

ABSTRACT

Dr. Joette Stefl-Mabry, Director of the School Library Program at the University at Albany, State University of New York; and Dr. Michael S. Radlick, Chief Executive Officer Learning Technology Visions, LLC. Albany, NY, are the Co-PIs for this research project: *Seeking Stronger Evidence of School Library Effects on Student Outcomes*. This three-year research project responds to IMLS's Laura Bush 21st Century Librarian Program's call for research, addressing key needs and challenges that libraries face—specifically school libraries. As an important aspect of education programs, school libraries need to provide strong evidence of their efficacy—how what they do, or the resources they provide result in student learning. We have developed an extensive set of research questions underlying our study, however all of our questions revolve around two key areas of inquiry: **whether** and **in what specific ways** do school libraries effect changes in students (both academically and behaviorally).

Although the effectiveness of school libraries has been investigated for over twenty-five years two critical components remain absent: one is strong, empirical evidence of how school librarians contribute to student success, and the second is an underlying theory of action or model, that provides clear linkages between what a school librarian does, or the resources that a school librarian provides, and the effect on student outcomes (American Library Association, 2014; Grover & Fowler, 1993; Morris & Cahill, 2017; Stefl-Mabry & Radlick, 2017). To work towards addressing both of these concerns we will build upon our prior IMLS research, in which we investigated the effect of school librarians on student achievement and created multiple statistical models based on five years of school-level data reflecting all public schools in New York State and expand our analyses to a total of eight years of data--making this the first longitudinal study of school library effects on academic outcomes using empirical analyses and replication across multiple years on a large population of school libraries—over 4,000 public school buildings.

In addition to academic outcomes, we will empirically examine the influence of a school librarian's experience, diversity, background, library schedule, curriculum, pedagogy, and administrative support on nonacademic, school-behavior related outcomes such as attendance and discipline. We will conduct statewide school librarian web surveys, and combine the web survey data together with our larger data set, making use of the extensive school library data collected each year by the New York Department of Education's Basic Educational Data Systems ([BEDS](#)) which provides yearly building level school library information on 45 different aspects of school library programs and resources. We will also use outcome measures from English language arts, mathematics and social studies (Grades 3-8 and English, Math and Grades 9-12 Social Studies Regents) and 40 other school demographic and climate variables for all public schools in New York State.

We will employ an outlier (beating the odds) analysis technique to identify top and bottom outliers to examine school library variables in the top (and bottom) 10% of schools that exceed (or fall below) predicted outcomes based on the statistical models. We will also conduct focus interviews of top and bottom outliers—to reveal the characteristics of SLs in the top performing schools to shape and inform theoretical models based on school library variables that truly make a difference. We will also attempt to gather similar data from other states to conduct a multi-state comparison. Additionally, we will try to identify the state of the racial diversity within the school librarian workforce in NYS, to explore whether racial interaction effects that have been found between students and teachers also exists with school librarians. The application and combination of several research methods will enable us to analyze our research questions from multiple perspectives.

Assembling strong evidence of library effects on student outcomes, addressing prior weaknesses in the research, and identifying the elements that influence school libraries' effect on student learning and behavior is of critical importance to all educators. School library characteristics, when demonstrated to positively affect student outcomes, may then be integrated into PreK-12 and higher education instructional practices: in school library, teacher education and school leadership programs and curricula. Thus, by allowing us to extend our work, we can provide a more credible school library research foundation of new understandings for practitioners as well as established and emergent researchers.

Project Title: Seeking Stronger Evidence of School Library Effects on Student Outcomes

Introduction

This three-year research project responds to IMLS's Laura Bush 21st Century Librarian Program's call for research, addressing key needs and challenges that libraries face—specifically school libraries. As an important aspect of education programs, school libraries need to provide strong evidence of their efficacy—how what they do, or the resources they provide effects students. We will build upon our prior IMLS research, in which we investigated the effect of school librarians on student achievement and created multiple statistical models based on five years of school-level data reflecting all public schools in New York State and expand our analyses to a total of eight years of data--making this the first longitudinal study of school library effects on academic outcomes using empirical analyses and replication across multiple years on a large population of school libraries—over 4,000 public school buildings. We will also work toward addressing seven methodological weaknesses identified in the prior project.

Statement of Broad Need

Seeking Stronger Evidence of School Library Effects on Student Outcomes builds on the results of our prior, three year IMLS research grant that explored the effects of school libraries (SLs) on student achievement in all public schools in New York State (NYS). In that research, we undertook a comprehensive methodological review of all research studies related to SLs and student achievement, and identified seven major weaknesses in the design and analysis of prior SL studies. This project focuses on addressing those limitations, and will generate critical foundational research using eight years of SL, school and student demographic characteristics, and achievement data for all public schools in NYS (4,000+ buildings) spanning the full gamut of urban, suburban and rural communities. We have established a series of research questions focused around two key areas of inquiry: **whether** and **in what ways** SLs effect changes in students (both academically and behaviorally). We will combine the eight years of longitudinal data on schools/libraries with multiple web surveys and interview data from school librarians. Feedback provided by our advisory board of practitioners, school administrators and researchers will help to shape and inform our work. Dissemination of our research results will take place through multiple channels, including both SL and general educational research publications, state and national conferences and online forums. We will host at least two webinars open to all educational practitioners, graduate and undergraduate students and researchers, along with a designated web site and blog to foster greater knowledge sharing and dialog across fields and disciplines. In the final year of this project we will design two professional development modules based on our findings, one for inservice and preservice education practitioners (including school librarians, teachers and school administrators) to help them to make use of our findings, and the other for library science and educational researchers to help strengthen the methodological design of future research.

