



School Library Research

Research Journal of the American Association of School Librarians

Volume 22, 2019
ISSN: 2165-1019

Approved August 28, 2019
www.ala.org/aasl/slr

The Preparation and Certification of School Librarians: Using Causal Educational Research about Teacher Characteristics to Probe Facets of Effectiveness

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Abstract

How do we define a high-quality school librarian? Decades of educational researchers have attempted to link teacher characteristics—such as how teachers are prepared, which credentials they carry, and years of experience—to student outcomes. These researchers have contended that individual educator attributes may have a direct effect on what and how much their students learn. School librarians are also teachers who have direct student contact, and although numerous studies have indicated that school librarian preparation, licensure, and other background characteristics are promising areas for further direct exploration, researchers have yet to examine if, how, and why school librarians' certification or preparation positively impacts students' learning outcomes. The purpose of this paper is to compare findings from causal educational research to findings from descriptive school librarianship research to discern possible areas of causal alignment that warrant further investigation. In this study, we present a subset of a larger mixed research synthesis of causal educational research related to student

achievement, contextualized with existing school librarianship research, to draw relationships between classroom teacher and school librarian preparation and characteristics and to shape researchable conjectures about school librarians' effects on learner outcomes.

Introduction

Is who a teacher *is* just as important as what a teacher *does*? Many educational researchers (for example, Darling-Hammond and Youngs 2002; Rice 2003; Buddin and Zamarro 2010) have attempted to link teacher characteristics, such as how teachers are prepared and which credentials they carry, to student outcomes. Because teachers' credentialing, preparation, years of experience, and evaluation scores are relatively easily codified and recorded, educational researchers point to these characteristics as the "low hanging fruit": an obvious entry point to causal explanation for what and how much their students learn (Boyd et al. 2007). However, the field of school librarianship has yet to establish theoretical or practical connections to the research about teacher characteristics to examine how these characteristics might provide similar causal explanations for how school librarians impact student learning.

The American Association of School Librarians (AASL) has centered its definition of an effective school library program on a school library led by a state-certified school librarian (AASL 2016). The *International School Library Guidelines* argue that "because the role of school libraries is to facilitate teaching and learning, the services and activities of school libraries need to be under the direction of professional staff with the same level of education and preparation as teachers" (IFLA 2015, 7). However, the assumptions implicit in these statements that state and/or professional certification ensures quality school librarianship remains largely unquestioned and untested in the field. In a critical review of international literature from 2001 to 2013, Dorothy Williams, Caroline Wavell, and Katie Morrison concluded that effective school librarianship relies upon professional qualifications. They reported that evidence from available research implies that "a qualified, full-time librarian, who is proactive and has managerial status," (2013, ii) contributes to the school library's impact on learning.

School librarians in the United States have new *National School Library Standards* (AASL 2018) that are based on the idea that "qualified school librarians lead effective school libraries" (AASL 2018, 12). However, just after the release of these new standards, Debra E. Kachel and Keith Curry Lance shared reports of an alarming loss of school library positions in the United States in the past decade (2018). Lance has questioned whether this decline might, in part, be attributed to a shift in school librarians' work titles to "digital learning specialist" or "information literacy teacher"—titles that would allow school administrators to sidestep professional qualification requirements (2018a). Job titles may shift, but all members of the school library community should still wonder about the professional preparation and qualifications of the individuals in those positions.

Regardless of cause and despite worsening manifestations, the core element of the generally considered link to improving student outcomes remains unexamined: the characteristics of a quality school librarian. Preparation standards and other definitions of "qualified" or "state-certified" all identify the qualifications expected of professional school librarians, but the school librarianship field lacks a body of high-quality causal evidence connecting school librarians' preparation and qualifications to student-learning outcomes.

Research Purpose and Question

A fundamental question surrounding the link between school librarians and student outcomes arises from the characteristics of a quality school librarian. The purpose of this paper is to create evidence triangles (Erzberger and Kelle 2003; Östlund et al. 2011) composed of:

- 1) research findings on school librarian characteristics linked to student achievement;
- 2) empirical research on teacher characteristics that have demonstrated causal effects on student success; and
- 3) conjectures and empirical explorations concerning the preparation and qualifications of school librarians likely to positively affect student outcomes.

Framed by the question, “How might causal educational research in teacher preparation and quality inform research on the preparation, licensure, and qualifications of school librarians?” we examined a set of studies concerning teacher characteristics that surfaced from a larger mixed research synthesis (MRS) of causal research related to student achievement (Mardis et al. 2019).

Literature Foundation

Causality and Educators’ Practice

When student achievement is the measure under consideration, a quality teacher is defined as one whose students perform well on achievement tests. Identifying the characteristics of quality teachers or high-quality teaching has been the subject of numerous research studies, as compiled by James Hattie (2009). Educational effectiveness researchers have aimed to identify the factors in teaching and learning environments that directly or indirectly explain differences in student outcomes (Creemers, Kyriakides, and Sammons 2010). That research has often focused on causal relationships. Although causal relationships between what teachers do and what students learn are difficult to prove, the imperative to establish these relationships has a long heritage in educational policy, beginning with a key finding of the 1966 *Coleman Report*. James Coleman’s report, commissioned by the U.S. Department of Education in 1965, was the first effort to document the effectiveness of U.S. public schools. A key finding in the report was that external factors accounted for a large part of the variation in student outcomes, but among school factors, teacher quality had a substantial positive relationship with student achievement. As Coleman noted, “The quality of teachers shows a stronger relationship to pupil achievement. Furthermore, it is progressively greater at higher grades, indicating a cumulative impact of the qualities of teachers in a school on the pupil’s achievements” (1966, 22). New empirical work using longitudinal data and statistical modeling has reinforced Coleman’s conclusion that the teacher is the most critical schooling variable concerning student outcomes (Goldhaber 2016).

Many federal education policy waves have since passed and been influenced by Coleman’s work. The 2001 reauthorization of the 1965 *Elementary and Secondary Education Act* (ESEA), known as *No Child Left Behind* (NCLB), compelled states to:

- conduct annual student assessments linked to state standards;
- identify schools that are failing to make “adequate yearly progress” (AYP); and

- institute penalties and rewards based on each school’s AYP status (Dee and Jacob 2010).

To receive NCLB funding, school leaders implemented strategies to improve students’ performance based on “scientifically-based research,” which is defined in NCLB’s Title IX centering on quantitative causal approaches, as table 1 shows. As the comparison in table 1 also illustrates, the 2015 ESEA reauthorization, the *Every Student Succeeds Act* (ESSA), includes an approach to classifying evidence standards for educational interventions that give particular weight to experimental or quasi-experimental designs that are designated as strong and moderate research designs, respectively (U.S. Dept. of Ed. 2016).

Table 1. Research definitions from Elementary and Secondary Act (ESEA) Reauthorizations.

