussions with Aspen's novice and experienced science teachers, it was clear that they regularly supported and intellectually challenged each other, and possessed a collective sense of self-efficacy from the high academic achievement of the Aspen students. A common theme among the interviews was that the teachers in Aspen felt that they worked hard for themselves, for their students, and for their administration. Noting this common teacher attribute, one administrator said, "One of the things that amazes me about [Aspen teachers] is that these people are doing it because they want to do it and they're excited to do it and make science better for kids here. I don't know how you teach that."

The science department itself had a well-defined identity within the school, and it was clear from our interviews that new teachers felt invited into this professional community. Though

the teachers we interviewed mentioned this sense of mutual support, a number of veteran teachers pointed to a particularly difficult stretch of time a decade prior, when the bonds of the current science teacher community in the district were forged. One teacher, who was relatively new at the time, recalled the impact of one new district administrator in particular:

> She came down with many rules. She got rid of all of our Jewish holidays. We had a very strict dress code. She'd come into your classroom and accost you in front of your students. If you spoke at a board meeting, she'd come in your class the next day and observe you. I mean, it was not supportive. The morale here was in the toilet. It was really bad.
>
> *(Interviewer: What convinced you to stay after those incidents?)*
>
> The support of my fellow colleagues. We got each other through it.

Though the teachers reported that a number of people left their positions in the district as a result of this atmosphere, this period also overlapped with a time when the retention rates of new science teachers were high. One possible explanation is that during this time, the science department was able to come together in resisting some of the proposed changes—which they perceived to impact students' science learning—and in doing so fostered a coherence as a department around a professional identity. One administrator who began working in the school at the end of this period recounted his initial interactions with the department members:

> When I came in, the morale of the department was very low…. I did some activities to get to know the department, like what are all the things I need to know? I got lots of things like, "We're the black sheep of the school," all kinds of stuff like that. Which surprised me because it was a group of really—just excellent—committed teachers who felt like they were under attack by the administration that was in place at the time.

The current and previous science supervisors were frequently mentioned as a source for sustaining both the identity of collegial collaboration in the department as well as individuals' professional development.

The science supervisor reported being able to meet with new teachers weekly in their first two months, then monthly after. He reported that these informal check-ins were a way for him to build relationships and communicate his support, a statement validated by the teachers. One experienced teacher noted, "Thankfully our supervisor is very supportive that way, and tells us, 'If you need something, please come to me.'" It was also apparent that this close-knit science department community had benefited from both formal and informal mentoring efforts by the district (as discussed below). Most of the people we interviewed described these efforts as an outgrowth of the collaborative and supportive atmosphere, rather than its cause.

Factor #2: School Culture, Students, and Community

A defining characteristic of the culture for students and teachers alike is high expectations. The science supervisor told us, "The science department here, it's a very strong group of teachers. They are devoted to their students. They hold each other and themselves to a very high standard." Though novice teachers reported that these high expectations and high-performing colleagues were occasionally intimidating, they noted Aspen also provided a lot of support for both new and experienced teachers and encouraged risk-taking and reflection to continually improve their teaching. It was evident that teachers and supervisors support each other in learning and that teachers are valued as experts.

One driver of the Aspen teachers' workload as described above was the expectations of the Aspen community. The parents of Aspen students clearly had a reputation among teachers and administrators alike for being both highly involved and demanding. One administrator noted,

"We have very demanding parents, and we have a very high performing team. That can be tough for a new teacher."[5] Yet, the willingness to undertake this work was evident in our discussions with teachers. A *students-first* attitude was clearly a part of the professional culture, and was communicated to us from teachers and administrators alike.

A number of teachers described Aspen as a good place to work, referring to the larger community as well as the student body. Participation by parents was reportedly high in school events and activities, including a recent workshop offered by the district on improving resiliency in their children. Such workshops are reportedly well-attended. There also appeared to be clear lines of communication between teachers and students' families. One teacher said "I knew I was also teaching at a community that valued education. That our students were there to learn and that helped my day go better and felt more professionally rewarding." Even more than the parents, teachers spoke about the students as a reason they stay.