Relevance of Our Research for Current Practice

Seeking Stronger Evidence of School Library Effects on Student Outcomes is in response to IMLS's Laura Bush 21st Century Librarian Program's call for research that addresses key needs and challenges that libraries face—specifically school libraries (SLs). As an important aspect of education programs school librarians need to provide strong evidence of their efficacy—how what they do, or the resources they provide result in student learning. This study will work toward providing critical foundational research on SLs, and attempt to improve the quality of SL research and practice by employing rigorous statistical techniques to identify what variables contribute to a school librarian's effectiveness as well as determining the strength of such variables. This study will expand our prior research to explore SL effects on school-related behaviors such as attendance and discipline, in addition to achievement. Results from this research will be used to shape and inform a theory of action (or description of how programs or activities influence the change process) by identifying evidence of variables that contribute to effective SL practice. This project has the potential to strengthen and improve SL practice, services and research to benefit all SL stakeholders: PreK-12 students, teachers, parents, administrators, and higher education school library and teacher training programs. Although the effectiveness

of SLs has been investigated for over twenty-five years two critical components remain absent: one is strong, empirical evidence of how school librarians contribute to student success, and the second is an underlying theory of action or model, that provides clear linkages between what a school librarian does, or the resources that a school librarian provides, and the effect on student outcomes (American Library Association, 2014; Grover & Fowler, 1993; Morris & Cahill, 2017; Stefl-Mabry & Radlick, 2017).

Project Team

Our project team is led by two Co-Principal Investigators funded through the project--**Dr. Joette Stefl-Mabry and Dr. Michael Radlick**. **Dr. Stefl-Mabry** is an Associate Professor, and director of the University at Albany's School Library Program, with an established track record in educational assessment and evaluation. In addition to her research publications (see CV) she has been the principal investigator of two IMLS funded projects *The School Librarian Effect on Student Academic Achievement in New York State Research Project*, and the *21st Century Assessment Planning for Educators (Project CAPE)* in which she designed an online course to enable teams of school librarians and teachers to collaboratively design, implement and assess PreK-12 curriculum. In 2017 Dr. Stefl-Mabry designed a *School Librarian Performance-Based Assessment* for New York State preservice school librarians which is currently being reviewed by MaryEllen Elia, the New York State Commissioner of Education and President of the University of the State of New York, for adoption as a new statewide school librarian certification requirement. Dr. Stefl-Mabry has served as an external evaluator for the Council on Addiction Prevention and Education of Dutchess County, and as an external evaluator for New York State Library's *Ready to Read Program*, funded by IMLS. In January, 2017 she and Dr. Radlick were hired by AASL as Research Associates for *CLASS II: Causality: School Libraries and Student Success II* project also funded by IMLS. She serves on the United University Professionals' (UUP) Teacher Education Task Force, as well as the NYSED's edTPA Special Regents' Taskforce. **Dr. Michael S. Radlick** is the chief executive officer for a research consulting company, Learning Technology Visions, LLC. Dr. Radlick was the Director of Planning Evaluation and Technology for the New York State Education Department for over 16 years, and has extensive experience and knowledge of school data systems and statistics. His work as an independent educational researcher, statistical modeler and program evaluator is known and respected throughout New York State (NYS) and beyond. Stefl-Mabry and Radlick both were invited as top researchers from across the nation to participate in the AASL Causality: School Libraries and Student Success (CLASS) research forum and also participate in the follow up CLASS Research Summit (American Library Association, 2014). Our research team's activities will be supported through the work of two doctoral students—**Yenisel Rodriguez Gulatee** an Information Science student and Hispanic researcher focusing on collaboration and group learning; and **Shannon Mersand**, an Information Science student, practicing school librarian, adjunct professor and instructional designer who was awarded *Teacher of the Year* by the New York State Association for Computing and Technology in Education in 2011, who is investigating the effect of Makerspaces.

Research Questions: We have a large set of detailed research questions underlying our study (see Supportingdoc1), however all of our research questions revolve around two key areas of inquiry: **whether** and **in what specific ways** do SLs effect changes in students (both academically and behaviorally). Among the most critical research questions our 8-year longitudinal data from over 4,000 schools, as well as our web survey data, will allow us to address are the following:

1. Do fulltime certified school librarians effect overall student achievement?
2. Do certified school librarians effect students' performance of statewide assessments in multiple subject areas.
3. What factors, including hours the library is open and staffed, book and technology resources available and available programs influence the effectiveness of certified school librarians?
4. Does educational background or experience influence the effectiveness of certified school librarians?
5. Do certain types of professional development experiences influence the effectiveness of certified school librarians?
6. Do the number of computers/laptops/Chromebooks, iPads, and/or other technologies influence the effectiveness of certified school librarians?

7. Are nonacademic student outcomes such as discipline and attendance influenced by certified school librarians?
8. Does the collaborative culture of the building influence the effectiveness of certified school librarians?
9. Does the demographic background of the SL such as ethnicity, age, gender, years in the building influence the effectiveness of certified school librarians?
10. Does the geographic location of the school (urban, rural or suburban) influence the effectiveness of certified school librarians?

To answer these questions, we will be using quantitative and qualitative data from NYSED's eight-year longitudinal database (reflecting SL, student and building demographics and student achievement data), along with web survey data from school librarians throughout NYS, to build statistical models and analyze results. We will follow up with interviews of top and bottom outliers to try and determine whether there are demographic, instructional, pedagogical, or curricular differences between the groups. The application and combination of several research methods will enable us to analyze our research questions from multiple perspectives to establish validity.

Theoretical Framework: Grounded theory, the systematic collection and reflective analysis of data to construct theory, underlies our overall conceptual approach (Miles & Huberman, 1994). Hypotheses regarding the effect of school librarians on student outcome are tentative at this point and will develop through the use of comparative analysis of the data. Hypotheses will emerge simultaneously with the collection and analysis of new data. As Merriam (1998) explains, "Thinking about data theorizing is a step toward developing a theory that explains some aspect of educational practice and allows a researcher to draw inferences about future activity" (p. 188). In addition, in our statistical modeling we will incorporate an econometric production function theoretical framework in considering how the school librarian/library contributes to student outcomes (either academic or behavioral). We will look at the connection between different resource inputs and the achievement/behavioral outcomes related to SLs using statistical models. We will also operate under a theoretical/conceptual assumptive framework that SLs and libraries reflect important school-level resources that, in conjunction with the rest of the educators in the building, have the potential to effect changes in students.