<i>No Child Left Behind (NCLB) Act 2001</i>	<i>Every Student Succeeds Act (ESSA) 2015</i>
<p>A. research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs; and</p> <p>B. includes research that:</p> <ul style="list-style-type: none"> i. employs systematic, empirical methods that draw on observation or experiment; ii. involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn; iii. relies on measurements or observational methods that provide reliable and valid data across evaluators and observers, across multiple measurements and observations, and across studies by the same or different investigators; iv. is evaluated using experimental or quasi-experimental designs in which individuals, entities, programs, or activities are assigned to different conditions and with appropriate controls to assess the effects of the condition of interest, with a preference for random assignment experiments, or other designs to the extent that those designs contain within-condition or across-condition controls; v. ensures that experimental studies are presented in sufficient detail and clarity to allow for replication or, at a minimum, offer the opportunity to build systematically on their findings; and vi. has been accepted by a peer-reviewed journal or approved by a panel of independent experts through a comparably rigorous, objective, and scientific review. (§ 7801) 	<p>[T]he term ‘evidence-based,’ when used with respect to a State, local educational agency, or school activity, means an activity, strategy, or intervention that –</p> <ul style="list-style-type: none"> (i) demonstrates a statistically significant effect on improving student outcomes or other relevant outcomes based on – <ul style="list-style-type: none"> (I) strong evidence from at least one well-designed and well-implemented experimental study; (II) moderate evidence from at least one well-designed and well-implemented quasi-experimental study; or (III) promising evidence from at least one well-designed and well-implemented correlational study with statistical controls for selection bias; or (ii) <ul style="list-style-type: none"> (I) demonstrates a rationale based on high-quality research findings or positive evaluation that such activity, strategy, or intervention is likely to improve student outcomes or other relevant outcomes; and (II) includes ongoing efforts to examine the effects of such activity, strategy, or intervention. (§8101)

As table 1 suggests—judging from the language in NCLB and ESSA—over the years U.S. federal education statutory requirements for evidence of effectiveness have been simplified, but remain centered on rigorous research that elevates the weight of causal studies in policymakers’ intervention choices. Notable in the ESSA requirements for evidence is the inclusion of “demonstrates a rationale,” which allows policymakers to base some of their intervention choices on positive program evaluations of “relevant outcomes.” The U.S. Department of Education has defined a relevant outcome as “the student outcome [that]...the proposed process, product, strategy, or practice is designed to improve” (2016, 10). This ESSA requirement expands the scope of evidence-based interventions to include student outcomes beyond annual test scores.

Causality in School Library Research

A significant issue for school librarians, who are teachers as well as instructional partners (AASL 2014), is to demonstrate their impact on student-learning outcomes. In many correlational studies, researchers used regression modeling to illustrate positive relationships between students’ test scores and many school library factors including access to a qualified school librarian. However, the design of those studies could not produce evidence of cause and effect relationships (Lance and Kachel 2018). Nevertheless, the regression models used in almost two decades of those studies have consistently shown that when a school has a state-certified school librarian, students’ scores on standardized reading tests tended to be higher, even when taking into account the major external social, cultural, and economic factors identified by researchers such as James S. Coleman (1966) or Keith Curry Lance and Linda Hofshire (2011, 2012). Coleman (1966) used similar regression analyses to identify factors that warranted further investigation. While correlational research is not causal research, it is a solid point of departure for further study.

Given the tension between objective scientific research, like that required by ESSA, and the advocacy-motivated regression model studies such as the state library studies and their replications, Ross. J. Todd (2009) proposed an evidence-based practice (EBP) framework for school librarians that encompasses many of the relationships explicated further by Marcia Mardis (2011):

Evidence for Practice - Focuses primarily on examining and using best available empirical research to form practices and inform current actions, and to identify best practices that have been tested and validated through empirical research.

Evidence in Practice - Focuses on reflective practitioners integrating available research evidence with deep knowledge and understanding derived from professional experience, as well as implementing measures to engage with local evidence to identify learning dilemmas, learning needs, and achievement gaps to make decisions about the continuous improvement of the school library practices to bring on optimal outcomes and actively contribute to school mission and goals.

Evidence of Practice - Is derived from systematically measured, primarily learner-based data. It focuses on the actual results of what school librarians do, rather than on what school librarians ought to do. This level of evidence documents what has changed for learners as a result of school librarian led inputs, interventions, activities, processes, and charts the nature and extent and quality of effect (Mardis 2011, 89).

Todd's (2009) holistic categorization values the research/practice cycle and honors the many ways in which the effects of school librarians' practice on learner outcomes can be measured without the use of a scientific experiment. By giving school library researchers a sophisticated methodological articulation of the types of evidence that school librarians generate that should inform practice decisions, Todd incrementally moved school library research toward the ESSA levels of evidence. Building on and responding to Todd's work, Ray Lyons (2009) stressed the need for school library research to shift from advocacy-driven research because this advocacy, by its nature, directs research questions and drives methodological choices.

Despite their utility, neither formulating a slanted question to confirm the relevance or appeal of an intervention nor conducting, compiling, and promoting impact studies is EBP; these efforts are purely advocacy and promotion because they are not impartial or scientific. EBP requires that school librarians' effectiveness in meeting specific student needs should be evaluated in comparison to or in conjunction with relevant alternative educational interventions (Lyons 2009, 65). To date, the school library evidence base has been mainly composed of descriptive qualitative studies and survey reports (Johnston and Green 2018; Mardis 2011; Morris and Cahill 2017; Neuman 2003), leaving ample opportunity for researchers to explore other quantitative approaches (Lyons 2009).

Methodological choices aside, less clear are the topics on which school library researchers should focus. However, correlational studies in education (for example, Coleman 1966) and school librarianship (for example, Lance and Hofschire 2011, 2012) have made evident numerous strong relationships for further investigation. Specifically, these foundations suggest that school librarian preparation, licensure, and quality (that is, characteristics) are promising areas for causal exploration, especially given the causal relationships that are emerging from research on these same characteristics as they relate to teachers. In numerous statewide studies, researchers have examined the correlation between school library staffing and student achievement, and report, "the most substantial and consistent finding is a positive relationship between full-time, qualified school librarians and scores on standards-based language arts, reading, and writing tests, regardless of student demographics and school characteristics" (Lance and Kachel 2018, 17). An open question centers on the identification of a "qualified school librarian" with most authors defaulting to the AASL definition of state-certified school librarian.

School Librarian Credentialing in the United States

Definitions of state-certified vary across the fifty states. Deborah J. Jesseman, Scott M. Page, and Linda Underwood (2015) compiled a state-by-state listing of licensure requirements for school librarians, including degrees, teaching certification, and testing requirements. Their compilation illustrates wide variance in licensure requirements for school librarians, including differences in preparation program accreditation, and required degrees and credentials. Programs that prepare school librarians in the United States may be accredited through the American Library Association (ALA), the Council for the Accreditation of Educator Preparation (CAEP), or a state agency. AASL (2016) reported that some states also offer non-accredited programs that allow completers to work as school librarians in that particular state. Audrey Church et al. (2012) compared overlapping and potentially competing standards for school librarians, including the ALA/AASL *Standards for Initial Preparation of School Librarians*, approved by the Specialty Areas Studies Board of the National Council for Accreditation of Teacher Education (AASL 2010), *Empowering Learners: Guidelines for School Library Programs* (AASL 2009), and the National Board of Professional Teaching Standards *Library Media Standards for Teachers of*

Students 3–18+ (NBPTS 2012). National Board certification became available to school librarians beginning in 2001 and was the subject of several articles addressed to practitioners (for example, Shannon 2004; Dickinson 2004; Loertscher 2004; Yeatts 2014) and only a few research studies (for example, Everhart and Dresang 2007; Everhart, Mardis, and Johnston 2011).

