

PROMISING PRACTICES

Educational Research Applied to the Shared Foundations

A Report of the CLASS II
Research Project



American Association
of School Librarians
TRANSFORMING LEARNING

Acknowledgments

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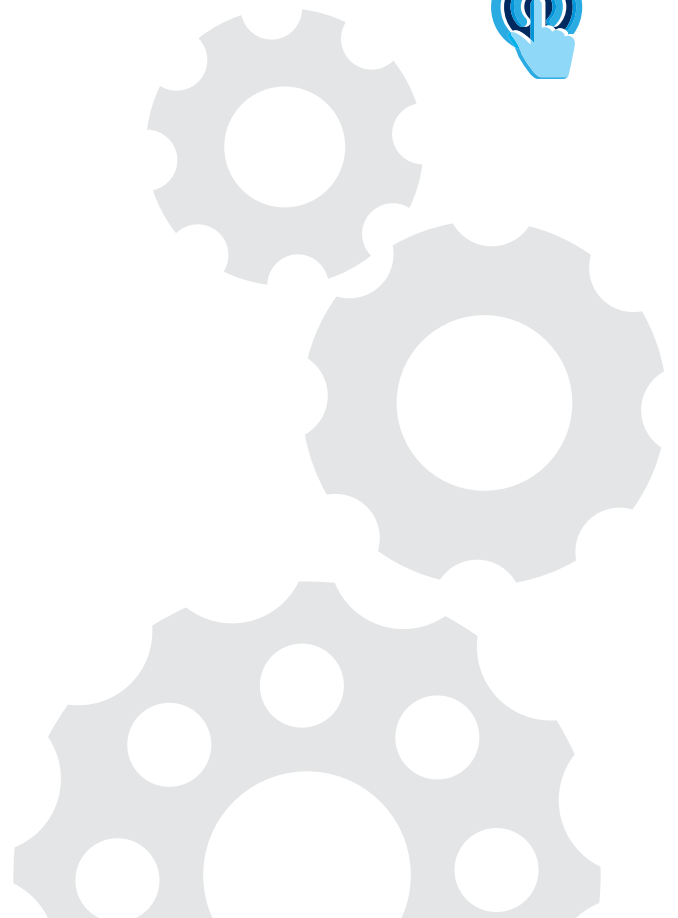
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Table of Contents



2	Introduction
16	Shared Foundations
16	INQUIRE
32	INCLUDE
40	COLLABORATE
50	CURATE
60	EXPLORE
70	ENGAGE
78	Works Cited
88	CLASS Publications and Products



Introduction

The American Association of School Librarians' (AASL) Causality: School Libraries and Student Success II (CLASS II) project (IMLS RE-00-15-0114-15, 2015–2020) was the first step in developing a long-term, three-phase school library research agenda to investigate causal relationships between school libraries staffed by professionally prepared school librarians and student learning. CLASS II built on the outcomes of AASL's Causality: School Libraries and Student Success (CLASS I) National Forum (IMLS LG-62-13-0212-13, 2013–2014) in which researchers convened to discuss relationships between student learning and school libraries and to articulate how to build a research agenda to surface evidence of causal links between school library instruction, resources, and services and learner outcomes.

CLASS II researchers were guided by the research question: What causal relationships between school-based malleable factors and student learning are present in published research? School-based factors were defined

as learning activities that occur within school, such as classroom practices, after-school programming, or other factors that might be manipulated within a school. The goal of this research was to identify what educators were doing in the classroom related to positive learner outcomes. Further developing and testing these promising practices would be the basis for a research agenda for school library researchers and practitioners to investigate using causal designs in their own schools and school libraries.

Over five years, the researchers investigated the research question using the process outlined in the Research Methodology section of this report (p. 8–11). The researchers aggregated and synthesized high-quality published research and distilled the identified promising classroom practices into a variety of scholarly and informational products for researchers and practitioners. The CLASS Publications and Products (p. 88) details this output. A final phase of the project included testing promising research findings in small-scale field studies to spark further research development.



This report, designed for school library researchers and practitioners, features syntheses of select CLASS II research findings as they relate to the Shared Foundations of Inquire, Include, Collaborate, Curate, Explore, and Engage from AASL's *National School Library Standards for Learners, School Librarians, and School Libraries* (2018). Each synthesis includes a brief topical overview, narrative descriptions of relevant research studied, and recommendations for operationalizing research on the topic. Synthesized studies were drawn from the CLASS II Dataset of Educational Research Studies 1985–2016, available through AASL. In addition to future research directions, the syntheses are accompanied by research scaffolds: three Shared Foundation syntheses provide reports of field studies that employed causal designs and three Shared Foundation syntheses outline conjecture maps that illustrate how promising findings might be operationalized in a study.

Major Areas of Educational Research from the Shared Foundation Syntheses

Table 1 provides an overview of the major areas in educational research that provide promising directions for causal research in school librarianship that the CLASS II researchers identified. Each area is detailed within the corresponding Shared Foundation synthesis.

How to Use This Report

The CLASS II researchers' work was not proscribed by the AASL Standards; in fact, the standards were released well into the CLASS II project. However, the standards provide a useful lens through which to view the project's research findings since the aim of CLASS II was to provide empirical evidence that would enable library and information practitioners, researchers, supporters, and advocates to meaningfully connect with education policy decision-makers and lawmakers for partnerships to improve learning for all K–12 learners. The

SHARED FOUNDATION	RESEARCH SYNTHESIS AREA		
	LEARNER	SCHOOL LIBRARIAN	SCHOOL LIBRARY
INQUIRE	Strengthening Intellectual Tools <ul style="list-style-type: none"> • Goal Setting • Inquiry Processes • Problem-Solving Skills • Interdisciplinary Curriculum Integration • Self-Regulated Learning 	Instructional Approaches <ul style="list-style-type: none"> • Conceptual Challenges • Creativity Training • Explicit Instruction • Learner Directed • Resource-Based Instruction • Assessment • Feedback • Domain Dependence • Questioning • Metacognitive Conversation 	Climate
INCLUDE	Self-Concept Inclusive Learning	Knowledge of Learners <ul style="list-style-type: none"> • Learning Trajectories • Educator Perception of Learners • Individualized Instruction 	Opportunities to Learn <ul style="list-style-type: none"> • Access to Resources • Access to Instruction Interdisciplinary Instruction
COLLABORATE	Shared Learning Experiences	Co-Planning and Co-Teaching Strategies Professional Developer, Mentor, and Leader	Leadership Parent Involvement
CURATE	Thinking Skills and Strategies <ul style="list-style-type: none"> • Concept Mapping • Visual Skills • Skill Development • Note-Taking 	Challenging Learners <ul style="list-style-type: none"> • Youth Development Model • Educator-Led Strategies Expert Curation	School Library as Instructional Resource Access to Resources <ul style="list-style-type: none"> • Online Information • Media Rich and Curriculum Related • Access to Computers • Resources at Home
EXPLORE	Opportunities to Explore with Concrete Materials <ul style="list-style-type: none"> • STEM Learning • Technology-Aided Instruction 	Interventions Disrupt Low Reading Achievement <ul style="list-style-type: none"> • Integrating Reading with Content • Talking about Reading • Modeling Reading 	Space for Social Learning Readers Need Practice <ul style="list-style-type: none"> • Reading Is Learned Outside School • Access to Reading Materials
ENGAGE	Socio-Emotional Learning <ul style="list-style-type: none"> • Parent Involvement • Self-Perception • Structured Curriculum Life beyond School <ul style="list-style-type: none"> • Mentored Learning • Adventure-Based Curricula 	Experts in the Field	Opportunities to Lead and Communicate Support for College Success School Day Configurations

TABLE 1. Major areas from research syntheses.

CLASS II findings also provide researchers and practitioners with many opportunities to identify and further evidence-informed, sustainable, precedent-setting strategies for learners.

While the CLASS II project results do not provide definitive answers to the causal link between school librarianship and learning, they do offer promising directions. Suggested queries for future pursuit offer promising research areas for a variety of audiences. Other gaps identified by readers in the existing research could be useful in building additional conjectures for exploration.