Data Sources: Our project will use three major data sources. First, we will extend our prior five-years of longitudinal data modeling to eight years (2011-2019) for all public schools in NYS using data from the NYSED Basic Educational Data System (BEDS), including demographic, SL, and student achievement data. Second, working with School Library Systems Directors and School Library Coordinators throughout NYS, we will conduct statewide SL web surveys to understand how trends revealed in the data reflect the realities of SL practice. The survey data—along with the larger set of school data that can be matched at the school building level—will allow us to identify what and how staffing, resources, library activities, and library structures affect student outcomes. This will allow us to dig more deeply into SL factors and understand their relationship to student outcome measures. Third, we will meet virtually twice a year with an advisory board representing researchers, practitioners, school administrators, higher education SL faculty and New York State Education Department officials: [John Brock](#), [Terrence Clark](#), [Dr. Mike Eisenberg](#), [Sara Kelly Johns](#), [Dr. David Loertscher](#), [Sheri McNair](#), and [Dr. Ruth Small](#). The advisory board will provide feedback, guidance, and practitioner insight addressing Cahill and Morris's call for more practitioner involvement in SL research (2017). Each advisory board member has been selected because of his/her background and professional expertise (see Supportingdoc2). The Advisory Board will help to shape the dissemination of information generated through various mediums (blog, online forums, professional development modules and/or website). Each board member is a leader within his/her specialized area (often across multiple content areas), and each understands the information needs of the stakeholders they represent. Advisory Board members also represent different geographical areas throughout the United States which will help to generate and promote conversations across a broad population of stakeholders. To promote knowledge sharing amongst researchers and practitioners the Co-PI's and doctoral students will host webinars and use our blog and online forums to encourage ongoing conversations amongst practitioners, researchers and other

interested parties (see: <https://sites.google.com/view/slesany/home>).

Data Collection and Analysis: Data is provided on an annual basis through an arrangement with the NYSED, and includes school building and district level demographic, economic, enrollment, attendance, discipline and achievement data for over 4,000 public schools in NYS. Web survey data is collected via statewide web surveys distributed to all school librarians in the state. Quantitative analysis, encompassing statistical modeling using SEM, is conducted primarily through a range of statistical tools—primarily Stata and R. Qualitative analysis is conducted using content analysis and constant comparative analysis of data using tools such as Text Analysis Markup System (TAMS) (<http://tamsys.sourceforge.net/>) and Inqscribe (<https://www.inqscribe.com/>).

Status of School Library Research: For decades, SL researchers and practitioners have sought to provide evidence of the positive effect of SLs on student achievement. We examined over 300 publications and identified the following weaknesses: 1) lack of an underlying theory of action 2) disproportionate reliance on descriptive data 3) conflation of correlation with causation 4) problems in measurement and statistical analyses 5) absence of replication studies 6) weak designs without comparability between library and non-library groups, and 7) evidence of publication bias focusing on positive results (Stefl-Mabry & Radlick, 2017; Stefl-Mabry, Radlick, Armbruster, & Keller, 2016).

We are not the first to call attention to methodological weaknesses in library and information science research (LIS). Martyn & Lancaster (1981) criticized the lack of rigor in LIS research and Winters (1996) reported being “...on the warpath for a number of years now because I believe that we as librarians do not replicate our own research as we should, and that the profession suffers as a result” (1996, p. 393). Powell (1997) too described the methodological design of LIS research as limited. The American Association of School Librarians (AASL) in 2014 called for a national research agenda to “investigate causal phenomena in school library instruction, resources, and services...through new directions in research” (American Library Association, 2014, p. 3). Zhang et al., (2016) reported that the quality of LIS research studies is currently being taken more seriously and that although research questions, research methodology and implications of research papers are widely recognized to determine the value of investigations “research methodology is one of the most important factors” to determine the quality of LIS research (p. 430). More recently, Morris & Cahill (2017) revealed that research methods used in SL research continue to “use less high-level statistical analysis than methods used in other fields of study in education” and no evidence of “experimental or quasi-experiment designs” (p. 17). The major goal of this project is to improve the quality of SL research and work towards gathering empirical **causal evidence** of how school libraries/ librarians contribute to student success. This is essential in order to generate a model or theory of effective school library practice. To speak to the design and analysis weaknesses of prior SL studies we have designed our project to address each of the seven limitations of prior SL research:

1. **Lack of a theory of action--** The unanswered critical question that emerged from our SL research review is “What is the theory of action for actual intervention of the school library/librarian that is influencing student achievement?” What is it that school librarians do, or what resources do they provide that influences student outcomes? Through the use of **structural equation modeling**, grounded theory and “beating the odds” analyses (looking statistically at schools with certified school librarians that perform better—top 10% and worse—bottom 10% than would be expected based on their characteristics) we will seek to understand how the different variables related to the professional role of a school librarian work together and contribute to student achievement to inform theory building (Abe et al., 2015; Miles & Huberman, 1994).

2. **Over-reliance on descriptive data--** Despite Grover and Fowler’s (1993) warning that SL researchers are “skimming across the surface of problems by gathering quantities of data using surveys or other single-method devices” (p. 11), Morris & Cahill (2017) reveal this trend continues despite caution from SL scholars “that over-reliance on surveys and questionnaires might be a symptom of an unhealthy profession” (p. 15). We will use a comprehensive data set making use of extensive SL data collected each year by the NYSED’s Basic Educational Data Systems (**BEDS**) which provides yearly building level SL information on 45 different aspects of SL programs and resources (see Supportingdoc3), as well as outcome measures from English

language arts and mathematics—Grades 3-8 and English, Math and Social Studies Regents—Grades 9-12, and 40 other school demographic and climate variables for all public schools in NYS; and with two statewide school librarian web surveys. We will link our web-survey data with the specific building data in our longitudinal database and explore an expansive range of analyses (e.g., scheduling, instruction, resources, collaborative support, diversity, educational background, and longevity within school buildings). In addition to examining student achievement and behavior data across school buildings, we will also analyze the data by the type of school (urban, suburban or rural). We will also attempt to gather similar data from other states to conduct a multi-state comparison. Additionally, we will try to identify the state of the racial diversity within the SL workforce in NYS, to explore whether racial interaction effects that have been found between students and teachers also exists with school librarians. Students' academic performance improved across all grade levels for male and female students, regardless of socio-economic status (Egalite, Kisida, & Winters, 2015; Sawchuk, 2015) and disciplinary incidents fell (Lindsay & Hart, 2017) when students were taught by a teacher of their own race/ethnicity. While this phenomenon has been studied with teachers, we know of no similar study that has been conducted with school librarians.

