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Effect of teacher quality on students

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Abstract
Teacher qualifications are particularly necessary for regulating entry into the classroom when performance and outcome data are not yet available, as is the case with new teachers. Teacher qualifications are also commonly used as indicators of teacher quality because of the relative ease and cost-effectiveness of collecting this data, which can often be found in public records maintained by states and districts.

There are many issues and challenges in defining and measuring teacher quality this way—from statistical concerns with particular value-added models to more conceptual issues about the fairness of comparing classrooms serving different groups of students. Researchers have yet to reach consensus on these issues and challenges. We do not have a method for confirming whether a value-added model has attributed the "right" amount of variance in student achievement to teachers; other factors that impact student learning may have influenced students' achievement in a particular classroom.

Keywords: Quality, Teacher, Student, Achievement

Introduction

Teacher characteristics are often included in descriptions of teacher quality but are less often measured in conjunction with student learning outcomes. Some teacher characteristics are immutable, such as race and gender, and others may be more resistant to influence by policy initiatives than are teacher-qualification variables. All are viewed as related to teacher quality in Goe's (2007) framework because these characteristics are brought into the classroom by teachers and because they exist independently of the actual act of teaching.

The teacher-practices variable represents a process view of teacher quality, which might more aptly be described as instructional quality. Research on teacher practices investigates the relationship between student achievement and the classroom practices that teachers employ (i.e., the ways in which teachers interact with students and the teaching strategies they use to accomplish specific teaching tasks).

As defined and measured in the literature, teacher practices are usually delineated into "best practices" and teachers' actual practices to determine their impact on achievement. One measure of teacher quality that is playing a key role in current discussions throughout the country about educational policy, merit pay, and differential pay is teacher effectiveness.

Derived through the use of "value-added" methodologies that estimate teachers' contributions to their students' learning (as measured by standardized achievement tests), teacher effectiveness can be determined only after a teacher has had an opportunity to impact his or her students' learning. Thus, this measure is not useful as a measure of teacher quality for new hires.

Although teacher effectiveness scores may seem like "magic bullets" that allow us to rank and reward teachers for improving student achievement, policymakers should be wary that various models may attribute changes in student achievement to teachers when these changes are actually the result of factors outside the teacher's control—such as community and school resources, parent involvement, family socioeconomic status, student effort, and the impact of other students in the classroom, to name just a few.

There is no firm consensus within the field as to exactly what constitutes high-quality teaching or a quality teacher. However, it will be useful to establish a working definition of teacher quality for the purposes of the current report. The clearest and potentially most useful example identified in our review of the literature comes from the Center for High Impact Philanthropy (2010, p. 7): A quality teacher is one who has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogic skills, and communications/interpersonal skills.

Quality teachers are life-long learners in their subject areas, teach with commitment, and are reflective upon their teaching practice. They transfer knowledge of their subject matter and the learning process through good communication, diagnostic skills, understanding of different learning styles and cultural influences, knowledge about child development, and the ability to marshal a broad array of techniques to meet student needs. They set high expectations and support students in achieving them. They establish an environment conducive to learning, and leverage available resources outside as well as inside the classroom.

While this definition could apply to teachers working with students of all ages, it resonates most strongly with teaching at the K-12 level. By contrast, discussions of teaching and teaching quality during the early-childhood years tend to focus more heavily on knowledge of child development. Specifically, the early-childhood literature emphasizes: the importance of knowing how to best promote children's social and emotional needs, organize the learning environment for young children, help children make connections, and encourage language skills and higher order thinking (Pianta & Hadden, 2008; Sadowski, 2006).

The assumption is that quality early-childhood teachers possess these abilities, which will translate into academic and developmental success in future schooling and life. These

definitions suggest that teaching quality in practice constitutes a set of actions and activities that improve student outcomes.

Review of Related Literature

Teachers' subject-area certification or authorization is one of the teacher qualifications most consistently and strongly associated with improved student achievement, especially in middle and high school mathematics (Betts *et al*., 2003; Cavalluzzo, 2004; Goldhaber & Brewer, 2000) [2].

Carr (2006) also indicates that highly qualified teachers, or those with both full certification and demonstrated subject-matter competency, are associated with increased elementary and middle school achievement in reading, science, and social studies as well as in mathematics. This is another area where more work must be done because the evidence of a relationship between certification and student achievement is strong primarily in mathematics but there is scant evidence in other subjects.

In an effort to pinpoint teacher quality variables across studies for which there is strong agreement, Goe (2007) recently undertook a research synthesis for the National Comprehensive Center for Teacher Quality. This particular synthesis—which is available online examines dozens of research studies that link a number of teacher quality variables to student achievement, as measured by standardized tests.

