

The goal of the Noyce Program is to increase the number of highly qualified science and math teachers with strong content knowledge working in high need school districts. This is proposed to address the projected need for higher numbers of science and math teachers, and the importance of strong content knowledge for effective teaching (<http://www.nsf.gov/pubs/2006/nsf06528/nsf06528.pdf>).

In order to increase the number of these teachers, more teachers must be brought into teaching (recruitment) or must stay in teaching (retention). Elsewhere on this Web site, we allow authors to define recruitment and retention for [themselves](#). Here, we examine in more depth definitions of retention, and what is known – and not known – about that concept.

We have chosen to consider both recruitment and retention as two stage processes, happening both within teacher training and certification programs, and again within schools and districts.

When talking about recruitment and retention for programs, a college of education recruits candidates and either keeps them through the conferral of a degree and/or state certification or licensure, or loses them to another field. In addition, depending on how well they train their candidates, they set them up more or less effectively for doing well and feeling successful during the program, and later in their teaching position, thus being more likely to stay in teaching. Part of recruitment and retention, then, is the responsibility of these higher education institutions.

Districts also recruit teachers, and a good deal of literature addresses the characteristics they look for, the demographics of who is hired, and how teachers vary between districts. Working conditions in districts, salaries, school culture, student demographics, and many more factors play a role in how long teachers stay in those jobs – again, retention.

## **Retention**

This section begins with a general discussion of retention, and then addresses the particular issues faced by teacher preparation programs and by districts in increasing retention of teachers.

It's generally assumed that it's important for educators to increase retention of teachers; that said, it's important to keep in mind two things here. First, education has levels of turnover similar to comparable professions (Harris & Adams, 2003; Henke, Zahn, & Carroll, 2001). Second, high levels of retention might indicate that ineffective teachers were being retained. Retention levels somewhat below 100% are to be expected, and indeed, hoped for.

There are still clear reasons to work to increase levels of retention. The current U-shaped curve, in which youngest and oldest teachers are most likely to leave (Kirby & Grissmer, 1993; Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001), raises concerns about teaching conditions for the newest teachers in our schools. For those interested in math and

science education, the problem is compounded, as retention rates are lower (Ingersoll, 2003; Kirby & Grissmer, 1993; Shin, 1994; Hansen Lien, Cavalluzzo, & Wenger, 2004). Three particular issues are involved with teacher turnover. First, this turnover creates a financial burden for schools that must find replacement teachers; second, students see instructional benefit from teachers with more experience; finally, teachers who have been in a school longer provide continuity and leadership for younger teachers (see Johnson, Berg, & Donaldson, 2005, for a longer discussion of these factors).

Unfortunately, the highest burden of teacher turnover is faced by schools that can least bear it. Schools serving academically disadvantaged students have difficulties retaining teachers, especially early-career teachers (Hanushek, Kain, & Rivkin, 2004), and school poverty is linked to student performance which, again, is related to teacher retention (Plecki et al, 2005). These problems are likely inter-connected; poor student performance is likely a reason for teachers to leave, but high turnover of teachers can be a factor in student underperformance.

In order to track retention, there are normative decisions that must be made about what “counts” as retention; these will depend on the purposes of the study and the ways that it will be used. For this project, Noyce scholars fulfill their obligation to NSF through a few years of work in a high need district (two years for every year of funding, so a maximum of four years); however, longer or more nuanced tracking of teachers might still be appropriate.

Tracking retention is complicated by questions about what retention actually looks like. Teachers can stay in teaching but change schools (turnover) or leave teaching entirely (attrition). For a district concerned about hiring new teachers for September, these look functionally the same, but for a policy-maker concerned about the total number of teachers in the state, they are very different.

Another question involves how to track teachers who leave teaching and then return. These teachers might be counted as leavers, when in fact they are retained if one takes a longer perspective. This is of particular importance in teaching, still a female-dominated profession, where many teachers drop out and return for family reasons. Another complicating factor is teachers who leave the classroom but stay in education – as administrators, for example.

For a program like Noyce, where the intention is to place teachers in high need districts, questions of retention become even more nuanced. If a teacher leaves a high need district for another teaching position, they are retained in the teaching profession, but not in high need teaching.