> If you sit down and really take a look at our student population, for the most part, they're really good. We don't have a lot of volatile situations and things like that. We don't have the same student population as perhaps an inner city school does, where perhaps the burnout rate is a bit higher. So in general... I don't feel tremendously threatened when I walk into one of our classrooms.[6]

Another teacher described it this way:

[5] The research team noted that the term "parents" was used almost universally by Aspen teachers and administrators. On the district website, the more inclusive term "parents/guardians" is used. It is difficult to draw conclusions based on limited data from language use and word choice, but it is possible that this tentative data point speaks to the construction of a "typical Aspen student" as discussed below.

[6] A few of the teachers contrasted Aspen High School with images of other schools. Some appeared to the research team to be grounded in popular representations and misconceptions about "inner city schools" rather than from first-hand experiences in such settings.

> Our student body's a good one in terms of behavior. So, I always felt like my energies were on instruction and not discipline. Now, part of that comes with being a physics teacher of juniors and seniors, but in general our issues are not the same issues that other teachers have to deal with in districts where concerns are—can be—more dire at times.

There were a few contradicting comments about select groups of student students (English language learners, out-of-district students, and students with special needs,) but these students were seen as a challenging exception to the typical Aspen student, rather than a full part of the Aspen community. One focus group discussion highlights this point:

> Teacher 1: We do have a growing ELL population and we have a lot of kids that come into district for special services.
>
> Teacher 2: Absolutely, I have several students who are actually driven from [nearby urban area] this year.
>
> Teacher 3: … since we're a choice school.

Another teacher described her work with a group of students in the school's program designed to address the needs of students identified with certain disabilities:

> I taught this program we have…which is basically kids that are emotionally damaged in the school and they can't do a traditional school. They can't, it doesn't work for them. They stay with each other all day. I got into it too deep emotionally and I had to step away from that program.

One final noteworthy aspect of the school community was that several teachers we interviewed either went to Aspen as students, or were placed there as a component of their teacher preparation program (i.e. student teaching). One veteran teacher said, "I always knew I wanted to teach here. I went to high school here actually. I always knew I wanted to come here. Then as

soon as a job opened up here, I applied and got the job." Another said, "I was close with everybody here in the department already from student teaching."

Factor #3: Hiring and Induction Practices

Given the collaborative and supportive nature of Aspen's science department, it came as little surprise that teachers played a role in both the hiring and induction of new members of the group. These processes had changed somewhat over the past decade, both driven by policy decisions at the state level as well as efforts to build on practices that were already considered successful.

Within recent memory of the teachers and administrators, Aspen has remained a desirable district in which to work. Even as science teacher vacancies attracted fewer applicants than those in other subject areas, the district appeared to weather the shortages that vex many other districts in the state. Throughout, a key strategy for science teacher retention in the district has been recruiting teachers who are seen as likely to succeed.

Participants reported that in past years the district had embraced taking on student teachers both as a part of their professional obligation to the field of teaching and as a type of long-term interview for recruiting new teachers. In those times, student teachers had been a steady source of potential science teacher hires. In recent years however, Aspen ceased working with student teachers altogether. It also ceased hiring new teachers from the state's alternate route programs, in which teachers earn their certification as a full-time teacher over a two-year provisional period. One reason for this offered by a teacher referenced the privacy issues raised by the state-mandated performance assessment required for all new teachers in the state since 2017, which has a video recording requirement. However, there does not appear to have been an

official policy to this effect; the district simply stopped taking student teachers when the requirement went into effect.

In recent years, it appears that Aspen preferred to hire teachers with experience, and both teachers and administrators in Aspen mentioned intentionally hiring teachers away from other districts. The individuals we interviewed noted a preference not only for certain nearby districts from which these teachers tended to be hired, but a strong preference for and against specific teacher preparation programs as well.