No comprehensive research review has examined the role and kinds of school librarian preparation in producing a “qualified school librarian” or the causal effect of that preparation on student-learning outcomes.

School Librarian Preparation

Much of the research about school librarian preparation has focused on course syllabi, course content, and student perceptions. The various routes recognized for school librarian preparation hint at the complexity of this preparation as it represents a hybrid of teacher education and librarianship. School librarians are often prepared at the graduate level, but their professional credentials are most often delivered through two primary means: 1) educator preparation programs offering a Master of Education degree, often through a department, school, or college of education, or 2) librarian preparation programs in schools of library and/or information studies offering a Master’s degree in Library and Information Science (or similar degree). The educator preparation programs are usually CAEP-accredited, while the MLIS programs usually have ALA accreditation. Many ALA-accredited programs are also CAEP-accredited.

This complexity is further evidenced in the roles identified for school librarians in *Empowering Learners* (AASL 2009) and the 2018 AASL *National School Library Standards*: teacher, leader, instructional partner, information specialist, and program administrator. Focusing on the instructional partner role, Judi Moreillon, Sue C. Kimmel, and Karen Gavigan (2014) examined courses, assignments, and textbooks from a small set of school librarian preparation programs and found a few differences between two types of school librarian preparatory programs. For example, the CAEP-accredited Master’s degree in education programs had more courses dedicated to school librarianship with six to nine courses compared with three to seven school librarianship courses in ALA-accredited Master’s in library and information science degree programs. ALA-accredited programs tended to concentrate readings and assignments related to the instructional partner role of librarians in the fewer classes dedicated to school librarianship. CAEP-accredited programs tended to rank the teacher role highest, while ALA-accredited programs were more likely to rank the instructional partner role highest.

Programs preparing school librarians are also expected to reflect the new literacies and technologies impacting K–12 classrooms. Shelbie D. Witte, Melissa R. Gross, and Don L. Latham (2015) looked at course syllabi for the presence of 21st-century literacies in librarian preparation coursework and teacher preparation coursework. Their findings that both types of professional preparation included 21st-century literacies was seen to provide a potential area for collaboration between school and public librarians, and between school librarians and K–12 teachers. Lucy Santos Green, Stephanie A. Jones, and Panne Andrea Burke (2017) used a survey to look at how school librarians are prepared to work in online teaching environments. The survey addressed the presence of various kinds of technologies in coursework and student work. Eighty percent of respondents reported offering a course in technology integration while only 17 percent reported offering a course in K–12 online teaching. While well over 50 percent of programs reported the expectation that student work employ technology tools, the numbers reporting the design of digital online environments ranging from virtual library resources to full K–12 learning modules were fewer, leading Green, Jones, and Burke to conclude that programs

emphasize tools rather than online pedagogies and design of digital learning spaces. In an earlier survey Dana Hanson-Baldauf and Sandra Hughes Hassell (2009) found students enrolled in pre-service school library programs felt empowered to integrate technologies with instruction yet reported low levels of competence with a variety of specific new online technologies. Of further concern, Kaye B. Dotson and Jami L. Jones (2011) found graduates of a school library preparation program were unlikely to report serving in technology leadership roles, with only 30 percent reporting serving on media and technology committees. Interestingly, Marcia Mardis's (2013) follow-up with five graduates of a school library program found these graduates reported what they learned about information-seeking and technology prepared them to be better educators. This finding suggests that these two areas—21st-century literacies and technology—may be areas for further exploration regarding the impact of school library preparation on better teaching and, therefore, better student-learning outcomes.

Other roles have also been the focus of research regarding school librarian preparation. Donna M. Shannon (2008) reported that both program supervisors and people who had completed a school librarian preparation program felt a need for more leadership training, and program completers wished for more practical experiences related to program management. This finding echoes Sharon Vansickle's (2000) survey of pre-service school librarians that found they perceived themselves more in a support role than a leadership role. Barbara Schultz-Jones et. al. (2017) examined pre-service school librarians' perceptions of the roles of the school librarian, finding that the first course in the sequence of preparation coursework was essential for providing an orientation to their roles and responsibilities. Daniella Smith (2011) reported on a leadership training program that recruited teacher leaders to a school librarianship Master's degree program, preparing school librarians with targeted training in transformational leadership. Participants were selected based in part on a leadership assessment completed by their principals using a rubric provided by the training program. The selection of teacher leaders implies a connection with the student-learning mission of the school and suggests their qualities as teachers. Student-learning outcomes, however, were not explicit in this or the other leadership-focused studies.

While the research described above begins to identify and unravel the complexity and changing expectations of school librarian preparation for a variety of roles within K–12 schools, none of these studies employed a strong or moderate design by ESSA standards or examined the effect of school library preparation for any specific school librarian roles on student-learning outcomes. Researchers have agreed that specific preparation, certification, and credentialing is important enough to justify that school librarians be afforded unique status as educators who make individual and collaborative contributions to student success. However, this literature foundation has not yet explored how and why this preparation and certification makes a difference for learning.

Method

Overview

Our research was guided by the question: “How might causal educational research in teacher preparation and quality inform research on the preparation, licensure, and qualifications of school librarians?” To begin to address this question, we located and synthesized the findings from strong or moderate causal studies regarding teacher preparation and qualifications.

Study Background

We derived our study's data from a larger data set that employed a mixed research synthesis (MRS) (Mardis et al. 2019) to locate, select, appraise, and synthesize experimental or quasi-experimental research concerned with school-based malleable factors (that is, factors that could be altered) that positively impact student learning. The larger study encompassed many topical domains, one of which is teacher characteristics. Table 2 provides a list of the domains included in the larger study's data set.

Table 2. Domains derived from Hattie (2009) with topical sub-domains.

Domain	Definition	Topical Sub-Domain
School Characteristics	Building-level statistics or structures that are often controlled by division policies.	Principals/School leaders Class size Teacher turnover Mobility Demographics
Teacher Characteristics	Characteristics of teachers that might be found on a resume or personnel record. While these characteristics are not malleable, when making hiring decisions, school divisions can decide which teacher characteristics they value.	Preparation Evaluation Experience Efficacy
Curriculum	The ways content is organized such as by discipline (for example, science) or other means such as outdoor learning.	Reading Writing Mathematics Science Social Studies Outdoor Learning
Classroom Practices (Hattie labels as "Teaching Approaches").	Pedagogies and strategies used to deliver instruction to meet learning objectives or otherwise enact teaching.	Group work Note taking Cooperative learning Questioning Tutoring Feedback Metacognitive strategies

Student Characteristics*	Characteristics assigned to students, such as previous achievement and dispositions, as well as demographic information, such as gender, age, race, etc.	Attitude Motivation Self-concept
Home Characteristics*	Family characteristics such as income, education level of parents, parent involvement, and family structure, and of the home, including access to books, television, technology, or basic shelter or food resources.	Employment Homework School involvement

* Denotes external domains beyond the scope of this study.

Table 2 displays the domains we considered in broad to narrow order, beginning with school characteristics and moving down to classroom practices. Hattie (2009) also included two domains, Student Characteristics and Home Characteristics, that were beyond the scope of this study because these characteristics are not malleable.