Goe's analysis unearths many contradictory and weak conclusions, but the synthesis also identifies a few strong and consistent predictors of student achievement. This Research and Policy Brief culls the associations between teacher quality and student achievement that Goe identifies, with the goal of elucidating trends relevant to current educational policymaking.

Goe' s (2007) examination of teacher quality focuses on four categories of teacher quality indicators— teacher qualifications, teacher characteristics, teacher practices, and teacher effectiveness—which, Goe determined, empirically capture the primary variables examined in research studies on teacher quality published between 2000 and 2007.

Largely due to the "highly qualified teacher" provisions of the No Child Left Behind (NCLB) Act, these four categories also align with the current national emphasis on certification and licensure, experience, and subject-matter knowledge. In addition, the four categories summarize the ways that teacher quality is commonly defined for policy purposes, and they are frequently linked to hiring and career-ladder decision making.

As is often the case, despite some areas of common ground, the field remains engaged in active debate and discussion around some key aspects of defining quality teaching and its impacts. Understandings of "quality" can be contentious.

For example, in a widely cited review of research on teaching quality, Laura Goe, an expert on teacher effectiveness with the Educational Testing Service, cautions against "a one-size-fits-all definition … because a variety of occasions and purposes exist for which different definitions may be appropriate (Goe, 2007, p. 3)."

She notes that "indicators of quality relevant to making initial hiring decisions may be different from the indicators used in granting tenure, rewarding excellent performance, or identifying and supporting struggling teachers (Goe, 2007, p. 2)." She speaks to the point that different definitions may be relevant in different contexts and at different points of a teacher's career. In investigating the meaning of quality, the research literature has examined a wide range of student outcomes.

Research Study

Much of the recent work in the field has focused particularly on quantifiable indicators of educational performance such as student test scores. "Hard" performance measures of these kinds have the appeal of quantifying a key outcome of student learning in a relatively objective and standardized manner for large numbers of students and teachers.

In fact, test scores and other quantitative measures are an essential foundation of the research programs that have generated key insights regarding the importance of quality teaching and supported consensus that teaching has the largest in-school impact on student learning and school leadership exerts the next-largest influence.

There is an emerging understanding about the ways in which professional development impacts student achievement. Although an experimental study examining the features of high-quality professional development showed increased teacher knowledge and desired classroom practice, it did not find that this knowledge translated into improved student outcomes or sustainable changes in practice over time.

Systematic reviews exploring the effects of professional development on student achievement have produced some additional insights. For example, a review of professional development programs in math and science found that programs focused mainly on teacher behaviors demonstrated smaller influences on student learning than did programs concerned primarily with teachers' knowledge of the subject, the curriculum, or how students learn the subject.

In a more recent review that examined more than 1,300 studies on professional development, researchers identified just nine that met the arguably overly rigorous evidence standards of the U.S. Department of Education's What Works Clearinghouse. The resulting research showed that teachers who receive "substantial" professional development — that is, an average of 49 hours in the nine studies — can increase their students' achievement by about 21 percentile points.

Another study reviewed the designs of professional development programs that reported significant effects on improving student achievement in mathematics or science. Such effective programs tended to have certain features in common, including: a strong emphasis on teachers learning specific subject content as well as pedagogical content, follow-up reinforcement of learning, assistance with implementation, and support for teachers from mentors and colleagues in their schools.

Induction programs are often the focus of professional development efforts aimed specifically at meeting the needs of new teachers. These programs may include mentoring, orientation sessions, classroom observations, and the use of formative assessments.

Supporters of induction and mentoring argue that high-quality programs address teacher quality by reducing the high rates of attrition among new teachers and by building the capacity of new teachers to provide quality instruction.

Moir and colleagues describe high-quality mentoring programs as having highly skilled mentors, dedicated time for mentoring, a focus on classroom and student data, engaged stakeholders, alignment with instruction, and a supportive school culture. However, a recent randomized controlled trial by the U.S.

Department of Education's Institute of Education Sciences found that teachers in the focal induction programs reported spending more time meeting with mentors, but that the programs produced no significant impact on teacher retention, student achievement, or teaching practice.

Conclusion

Teacher certification as a signal of teacher quality has been investigated at various levels, including full standard certification, emergency certification, advanced or National Board Certification, and subject-area certification. While recent studies find that full certification is either unrelated or positively related to student achievement, other research shows that emergency certification is generally either unrelated or negatively related to student achievement.

In particular, one study suggests that teachers with emergency certification negatively influence middle and high school student achievement but not elementary student achievement.

Another study finds no significant differences between the mathematics and science achievement of high school students of teachers with either emergency or full certification. Thus, while there are a number of studies that suggest certification makes a difference, the studies that find certification has no significant or practical value suggest that we still have much to learn about what certification is "signaling" in terms of teachers' ability to teach specific content effectively.

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