In addition to experience, mindset seems to be important to their hiring process. One administrator noted "It's nice when somebody has teaching experience for sure, but just because they have teaching experience does not mean they're necessarily a good teacher or that their teaching philosophies align with our district mission and our philosophies on pedagogy." Another administrator echoed this sentiment, saying "I think there's a temperament that you want to look for even in recruiting someone. To be honest I've interviewed folks who you just know are not going to last more than a year." The clear message was that the Aspen administration was willing to put in the time to support teachers in their growth as long they are open to continue learning.

One notable feature of the Aspen School District is that the current teachers themselves are regularly included as part of the hiring process. Science teachers in Aspen reported that they are regularly brought into interviews and demonstration lessons for job candidates, and that their opinions about hiring were valued by the administration. One experienced teacher explicitly described this fit as a key aspect of department collaboration:

> I think it's probably safe to say we've known who wasn't going to make it, probably before they knew it. Or before they were told they weren't coming back if they left not of

> their own choice. You can kind of get that sense from someone just as to how they fit in. Like we were talking about the collaboration, and everything that happens and the people that are offered and opportunities and assistance and kind of rejected it or just flat out aren't on board. I don't think any of those people are still here.

The state of New Jersey requires all districts to provide induction support for all new teachers as a component of their provisional license, and one unique feature of the Aspen district is that it provides such support to novice and experienced teachers alike who are new to the district. Once a teacher is hired in Aspen, they undergo a thorough onboarding process through a three-day summer institute—referred to locally as the Aspen Teacher Academy—and then participate in an induction program for the remainder of the year. Given that most teachers are hired with the expectation that they are well-prepared to teach, topics covered in this institute generally focus more on the specific culture and community of Aspen, including procedural and instructional supports, training in Aspen's teacher evaluation system, and the development of reflective practices.

All first-year teachers are assigned a *mentor*, as required by the state's Provisional Teacher Program for all new teachers. However, we found it notable that experienced teachers new to the school were also assigned a *buddy,* who had many of the same responsibilities as mentors—particularly in serving the role of a designated confidant who was available to assist in answering the day-to-day questions that arise when acclimating to a new workplace. The buddy role was created to ease the transition of seasoned teachers to a new district, and was not a paid position. For many years, only the mentors of first-year teachers received any compensation for their mentoring work, which included the mentor training that was part of the summer Aspen Teacher Academy activities. However, the year of our site visit marked the first time that

buddies were also paid a stipend to attend the third summer day of the Aspen Teacher Academy. This day involved mentor/buddy training in the morning by the district induction coordinator, followed by a session when mentor/mentee and buddies were paired for conversations in the afternoon. Unlike the stipends for mentors, this buddy stipend was paid directly by Aspen District.[7]

The content of induction program—which continues throughout the year as the Aspen Teacher Academy—is responsive to the needs of the new teachers, and might include topics such as time management, administrative tasks, how to write their official Student Growth Objectives (which are state-mandated for evaluation purposes), and the creation of student-centered lessons. Attendance is required for first-year teachers and "strongly suggested" for experienced teachers new to the district. Teachers we interviewed reported that although the induction program was a substantial time commitment, it was worthwhile. Novice teachers we interviewed in Aspen noted that induction was also valuable in building community outside the science department, especially in such a large school.

Within the science department, mentors and buddies were selected by the department supervisor, who looks for a person that will take an active role in supporting the new teacher. The mentor and buddy teachers we interviewed mentioned flexibility as being important in this relationship. Matches were also made based on common prep time and content.[8] Given the

[7] The state of New Jersey requires all first year teachers to complete the Provisional Teacher Process. Mentors are paid a stipend at a set rate, which is $550 for teachers who have completed a traditional teacher preparation program, and $1000 for those earning an alternate route certification. This amount is deducted from the new teacher's paycheck as a fee, and paid directly to the mentor. In Aspen, buddies are paid $145 for their attendance at the Aspen Teacher Academy.

[8] *Prep time* is any time period of the school day when a teacher is not assigned to teach a class or undertake a specified duty, and is typically designated for the preparation of lessons and carrying out the bureaucratic requirements of teaching. This period is often referred to as prep time by teachers and administrators to indicate that the time is part of the salaried professional work day, and is not simply a break from teaching.

strong collaborative nature of the Aspen science department, this mentoring process was viewed as one of socialization and enculturation through extensive support. One mentor's comment encapsulated this view: "My job is not to tell you how I would do it. It's to help you be successful in this environment."