3. **Conflation of correlation with causation**-- Many prior studies did not account for other student or school-related covariates (Lance & Hofschire, 2012; Lance, Rodney, & Hamilton-Pennell, 2005; Small & Snyder, 2009). Correlational research can suggest that a relationship exists between variables, however it cannot prove that one variable causes the other. It might be the result of a third 'confounding' or 'lurking' variable" (Higgins, 2013, p. para 5). As Higgins explains there is a strong positive relationship between ice cream sales and drownings: when ice cream sales increase so do drownings. In the case of ice cream and drownings the hidden variable is the warm weather which increases ice cream sales and swimming. But ice cream and swimming have no relationship to each other—one does not cause the other. As a result of our prior IMLS funding we have created robust statistical models that will allow us to explore complex SL relationships and investigate [causal linkages](#) amongst variables. We will try to extract causal relationships from a complex set of longitudinal data to explore causal relationships across years, as well as different subject areas and populations.

4. **Problems in measurement and statistical analyses**--Another important research challenge relates to measurement. The reliability and validity of any measure needs to be addressed. Reliability relates to the consistency of a measure, while validity addresses whether the measure accurately reflects what it is supposed to measure. Many SL research studies rely on students' self-reported perceptions of the value of the SL and its effect on their learning (Tepe & Geitgey, 2005; Todd, 2004; Todd & Kuhlthau, 2005). Although self-reported measures can be a valuable source of information, they are "always subject to contamination" (Johnson & Christensen, 2017, p. 178) and the face validity – how well does the measure identify what we want to measure – is questionable (Remler & Van Ryzin, 2015). We are using high-stakes standardized educational tests which are often criticized as having low content validity because some dimensions of educational achievement may be missing. However empirically the test results predict later academic performance, a form of criterion-related validity known as predictive validity. We acknowledge that although standardized tests do a good job at capturing some dimensions of education, other elements may be missing. However, few measures capture the full scope of a complex construct and because the tests are common across all school buildings throughout NYS they provide us with an important and reliable outcome measure (Remler & Van Ryzin, 2015). Since academic outcomes may not be sufficiently sensitive to the kinds of effects that SLs have on students, we will also include measures of non-academic outcomes, such as student attendance and student discipline in our modeling. These kinds of non-academic outcomes are important because they may be more sensitive to the positive changes effected by school librarians.

5. **Absence of replication studies**--The strength of any evidence is dependent on the number and size of the studies being investigated. The essence of good research is replicability: the repeating of the same experiment with slightly different populations with the same result. Although we did report on one set of statistically significant results demonstrating the positive effect of SLs on student achievement in one year of our study (Radlick & Stefl-Mabry, 2015) we have not been able to replicate the same results in subsequent years. Using eight years of data will allow us to test the models across multiple subject areas, grade level groupings and different building population groups. Makel & Plucker (2014) explain "If education research wants to be relied upon in the real world, conducting independent replication is essential..." (p. 313).

6. **Weak research designs without comparability between library and non-library groups**--Most of SL research minimally accounts for other differences between schools with SLs and librarians, and schools without SLs. It is important in any statistical analysis to control for, or take account of the widest range of factors such as poverty status, school wealth, enrollment size and prior student academic achievement before comparing results from the SL and non-library groups. Our models consider a large number of confounding variables or covariates to ensure that the SL treatment group and the non-library control groups are comparable before analysis.

7. **Evidence of publication bias focusing on positive results**--The issue of using research to promote and support SLs has been an unspoken matter for decades (Steffl-Mabry & Radlick, 2017). Despite hundreds of studies examining the effect of SLs on student achievement, we were unable to find any that have challenged or negated the notion that SLs positively affect student achievement (see Supportingdoc4). As researchers, we understand the underlying circumstances to provide evidence that “school libraries work”. School librarians want to prove their value to the PreK-12 teaching and learning community. SL faculty, as other faculty in academia, regularly write articles for scholarly publication for tenure and promotion purposes to establish and protect their positions as faculty. However, the “publish or perish” edict which often focuses on quantity and not quality reflects a serious downside leading to competition for jobs and funding (Davies & Felappi, 2017). This is not to say that all prior SL research has been flawed but that its often-unarticulated intent was to identify weak results that were positive, and therefore could be used as support for SL positions, more staffing and more resources. This leaves practitioners with the misperception that there is strong evidence supporting the role of the school librarian when research has only been focused on positive results. This is prevalent in other fields and disciplines as well where “low-power research designs combined with publication bias favoring positive results together produce a literature with upwardly biased effect sizes (Open Science, 2015, p. 5). Fannelli (2012) analyzed over 4,600 papers published across disciplines that reportedly “tested” a hypothesis and reported a positive result. He found that the overall frequency of positive supports across disciplines has grown by over 22% between 1990 and 2007. Negative findings are important to advance scientific inquiry. At the core of this distinction is that the goal of research is “to tell the truth about some reality...to improve not to prove preexisting viewpoints or beliefs” (Mead, 2015, p. 261). The goal of promotion on the other hand is to affirm, reaffirm and/or bolster the promoter’s primary argument (Streib, 1988). While the SL field needs strong support, it also needs rigorous research. Publication bias is not unique to SL research as it has been documented in other fields as well. The fact is that very few journals focus on negative results. Negative results are not exciting, but they are critically important. Many disciplines are beginning to address this problem (Fannelli, 2012; Makel & Plucker, 2014; Matosin, Frank, Engle, Lum, & Newell, 2014).

While our work in this new project will be framed around trying to address these seven methodological weaknesses, in our previous research, we applied a range of statistical modeling techniques and examined five years of data on the effect of certified school librarians (staffing and library functions, library capabilities, instructional methods, operation and resources) on students’ English language arts and math achievement, while taking into account prior achievement, student demographic variables, and building level characteristics in every public school in New York State (N=4,520).