Each Shared Foundation synthesis includes queries or questions that might provoke practitioners and researchers to apply the findings to practice. Practitioners are encouraged to use these queries for reflection and as a basis for action research to improve their practice. The queries could also form the basis for research questions to be applied by researchers in the field. The queries encourage school library researchers and practitioners to probe for ways in which the *National School Libraries Standards* can improve practice and promote learning in both practice and research. Practitioner and researcher partnerships truly leverage the power of these findings in applying the Shared Foundations.

The report includes references to studies in the Dataset of Educational Research Studies 1985–2016 from the data aggregation accomplished by the CLASS II researchers. Some studies outside of the final dataset have been included in the syntheses as they helped to illuminate findings related to the Shared Foundations.

Causal research, by its nature, depends on the specific context in which it is applied. We encourage researchers and practitioners to partner for robust and rigorous research that further defines the elements of school librarianship that advance learning.

Future Directions

In addition to reflection, conjectures, and research concerning the impact of school libraries and school librarians on learner outcomes, the CLASS II researchers recommend several directions for continuing this work.

Pursue funding to advance research conjectures and researcher-practitioner partnerships to further investigate the areas addressed in this publication. Feedback from attendees at conference presentations indicates that scholars and practitioners are very interested in pursuing conjecture mapping and researcher-practitioner partnerships for future research.

Continue to frame research through the application of the Shared Foundations from the AASL Standards.

Create a dedicated online space and project team to advance ongoing research and assist with the construction and dissemination of research activities. This would further support the third goal in AASL's strategic plan, "AASL advances research that informs school librarian practice," and its objectives to:

- Facilitate evidence-informed school librarian practices.
- Increase visibility of research related to school librarians.
- Communicate research findings to practitioners and other leaders. (2019)

CLASS II Background

The Causality: School Libraries and Student Success II (CLASS II) project (IMLS RE-00-15-0114-15, 2015–2020) was the first step in developing a long-term, three-phase school library research agenda to investigate causal relationships between school libraries staffed by professionally prepared school librarians and student learning. CLASS II built on the outcomes of the Causality: School Libraries and Student Success (CLASS I) National Forum (IMLS LG-62-13-0212-13, 2014–2014) in which researchers convened to discuss relationships between learning and school libraries and to articulate how to build a research agenda to surface evidence of causal links between school library instruction, resources, and services and learner outcomes.

The CLASS projects were the culmination of earlier events influencing AASL's support for empirical research. In 2009, AASL contracted with Learning Point Associates (Hoogstra et al. 2009) to examine a subset of what were known as the “state” or “impact” studies revealing correlations between strong school libraries staffed by professional school librarians with learner achievement. The consultants identified a weakness in the lack of causal evidence connecting school libraries directly with learner achievement and eliminating other explanations. The Learning Point Associates report provided one impetus for AASL to successfully conduct a national forum titled “Causality: School Libraries and Student Success (CLASS),” funded by an IMLS grant.

In April 2014, fifty researchers interested in school libraries convened for the first CLASS Research Forum. Dr. Gail Dickinson, one of the participants, later described a restlessness among school library researchers at that forum. At this first research forum, participants heard from Dr. Thomas Cook, an influential methodologist in education research, and a panel of expert scholars and researchers. Participants also provided input for the publication of a white paper titled *Causality: School Libraries and Student Success (CLASS)*.¹ The white paper outlined an ambitious ten-plus-year national research agenda (shown in Figure 1) aimed at exploring causal phenomena through experimental and quasi-experimental designs in school library research.

Following the success of the CLASS National Forum, AASL was awarded CLASS II: Causality: School Libraries and Student Success, a research project focused on moving the national school library research agenda toward the causal analyses underlying the differences school librarians can make for learners. To conduct this research, AASL engaged researchers from Florida State University, Old Dominion University, and University of North Texas (see Acknowledgments on the inside front cover for a full list of researchers and project participants). The teams were guided by the research question “What causal relationships between school-based malleable factors and student learning are present in published research?” “School-based factors” are defined as learning activities that occur within and beyond school, such as classroom instruction, after-school programming, or other malleable factors.

1. AASL. 2014. *Causality: School Libraries and Student Success (CLASS)*. <www.ala.org/aasl/sites/ala.org/aasl/files/content/advocacy/research/docs/CLASSWhitePaper_FINAL.pdf>.

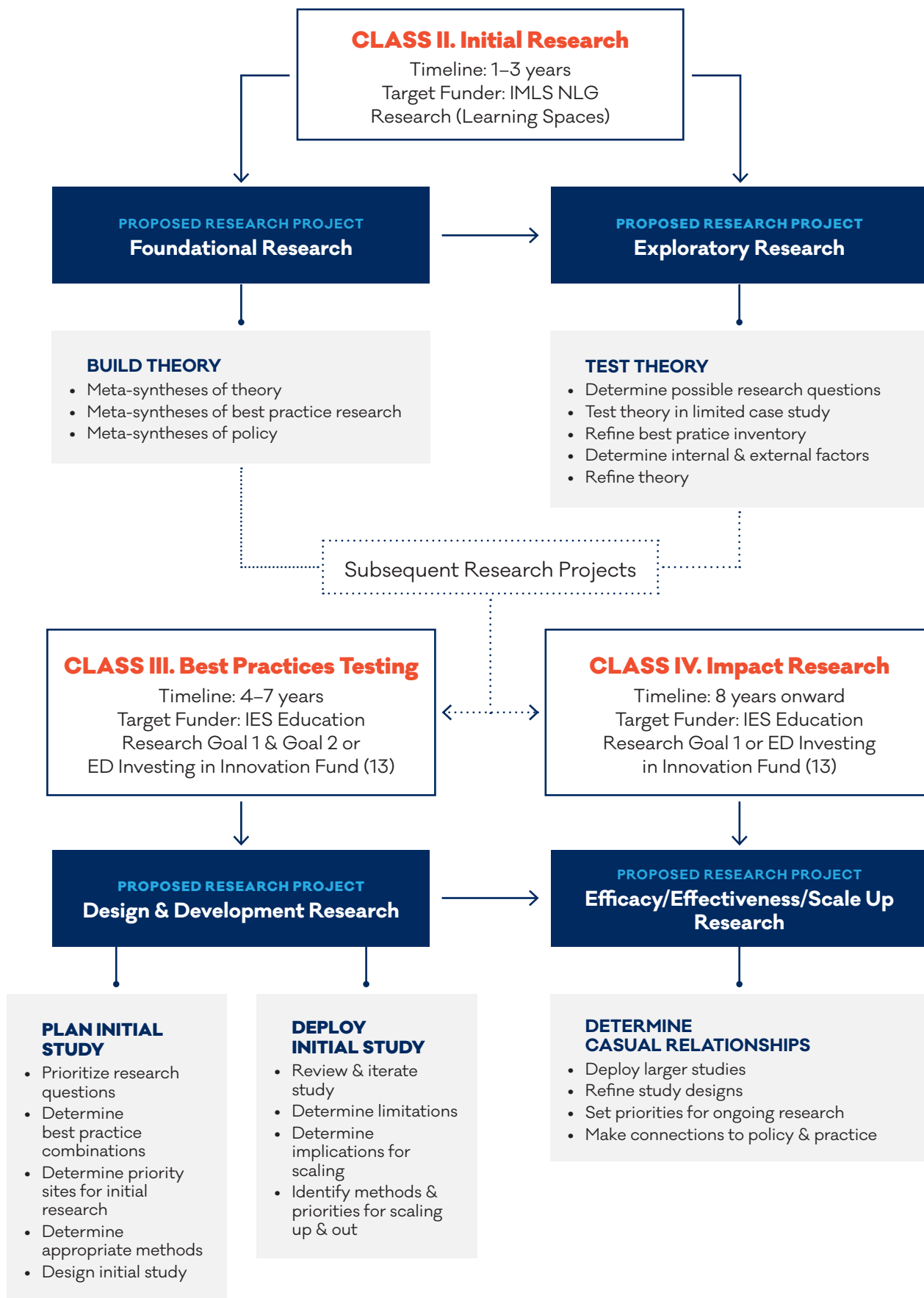


FIGURE 1. CLASS research agenda phases.