One ongoing challenge in Aspen's mentoring and induction efforts was the absence of a designated time for mentors and mentees to work together after the initial summer sessions. Mentors were expected to schedule meetings during their prep periods or after contractual hours, and the amount of time spent together was determined as much by availability as the needs of the mentee. Similarly, the attendance of teachers at the Aspen Teacher Academy over the year was often contingent on the availability of teachers to attend sessions held after the end of the contractually obligated day had ended.[9]

Finally, though the official mentoring and induction programs provided by the district served as a way to ensure that every new teacher received support, the collaborative culture within Aspen's science department was the primary means for supporting new science teachers. Many of the teachers we interviewed indicated that they received a great deal of support from the unofficial mentors within their department as well.

Factor #4: Sufficient Resources

[9] This situation was not unique to Aspen; the literature on teacher mentoring and induction is replete with accounts of such time pressures. The heart of the dilemma is that new teachers are often required to engage in mentoring activities as a condition of their state certification, but that these activities often extend beyond the contractual school day. From one perspective, the time and labor spent allocated to being mentored is a function of professional advancement. In New Jersey, engaging in 30 weeks of mentoring is a requirement for completing the Provisional Teacher Process and advancing from provisional to standard certification. Yet from another perspective, a district that wishes to retain a teacher must ensure that the teacher completes any provisional requirements in order to remain employed. One possible solution is to build time into teachers' (and mentors') contractual schedules in order to ensure that adequate time is available for mentoring activities. Yet such an approach runs counter to the scheduling approach in most U.S. schools, where teachers are maximally scheduled for classes.

Upon entering the high school media center in Aspen, our team was confronted by a sight that none of us had ever encountered in a school previously: a cluster of exercise bicycle-desks, prominently situated in the main space, accessible for use by both students and teachers alike. As our team constructed this case study, these bicycle-desks took on a symbolic role in our analysis. To us, they represented an effort by those who had ordered them and authorized their purchase to communicate a vision of both health and industriousness. They also seemed to be an existence proof of the fact that if someone had a good idea to benefit the education of students in Aspen, funding was available to support that idea.[10]

As noted above, the Aspen School District is located in one of the wealthier communities in New Jersey. Though gains have been made in New Jersey toward equitable school funding, school finance formulas and funding mechanisms continue to permit districts with a greater tax base to spend more money per pupil than poorer districts (Baker, 2018). And like many of the wealthier districts in the state, Aspen High School has a foundation that also makes funding available for initiatives not funded through the school budget.

As a result, teachers in the district enjoyed an unusually ample level of financial support for their work. Each teacher was provided their own computer tablet and all students were issued Chromebooks. In addition to the bicycle-desks, the media center also housed a well-resourced maker space for student use, as well as extensive holdings and databases. Teachers we interviewed reported that supplies and equipment needed for teaching were readily acquired.

This support for teachers at Aspen also extended to ongoing professional development opportunities, including reimbursement for graduate-level coursework. Aspen supported both in-

[10] The bicycle desks may also communicate other messages, including a vision of the "ideal" Aspen student. As a public space accessed by visitors, the presence of the bicycle desks may also serve as a signifier to families and the community in general that Aspen remains on the cutting edge of educational innovations, a position likely to confer competitive advantages to students.

house and external professional development, and teachers are encouraged to seek out opportunities that they feel are professionally relevant to them. Such activities are supported by the district, and if they occur outside of contracted time, teachers are paid to attend. Professional development that occurs during the school day, including observations of peers, are additionally supported by the district through the provision of a substitute teacher for coverage. This struck our research team as notable, particularly because of our awareness (from being teachers and from providing professional development ourselves) that class coverage for professional development purposes has become quite rare throughout the state. Supporting these professional development opportunities for all teachers, as well as the mentoring and induction program for new teachers, required significant financial and structural support, which the district was clearly willing to bear. For example, the induction coordinator, who is a teacher in the district, receives both a stipend and a reduced course load.