In this study, we begin to respond to AASL's call to investigate "the causal relationships between school libraries/librarians and student learning" (2014, 13). A first step in this research agenda is conducting an MRS to develop theory and reveal potential areas for future causal exploration in the field. A goal of an MRS is to develop evidence triangles (Erzberger and Kelle 2003; Östlund et al. 2011) composed of:

- 1) research findings on school librarian characteristics linked to student achievement;
- 2) empirical research on teacher characteristics that have demonstrated causal effects on student success; and
- 3) conjectures and empirical explorations concerning the preparation and qualifications of school librarians likely to positively affect student outcomes.

As figure 1 shows, our MRS distilled the findings from school librarian research, and from the causal studies of teachers we identified through the MRS that met ESSA Level 1 (Moderate) and Level 2 (Strong). We then compared these findings to draw conclusions that serve as researchable conjectures or testable hypotheses.

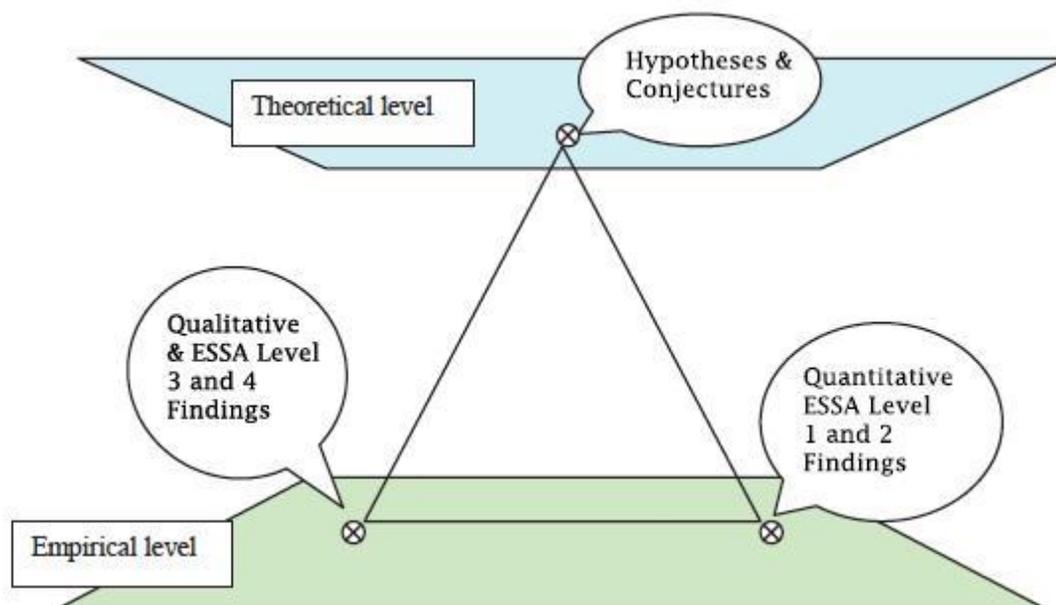


Figure 1. Evidence triangle contents (adapted from Erzberger and Udo Kelle 2003; Östlund et al. 2011).

In the context of this study, the “Qualitative & ESSA Level 3 and 4 Findings” point in figure 1 is the school librarianship research presented in the “Literature Foundation” section of this paper. In that section, we distilled findings from school librarianship research that related to the preparation’s impact on a quality school librarian. We have no strong or moderate research exploring licensure paths or characteristics of school librarians such as years of experience, degree, or undergraduate major.

MRS is a robust systematic approach to integrating studies’ qualitative and quantitative findings to inform causal hypotheses or theoretical conjectures to be pursued through subsequent research (Sandelowski, Voils, and Barroso 2006). The MRS approach has been used to shed light on the relationship between educational interventions and outcomes, such as in the study of the out-of-class activities of engineering students (Simmons, Creamer, and Yu 2017). For this study of only the teacher characteristics domain, we complemented the MRS with Narrative Synthesis (Popay et al. 2006) to include: 1) preliminary analysis, 2) exploration of relationships, and 3) assessment of the robustness of the synthesis.

Data Collection and Analysis

Aggregation

We conducted the aggregation for the earlier, larger MRS in independent teams through a systematic search of causal research regarding the school-based malleable factors that impact student-learning outcomes (Mardis et al. 2019). Our inclusion criteria for the larger data set were peer-reviewed publications that were available in English and published between 1985 and 2016, and that were centered on school-aged children and employed causal designs, including meta-analyses, matching designs, propensity score matching, regression discontinuity, and strong

correlational designs. We identified potential studies about teaching through the *What Works Clearinghouse* <<https://ies.ed.gov/ncee/wwc>>, Hattie's *Visible Learning* (2009), and a systematic search of prominent databases such as EBSCOhost, Scopus, Google Scholar, and JSTOR. Articles that reflected research yielded 489 potential studies that were identified for this aggregation of research about school-based malleable factors that impact student learning outcomes.

Domains

Popay et al. suggested that researchers divide large data sets for synthesis using the “nature of the results being reported (different outcome measures for example, or different types of factors impacting on implementation)” (2006, 17). Therefore, two researchers in the earlier study by Mardis et al. independently grouped articles using preliminary domains derived from titles, abstracts, and database-assigned subject headings, and related to factors found in the literature such as classroom practices, teacher characteristics, and leadership. Researchers met to share the assignment of preliminary domains. Differences were handled through re-examination of the article together and discussion to reach agreement. During the earlier study we sorted search results into groups informed by Hattie's (2009) *Visible Learning*, which includes chapters that grouped characteristics relating to learning from the 1) student, 2) home, 3) school, 4) teacher, 5) curricula, and 6) teaching approaches. We intend to explore each of these domains in turn. At this stage forty-three studies were assigned to the domain of Teacher Characteristics.

The Teacher Characteristics domain was selected for this initial report because of the domain's relationship to the preparation of school librarians and to the very fundamental question of what constitutes a quality school librarian. Teacher characteristics were defined as characteristics attributed to the teacher such as licensure or education. In other words, we excluded studies about what a teacher *does* in the classroom and focused on who the teacher *is* and how the teacher was *prepared*. Teacher characteristics include preparation type and extent; licensure and credentialing; and years of experience—the kinds of metrics that might be used in teacher hiring and retention decisions or derived from a resume.

Data Extraction

The forty-three original studies identified for the domain of Teacher Characteristics were read in their entirety with careful attention to the methodologies employed.

Focusing on the studies that were judged as strong or moderate evidence level based on the ESSA levels of evidence (U.S. Dept. of Ed. 2016) illustrated in table 1, one of us read in its entirety each article assigned to the Teacher Characteristics domain to identify experimental or quasi-experimental studies that met the ESSA level of 1 (Strong) or 2 (Moderate) evidence. Seven studies were identified that met this criterion.

Findings extraction also involved extraction and tabulation of details related to methodology, sample, data gathering method, research design, bibliographic description, ESSA level, and key findings. For each study, at least two additional team members verified the extraction and tabulation, including the ESSA level and key findings. Differences among researchers' extraction and tabulation for specific studies most often focused on what details related to key findings were extracted. For example, after some discussion, researchers decided to include relevant null findings.