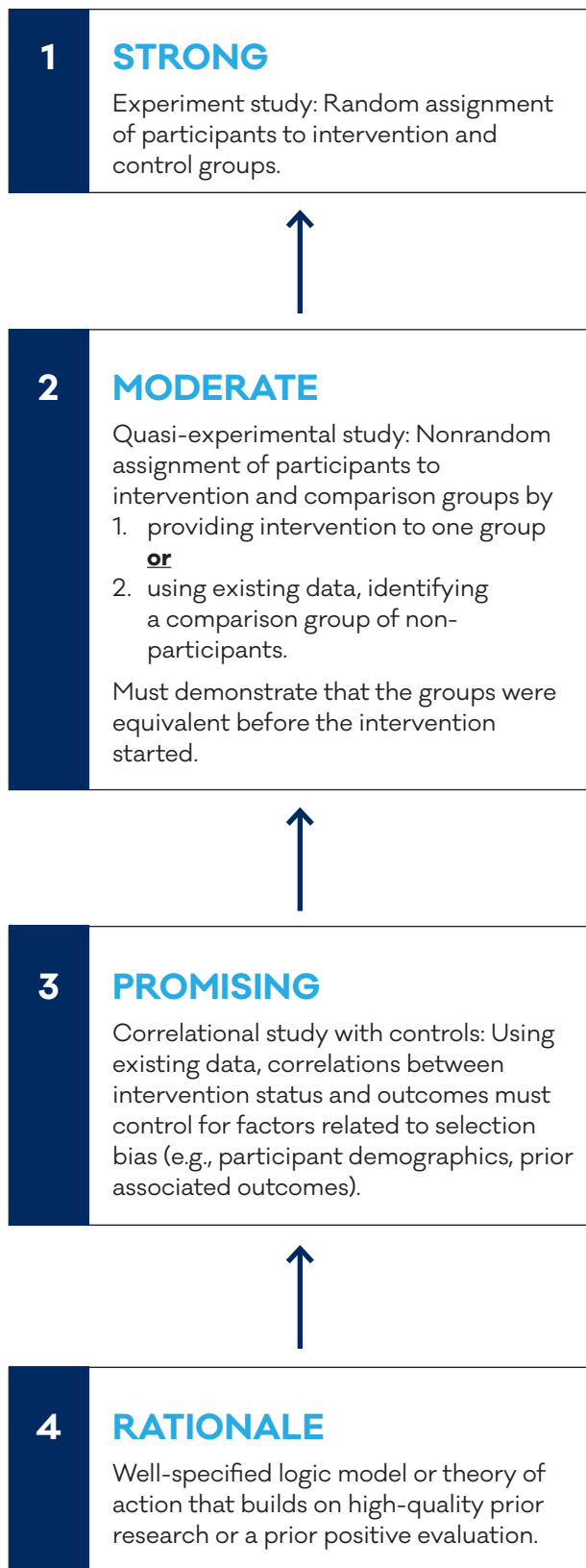


FIGURE 2. ESSA levels of evidence (adapted from Herman et al. 2017).

In addition to completing the research as described in the Methodology section of this report, as Figure 1 suggests, the CLASS II scope of work included three field studies in which researchers and practitioners worked together to design and implement small-scale causal studies centered on one of the promising practices identified through the CLASS II research.

The CLASS II project formally concluded in a school library research summit in January 2020, held in conjunction with the American Library Association (ALA) Midwinter Meeting. Participants, researchers, and school library community leaders were invited to attend the summit based on their expressed interest in causal research. The opening keynote speaker, Dr. Gail Dickinson from Old Dominion University, addressed attendees. Dr. Dickinson, a leading school library researcher and past AASL President and AASL Board member, described the background and vision of the CLASS projects. Then, CLASS II researchers shared preliminary research findings and led a discussion about them. Finally, the University of Colorado's Dr. Annie Allen, a renowned expert on the collaborative Research Practitioner Partnership (RPP) model, worked with attendees to develop causal conjectures based on the CLASS II findings and investigate them collaboratively in local projects.

Research Methodology

The CLASS II researchers employed a Mixed Research Synthesis (MRS), a method often used in public health research (Sandelowski, Voils, and Barroso 2006). In MRS, the findings in written reports of empirical qualitative, quantitative, and mixed methods studies, as well as the qualitative and quantitative

approaches used in the studies, are synthesized. Each team took a different approach to investigate the research problem, but all teams looked at causal relationships within and beyond school library research in an effort to identify interventions that may already or could potentially be used by school librarians. Evidence standards issued through the Every Student Succeeds Act (ESSA), the major federal funding bill for public education (U.S. Department of Education 2016), were used to assess the studies for interventions for learner improvement that are evidence based and demonstrate a statistically significant effect on improving learner outcomes or other relevant outcomes (see Figure 2).

MRS Step 1: Aggregation. Each team reviewed a different corpus of peer-reviewed published research on causes of learning published between 1985 and 2016, as shown in Table 2. In accordance with the Common Guidelines for Educational Research section on foundational research (IES and NSF 2013), searches of appropriate databases and library catalogs were conducted to identify applicable empirical research. Studies found by the three teams were aggregated into one database. Researchers kept track of the searches conducted by recording the date, source, search string and filters, citation, and number of results. An original data set of 1,598 publications was identified and aggregated in a spreadsheet that listed the characteristics of the identified studies, including methodological approaches, limitations, and results.

MRS Step 2: Synthesis. Researchers then synthesized the aggregated corpus of 1,598 studies from MRS Step 1 by examining each study again for relevance to the research question and sorting studies according to

the ESSA standards for using evidence-giving causal research studies. Only studies rated as strong or moderate were retained, with a resulting dataset of 362 studies.

MRS Step 3: Inter-Team Aggregation. The CLASS II research teams combined individual aggregation lists, removed duplicates, and produced a dataset of 310 studies. The studies contain causal education research studies, segmented by ESSA evidence levels. The geographical setting for each study was identified, with the majority of investigations located in the United States (83.5%). Other study settings included the Netherlands, Germany, Finland, Great Britain, Norway, Belgium, Israel, Japan, Hong Kong, Singapore, Canada, Australia, and New Zealand.

MRS Step 4: Inter-Team Verification. The three teams worked through the inter-team aggregated studies to verify the studies that represent strong and moderate research. The corpus of studies was divided into thirds, and each study was verified by at least two readers. Studies that were flagged for questions were reviewed collectively by all teams. As a result of the inter-coder verification review, some studies were removed from the corpus, leaving a final set of 183 items. An additional step in the synthesis was the coding of each study with relevant Shared Foundations from the AASL *National School Library Standards*, thereby relating the study to school library practice through learners, school librarians, and school libraries. Promising studies not included in the final aggregation were also included in these syntheses as supporting evidence for the findings and conjectures.

Table 2 provides an overview of each research team's process.

MRS STEP	TEAM ACTION		
	FLORIDA STATE UNIVERSITY	OLD DOMINION UNIVERSITY	UNIVERSITY OF NORTH TEXAS
AGGREGATION	<p>Reviewed practice guides, intervention reports, and individual studies included from the What Works Clearinghouse (WWC).*</p> <p>Considered only WWC studies that met WWC design standards with or without reservations and that had significant results.</p>	<p>Identified effective practices from <i>Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement</i> (Hattie 2009).</p> <p>Searched EBSCO, Scopus, Google Scholar, and JSTOR for articles 1) available in English; 2) peer-reviewed, published after 1985–2016; 3) centered on school-aged children without disabilities.</p> <p>Snowballed citations from articles and Hattie (2009) bibliography.</p> <p>Included random-controlled trials, matching designs, propensity score matching, regression discontinuity, and other strong correlational designs.</p>	<p>Searched Scopus with keywords “school librar*” + “caus* AND school* AND/OR learn* AND/OR achiev*” for articles 1) available in English; 2) peer-reviewed; 3) published 1985–2016; 4) centered on school libraries.</p> <p>Coded 18 themes related to a school librarian’s role; coding confirmed by two coders.</p>
SYNTHESIS	<p>Grouped studies by WWC-assigned domains that fit with study scope: behavior; early childhood; English learners; literacy; mathematics; path to graduation; science; and teacher excellence.</p>	<p>Created a concept map of broad domains that influence learner achievement.</p> <p>Synthesized each domain independently.</p>	<p>Coded articles by concept: learner, learning environment.</p>

TABLE 2. CLASS II team Mixed Research Synthesis activities (excerpted from Schultz-Jones et. al 2018, 24).