Important results of our prior IMLS research project (publications and abstracts are listed in Supportingdoc5) include:

- Conducted and published a systematic methodological review of all SL research (1990-2017) related to student achievement.
- Examined five years of data and statistically modeled the effect of SLs/librarians on academic outcomes in conjunction with a wide range of student demographics and other variables in [complex structural equation models \(SEM\)](#).
- Applied a type of value added modeling by controlling for prior year achievement in models.
- Used five years of data across two different subject-area sets of achievement outcome measures (English language arts and math) for two different target grade level groups (grades 3-8 and grades 9-12).
- Replicated analyses in two populations of schools (one large single city school district and all other public

schools in the state). We now have 40 different large-scale replications to test models with two subject areas, two age groups, two populations groups and five years of data.

- Created a variable reflecting the number of years that a particular school has a certified school librarian across the five years of data from 2011-12 to 2015-16.
- In addition to regular [structural equation modeling](#) and [regression modeling](#), employed both traditional [hierarchical linear modeling](#) (HLM) and [multi-level SEM](#) to address nested district level effects.
- Used data to build [treatment effects models](#) that examine achievement between schools with SLs and schools without SLs using [propensity score matching](#) and [inverse probability weighted regression](#) adjustment for matching treatment and control groups to assure they are comparable.
- Used an outlier (beating the odds) analysis technique to explore differences in scheduling, curriculum, support, pedagogy, and instruction between top and bottom outliers from different models using web survey data and statewide data.
- Designed full structural equation models and [confirmatory factor analysis](#), generating latent variables of librarian and SL characteristics, based on the web survey data, in conjunction with the larger data set.
- Explored the challenges of designing and implementing randomized control trials (RCTs) in SLs.
- Began to explore other statistical techniques such as [quantile regression](#), [panel data mixed effects analysis](#), and [vector autoregression](#) to address both the strengths and weaknesses of the data in the models.

Findings from 2015-18 IMLS Research: Findings from our “beating the odds analysis”, in which we examined schools with libraries that exceed (or fall below) predicted outcomes based on the statistical models, thus far indicate a higher percentage of top ELA school librarian outliers have flexible schedules in elementary schools; have teachers accompanying their classes to the library; report teachers reaching out to them to collaborate; participate more often in curriculum development activities; align what is taught in their library to classroom activities; perceive an administration supportive of collaboration; believe that students’ home life provides more advantages, and view the community as providing opportunities to support students’ learning.

Depending on the outcome measure examined, we have found at least two years where having a certified school librarian in that school year had a statistically significant effect on student achievement. However, we cannot focus only on a few significant findings to support a positive SL claim without acknowledging the years in which we found no such effect. Such an approach would prevent us from developing a deeper understanding of the role of the SL and the development of a reliable theory of action to explain, with confidence, how SLs effect student achievement. Mixed results showing generally non-significant SL effects on student achievement are important as they push SL theory forward and demonstrate the challenge of identifying SL effects on student outcomes. Studies that find no effects “can still reveal important lessons and inspire new ideas that drive scientific progress” (Wei, 2016, p. para 1). Our results, though published in peer reviewed LIS and educational research venues, are not always well received by SL researchers who may feel that we are diminishing the value of SLs. In truth, we are trying to strengthen the profession by improving the quality of SL research using rigorous empirical techniques to document the causal effects of SLs on student outcomes to enable theory building. Our findings have inspired us to generate a deeper understanding of the causal effects school librarians have on student outcomes.

Building on Prior 2015-18 IMLS Research: This three-year research grant will enable us to build upon our prior IMLS research study, (IMLS Grant RE- 04-15-0081-15). In that study, we investigated the effect of school librarians on student achievement and created multiple statistical models based on five years of school-level data reflecting all public schools in NYS. In this project, we will expand our analyses to a total of eight years of data--making this the first longitudinal study of SL effects on academic outcomes using empirical analyses and replication across multiple years on a large population of SLs (over 4,000 public school buildings) representing urban, suburban and rural school districts. In addition to examining academic achievement outcomes, we will work toward providing evidence of the SL effect as well as the influence of the school librarian’s experience, diversity, background, scheduling, curriculum, pedagogy, instruction, and administrative support on student outcomes. We will empirically examine the effects of SLs on non-academic, school-behavior related outcomes,

such as attendance and discipline. We will conduct statewide school librarian web surveys, and combine the web survey data together with our larger data set. We appreciate the challenges of survey fatigue among librarians and will work to address it through shorter, more focused surveys and better outreach to understand why surveys are important. We will continue to employ the use of a “beating the odds” or outlier analysis strategy, which looks statistically at schools with certified school librarians that perform much better—top 10% (and much worse—bottom 10%) than would be expected based on their characteristics, and then examines what SL variables may be (or not be) in those schools with certified school librarians that most fall below predicted outcomes based on the statistical models. We will also conduct focus interviews of top and bottom outliers—to hopefully reveal the characteristics of SLs in the top performing schools that would allow us to formulate theoretical models based on SL variables that truly make a difference. We will also work to extend our models to other states, to identify SL data from states and attempt to replicate the models we have developed. Finally, we will design two self-paced professional development (PD) modules, one for inservice and preservice practitioners (including school librarians, school administrators, graduate and undergraduate students as well as other interested parties) to help them to make use of our findings in educational practice, a second PD module will focus on research design and methodologies will open to researchers and graduate and undergraduate students across disciplines to help strengthen the design of subsequent research. These modules will be designed as Massive Open Online Courses (MOOCs) similar to Coursera (<https://www.coursera.org/>) and EdX (<https://www.edx.org/>), and will be freely available. We will work with our Advisory Board to disseminate information to various stakeholders about the availability of the two PD modules.

Project Timeline:

Year 1: June 2018-May 2019

Research

- July 2018– June 2019- Using existing and new data, extend existing statistical (structural equation) models
- September 2018 - Based on models identify top and bottom outliers using 2016-17 and 2017-18 NYSED school performance and BEDS data.
- September 2018- Identify SL variables for additional focus based on top and bottom outliers. Integrate web survey data.
- October 2018 – June 2019 - Explore possibilities of attaining similar SL data from other states.
- October 2018 – June 2019 - Design first web-survey for all school librarians throughout NYS based on outlier findings across multiple years.