Narrative Synthesis

At this interpretive stage, researchers returned to the seven studies that met the Strong or Moderate ESSA evidence levels to identify emerging evidence about what works, for whom, and under what circumstances. In the case of teacher characteristics, we sought to distill current knowledge generated through rigorous educational research that shows a causal relationship between teachers' characteristics and student-learning outcomes. Many teacher characteristics that we found did not have significance related to student-learning outcomes; these were also included in the synthesis. As the methodological characteristics of included studies are also part of a narrative synthesis (Popay et al. 2006), we include this discussion in the findings.

Findings from the Narrative Synthesis

Introduction

As we feature in the appendix, seven studies met the ESSA (2016) criteria for ESSA Level 1 (Strong) and Level 2 (Moderate) research designs in the area of teacher characteristics and student outcomes. These studies provided insights into the effects of teacher background, preparation, and licensure on student achievement that we contrasted with the findings from ESSA Level 3 (Promising) or Level 4 (Demonstrates a Rationale) research in school librarianship and teacher research. (As previously noted, almost no school librarianship literature described causal studies having ESSA Level 1 and Level 2 research designs.)

Teacher Effectiveness

A quality teacher matters to student achievement perhaps more than the school attended. This difference may be especially important for students from lower socioeconomic status (SES) schools. "In low SES schools it matters more which teacher a child receives than it does in high-SES schools" (Nye, Konstantopoulos, and Hedges 2004, 254). Research has shown that students randomly assigned to a teacher with past higher student achievement and, therefore, high evaluation ratings were more likely to demonstrate significant achievement (Kane et al. 2013). When a high-quality teacher moves from one school to another, researchers have found significant breaks in student achievement with declining achievement scores in the previous school (Chetty, Friedman, and Rockoff 2011) and rising scores in schools where highly qualified teachers have transferred (Glazerman et al. 2013). Indeed, the research suggests the differences in teachers within a school may be more important than the particular school attended, particularly in mathematics. Barbara Nye, Spyros Konstantopoulos, and Larry V. Hedges (2004) found the achievement difference between having a teacher in the 25th (not very effective) and 75th (effective) percentiles was about a third of a standard deviation for reading and a half of a standard deviation for mathematics. This causal research supports Coleman's (1966) finding that the quality of teachers is strongly related to student achievement but leaves open the question about how to identify a quality teacher. To answer this question, educational research has examined the "low hanging fruit" (easily defined and identified) teacher characteristics related to teacher preparation and licensure.

Teacher Background, Preparation, and Licensure

Characteristics such as years of experience, college major and degrees, and types of licensure often influence hiring decisions and have been the subject of numerous studies (Aaronson, Barrow, and Sander 2007; Goldhaber, Brewer, and Anderson 1999; Guarino et al. 2006; Slater, Davies, and Burgess 2012). Few of these characteristics have been found to be significantly related to student outcomes in strong and moderate studies with one exception: mathematics achievement.

In the case of mathematics achievement, years of experience, specific certification in mathematics, and alternative licensure were found to be predictors of student achievement. Nye, Konstantopoulos, and Hedges (2004) found no significant differences among years of experience of the teacher or whether teachers had a Master's degree except for third-grade mathematics where the number of years of teaching experience had a significant impact. Parmalee P. Hawk, Charles R. Coble, and Melvin Swanson (1985) found moderate evidence that teacher certification in mathematics was significantly related to student mathematics achievement in grades 6–12.

Alternative paths to licensure, such as Teach for America (TFA), that place teachers in high-need or disadvantaged schools after an intensive but brief preparation period, are of keen interest to schools and policymakers concerned with staffing those schools. Again teachers' impact on mathematics achievement was found to be a significant exception among the disciplines, with TFA teachers making a positive difference in elementary schools (Decker, Mayer, and Glanzerman 2004) and in middle and high schools (Clark et al. 2013). While alternatives to traditional teacher licensure may be debated, the data from TFA studies suggests no difference in impact between TFA and comparable teachers with the same number of years of experience (Clark et al. 2013).

The causal research regarding teacher preparation path, degrees, years of experience, and other characteristics that might be assigned to individual educators offers few clues to predict a high-quality teacher. The strong exception is mathematics, for which this research suggests certification in mathematics and intense alternative licensure are significant predictors of student achievement in mathematics.

Methodological Reflections

Ethical issues are often raised regarding causal methodologies. Researchers hesitate to knowingly place students with ineffective teachers for the purpose of random control trials (Connolly, Keenan, and Urbanska 2018). The studies included here used a variety of techniques to identify and study differences. In addition to identifying matched pairs among existing settings (Hawk, Coble, and Swanson 1985) or looking for natural breaks, for example when a high-quality teacher moves from one school to another (Chetty, Friedman, and Rockoff 2011), researchers also took advantage of larger studies or initiatives. Glazerman et al. (2013) randomly assigned schools to two conditions: eligible to hire transfer teachers or not eligible. Transfer teachers were identified as highly effective and were offered incentives to transfer to a low-performing school. Schools from both conditions were matched on student characteristics with the finding that the schools with the option to fill vacancies with highly effective transfer teachers showed significant gains in math and reading achievement at the elementary level. Nye, Konstantopoulos, and Hedges (2004) took advantage of the Tennessee Class Size Experiment in

which elementary students and teachers were randomly assigned to three conditions: small class size, larger class size, and large class size with a full-time aide. Matched pairs from this larger study that was focused on another research question were identified using past test scores as a measure of teacher quality. Student achievement data from the class-size study was then used to examine the relationship between a quality teacher and student achievement.

Discussion

The causal research related to the preparation and quality of teachers has affirmed that a high-quality teacher predicts student achievement and that these differences are more important in mathematics and low SES schools. Identifying what kinds of preparation might predict a high-quality teacher has been less conclusive, but years of mathematics teaching experience and certification in mathematics were found to be significant for student achievement in mathematics. These findings echo other promising correlational studies that found few “resume” characteristics predict an impact on student achievement (Aaronson, Barrow, and Sander 2007; Goldhaber, Brewer, and Anderson 1999; Guarino et al. 2006; Slater, Davies, and Burgess 2012). Alternative paths to licensure have also been the subject of study. In the case of TFA teachers, higher mathematics achievement in students was evident (Clarke et al. 2013; Decker, Mayer, and Glanzerman 2004). Figure 3 uses an evidence triangle to portray some ways in which the findings from the studies we examined in this paper might translate into researchable questions or directions for school library research.