* The WWC conducts broad ongoing searches of education research databases and websites to identify a wide range of studies to review. In this process, WWC reviewers screen studies to ensure that they use an eligible design (i.e., randomized controlled trial, quasi-experimental design, regression-discontinuity designs, or single-case designs) and assess whether it “Meets WWC Design Standards without Reservations,” “Meets WWC Design Standards with Reservations,” or “Does Not Meet WWC Design Standards.”

Scope and Considerations

Though the researchers intended to review the widest possible range of causal studies, the researchers had to make some decisions about the CLASS II study's scope. For example, to establish a contemporary view of effective practices, the researchers included only studies published between 1985–2016; studies outside those dates may include promising causal practices. The researchers excluded dissertations, conceptual and theoretical papers, studies that were not peer reviewed, and studies written in languages other than English. These restrictions may have affected the size and diversity of the dataset.

Though presented in this report through the lens of AASL's Shared Foundations, readers are encouraged to remember that the AASL Standards were published after the CLASS II project had begun. The standards were not used as a guide to conduct the research. However, to support AASL's use of the Shared Foundations as points of departure for school library practice, the researchers did use the Shared Foundations as an organizing mechanism for this report. Readers are reminded that there will be areas of the Shared Foundations that were not aligned with the research findings, and these areas may be productive for future research.

A basic premise of the CLASS II project was to enable school library research to link to larger educational research and policy priorities. Evidence standards issued through ESSA (U.S. Department of Education 2016) were used to assess the studies for interventions for learner improvement that are evidence based and demonstrate a statistically significant

effect on improving learner outcomes or other relevant outcomes. During the project the U.S. Department of Education shifted its policy stance from a positivist causal paradigm to a design-based approach through research practitioner partnerships (RPPs), only to return to the positivist perspective two years later. These policy shifts challenged the researchers' abilities to frame the results in current policy priorities.

Theory Building

Phase one of the research agenda proposed in the CLASS white paper concerned identifying working theories regarding the impact of school library practices on learner outcomes. In this phase, researchers sought to connect findings from educational causal research to school librarianship. At this stage, theory building involved three funded field studies designed as RPPs and conjecture mapping drawn from the aggregated database with application to the AASL Shared Foundations.

RESEARCHERS AND PRACTITIONERS TOGETHER: CLASS II FIELD STUDIES (2017–2018)

An important piece of the CLASS II research seeks to have researchers and practitioners work together in small-scale, design-based causal studies in which they attempt to implement one or more of the research findings' promising practices in a school library field context. Three field studies were conducted to allow the CLASS II and field participants to better understand the extent to which effective classroom and school practices can be adapted to a school library context.

CLASS II Field Studies

Field studies occurred over eighteen months, between 2017 and 2018. An extended abstract for each study is included with the appropriate Shared Foundation.

1. A Continuum of Care: A Model of Collaboration for New Teachers.

The purpose of this study was to determine the effectiveness of standardized interventions performed by school librarians for new teachers to build the resilience necessary to survive and thrive (Beltman, Mansfield, and Price 2011) as classroom teachers and to promote retention. Actions taken by the school librarian may promote new teacher resilience, leading to a defined Continuum of Care by school librarians for new teachers and increasing knowledge of the influence of the school librarian on the professional lives of new teachers.

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2. Impact of Length of Information Literacy Instruction Sessions on Learning.

The grant addressed the following research question: To what extent do learners who are exposed to shorter, more-frequent information literacy instruction perform better compared to learners who are exposed to longer single-session information literacy instruction and to learners who are not exposed to any information literacy instruction?

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3. Elementary and High School Learners' STEM Learning Experience through the Use of a Transmedia Book.

This project sought to increase elementary and high school learners' STEM learning experiences through the use of a transmedia book. School librarians exposed learners to a storyline where a newly graduated engineer sought to help a former middle school classmate save a family farm. The book utilized project-based learning to enhance skills needed to be an engineer. The book also incorporated QR codes and links to web resources that served as extenders to explore various aspects of STEM careers.

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These exploratory projects informed theories about how effective learning works and the school librarian's role in the process and ways that the research findings might be applied in future settings.

Through a 2017 request for proposals (RFP), the CLASS II team recruited three field study teams. The field study RFP sought established and/or new RPPs for causal impacts that school libraries can influence in K–12 education. RPPs are “long-term, mutualistic collaborations between practitioners and researchers that are intentionally organized to investigate problems of practice and solutions for improving outcomes” (Coburn, Penuel, and Geil 2013, 10). The RFP solicited RPPs structured as design research teams that sought to simultaneously build and study solutions in real-world contexts. Partnerships often engage in iterative processes in which findings from one study lead to follow-up studies in rapid succession; these partnerships were charged with carrying out initial research on an education issue, to be completed by summer 2018, and developing a plan for future research.

The goals of the CLASS II field studies were to:

- Encourage creative design research to solve problems/challenges school librarians encounter in K–12 learning environments
- Foster dialogue among learners, educators, administrators, researchers, school librarians, and other relevant stakeholders
- Promote a collaborative scholar-practitioner approach toward the development of solutions for school librarians to contribute to causal impacts

CONJECTURE MAPPING

Researchers and practitioners interested in exploring the causal mechanisms of learning use conjecture mapping to express conjectures about how learning manifested in a setting and context related to specific learning outcomes of interest. Conjecture maps are iterative and meant to be adjusted through multiple research implementations. Field testing a conjecture provides additional data about practices and local contexts that can then be used to elaborate and build on the original conjecture map.

As the CLASS II research moved into a theory-building phase, conjecture mapping offered a framework for applying the findings from the aggregation of moderate and strong educational research to school library settings. As Figure 3 shows, the map begins with a high-level conjecture, or hypothesis, about a learning process. For example, one conjecture from school librarianship supported by decades of correlational studies is that learners in schools with a well-stocked school library staffed with a professionally trained school librarian will be better readers. The learning outcome might be scores on reading assessments. In building the map, a researcher would consider the embodiment or conjectures regarding the elements designed to lead to better scores on a reading assessment.

Initially a conjecture map asks the researcher to surface theories or assumptions about what the researcher expects to happen (outcome) from a design and what mediating

factors will lead from the design to the outcomes. The syntheses for the Shared Foundations provide several examples of conjecture maps built upon the empirical findings from the strong and moderate studies in the aggregation. The CLASS II researchers anticipate that field testing these designs and conjectures would lead to revisions to these original conjectures, leading to further testing and refinement of theory.

AASL NATIONAL SCHOOL LIBRARY STANDARDS

In 2017, AASL released the *National School Library Standards* to help school librarians establish effective school libraries and provide goals to advance and prepare learners (K–12) for college, career, and life. The standards, introduced after the CLASS II project was under way, did not guide the CLASS II work, but do provide a useful sorting and categorization theme for some of the research findings. The application of the Shared Foundations from the standards provided alignment with the major themes uncovered across the research studies.

CONJECTURE: Propose a High-Level Conjecture about How to Support Learning		
DESIGN CONJECTURES	MEDIATING PROCESSES	OUTCOMES
<p>What the conjecture looks like in a design:</p> <ul style="list-style-type: none"> • Tools and Materials • Task Structures • Participant Structures • Discursive Practices • Other Designed Components 	<p>What the design produces to yield outcomes:</p> <ul style="list-style-type: none"> • Observable Interactions • Participant Artifacts • Other Contextual Influences 	<p>If the mediating processes occur, then the outcomes are:</p> <ul style="list-style-type: none"> • Learning • Interest/Motivation • Other Desirable Outcomes

FIGURE 3. The grammar of conjecture mapping (adapted from Lee, Recker, and Phillips 2018).