Dissemination

- July 2018 – June 2019- Generate and publish reports on models, survey results and outlier findings based on 2017-18 data. Target non-library focused, peer reviewed conferences and publications (AERA and SREE) in addition to SL-focused conferences and publications.
- October 2018 and May 2019- Meetings with Advisory Board to share findings. Solicit questions, concerns, feedback, discuss dissemination efforts.
- June 2019 - Meet with external reviewer, solicit questions, concerns and feedback.
- June 2019- IMLS 2018-19 Annual Interim Report.

Year 2: June 2019-May 2020

Research

- July – June 2019- Extend existing models with new annual data to investigate academic outcome as well as school behavior-related outcomes such as attendance and discipline. Generate structural equation models with listings of schools’ top and bottom outliers
- July – June 2019 - Explore possible data sets from other states.
- July – December 2019 – Design Web Survey
- January 2020 - Disseminate 2020 New York Public School Library Web Survey to all public school librarians in NYS.
- February – June 2020- Analyze 2020 web survey data
- February - June 2020 - Conduct follow up telephone, onsite or virtual interviews with top and bottom

outliers identified in 2018-19 NYSED school performance and BEDS data, as well as 2020 Web Survey data

- May – June 2020 - Integrate 2020 web survey data to 2018-19 NYSED school performance data and BEDS data
- June 2020- Identify areas for focus related to 2018-19 top and bottom outliers

Dissemination

- July 2019 – June 2020- Generate and publish reports on models, survey results and outlier findings based on 2018-19 data.
- August-September 2019 - Publicize webinar through SL and non-library-related venues
- October 2019 - Conduct First Webinar
- October – June 2020- Design PD modules for practitioners and researchers.
- January – May 2020- Pilot PD modules with graduate students.
- October 2019 and May 2020- Two meetings with Advisory Board to share findings. Solicit questions, concerns, feedback, discuss dissemination efforts.
- June 2020 - Meet with external reviewer, solicit questions, concerns and feedback.
- June 2020 - IMLS 2019-2020 Annual Interim Report.

Year 3: June 2020-May 2021

Research

- July – April - Extend existing models with new annual data and generate structural equation models with listings of schools' top and bottom outliers using 2019-2020 NYSED school performance data and BEDS data.
- July – April - Extend existing models with other state data and generate structural equation models for data sets
- July – December 2020 - Design second web-survey for all school librarians throughout NYS based on 2019-20 outlier findings and models.
- January 2021 - Disseminate 2021 New York Public School Library web survey to all public school librarians.
- February – April 2021 - Analyze 2021 web survey data.
- February – April 2021 - Integrate 2021 web survey data with 2019-20 NYSED school performance data and BEDS data
- April – May 2021 - Identify areas of focus related to 2019-20 top and bottom outliers and models

Dissemination

- July 2020 – June 2021- Generate and publish reports on models, survey results and outlier findings based on 2019-20 data. Target non-library focused, peer reviewed conferences and publications (AERA and SREE) in addition to SL-focused conferences and publications (AASL, IASL, ALISE).
- October 2020 and May 2021 - Meetings with Advisory Board to share findings. Solicit questions, concerns, feedback.
- December 2020 – April 2021 - Update professional development modules based on feedback and current findings
- March 2020 - April-2021: Publicize webinar through SL and non-library-related vehicles
- May 2021- Conduct second webinar and share PD links for practitioners and researchers.
- May 2021 - Disseminate professional development modules
- June 2021 - Meet with external reviewer, solicit questions, concerns and feedback.
- June 2021 - IMLS Final 2018-2021 Performance Report

Diversity Plan

NYS is a highly diverse state with 733 school districts, 4,458 school buildings and 2,640,250 students—reflecting urban, suburban, and rural locations. NYS's public school student populations reflect the widest range of backgrounds and abilities, mirroring the entire U.S. population. We will attempt to obtain from NYSED, ethnicity data for all school librarians, thereby allowing us to analyze the effect of SL diversity in

addition to other factors on student outcomes. We have an ongoing commitment from the [Office of Diversity and Inclusion](#) at UAlbany which has helped us recruit a doctoral student who has worked on our prior IMLS grant, and will continue to work with us should this grant proposal be funded. Yenisel Gulatee is a native-born Cuban, now an American citizen, studying in the area of information science. As a Hispanic researcher, she provides special insight into our work, and as she develops her research knowledge and experience, she will be able to make important contributions to the field. The educational benefits from diversity are many: "the vitality, stimulation, and educational potential of an institution are directly related to the composition of its student body, faculty, and staff" (Allen, Bonous-Hammarth, & Teranishi, 2012, p. 374).

Evaluation Plan: The project includes an outside, independent program evaluator, [Dr. William Doane](#), (research staff member with [IDA Science & Technology Policy Institute](#)) who will review our project at different stages and provide formative evaluation information to the principal investigators. The formative evaluation component will focus on overall project implementation with a special focus on the design components of the grant (web-survey instrumentation, telephone survey rubrics and on-site observational rubrics), the statistical modeling components, and analysis and reporting components, identifying where activities may not be on task or where improvements might be made. In addition, he will provide a final report assessing the outcomes of the project along with recommendations (summative evaluation). The principal investigators in this project have worked with the independent evaluator on previous projects and have found his focused feedback to be invaluable in insuring effective project implementation.

Dissemination Plan: In addition to our website, blog and webinar and with sustained assistance from the Advisory Board, we will share our findings with school library practitioners, educators, administrators and researchers in regional, state and national forums. We hope to generate conversations and explore how our research can help to shape and inform educational practice. In addition, our research findings will be submitted as papers and conference presentations in library and information science research and practitioner-based venues including the American Association of Information Science & Technology (ASIS&T), Association for Library and Information Science Education (ALISE), the American Association of School Librarians (AASL), the International Association of School Librarians (IASL), the New York Library Association (NYLA) and educational research venues: the American Educational Research Association (AERA), Society for Research on Educational Effectiveness (SREE) and others. Our blog, online forums, webinars, website and PD modules will be open and freely accessible to preservice and inservice practitioners, school administrators, information science and educational researchers, undergraduate and graduate students. Information and resources related to this project will be posted to our website: <https://sites.google.com/view/slesany/home> which will remain as a digital resource after the completion of the grant period.