In the 2018-2019 school year, the average district per-pupil expenditure in New Jersey was $22,816. The per-pupil expenditure that same year in Aspen was approximately $26,000. In contrast, the median teacher salary in Aspen was nearly identical to the median teacher salary in New Jersey. Teachers perceived that the starting pay in Aspen was lower than in surrounding districts, but a recurring theme in the interviews was that the availability of resources for students and teachers more than made up for this fact.[11] One experienced teacher explained this as an explicit trade-off:

> When I first got hired here, the pay was terrible, but when I looked at it comparatively to pay versus resources for students, the resources that we had here was [*sic*] immeasurable. That to me was very important....The fact that my pay wasn't that high, I could rationalize

[11] The actual starting salary in Aspen was $8000 above the state median starting salary.

it. The draw for me here… was because of all of the opportunities that were here for teachers and for students, plus it's a beautiful school.

Because of the large faculty at Aspen, most science teachers do not have their own classrooms. Yet, teachers in Aspen do have shared office space, which was mentioned as a factor contributing to the culture of collaboration described above. The number of teachers at Aspen also means that most teachers only teach five classes per day and are typically limited to two preps each year.[12]

Discussion: Science teacher retention in Aspen through the lens of job-embeddedness

A key takeaway from this study is that a well-resourced school district with a relatively autonomous, collaborative, and supportive science department makes it possible for science teachers to form relationships that sustain them in their careers. Similarly, there was little sense in Aspen that science teachers needed to make trade-offs at the expense of their professionalism in order to be successful science teachers there. A lingering question for our research team was the relationship between teacher retention and the relative demographic homogeneity among both the students and teachers.

In analyzing the data through the job embeddedness framework, it is clear that fit, links, and sacrifice, related to either the organization (Aspen School District) or the community of Aspen—or in some cases, both—played a role in retention. In some cases it is difficult to tease apart the difference between fit and links or organization and community, but below we placed them in the category we found most appropriate.

[12] A "prep" in this context refers to the preparation of a class with a specific title and curriculum. For example, biology and honors biology might each be considered separate preps if they involve the preparation of different lessons for each. In New Jersey, the negotiation of the number of preps is a common topic of collective bargaining in contracts between the school board and the local teachers union. Under the most recent contract between the Aspen School Board and the Aspen Teachers Union, teachers hired prior to 2017 who are asked to teach a sixth class are paid an extra 10% in salary. Teachers hired after 2017 do not receive this additional compensation.

Fit

Organizational Fit. From our interviews, Aspen may clearly be described as "close-knit," with shared goals around professionalism and student achievement. In Aspen, these included a students-first attitude and high standards for students and teachers. By instilling these norms within the newcomers through a strong mentoring and induction program like Aspen's, and including faculty in hiring decisions, schools can improve the fit of new teachers, and therefore the likelihood of retention, within their school buildings. However, one may argue that mentoring programs can accelerate novice teachers' awareness of their lack of fit, providing a possible explanation for why teachers choose to leave within their first five years of teaching. Also, in a less functional science department or school, fit may be as much a matter of a capacity to shape one's working environment in contrast to simply adjusting to an existing one.

Community Fit. In addition to the fit with the school itself, fit within the community is also an important factor. In Aspen, this is present in the form of teachers holding the same high expectations of the students that the parents hold, as well holding themselves to the same high standards the parents hold the teachers to. While high standards can be daunting at times, this agreeance, perhaps along with the demographic homogeneity, is what makes Aspen a "good place to work."

Links

Organizational Links. In the Aspen School District, the role of links was clearly in operation. Working with "really good people" (supportive colleagues) was a salient reason for their retention, and opportunities to collaborate with colleagues contributed to their decisions to teach within the district. In some cases, these links began before the individual was a teacher at Aspen—some teachers began forming these links as students in the district themselves, or as

student teachers. For educators, links are often established with individuals other than co-workers, a characteristic that may differentiate teaching from other career embeddedness models. In their interviews, teachers at Aspen often described their relationships with students as essential to their retention.