Further Readings about Conjecture Mapping

For more about conjecture mapping, check out these articles in which the authors propose and discuss conjecture maps they used in learning environments:

Lee, V. R., M. Recker, and A. L. Phillips. 2018. "Conjecture Mapping the Library: Iterative Refinements toward Supporting Maker Learning Activities in Small Community Spaces." Paper presented at the Rethinking Learning in the Digital Age: Making the Learning Sciences Count 13th International Conference of the Learning Sciences London, UK. <https://digitalcommons.usu.edu/itls_facpub/638/>.

These researchers share multiple cycles of observations and conjecture mapping applied to a study of STEM makerspaces in rural school and public libraries. They reveal the ways participant responses and activities altered their original conjectures about the outcomes of implementing makerspaces in these library settings.

Wozniak, H. 2015. "Conjecture Mapping to Optimize the Educational Design Research Process." *Australasian Journal of Educational Technology* 31 (5): 597–612.

This paper outlines a conjecture mapping exploration of how to support health science students to overcome barriers of transitioning to online distance study. The conjecture mapping process provided a framework to align and review the outcomes at universities.



SHARED FOUNDATION

Inquire

The skills needed to effectively power the Inquire Shared Foundation are curiosity and questioning for learners of all ages.

Although individuals may not always consciously reflect on their inquiry processes, the process of asking questions, gathering information, making sense of the information, making decisions, and sharing results is something we all do every day. Learners who harness their prior knowledge to bring new meaning to the answers to their questions take a first step toward:

- addressing their knowledge gaps;
- building collective knowledge; and
- strengthening intellectual tools to sustain an inquiry process (AASL 2018, 28)



SYNTHESIS OF RESEARCH CLASSIFIED WITH THE INQUIRE SHARED FOUNDATION

OVERVIEW

The Inquire Shared Foundation places inquiry and investigation at the core of the learner experience. School librarians and other educators engage learners in the use of inquiry-based models, and learners benefit from guides to their inquiry processes. Learners' cognitive development processes with various subjects inform scaffolding of these processes. Instructional design, learning activities, a collaborative approach, and development of critical thinking skills are fundamental to research related to this foundation.

Findings from Educational Research

LEARNER

In the Inquire Shared Foundation learners build new knowledge by inquiring, thinking critically, identifying problems, and developing strategies for solving problems. They display curiosity and initiative by formulating questions and recalling prior and background knowledge. They engage with new knowledge by following a process.

Learners adapt, communicate, and exchange learning products with others in a cycle that includes interacting with content, providing constructive feedback, acting on feedback, and sharing products. They participate in an ongoing inquiry-based process.

Strengthening Intellectual Tools

A variety of interventions have been enacted to discover the effective ways to equip learners with the skills to inquire, think critically, identify problems, and develop strategies for solving problems. J. A. Bulgren et al. explored the use of analogies while teaching important concepts in secondary content classrooms containing learners of diverse abilities to determine the effects of an analogically based routine on student learning and the effects of training on teacher use of the routine (2000). They found that use of the routine led to increased learner retention and expression of information; teachers easily learned the routine and used considerably more analogies to instruct concepts after they became familiar with the routine. R. G. Fukkink and K. de Gloppe conducted a meta-analysis of twenty-one instructional

treatments aimed at enhancing the skill of deliberately deriving word meaning from context during reading (1998). An exploratory, multilevel regression analysis shows that clue instruction appears to be more effective than other instruction types or just practice.

Understanding how learners learn was the focus of a randomized control study by B. A. Brown and K. Ryoo (2008). They began with the assumption that students who learn to understand phenomena in everyday terms prior to being taught scientific language will develop improved understandings of new concepts. Using web-based software, learners were taught with a “content-first” approach that allowed learners to transition from everyday understanding of phenomena to the use of scientific language. The results demonstrate that teaching without respect to language learning may promote issues of cultural conflict for minority learners and limit learners’ conceptual understanding. In other words, the listener and speaker need to share a similar understanding of the genre of language as learners taught with the “content-first” approach developed significantly improved understanding when compared to learners taught in traditional ways.

Using response cards (learners raise a card, either handwritten or preprinted) to respond to an educator’s question is significantly more effective than hand raising as a means of participating, improving quiz and test scores, and reducing off-task behavior (Randolf 2007). The meta-analysis also found response cards were effective in engaging learners and provided a means of assessment for the teacher.

In a study on information load, R. J. Todd found that choice of the correct information is independent of the number of choices presented to learners who were card-catalog searching (1992). Learners in a hurry benefit from fifteen to twenty items of information on catalog cards but with reduced levels of satisfaction and certainty and increased confusion; to be sure of choices, educators should include twenty-five elements of information per card. Since schools have moved to an online environment, the impact of information load on problem solving is worthy of attention.

L. S. Fuchs, R. F. Schumaker, et al. investigated whether individual differences in working memory moderate effects of two variations of intervention designed to improve at-risk fourth-graders’ fraction knowledge (2014). They also examined the effects of each intervention condition against a business-as-usual control group and assessed whether children’s measurement interpretation of fractions mediated those effects. Each intervention lasted twelve weeks, with three thirty-minute sessions per week. The major focus of both intervention conditions was the measurement interpretation of fractions. Across the two conditions, only five minutes of each thirty-minute session differed. One condition involved completing activities to build fluency with four measurement interpretation topics; in the other, activities were completed to consolidate understanding on the same four topics. Results revealed a significant aptitude-treatment interaction, in which learners with very weak working memory learned better with conceptual activities

but children with more adequate (but still low) working memory learned better with fluency activities. Both intervention conditions outperformed the control group on all outcomes, and improvement in the measurement interpretation of fractions mediated those effects.

Goal Setting. In a meta-analysis not limited to K–12 settings, R. E. Wood, A. J. Mento, and E. A. Locke found that goal setting impacts performance, with the strongest effect for less-complex tasks (1987). This was also supported by M. E. Tubbs (1986), who found a higher impact with easier tasks and increased specificity of tasks. Setting goals has an impact on performance, especially if learners participate in goal setting. Tubbs also found some empirical support for task feedback as part of goal performance.

Inquiry Processes. Inquiry-based pedagogical approaches were one of the methods examined in a meta-analysis of 161 studies by C. S. Camilli et al. (2010). These researchers set out to determine the impact of early childhood education programs on preschoolers and, in particular, on the magnitude of cognitive and affective gains for children considered at risk of school failure in early grades. The main outcomes of interest were cognitive, although other types of outcome measures were also recorded, including children’s social-emotional development and school progress. A preschool education was found to positively impact children’s cognitive skills, social skills, and social progress.

R. F. Lorch et al. found that combining explicit instruction with experimentation is

much more effective than experimentation alone, even for learners in low-performing schools (2010). This suggests that learners benefit from guides to their inquiry processes.

Problem-Solving Skills. S. A. Denham and M. C. Almeida performed a meta-analysis to examine reported relations between children’s interpersonal cognitive problem-solving skills and adjustment and the effects of interpersonal cognitive problem solving (ICPS) training (1987). ICPS theory predicts that a child who can formulate many alternative ways of dealing with others can be flexible in choosing alternative solutions to problems. Furthermore, a child who plans actions through means-end thinking and can weigh pros and cons of the effects of interpersonal acts (consequential thinking) is less likely to make impulsive decisions and more likely to act appropriately in social situations, benefiting all parties involved. However, the authors maintain that continued replication and refinement of ICPS skill theory and its applications are necessary.

Visualization is an important problem-solving skill, especially for grades 6–8. Educators trained in systematic problem solving are especially effective at imparting these skills, according to R. Hembree (1992), and direct significant links exist between problem-solving skills and various measures of basic performance, particularly in basic mathematics.