Having established that higher (but not highest) levels of retention are desirable, and that tracking retention involved normative as well as methodological decisions, we now turn to the research on what effects teacher education programs and school districts can have on retention.

## **Program retention**

First, we must point out that there is little examination of retention *within* programs. Occasionally a teacher education program will report their attrition statistics within a given year in an evaluation report, but we found no research studies that looked at rates at which those who start out in teacher preparation programs complete those programs. But there does seem to be a good deal of research on what happens *in* programs, or more precisely, the choice of program, that has an effect on retention in later careers.

Much research has examined how teachers trained in different ways are retained at different rates. Teachers with graduate degrees have been found to be more likely to stay in teaching (Adams, 1996), or leave teaching (Kirby, Berends, & Naftel, 1999; Rees, 1991). Some research suggests that teachers trained through alternative routes are more likely to stay in their current jobs (Adams, 1996), though other research suggests that teachers trained through alternative programs felt less well prepared and less likely to stay in teaching (Darling-Hammond, Chung, & Frelow, 2002; Shen, 1997). These mixed results can in part be understood by remembering the range of master's programs teachers can enroll in (not all studies distinguish content master's from those in education), and by the lack of separation between what counts as traditional certification and alternative certification.

On the other hand, little research seems to have examined how particular elements of a teacher preparation program (types or order of classes, nature of the student teaching experience or other choices made in the preparation of teachers) affect the retention of teachers. Though challenging to track, it would be less challenging yet than looking at how teachers' content knowledge and pedagogy relate to their retention, which are also unstudied. (Of course, teacher content knowledge has been linked positively to student achievement (Wayne & Youngs, 2003), but our concern here is teacher retention, not student achievement.)

## **District retention**

District and school conditions clearly play a role in the rate at which teachers stay or leave. Research has examined how the following affect retention: salary, school culture and conditions, mentoring programs, teacher ethnicity (which often interacts with student ethnicity), and teacher affective characteristics and personal choices.

Retention is related to absolute salary for all teachers (Ingersoll, 2003), for women (Brewer, 1996), and for teachers of color (Kirby, Berends, & Naftel, 1999); it is also related to salary relative to other jobs available in the area (Brewer, 1996; Ballou, 1996) or in near districts (Hanushek, Kain, & Rivkin, 2001), and a greater differential in salary according to training and experience also increases retention (Shen, 1997).

Positive school culture helps retain teachers (Shen, 1997; Weiss, 1999); poor school culture increases rate of STEM teachers leaving (Ingersoll, 2003). Mentoring programs help retain teachers (Ingersoll & Kralik, 2004; Shen, 1997). Not surprisingly, attrition in

high need districts is higher (Kirby, Berends, & Naftel, 1999; Hanushek, Kain, & Rivkin, 2001; Shen, 1997; Plecki et al, 2005).

Retention in high needs districts varies by race of the teacher (Kirby, Berends, & Naftel, 1999) and students (Plecki et al, 2005). Retention rates seem to vary by ethnicity, though research results are mixed: one study showed that Latino teachers have higher retention rates than white or African-American teachers (for whom rates are indistinguishable) (Kirby, Berends, & Naftel, 1999). Another indicated that white teachers are more likely to leave teaching or change districts than teachers of color (Adams, 1996). A third showed nearly equal rates of retention in a school between white teachers and teachers of color (African-American teachers had slightly *lower* retention rates) (Plecki et al, 2005). Interestingly, minorities teach at higher rates in high need districts (Kirby, Berends, & Naftel, 1999). Teachers seem to prefer to teach students of the same race or ethnicity (Hanushek, Kain, & Rivkin, 2001).

Teachers who are very certain about their decision to teach transition better into teaching (Marso & Pigge, 1997) However, Miech and Elder (1996) found mixed results when looking to see whether those drawn to teaching as a way to contribute to society were more likely to stay in teaching.

There seems a clear need to continue to explore the effects of family and fertility decisions on male and female teachers' decisions to stay or leave, as most studies that address those questions draw from data before 1990.

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