Broad Impact Performance Goals and Outcomes: Our prior IMLS funded research demonstrates our ability to provide rigorous research that pushes the boundary of SL research. Assembling strong evidence of library effects on student outcomes and identifying the elements that influence SLs' effect on student learning and behavior is of critical importance to all educators. SL characteristics, when demonstrated to positively affect student outcomes, can then be integrated into PreK-12 and higher education instructional practices, as well as in library science, teacher education and school leadership programs and curricula. Thus, by allowing us to extend our work, we can provide a more credible SL research foundation of new understandings for practitioners as well as established and emergent researchers.

Schedule of Completion

2018-2019

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
	Research											
Using existing and new data, extend existing statistical (structural equation) models												
Identify top and bottom outliers - 2016-17 and 2017-18												
Identify SL variables for additional focus												
Design of web-survey												
Explore other states for data sets												
	Dissemination											
Generate and publish reports on models, survey results and outlier findings												
Meet with Advisory Board												
Meet with external reviewer												
IMLS 2018-19 Annual Interim Report												

Schedule of Completion

2019-2020

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	
	Research												
Extend existing models with new annual data -add school behavior-related outcomes													
Explore other states for data sets													
Design of web-survey													
Disseminate 2020 New York Public School Library Web Survey to all public school librarians in NYS.													
Analyze 2020 web survey data													
Follow up interviews with top and bottom outliers 2018-19 NYSED/2020 Web Survey data													
Integrate 2020 survey data to 2018-19 NYSED school performance data and BEDS data													
Identify areas for focus related to 2018-19 top and bottom outliers													

Dissemination

Generate and publish reports on models, survey results and outlier findings													
Design PD modules for practitioners and researchers													
Pilot PD modules with graduate students													
Publicize webinar through SL and non-library-related vehicles													
Conduct webinar													
Meet with Advisory Board													
Meet with external reviewer													
IMLS 2019-2020 Annual Interim Report.													

Schedule of Completion

2020-2021

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	
	Research												
Extend existing models with new annual data and generate structural equation models Including other states													
Extend existing models with other state data and generate structural equation models for data sets													
Design of web-survey													
Disseminate 2021 New York Public School Library web survey to all public school librarians.													
Analyze 2021 web survey data.													
Integrate 2021 survey data to 2019-20 NYSED school performance data and BEDS data													
Identify areas of focus related to 2019-20 top and bottom outliers and models													

Dissemination

Generate and publish reports on models, survey results and outlier findings												
Meet with Advisory Board												
Meet with external reviewer												
Publicize webinar through all SL and non-library-related venues.												
Conduct webinar reviewing all research.												
Update professional development modules based on feedback & new results												
Disseminate professional development modules												
IMLS Final 2018-2021 Performance Report												

DIGITAL PRODUCT FORM

Introduction

The Institute of Museum and Library Services (IMLS) is committed to expanding public access to federally funded digital products (i.e., digital content, resources, assets, software, and datasets). The products you create with IMLS funding require careful stewardship to protect and enhance their value, and they should be freely and readily available for use and re-use by libraries, archives, museums, and the public. However, applying these principles to the development and management of digital products can be challenging. Because technology is dynamic and because we do not want to inhibit innovation, we do not want to prescribe set standards and practices that could become quickly outdated. Instead, we ask that you answer questions that address specific aspects of creating and managing digital products. Like all components of your IMLS application, your answers will be used by IMLS staff and by expert peer reviewers to evaluate your application, and they will be important in determining whether your project will be funded.

Instructions

- Please check here if you have reviewed Parts I, II, III, and IV below and you have determined that your proposal does NOT involve the creation of digital products (i.e., digital content, resources, assets, software, or datasets). You must still submit this Digital Product Form with your proposal even if you check this box, because this Digital Product Form is a Required Document.

If you ARE creating digital products, you must provide answers to the questions in Part I. In addition, you must also complete at least one of the subsequent sections. If you intend to create or collect digital content, resources, or assets, complete Part II. If you intend to develop software, complete Part III. If you intend to create a dataset, complete Part IV.

Part I: Intellectual Property Rights and Permissions

A.1 What will be the intellectual property status of the digital products (content, resources, assets, software, or datasets) you intend to create? Who will hold the copyright(s)? How will you explain property rights and permissions to potential users (for example, by assigning a non-restrictive license such as BSD, GNU, MIT, or Creative Commons to the product)? Explain and justify your licensing selections.

The digital products we intend to create will be solely owned by The Research Foundation for the State University of New York (FOUNDATION). All copyrights for the digital products created will be solely owned/held by FOUNDATION. We do not anticipate creating any software through performing the project so the non-restrictive licenses mentioned would not be required. However, we do intend to offer non-commercial, non-restrictive Creative Commons licenses for copyrights to the digital products created under the project. The Research Foundation for the State University of New York (SUNY) is a private, non-profit educational corporation that manages and administers sponsored research across the 64 institution SUNY system to ensure ethical conduct and financial transparency. The Research Foundation works with the academic and business leadership of campuses to support research and discovery at SUNY through efficient and skillful administration of sponsored projects and adept transfer and sharing of intellectual property for public benefit and economic growth. Based on this role we feel it is responsible and appropriate to license copyrights to the digital products through the Foundation as a way to benefit the public good and responsibly balance the interests of all interested parties.

A.2 What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

The digital products we intend to create will be solely owned by The Research Foundation for the State University of New York (FOUNDATION). All of our products will be publicly available via our website and available for download and use. All products will include a FOUNDATION copyright and statement.

A.3 If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

We will not create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any

cultural sensitivities.

Part II: Projects Creating or Collecting Digital Content, Resources, or Assets

A. Creating or Collecting New Digital Content, Resources, or Assets

A.1 Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and format you will use.

Webinars – 2 – YouTube Live in collaboration with School Library Media Specialists of Southeastern New York (SLMSSSENY) – recorded and posted on YouTube by SLMSSSENY

Professional Development Modules – 2 self-paced modules will be created using a platform such as Canvas, Coursera or EdX – enrollment will be free for any who wish to participate

Website and Blog posts – Information will be disseminated on our website and blog throughout the project. The Blog is hosted on Google Blogger, the website on Google Sites.

A.2 List the equipment, software, and supplies that you will use to create the content, resources, or assets, or the name of the service provider that will perform the work.