Watson (2018) suggests improving mentoring structures within a school building as one way to increase links and improve embeddedness for new teachers. This seems to be the case in Aspen, where novice teachers cited the induction program as a factor in the strong sense of community within the building. According to Kiazad et al. (2015), "involvement in professional communities can help socialize occupational newcomers who become enmeshed in their occupation's language, rituals, and norms" (p. 647). These communities not only strengthen an individual's number of links within their workplace, but also increase an individual's level of occupational fit. Through its sustained mentoring program, Aspen not only encouraged but intentionally fostered relationships (links) between novice and master teachers.

Community Links. In addition to their relationships with colleagues and students, as noted above, Aspen teachers noted the high level of parental involvement and their relationship with parents and other community members. Several teachers also noted their desire to live in that part of the state. These are examples of links to the community of Aspen, even if they didn't live directly in Aspen.

Sacrifice

According to the job embeddedness framework, an example of *sacrifice* is the avoidance of loss, and a key component of an employee's decision to remain in a job (Kiazad et al., 2015). Fit and links may both be considered when looking at sacrifices, but there are additional tangible

and intangible sacrifices to consider, as well. Organizational and community sacrifice can be very difficult to separate, so are discussed together here.

Holtom et al. (2006) explain that, "while pay clearly is an important reason why most people work, numerous studies demonstrate that pay levels and pay satisfaction explain relatively little variance in actual turnover behavior" (p. 324). This is not unlike our finding in the Aspen School District. For the teachers at Aspen, leaving the particular "type" of student they taught and the colleagues they worked with, as well as the shared visions they had within their school community would be losses they were unwilling to accrue. Additional resources, such as the availability of teaching tools and supplies, the ability to choose your own professional development (and be paid to attend), and stipends for teaching extra classes would not be easy for teachers to give up if they chose to teach in a district other than Aspen.

One unusual example that could be related to sacrifice is the teacher that runs international trips for students each summer. While not an official offering of the Aspen School District, only Aspen students attend, and parents have said they only let their children go because of their and their children's relationship with this teacher. The cost of the trip for this teacher is covered by the students' fees. She has also been able to receive graduate credits as a result of these trips. Surely, if she moved to a different district, it would be quite a while before she was able to set up such a program (if at all.) Running these trips is a sacrifice she is not likely to make. Another teacher told us directly about not leaving due to sacrifice.

> There were a couple of times I was tempted to leave based on economic reasons in terms of, I was getting some other offers that were tempting during times when we were struggling during [salary] negotiations. So there are a couple of times I had to weigh

perceived economic gain versus comfort, familiarity as already established here, having student taught here. I was now developing friendships and it was, so sort of those feelings of comfort and this was a known entity and I was thriving here and felt like I was in a good situation.

Conclusion

The case of Aspen, along with the set of cases from the larger program of research, provides us with existence proof of districts that are able to stem the attrition of science teachers and practices that may be considered in improving the retention of new science teachers in other districts. The treatment of teachers as professionals–including their voice in the culture of the school and in the hiring, mentoring, and development of new colleagues, valuing them as experts, and giving them autonomy to be creative and take risks in their teaching–seemed to be valued by Aspen teachers.

The teachers we interviewed cited supportive colleagues as the main reason they were satisfied in their district during good times and helped them remain in the district during times of struggle. The active fostering of a collaborative culture among faculty led to the inclusion of teachers in decision-making processes. The school culture, students, and community in general also played an important role in fostering the type of work environment where teachers wished to remain.

Finally, the shared vision of excellent science teaching and high expectations was maintained in Aspen through appropriate supports for both new and experienced teachers alike. These supports included adequate resources for students as well as for continued professional development for teachers.

The theory of job embeddedness holds great promise as a theoretical framework, and we suggest that it may have great utility beyond its use as a predictor of turnover, and even serve to guide the development of mentoring and induction programs for teachers. We argue that new insights regarding a teacher's decision to stay in their current positions may be elicited using this framework, and policy and practice that leverage these insights may contribute to the strengthening of science teaching and learning for all students.

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