In a study designed to explore the effects of providing a high-quality curriculum unit to all eighth-grade learners in a large Maryland school district and the curriculum’s effects on specific groups of learners in schools characterized by high levels of

Queries for Research and Practice

- Investigate the effect of instruction on deriving word meaning from context and incidental word-learning skills to evaluate the instruction's contribution to vocabulary growth.
- Investigate the impact of information load on problem solving.
- To what extent do learners benefit from guides to their inquiry processes, and where are these guides best positioned for optimum results?
- How can a researcher-practitioner partnership implement self-regulation training programs and other fundamental changes of classroom practice successfully and affect educators' beliefs about learning and instruction?
- What are the long-term effects of online mathematics instruction supplemented by face-to-face mathematics instruction using an adaptive learning environment that tailors instruction to learner needs and provides feedback to educators on student learning?

learner diversity, C. S. Pyke et al. found that a Chemistry That Applies treatment did improve knowledge of content and higher levels of learner engagement (2004). Chemistry That Applies is an instructional unit designed to help students in grades 8–10 understand the law of conservation of matter; it is “learner-centered, hands-on, and phenomenon-based. Learners explore four chemical reactions with increasing sophistication, with the aim of acquiring a deep understanding of the target standard/benchmark. Groups of learners collect data, keep individual science notebooks for analyzing results, and use evidence-based arguments in large and small groups to support their claims. Chemistry That Applies provides question prompts (called “Think and Write”) that require learners to use critical thinking skills. Complicated vocabulary is kept to a minimum” (2004, 6). Students learning Chemistry That Applies reported higher levels of advanced engagement, such as staying deeply involved in lab work, talking with other learners to test understanding, and connecting things learned inside the class to the outside world than did learners who did not receive Chemistry That Applies instruction. The Chemistry That Applies curriculum unit did produce higher understanding scores than the comparison curriculum, but the higher scores did not affect learners' basic engagement in the overall curriculum. The authors further state: “We are certain that the treatment has improved learning of conservation for all learners, and has generally improved engagement and dispositions toward learning for understanding” (2004, 68).

Problem contexts may exert a larger effect on children's cognitive developmental processes than once thought (McNeill et al. 2011); general conceptual or working memory limitations, though important, cannot fully explain children's misconceptions in mathematics. Learners benefit from learning new academic content in a problem context.

Interdisciplinary Curriculum Integration.

Challenging learners through interdisciplinary curriculum integration was explored by M. M. Hurley (2001). The net effect was evidence that various forms of curricular integration have been used, including sequenced, parallel, partial, enhanced, and total. While the results for the integration of mathematics and science were not conclusive, the evidence does suggest that enhanced supplement enrichment programs and problem solving that integrates science and mathematics could be useful. Additional examination of curricular integration involved technology combined with face-to-face instruction, where online mathematics instruction supplemented face-to-face mathematics instruction using an adaptive learning environment that tailors instruction to learner needs and provides feedback to teachers to facilitate learner learning (Wang and Woodworth 2011). The randomized controlled trial examined the short-term effects of online mathematics curricula on elementary school learners with positive results.

Self-Regulated Learning. According to C. Dignath, G. Buettner, and H. P. Langfeldt, the concept of self-regulated learning has been brought up as a synthesis between

research on how learning functions, focusing on the learner's cognitive and motivational processes and research on how instruction functions, as well as the interaction between learner and instructor in a social environment (2008). Various approaches of providing learners with the skills of self-regulation have emerged. Considering the three areas where learners can benefit from self-regulated learning—academic performance, motivation to learn, and learning strategies—the value of self-regulated learning training programs becomes clear. Providing learners with knowledge and skills about how to self-regulate their learning helps them to self-initiate motivational, behavioral, and metacognitive activities to control their learning (2008, 102). This meta-analysis examined the effectiveness of self-regulated learning interventions on primary school learners' academic performance, strategy use, and motivation. Moreover, it investigated the effect of the different training characteristics on the effectiveness of the intervention. The results of this meta-analysis show that self-regulated learning training programs have a positive effect on learning outcomes, strategy use, and motivation, even for primary school children. The highest benefits from the analyzed interventions can be gained in mathematics performance, motivational outcomes, and the use of cognitive and metacognitive strategies. These findings are not concordant with the results of the meta-analysis conducted by J. Hattie et al., who found the highest effect sizes of learning skills intervention on performance, and the lowest on motivation/affect and study skills

(1997, 118). Interventions based on social-cognitive theory or a combination of social-cognitive and metacognitive theories led to the greater effect sizes, while interventions based on motivational theories reached lower effects. Summarizing the most-effective characteristics of interventions finds that a training program should be based on social-cognitive theories; should train cognitive (especially elaboration and problem-solving strategies), metacognitive (especially planning strategies), and motivational strategies (especially feedback); and should provide knowledge about strategy use and about its benefit.

SCHOOL LIBRARIAN

Questioning and curiosity are critical for learners. School librarians are conduits for inquiry by facilitating the building of new knowledge through the process of inquiring, thinking critically, identifying problems, and developing strategies for solving problems. Inquiry-based instruction involves mostly hands-on, learner-directed learning, with the educator acting as a facilitator.

Instructional Approaches

The context in which learners receive instruction may impact learner learning.

J. Sarama et al. found that classroom climate had a mediating impact on learner learning (2012). How educators construct instructional approaches may depend on the skills that need to be developed. T. S. Newell found that educators should not take an either/or approach to information literacy instruction; instead, the range of instructional approaches should be expanded on the basis of effectiveness and affordances (2008). The Problem-Based method coupled with a high level of direct and dynamic instruction

seems to be very effective in presenting content knowledge. The Participatory Simulation method coupled with scaffolding, Community of Practice, and process frameworks seems to be very effective in teaching the application of information literacy practices. Both approaches should be used to develop the type of information-literate learners that the school library field desires. However, educators must attempt (via research studies, learning theory, and instruction systems technology) to decrease the affordance gap between the two approaches. For example, the findings of the Newell study suggest that learning within the two approaches is distinct and that the two approaches have the potential to construct distinct types of information-literate learners (i.e., learners skilled in content knowledge and learners skilled in the application of information practices). Research studies that attempt to illuminate dynamic activity patterns within information literacy learning approaches are needed to give greater insight into learner learning and instructional affordances and to generate design recommendations that could decrease the distance between affordances tied to particular instructional approaches.

Conceptual Challenges. B. J. Guzzetti et al. synthesized quantitatively the experimental and quasi-experimental research in reading education and science education designed to test the effects of various instructional interventions on misconceptions (1993). Effective procedures had a common element of producing conceptual conflict. The nature of the intervention was less important than that the intervention included some sort of conceptual challenge.

Creativity Training. In a meta-analysis of creativity training, G. Scott, L. E. Leritz, and M. D. Mumford found that such training is effective (2004). Training that emphasized cognitive processing skills was particularly effective “where people are shown how to work with information in a systematic fashion” (2004, 382). This study deals with problem-solving and information-processing skills that are very relevant for information literacy.

Explicit Instruction. P. C. Abrami et al. found that implicit instruction in critical thinking is not sufficient to master the topic (2008). Mixed instructional approaches that combined content and explicit critical thinking instruction were significantly better than other approaches. Where critical thinking is explicitly and independently taught there is a moderate effect. The impacts were greatest when instructors had advanced training in teaching critical thinking.

In an earlier study of effect, R. L. Bangert-Drowns and E. Bankert conducted a meta-analysis to synthesize the results of explicit instruction on critical thinking (1990). To be included in the meta-analysis, studies had to compare the performance of two groups of learners on some measure of critical thinking. One group received explicit instruction to improve critical thinking, while the other group did not. Instructional variables were duration of instruction, subject matter of the course in which the instruction was given, and presentation of instruction via the educator or some other medium. Programs that focused continuously on thinking skills were

distinguished from those that addressed such skills periodically. Programs that taught critical thinking in a subject-matter domain were distinguished from those that taught critical thinking generally. Finally, the content of programs was coded as addressed to either internal or external consistency. A total of twenty studies, nineteen of which were doctoral dissertations, were found to be suitable for the meta-analysis. Results consistently favored programs that used explicit instruction methods. Intensive programs proved more effective than programs providing only periodic training in critical thinking. Length of treatment was unrelated to effectiveness.

Learner Directed. The study by L. V. Hedges et al. focused on learner achievement, learner attitudes, educator reactions, and the implementation of the curriculum, with a focus on reading mathematics, real-life applications, problem solving, use of calculators, quick pace, and implicit rather than explicit review of arithmetic skills (1986). Reading is key to implementing more learner-directed teaching and learning models. Without professional development, educators will fall back on those instructional practices with which they are familiar. Use of technology in problem solving did not result in dependency on technology; learners who used technology and learners who did not achieved the same results.

