Research Summary

The research on schools and positions that are hard to fill with qualified employees is focused on identifying both the causes of shortages as well as recruitment and retention policies to address the shortage problem. Some research has begun to address whether financial incentives to teach in a hard to fill positions or schools can affect teacher employment decisions. A few research studies have been conducted to determine the appropriate level of additional compensation needed to provide enough of an incentive to move to or stay in a hard to fill subject or school. Additional research has focused on identifying why hard to fill schools are not desirable places to work.

Key Findings

- Schools with high percentages of students in poverty and/or high percentages of students of color, in addition to low levels of student achievement, tend to have the most difficulty attracting and retaining experienced, effective teachers.

- Low-income schools have more out-of-field teaching where teachers might be assigned to teach some hard-to-fill positions in which they have shortages of more qualified teachers.

- Highly qualified teachers are more likely to leave teaching or switch from a hard to fill school to a school with less poverty, less students of color, more favorable working conditions and higher levels of student achievement.

- Low salaries and poor working conditions are significant predictors of teacher turnover.

- Differentials in salary between math and science teachers and individuals with similar educational degrees outside of the teaching labor market are substantial, get larger over time and deter qualified applicants from choosing teaching as profession.

- A variety of financial incentives for teaching in a hard to fill school or position exist, however it uncertain how large the incentive would need to be in order to attract and retain teachers.
Hard to Fill Schools

There is a large body of evidence from research that the schools with higher percentages of students in poverty (as defined by participation in the Free and Reduced Lunch Program and Title I funding) and higher percentages of students of color, with low levels of student achievement experience the most difficulty attracting and retaining experienced, qualified teachers. Most often, these “hard to fill” schools are disproportionately staffed by teachers who are inexperienced and uncertified and teaching positions which they have had minimal formal preparation (Clotfelter, Ladd, Vigdor & Wheeler, 2007; Hanushek, Kain, O’Brien & Rivkin, 2005; Ingersoll, 1996; Krei, 1998; Peske & Haycock, 2006; Useem, Offenberg & Farley, 2007; and Wayne, 2002). Hard to fill schools find it hard to retain teachers, due to higher than average rates of teacher turnover (Ingersoll, 2001). Some researchers have found that when teachers leave hard to fill schools it is most often to go to schools with higher levels of student achievement and fewer low-income students of color (Lankford, Loeb & Wyckoff, 2002; Caroll, Reichardt & Guarino, 2000; Chester, Offenberg & Xu, 2001; Freeman, Scafidi & Sjoquist, 2002; Hanushel, Kain & Rivkin, 2001). Other aspects of a job placement are important to teachers. Some research has found that effective school leadership affects teacher decisions about working in a school, particularly a hard to fill school (Koppich, Humphrey & Hough, 2007; Prince, 2007; Milanowski et al., 2007; and Boyd et. al., 2009).

Hard to Fill Positions

Research on hard to fill positions in public education has focused on science, technology, engineering and math (STEM), special education and bilingual/ELL subject areas. Washington’s Professional Educator Standards Board designates shortage areas based on supply and demand, maintaining a list which includes special education, early childhood special education, math, middle level-math, science (broad field), biology, earth science, physics, chemistry, middle level-science, school nurse, speech language pathologist, occupational therapist, physical therapist and school psychologist. Included in addition to subject areas are specific educational staff associate positions. Hard to fill positions are often locally determined by both the supply and demand of teachers who qualify to teach those positions, with each state submitting a list of their hard to fill positions to the U.S. Department of Education for federal student loan forgiveness programs. State level alternative routes to certification programs also utilize hard to fill positions lists to align alternative certification programs to teacher shortage areas.

Some research has found that math and science teachers have greater rates of attrition than teachers in other fields (Kirby, Naftel, & Berends, 1999; Podgursky, Monroe & Watson, 2004).
Additionally, Milanowski (2003) found that low pay was frequently cited as a reason to not pursue a teaching career by undergraduate STEM majors.

Financial Incentives

Teacher turnover is affected both by the pay and the working conditions in a school, with the characteristics of the student population potentially serving as a proxy for both (Hanushek, Kain & Rivkin, 2004; Kirby, Naftell & Berends, 1999; Lankford, Loeb & Wyckoff, 2002; Winter & Melloy, 2005). It isn’t clear whether higher pay or better working conditions would be a cost effective way to improve teacher recruitment and retention. When teachers do consider working in hard to fill schools, research has found that they look for effective leadership and administration, favorable working conditions, adequate resources and like-minded, collaborative colleagues (Koppich, Humphrey & Hough, 2007).

Research to determine how large a financial incentive would need to be to attract and retain teachers in hard to fill schools and positions is limited. One study of a specific incentive program in North Carolina with a $1,800 annual bonus to certified math, science and special education teachers in high-poverty, low-performing schools found that the effect of the relatively modest bonus was able to reduce teacher turnover by 12 percent (Clotfelter, Glennie, Ladd & Vigdor, 2006). In a survey of undergraduate majors in science, math and technology to determine the salary levels and other working conditions necessary to teach, Milanowski (2003) found that an increase in entry-level salaries of about 25 percent would be needed to motivate about 20 percent of the respondents to consider becoming a teacher. In other research, Goldhaber (2006) suggested that the incentives of several thousand dollars that have been traditionally offered for hard to fill positions and schools are not big enough to be effective, with a difference of about $11,000 a year between the earnings of math and science teachers and those with technological degrees working outside of the teacher labor market. In research on transfer and exit patterns in Wisconsin, Imazeki (2005) found that teacher pay would have to increase by more than 15 to 20 percent to reduce teacher attrition rates in Milwaukee to levels similar to an average district in Wisconsin. Additionally, Hanushek et al.(2001) concluded that an incentive of 20-50 percent would be needed for teachers to teach in a school with large percentages of low-income students of color compared to a school that is predominantly White and Asian, with academically proficient students.

Financial incentives for teaching in a hard to fill position or in a low-income school, in the form of student loan deferment and forgiveness, are available through the U.S. Department of Education. Perkins, Subsidized and Unsubsidized Stafford Loans are eligible for loan deferment and forgiveness for teaching in a low-income school or certain subject areas determined by
state education agencies. A low-income school is defined by the Perkins and Stafford loan programs as being one which qualified for federal funds during the year in which the loan forgiveness is sought and with more than 30 percent of the school’s enrollment made up of children from low-income families (under qualification for Title I funding). Additionally, all employees in public education are eligible for the Public Service Loan Forgiveness Program after making 120 payments on a federal student loan, with the remaining portion of the loan being forgiven.

Works Cited


Milanowski, A. (2003, Winter) An exploration of the pay levels needed to attract students with mathematics, science and technology skills to a career in K-12 teaching. Education Policy Analysis Archives, 11(50).