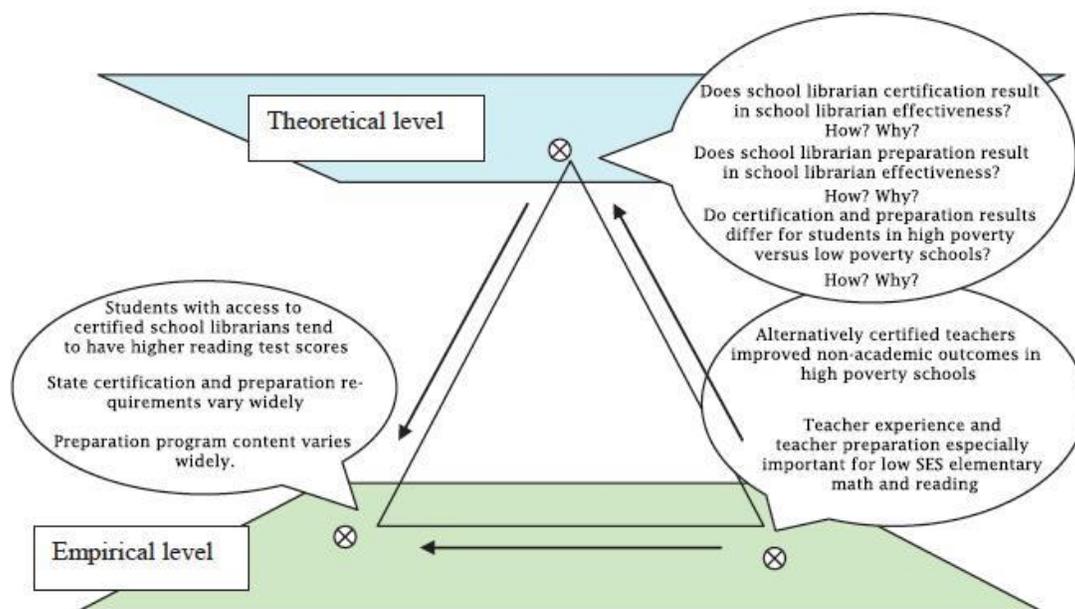


Figure 3. Evidence triangle demonstrating preparation, certification, and effectiveness (adapted from Erzberger and Kelle 2003; Östlund et al. 2011).

The evidence triangle in figure 3 demonstrates how findings from the two areas of research—school librarianship and causal educational research—when viewed concurrently offer possible

areas for investigation. For example, a preponderance of findings from school librarian research indicates that high-performing students tend to have certified school librarians, while rigorous quantitative studies in education indicate a teacher's certification route has an unclear relationship with student-learning outcomes. In high-poverty schools, students benefit from having committed teachers with some sort of certification, traditional or alternative. How and why does the preparation of school librarians matter to student achievement? How and why does licensure for school librarians matter to student achievement? And are there differences in the impact for high-poverty schools compared with low-poverty schools?

Digging deeper, what aspects of school librarian preparation matter? The research literature regarding the preparation of school librarians has focused on information literacies and technology as important aspects of school library preparation (Dotson and Jones 2011; Green, Jones, and Burke 2017; Hanson-Baldauf and Hughes Hassell 2009; Witte, Gross, and Latham 2015) and perhaps contributing to improved teaching (Mardis 2013) and, therefore, student learning. The standout of mathematics training in the educational causal studies raises the question of whether the specific training afforded to school librarians in information literacy, including problem-solving and information-processing skills, might impact student achievement in mathematics or other disciplines.

Hawk, Coble, and Swanson (1985) found teachers with certification in mathematics had a considerable effect on students' achievement in mathematics. Certification in school librarianship might also be significant. Without adequate national data, we do not know, but this area may be fertile for school library researchers to undertake causal explorations. While educational researchers have examined alternative paths to licensure such as TFA, school librarianship has no similar research. A common route to licensure as a school librarian is as an add-on to a teaching license. Therefore, many school librarians were previously classroom teachers, and we might ask about their original paths to teacher licensure. Tantalizing questions about licensure paths to school librarianship remain unanswered: Does the number of years of classroom experience matter? What about other paths to licensure?

Related research in the school library field might examine whether school librarians who were formerly identified as highly qualified classroom teachers have an impact on overall school achievement. For example, the Glazerman et al. (2013) study of schools eligible to hire high-quality transfer teachers found a significant difference between schools that elected to hire high-quality transfer teachers and those that did not. What happens when high-quality teachers from one school transfer to other schools as the school librarian?

Nye, Konstantopoulos, and Hedges (2004) found the impact of a quality teacher to have a more significant impact in schools with low SES. These schools merit particular attention for school library research as well. What is the impact of a high-quality school librarian in this context?

Conclusion

The research regarding the identification and impact of high-quality teachers offered some intriguing research designs for investigating quality school librarians. Many studies about teacher quality defined quality teachers by their students' past test scores and did not take into account the issue that students were not randomly assigned to schools, classrooms, or teachers. Several of the research designs included in this synthesis addressed this problem with matched pairs or natural breaks. School library researchers could look for natural breaks such as when a school

loses a librarian, as in the Chetty, Friedman, and Rockoff (2011) research about the movement of a quality teacher into another setting.

School library researchers might also find opportunities to examine matched pairs from a more extensive study that employed random assignment, similar to Nye, Konstantopoulos, and Hedges (2004) who used data from a large study of class size that employed random assignment of students.

These research designs require scholars trained in the quantitative methods required to conduct causal research. This training can be obtained through doctoral study and continuing professional development.

Finally, after family characteristics, teacher quality appears to be a major factor related to student achievement (Coleman 1966; Hanushek 1971; Murnane 1975; Opper 2019). To date, no causal research examining the impact of high-quality school librarians on student learning has been published. In short, it is not clear if a quality school librarian matters. However, a strong foundation of advocacy research suggests that quality school librarians make many contributions to learning environments.

Pursuing further research about the effects of school librarians is hobbled by the fact that researchers, practitioners, and policymakers lack access to the basic descriptive statistics about school librarians and the candidates who enroll in programs to become school librarians (Lance 2018b). These data are not collected nationally or systematically and reliably aggregated in any other way. Basic statistics would enable researchers to conduct the kinds of comparisons that would allow stakeholders to understand if school librarian characteristics are significantly related to student outcomes. Educational researchers have suggested that a high-quality teacher matters, but school librarianship has not explored the question of what happens when a high-quality teacher becomes a school librarian.

In this study, we examined the causal research related to teacher characteristics and student outcomes to inform research on school librarian characteristics. Given U.S. federal requirements for education leaders to adopt learning strategies based upon rigorous causal evidence and the opportunity for school library researchers to pursue research in this paradigm, we investigated how causal education research in teacher preparation and quality could inform research for the preparation and quality contributions of school librarians. Simply put, it stands to reason that if teacher characteristics matter, so should school librarian characteristics. While these professionals serve different roles within a school, school library researchers might use methods and findings from the research about quality teachers to inform their school library research agenda. Clearly, research regarding school librarians cannot ignore the basic facts about how school libraries are staffed, who is considered a school librarian, and what preparation and licensure they possess for the position.

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*Note: *Denotes quantitative study included in MRS teacher characteristics domain.*

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Appendix. Teacher Characteristics Articles Reviewed in this Study

Author: Chetty, Raj; John N. Friedman, and Jonah E. Rockoff.

Year: 2011

Title: *The Long-Term Impacts of Teachers: Teacher Value-Added and Student Outcomes in Adulthood*. NBER Working Paper 17699

Source: <https://www.nber.org/papers/w17699>

Design: Quasi-Experimental Design examining 3384 students, grades 4–8

Setting: Urban; Midwest, Northeast, South, West

Level of Evidence: Moderate

Abstract: Are teachers' impacts on students' test scores ("value-added") a good measure of their quality? This question has sparked debate primarily because of disagreement about (1) whether value-added (VA) provides unbiased estimates of teachers' impacts on student achievement and (2) whether high-VA teachers improve students' long-term outcomes. We address these two issues by analyzing school district data from grades 3-8 for 2.5 million children linked to tax records on parent characteristics and adult outcomes. We find no evidence of bias in VA estimates using previously unobserved parent characteristics and a quasi-experimental research design based on changes in teaching staff. Students assigned to high-VA teachers are more likely to attend college, attend higher-ranked colleges, earn higher salaries, live in higher SES neighborhoods, and save more for retirement. They are also less likely to have children as teenagers. Teachers have large impacts in all grades from 4 to 8. On average, a one standard deviation improvement in teacher VA in a single grade raises earnings by about 1% at age 28. Replacing a teacher whose VA is in the bottom 5% with an average teacher would increase the present value of students' lifetime income by more than \$250,000 for the average classroom in our sample. We conclude that good teachers create substantial economic value and that test score impacts help in identifying such teachers.