A meta-analysis by S. Higgins et al. documented that despite variations in age and gender, thinking skills programs improve learning (2005). However, schools

and school librarians need to design programs that match the particular school community composition. These programs should also be monitored and adjusted to ensure close alignment with local learning outcome needs.

Resource-Based Instruction. K. Hara examined the effectiveness of formal instruction for acquiring library study skills at the elementary school level (1997). The study examines the significant differences in the performances of library study skills in fourth-, fifth-, and sixth-grade learners, comparing resource-based and no library study skills, and non-integrated and no library study skills instruction. The performance of the sixth-grade learners in resource-based instruction was significantly higher than learners in no library study skills instruction for all the skills. However, no significant differences were found in the performance of the sixth-grade learners between non-integrated and no library study skills instruction. For the fourth- and fifth-grade learners, there were no significant differences found between resource-based and no library study skills instruction, as well as between non-integrated and no library study skills instruction. Resource-based instruction was the most effective approach for acquiring library study skills compared with no library study skills instruction and non-integrated instruction. S. Shoham found that learners receiving bibliographic instruction utilized a larger number of bibliographic items in the term papers and reported a more systematic search (2001).

Assessment. Where educators in elementary and middle schools used continuous monitoring in math to differentiate instruction for individual learners, learners achieved significantly better outcomes in mathematics (Ysseldyke and Bolt 2007). Technology was used to provide teachers with continuous data about learners—the actual process for learners was pencil/paper activities and assessments generated by computer (learner results scanned to alert teachers to who needed additional instruction and/or to move learners forward through content). This study found significant variance in how teachers implemented the treatment, which had a significant impact on findings (high fidelity = high results).

Learner achievement in mathematics improved when educators gave short assessments and used data from those assessments with targeted instructional supports/strategies with learners (Phelan et al. 2012). The plan included approximately eight class periods of intervention in the classroom (instruction and assessment), with an additional nine hours of professional development for educators. The randomized study of the formative assessment intervention yielded several interesting findings. A short amount of targeted intervention on key mathematical principles had some impact on learner performance on a transfer measure of related content. On average, the intervention learners did not outperform those in control groups; however, given that statistically significant main effects of the treatment were not found, a significant interaction between treatment and pre-test

scores was found. This indicates that learners with higher scores on the pre-test tended to benefit more from the intervention compared to learners with lower pre-test scores. In other words, the intervention had more impact on higher-performing learners than lower-performing learners. This study used assessment data versus giving assessments and did not address using formative assessment to give learners feedback.

L. S. Fuchs and D. Fuchs used a meta-analysis to investigate the effects of formative evaluation procedures on learner achievement (1986). The results indicated that the use of systematic formative evaluation procedures, within a group of studies that employed predominantly mildly handicapped subjects, significantly increased learners' school achievement, both statistically and practically. Effects may be enhanced when educators also employ behavior modification, data-evaluation rules, and graphed data displays. Technology may assist with employing this methodology.

Feedback. H. L. Swanson and C. M. Lussier found that dynamic assessment (when feedback is provided throughout the assessment) improves learner test performance (2001). This is true particularly for lower-achieving learners (and less so for those with learning disabilities) and more for younger learners. In addition, general feedback and modeling were more significant than scaffolding or coaching. In addition, R. L. Bangert-Drowns et al. found that mediated intentional feedback for retrieval and application of specific knowledge appear to stimulate the correction of erroneous responses in situations where mindful reception is encouraged (1991).

Queries for Research and Practice

- Is there a mediating factor if the school librarian collaborates with the other educator to integrate critical thinking instruction explicitly into content instruction?
- To what extent does routine metacognitive conversation (talking about the reasoning and problem-solving processes that accompany reading) affect learning as learners carry out learning tasks in the school library's makerspace area (science curriculum)?

Domain Dependence. A meta-analysis completed by R. Taconis, M. G. Ferguson-Hessler, and H. Broekkamp examined effective teaching strategies of problem solving in science (2001). The researchers concluded that more-effective treatments were domain dependent; developing problem schemata and the knowledge base—more-generic problem-solving heuristics such as attention to knowledge of strategy and the practice of problem solving—were less effective. Immediate feedback to learners, external guidelines, and criteria were positive learning conditions. Small group work was only effective if combined with other measures such as feedback and attention to schemata.

In a meta-analysis on teaching effectiveness, T. Seidel and R. J. Shavelson found the highest effect sizes for time for learning, differentiation/adaptive instruction, structured teaching, reinforcement, cooperative learning, and feedback (2007). An analysis of cognitive teaching models found domain-specific models were most effective (support for integrated instruction).

Questioning. In a meta-analysis of studies of teacher questioning, Samson et al. found a moderate effect for higher-level questioning (1987). B. Rosenshine, C. Meister, and S. Chapman found that learners who were taught to generate questions while reading improved reading comprehension (1996). The most successful types of prompt for expository material were using signal words (who, what, when, etc.), generic questions, or question stems.

Metacognitive Conversation. C. Greenleaf et al. explored professional development focused on integrating academic literacy instruction with content-area coursework on educator instructional practices and learner achievement in reading and high school biology and U.S. history (2011). The instructional model draws together research-based practices in reading instruction, including methods of engaging learners in extensive reading; integrating explicit teaching of comprehension strategies; establishing relevance and making personal connections to reading materials and curriculum activities; identifying and using a variety of text structures to support comprehension; and supporting collaborative sense-making activities with written materials. The central dynamic of this instructional model is routine metacognitive

conversation; that is, talking about the reasoning and problem-solving processes that accompany reading as learners carry out learning tasks in the science curriculum. The model was effective for both reading and biology, but it was most effective at improving history standardized test scores, especially for Hispanic and Asian learners, in contrast to White and Black learners.

In a meta-analysis of forty-eight school-based writing-to-learn programs, R. L. Bangert-Drowns, M. M. Hurley, and B. Wilkinson show that writing can have a small, positive impact on conventional measures of academic achievement (2004). Two factors predicted enhanced effects: the use of metacognitive prompts and increased treatment length. Two factors predicted reduced effects: implementation in grades 6–8 and longer writing assignments.

SCHOOL LIBRARY

The school library offers multiple opportunities for learners to integrate new and existing knowledge. By integrating a collaborative approach across a variety of content areas, the school library promotes an inquiry process that includes posing questions, finding answers, and developing critical-thinking and communication skills through information exploration (AASL 2018, 54).

Climate

M. Phillips compared schools with high “communitarian” engagement (learners’ academic achievement and attachment to school contingent on first satisfying educators’ and learners’ social and personal needs) to those with high-academic press

(high expectations for learner achievement, clear achievement-oriented goals, the amount of time spent on instruction, and the amount of homework assigned to learners) (1997). Phillips found little support for the hypothesis that communitarian climate enhances attendance or mathematics achievement and suggests that improving a school's academic climate may be a more promising way to enhance learners' attachment to school and their academic achievement. Demanding curriculum and high teacher expectations impact learner learning.

Trends in International Mathematics and Science Study (TIMSS) data from Singapore was graphed using three-level, multilevel linear modelling, and the results indicate that the learner- and school-level differences, equally, accounted for about one-fifth of the total variance in science achievement (Mohammadpour 2012). In contrast, more than one-half of the total variance was accounted for by the classroom-level differences. Science self-concept, teaching limitations, and school climate as perceived by the school principals were the strongest predictors of science achievement at the learner, classroom, and school levels, respectively.





INQUIRE

Field Study

Impact of Length of Information Literacy Instruction Sessions on Learning

FIELD STUDY TEAM MEMBER(S):

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Purpose of Research

Research demonstrates that increased frequency of instruction is a malleable factor that can improve learner achievement in the classroom. However, there is a dearth of this type of research as it relates to school library instruction specifically, so the researchers designed a study to see if these findings could be replicated in a school library setting. The study was motivated by the lack of information literacy skills shown by learners as they transition from high school to college, which begs the question: How can school librarians best teach learners information literacy skills to a new generation of learners? The results provide considerations on how to restructure one-shot instruction sessions to maximize student learning. The grant project ran from August 2017 to August 2018 and addressed the following research question: To what extent do learners who are exposed to shorter, more-frequent information literacy instruction perform better compared to learners who are exposed to longer single-session information literacy instruction and to learners who are not exposed to any information literacy instruction?