Google Sites, Google Blogger, YouTube Live, PowerPoint, Google Presentations, iMovie, Audacity, Adobe Creative Suite, Graduate Students

A.3 List all the digital file formats (e.g., XML, TIFF, MPEG) you plan to use, along with the relevant information about the appropriate quality standards (e.g., resolution, sampling rate, or pixel dimensions).

At this time, the intention is to use PDF format in print quality format, as well as accessible formats such as PowerPoint, Google Presentations, Word, and Google Docs. Any video or audio created will be accompanied by transcription. Specific information about products to be created using a Coursera, EdX or Canvas are unknown at this time, though every effort will be made to ensure that they are high resolution and ADA compliant.

B. Workflow and Asset Maintenance/Preservation

B.1 Describe your quality control plan (i.e., how you will monitor and evaluate your workflow and products).

The Co-PI's together with the Advisory Board as well as other practitioners, researchers and graduate students (as appropriate) will be asked to provide feedback on all products created, and adjustments may be made based upon iterative feedback.

B.2 Describe your plan for preserving and maintaining digital assets during and after the award period of performance. Your plan may address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

Professional Development Modules, Blog Posts and Webinars will remain available on free services for the duration of and for a period of at least 5 years after the grant period. These services include Google products such as Sites, Blogger and Google Drive – provided they remain free.

C. Metadata

C.1 Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata. Specify

which standards you will use for the metadata structure (e.g., MARC, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

N/A

C.2 Explain your strategy for preserving and maintaining metadata created or collected during and after the award period of performance.

N/A

C.3 Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content, resources, or assets created during your project (e.g., an API [Application Programming Interface], contributions to a digital platform, or other ways you might enable batch queries and retrieval of metadata).

N/A

D. Access and Use

D.1 Describe how you will make the digital content, resources, or assets available to the public. Include details such as the delivery strategy (e.g., openly available online, available to specified audiences) and underlying hardware/software platforms and infrastructure (e.g., specific digital repository software or leased services, accessibility via standard web browsers, requirements for special software tools in order to use the content).

Our products will be made openly available online via our website: <https://sites.google.com/view/slesany/>
Professional Development modules will be made publicly available via the platform chosen for hosting.

D.2 Provide the name(s) and URL(s) (Uniform Resource Locator) for any examples of previous digital content, resources, or assets your organization has created.

Website: <https://sites.google.com/view/slesany/>
October 2017 Webinar: <https://youtu.be/WeOIUjzOo9U> <https://youtu.be/WeOIUjzOo9U>
Blog: <https://schoollibraryeffect.blogspot.com/>

Part III. Projects Developing Software

A. General Information

A.1 Describe the software you intend to create, including a summary of the major functions it will perform and the intended primary audience(s) it will serve.

We do not intend to create any software.

A.2 List other existing software that wholly or partially performs the same functions, and explain how the software you intend to create is different, and justify why those differences are significant and necessary.

N/A

B. Technical Information

B.1 List the programming languages, platforms, software, or other applications you will use to create your software and explain why you chose them.

N/A

B.2 Describe how the software you intend to create will extend or interoperate with relevant existing software.

N/A

B.3 Describe any underlying additional software or system dependencies necessary to run the software you intend to create.

N/A

B.4 Describe the processes you will use for development, documentation, and for maintaining and updating documentation for users of the software.

N/A

B.5 Provide the name(s) and URL(s) for examples of any previous software your organization has created.

N/A

C. Access and Use

C.1 We expect applicants seeking federal funds for software to develop and release these products under open-source licenses to maximize access and promote reuse. What ownership rights will your organization assert over the software you intend to create, and what conditions will you impose on its access and use? Identify and explain the license under which you will release source code for the software you develop (e.g., BSD, GNU, or MIT software licenses). Explain and justify any prohibitive terms or conditions of use or access and detail how you will notify potential users about relevant terms and conditions.

N/A

C.2 Describe how you will make the software and source code available to the public and/or its intended users.

N/A

C.3 Identify where you will deposit the source code for the software you intend to develop:

Name of publicly accessible source code repository:

URL: N/A

Part IV: Projects Creating Datasets

A.1 Identify the type of data you plan to collect or generate, and the purpose or intended use to which you expect it to be put. Describe the method(s) you will use and the approximate dates or intervals at which you will collect or generate it.

We will use data that is made publicly available by the New York State Department of Education. We will also be conducting web-based surveys and virtual and face-to-face interviews. Please see the project timeline for approximate dates of collection.

A.2 Does the proposed data collection or research activity require approval by any internal review panel or institutional review board (IRB)? If so, has the proposed research activity been approved? If not, what is your plan for securing approval?

The proposed data collection requires IRB review as it involves human subjects research. An IRB protocol submission application has already been submitted under our previous IMLS Grant RE-04-15-0081-15 and has been approved through October 16, 2018. [#15-X-231-03 “The School Librarian effect on Student Academic Achievement in New York State Research Project” Approval Period: 10/17/15 – 10/16/18]

A.3 Will you collect any personally identifiable information (PII), confidential information (e.g., trade secrets), or proprietary information? If so, detail the specific steps you will take to protect such information while you prepare the data files for public release (e.g., data anonymization, data suppression PII, or synthetic data).

N/A

A.4 If you will collect additional documentation, such as consent agreements, along with the data, describe plans for preserving the documentation and ensuring that its relationship to the collected data is maintained.

N/A

A.5 What methods will you use to collect or generate the data? Provide details about any technical requirements or dependencies that would be necessary for understanding, retrieving, displaying, or processing the dataset(s).

Audio recorders, written notes, online survey tool such as SurveyMonkey.

A.6 What documentation (e.g., data documentation, codebooks) will you capture or create along with the dataset(s)? Where will the documentation be stored and in what format(s)? How will you permanently associate and manage the documentation with the dataset(s) it describes?

Data made publicly by the New York State Education Department available will be used in statistical analysis programs.

A.7 What is your plan for archiving, managing, and disseminating data after the completion of the award-funded project?

Data will be retained for 5 years

A.8 Identify where you will deposit the dataset(s):

Name of repository: New York State Education Department

URL: www.nysed.gov

A.9 When and how frequently will you review this data management plan? How will the implementation be monitored?

Annually. Implementation will be monitored by the project PI.