Table A1. Chetty et al. (2011) findings.

Outcome measure	Comparison	Period	Sample	Intervention mean	Comparison mean
Math and reading scores*	Value-added model (VAM) vs. Business as usual	1991-2009	Arrival of a top 5% teacher; 3,384 students	0.23	0.2
Math and reading scores*	Value-added model (VAM) vs. Business as usual	1991-2009	Departure of a bottom 5% teacher; 3,202 students	0.16	0.14

Math and reading scores*	Value-added model (VAM) vs. Business as usual	1991-2009	Arrival of a bottom 5% teacher; 3,286 students	0.19	0.22
Math and reading scores*	Value-added model (VAM) vs. Business as usual	1991-2009	Departure of a top 5% teacher; 3,304 students	0.19	0.24

*Denotes statistically significant finding

Author: Clark, Melissa A., et al.

Year: 2013

Title: *The Effectiveness of Secondary Math Teachers from Teach For America and the Teaching Fellows Programs*. NCEE 2013-4015

Source: <http://files.eric.ed.gov/fulltext/ED544171.pdf>

Setting: 44 secondary schools in nine school districts in eight states.

Design: Randomized Controlled Trial examining 4116 students, grades 6–12

Level of Evidence: Moderate

Abstract: Teach For America (TFA) and the Teaching Fellows programs are an important and growing source of teachers of hard-to-staff subjects in high-poverty schools, but comprehensive evidence of their effectiveness has been limited. This report presents findings from the first large-scale random assignment study of secondary math teachers from these programs. The study separately examined the effectiveness of TFA and Teaching Fellows teachers, comparing secondary math teachers from each program with other secondary math teachers teaching the same math courses in the same schools. The study focused on secondary math because this is a subject in which schools face particular staffing difficulties. The study had two main findings, one for each program studied: (1) TFA teachers were more effective than the teachers with whom they were compared. On average, students assigned to TFA teachers scored 0.07 standard deviations higher on end-of-year math assessments than students assigned to comparison teachers, a statistically significant difference. This impact is equivalent to an additional 2.6 months of school for the average student nationwide, and (2) Teaching Fellows were neither more nor less effective than the teachers with whom they were compared. On average, students of Teaching Fellows and students of comparison teachers had similar scores on end-of-year math assessments. By providing rigorous evidence on the effectiveness of secondary math teachers from TFA and the Teaching Fellows programs, the study can shed light on potential approaches for improving teacher effectiveness in hard-to-staff schools and subjects. The study findings can provide guidance to school principals faced with the choice of hiring teachers who have entered the profession via different routes to certification. The findings can also aid policymakers and funders of teacher preparation programs by providing information on the effectiveness of teachers from various routes to certification that use different methods to identify, attract, train, and support their teachers.

Table A2. Clark et al. (2013) results.

Outcome measure	Comparison	Period	Sample	Intervention mean	Comparison mean
Mathematics assessments	TNTP Teaching Fellows vs. Business as usual	0 Days	Full sample; 4,116 students	-0.39	-0.39

Author: Decker, Paul T., Daniel P. Mayer, Steven Glazerman

Year: 2004

Title: *The Effects of Teach For America on Students: Findings from a National Evaluation.*

Source: <https://www.irp.wisc.edu/publications/dps/pdfs/dp128504.pdf>

Setting: California, Illinois, Louisiana, Maryland, Mississippi, Texas

Design: Randomized Controlled Trial examining 1774 students, grades 1–5

Abstract: Teach For America (TFA) was founded in 1989 to address the educational inequities facing children in low-income communities across the United States by expanding the pool of teacher candidates available to the schools those children attend. TFA recruits seniors and recent graduates from colleges around the country, people who are willing to commit to teach for a minimum of two years in low-income schools. TFA focuses its recruitment on people with strong academic records and leadership capabilities, whether or not they have planned to teach or have taken education courses. TFA is particularly interested in candidates that have the potential to be effective in the classroom but in the absence of TFA would not consider a teaching career. Consequently, most TFA recruits do not have education-related majors in college and therefore have not received the same training that traditional teachers are expected to have.

[Primary findings from the study include:] From the perspective of a community or a school faced with the opportunity to hire TFA teachers...TFA offers an appealing pool of candidates....From the standpoint of TFA and its funders...the organization is making progress toward its primary mission of reducing inequities in education--it supplies low-income schools with academically talented teachers who contribute positively to the academic achievement of their students....From the perspective of policymakers who are trying to improve the educational opportunities of children in poor communities...many of the control teachers in the study were not certified or did not have formal pre-service training, [highlighting] the need for programs or policies that offer the potential of attracting good teachers to schools in the most disadvantaged communities. [The] findings show that TFA is one such program.

Table A3. Decker et al. (2004) findings.

Outcome measure	Comparison	Period	Sample	Intervention mean	Comparison mean
Summer school attendance	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,634 students	30.92	30.52

Days absent	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,676 students	8.83	8.31
Chronic absenteeism	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,672 students	15.6	15.07
Mathematics achievement*	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,715 students	30.44	28.01
Grade retention	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,774 students	13.03	12.09
Reading achievement	Teach for America (TFA) vs. Unknown	End of school year	Full sample; 1,715 students	28.17	27.61

*Denotes statistically significant finding

Author: Glazerman, Steven, et al.

Year: 2013

Title: *Transfer Incentives for High-Performing Teachers: Final Results from a Multisite Randomized Experiment*. NCEE 2014-4004

Source: <http://files.eric.ed.gov/fulltext/ED544269.pdf>

Setting: Seven states

Design: Randomized Controlled Trial examining 8,038 students, grades 3–8

Level of Evidence: Strong

Abstract: One way to improve struggling schools' access to effective teachers is to use selective transfer incentives. Such incentives offer bonuses for the highest-performing teachers to move into schools serving the most disadvantaged students. In this report, we provide evidence from a randomized experiment that tested whether such a policy intervention can improve student test scores and other outcomes in low-achieving schools. The intervention, known to participants as the Talent Transfer Initiative (TTI), was implemented in 10 school districts in seven states. The highest-performing teachers in each district—those who ranked in roughly the top 20 percent within their subject and grade span in terms of raising student achievement year after year (an approach known as value added)—were identified. These teachers were offered \$20,000, paid in installments over a two-year period, if they transferred into and remained in designated schools that had low average test scores. [The main findings from the study include:] [1] The transfer incentive successfully attracted high value-added teachers to fill targeted vacancies; [2] The transfer incentive had a positive impact on test scores (math and reading) in targeted elementary classrooms; [and 3] The transfer incentive had a positive impact on teacher-retention rates during the payout period; retention of the high-performing teachers who transferred was similar to their counterparts in the fall immediately after the last payout.

Table A4. Glazerman et al. (2013) results.

Outcome measure	Comparison	Period	Sample	Intervention mean	Comparison mean
Mathematics assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 2	Elementary students: Cohort 1; 6,139 students	-0.17	-0.27
Mathematics assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 1	Elementary students: Cohorts 1 and 2; 6,253 students	-0.27	-0.32
Reading assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 1	Middle school students: Cohorts 1 and 2; 7,063 students	-0.53	-0.57
Mathematics assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 2	Middle school students: Cohort 1; 2,355 students	-0.36	-0.35
Mathematics assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 1	Middle school students: Cohorts 1 and 2; 8,038 students	-0.56	-0.54
Reading assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 2	Middle school students: Cohort 1; 3,128 students	-0.45	-0.43
Reading assessment*	Talent Transfer Initiative (TTI) vs. Business as usual	Year 2	Elementary students: Cohort 1; 6,103 students	-0.28	-0.38
Reading assessment	Talent Transfer Initiative (TTI) vs. Business as usual	Year 1	Elementary students: Cohorts 1 and 2; 6,200 students	-0.37	-.041

*Denotes statistically significant finding

Author: Hawk, Parmalee P., Charles R. Coble, and Melvin Swanson

Year: 1985

Title: *Certification: It Does Matter*

Source: *Journal of Teacher Education* 36 (3): 13–15.

Setting: Two middle schools; two high schools (geographical and community location not identified)

Design: Matched pairs design examining 36 certified teachers (18 certified in math/18 in other areas); 826 students, grades 6–12

Level of Evidence: Moderate

Abstract: The debate on certification requirements is flourishing in several states. Within the context of the debate is the assumption that a positive relationship exists between certification and teaching effectiveness. Although this assumption may be valid, the connection is yet to be firmly established empirically. In this study, the authors examine the relationship between mathematics teacher certification and teaching effectiveness. They report a positive relationship between the two variables and make suggestions for further study.

Results of the study indicated that:

- student achievement is greater in general mathematics and algebra when the students are taught by teachers certified in mathematics (analysis of covariance: F ratio of 13.98, $p < .001$, for general math and $F = 7.96$, $p < .01$ for algebra);
- in-field teachers scored significantly higher in mathematics achievement than out-of-field teachers ($t = 4.23$, $p < .001$);
- in-field teachers also scored significantly higher on the instructional presentation function of the CTPAS;
- chi-square analysis of teacher data by sub-groups (years of teaching experience, years of experience teaching math, and degree held by teachers, bachelors or advanced) yielded no significant differences between in-field or out-of-field teachers
- no significant differences were found between sub-groups of in-field teachers;
- no significance was reported within the sub-groupings of out-of-field teachers;
- in-field certified math teachers know more mathematics and show evidence of using more effective teaching practices than their out-of-field counterparts; and
- students of in-field certified math teachers achieve at a higher level than do students taught by out-of-field teachers.

Author: Kane, Thomas J., et al.

Year: 2013

Title: *Have We Identified Effective Teachers? Validating Measures of Effective Teaching Using Random Assignment*. Research Paper. MET Project.

Source: <http://files.eric.ed.gov/fulltext/ED540959.pdf>

Setting: Six urban districts in Florida, New York, North Carolina, Tennessee, and Texas

Design: Experimental, random assignment; 67,402 students, 1181 teachers in experimental group; 186,886 students, 3802 teachers in non-experimental group; grades 4–8

Level of Evidence: Moderate

Abstract: [The authors] designed the Measures of Effective Teaching (MET) project to test replicable methods for identifying effective teachers. In past reports, [the authors] described

three approaches to measuring different aspects of teaching: student surveys, classroom observations, and a teacher's track record of student achievement gains on state tests. In those analyses, [they] could only test each measure's ability to predict student achievement gains non-experimentally, using statistical methods to control for student background differences. For this report, [they] put the measures to a more definitive and final test. First, [they] used the data collected during 2009-10 to build a composite measure of teaching effectiveness, combining all three measures to predict a teacher's impact on another group of students. Then, during 2010-11, [they] randomly assigned a classroom of students to each teacher and tracked his or her students' achievement. [They] compared the predicted student outcomes to the actual differences that emerged by the end of the 2010-11 academic year.

Here's what the authors found: First, the measures of effectiveness from the 2009–10 school year did identify teachers who produced higher average student achievement following random assignment. Second, the magnitude of the achievement gains the teachers generated was consistent with their expectations.

Table A5. Kane et al. (2013) results.

Teacher Effectiveness on Student Achievement by Grade Level

Coefficient on expected student achievement in teacher's class:	Math and ELA Stacked
Grades 4 and 5	0.994*** (0.153)
Grades 6 through 8	0.892*** (0.209)
p-value for test of equal coefficients	0.693
Observations	27,255
R-squared	0.684
Number of randomization blocks	619

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note: The sample consists of all randomized students in grades 4 through 8. The dependent variable is student achievement on state tests following random assignment in 2011, standardized by grade and district. Expected student achievement in a teacher's class is the prediction of the teacher's value-added in that subject, based on value-added, student surveys, and observations in the prior school year.

Author: Barbara Nye, Spyros Konstantopoulos, and Larry V. Hedges

Year: 2004

Title: How Large Are Teacher Effects?

Source: *Educational Evaluation and Policy Analysis* 26 (3): 237–57.

Setting: Tennessee

Design: Experimental, random assignment; 6377 students, grades K–3

Level of Evidence: Moderate

Abstract: It is widely accepted that teachers differ in their effectiveness, yet the empirical evidence regarding teacher effectiveness is weak. The existing evidence is mainly drawn from econometric studies that use covariates to attempt to control for selection effects that might bias results. We use data from a four-year experiment in which teachers and students were randomly assigned to classes to estimate teacher effects on student achievement. Teacher effects are estimated as between-teacher (but within-school) variance components of achievement status and residualized achievement gains. Our estimates of teacher effects on achievement gains are similar in magnitude to those of previous econometric studies, but we find larger effects on mathematics achievement than on reading achievement. The estimated relation of teacher experience with student achievement gains is substantial, but is statistically significant only for 2nd-grade reading and 3rd-grade mathematics achievement. We also find much larger teacher effect variance in low socioeconomic status (SES) schools than in high SES schools.

Results:

- Between-teacher (within-school) variance is more significant than between-school variance in both math and reading achievement.
- Variance of the teacher effects in mathematics is much larger than that in reading.
- Teacher experience is significant for 2nd grade reading and 3rd grade math (substantial for all other areas).
- Larger teacher effect variance on low SES schools than high SES schools.
- Teacher experience and teacher education explained much variance in teacher effects

Cite This Article

Kimmel, Sue C., Marcia A. Mardis, Shana Pribesh, Laura A. Pasquini, Barbara Schultz-Jones, Faye R. Jones, Lois D. Wine, and Lenese M. Colson. 2019. "The Preparation and Certification of School Librarians: Using Causal Educational Research about Teacher Characteristics to Probe Facets of Effectiveness."

<www.ala.org/aasl/slr/volume22/kimmel-mardis-pribesh-pasquini-jones-wine-colson>



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