Research Design

A quasi-experimental study was conducted at two local rural high schools. School librarian and English teacher pairings from each high school were recruited to participate. The study's dependent variable is student learning and is operationalized by test scores on multiple-choice tests. The independent variables in the study are a) the type of instruction: no instruction (control), long instruction (LI), and multiple

short instruction (MSI) groups, and b) high school. For the study, three on-level, grade-12 English classes were invited to participate. Since random assignment of learners to different treatment groups was not a possibility, classes representing logical test groups were randomly assigned to either control, LI, or MSI groups. The testing data was input into a spreadsheet, then imported into SPSS for analysis. A repeated-measures, mixed-design ANOVA was used to analyze the data to determine the effectiveness of the intervention. The initial test was a repeated-measures ANOVA, which indicated differences between treatment groups and high schools. Additionally, paired sample t-tests were applied to each test group and each high school to further interpret the results.

Findings

By Treatment Group. Looking at the treatment groups across high schools in combined treatment groups, the LI and MSI groups outperformed the control group, showing that instruction had a significant, positive effect on learning. A paired sample t-test showed the pre-test to post-test mean scores to be significantly different, an indication that the information literacy instruction was successful to some extent. However, the gains learners made on the post-test were lost by the time of the delayed post-test. When examining the treatment groups individually using a paired sample t-test, only the combined MSI group showed a significant improvement from pre-test to post-test. The LI group showed no significant improvement from pre- to post-test.

By High School. The paired t-test by high school showed that the MSI and LI combined treatment groups at high school A did not show a significant improvement from pre- to post-test. Looking more closely, the LI group at high school A failed to show any significant improvement; however, the MSI group did show significant improvement. High school B's combined treatment groups also showed a significant improvement from pre-test. Unlike high school A, high school B's MSI group failed to show any significant increase in test scores. However, high school B's LI group did show significant improvement. These tests, which considered each school individually, revealed the vast differences in performance between the two high schools and explains why initial results showed to be significant.

Research Limitations

Many limiting factors were observed by the field study research team throughout the study. Perhaps most significant, the school librarian-led instruction did not bear any weight on the learners' grades, providing little incentive for learners to take the instruction seriously. Patterns were used to fill out some of the Scantrons, indicating a lack of interest by some learners. Integrating the instruction into the course with low-stakes grading would have changed this situation, even if it was just for the post-instruction exams. The school librarians also represented different experience levels at their respective high schools: one in the first year of employment and one in their final year before retirement. The randomly assigned classes occurred at varying times of the day, impacting learner attendance.

The class in the morning had much higher attendance than the class immediately after lunch, where learners were repeatedly late enough to miss the short instruction entirely. The study was also conducted too close to learner graduation, which severely reduced enrollment numbers when compared to fall semester. There were also slight socioeconomic differences between the two high schools that could have caused problems with the research, with one high school having 8 percent more economically disadvantaged learners. Another important variable to consider is cell phone use, rules, and enforcement. In both schools, learners are allowed to carry and access their cell phones throughout the day. Despite educators and school librarians asking learners to put them away, they remained a clear distraction during instruction time. Finally, learners were not given time to apply the teaching through hands-on practice. Adding this practice element may increase learning and solidify the gains to avoid the downward trend in retention demonstrated in the delayed post-test results.

Research Implications

There is a dearth of causal research in the field of school librarianship. This study, funded by a grant by AASL and the Institute of Museum of Library Services (IMLS), was an initial step toward applying classroom research to a school library environment, but much remains to be studied in this arena. This study was designed to explore the impact of frequency of instruction using baseline pedagogy such as lecture and multiple-choice assessments. It would behoove

future research to include high-impact practices to ensure the engagement of learners. The researchers recommend this study be replicated, keeping in mind the limitations shared in this paper. First, causal research using high school seniors should be conducted in the first half of the school year, rather than the second. The instruction should be given weight in the collaborating class's grade, and a hands-on element should be added, giving learners the opportunity to apply and retain the new skills being taught. If true random assignment cannot be accomplished, attention should be paid to both the socioeconomic differences of the schools and experience levels of the respective school librarians. Finally, the school's cell phone policy should be carefully considered when designing the intervention. Most importantly, academic researchers should continue to invest their time in school library research, keeping in mind that school librarians' K-12 counterparts pass their learners along to academic librarians as the next step in a continuum of learning.

Practical Implications

Our study revealed that shorter instruction times did not hurt student learning when compared to longer instruction sessions. The researchers found that breaking up the traditional long one-shot instruction session into multiple shorter instructions will not negatively impact student learning and may be more accessible for learners and instructors. School librarians and subject-area teachers alike may find fifteen minutes of instruction easier to schedule and deliver, and learners benefit

from receiving the same total amount of instruction in smaller chunks.

Collaboratively, the field study researchers created an instruction schedule for the spring semester of 2018. The school librarian and English teacher partners were vital in navigating the complex schedule, including A-B day scheduling, late-start days, and parent-teacher conferences. The field study research team developed the teaching materials for both the long and short instruction sessions and trained and assessed the school librarians to ensure consistency. Under the direction of the field study research team, each school librarian taught a mock lesson with the new content. The field study research team used a rubric to evaluate and ensure the school librarians' readiness to perform the intervention while ensuring consistency in content delivery.

Teaching materials included lesson plans, presentation slides, and assessments for each topic. The four topics covered were source types, locating information, search strategies, and evaluating information. Each of the four topics were covered separately in fifteen-minute instruction sessions and all at once in the sixty-minute lesson. Scantrons were ordered, counted, labeled, and organized, along with copies of the pre- and post-tests. On-level English classes from each high school were randomly assigned to either a control group or to one of two treatment groups. The control group received no instruction until the study was complete. Treatment group one received the four short, frequent information literacy lessons. Treatment group two received the traditional one-

hour instruction session. The certified school librarian instructors administered post-tests after each of the four fifteen-minute instructional segments. All groups, including the control group, received a pre-test, an immediate post-test, and a delayed post-test.

In January 2018 the instruction delivery began, completing the final post-tests in late February. At least two of the Southern Utah University field study research team members were present for the delivery of the lessons by each school librarian and carefully observed each instruction session, taking detailed notes. Each school librarian was invited into the other grade-12 English classes (those not included in the study) to conduct the same instruction. Though not related to the study results, this project positively impacted the collaborative relationships at both high schools. Data entry continued through March and April, with statistical analysis completed during the summer of 2018.

Future Research Plans: Iron County — where the field study research team conducted past research — has three new certified school librarians at the high school level. The field study research team has discussed the possibility of a replication study to establish collaborative relationships, especially now that some important lessons for study design in local schools have been learned.

SHARED FOUNDATION

Include

When learners' community includes members with diverse experiences, learners are aware of a range of viewpoints and anticipate the challenges often encountered in reaching consensus.

Learners who include other perspectives in their understanding:

- build balanced perspectives and develop skills that allow these learners to articulate ideas;
- develop comprehensive and authentic knowledge products;
- exhibit tolerance for differing viewpoints; and
- reflect on their perspectives and the perspectives of others. (AASL 2018, 29)



SYNTHESIS OF RESEARCH CLASSIFIED WITH THE INCLUDE SHARED FOUNDATION

OVERVIEW

The Include Shared Foundation directly addresses equity, diversity, and inclusion through attention to the broad range of learner needs, inclusion of multiple perspectives, and a commitment to seeking and honoring difference among all members of the learning community. Dimensions of diversity addressed in educational research include socioeconomic, racial and cultural, linguistic, and gender identities as well as individual developmental and learning differences. Often an intervention or teaching practice has different impacts for different learners, suggesting the need to consider individual differences when designing instruction. Educators address diversity by differentiating and personalizing instruction. Addressing equity requires attention to the individual needs of learners and their access to resources and opportunities to learn. Interdisciplinary approaches to teaching and learning engage both educators and learners with multiple perspectives.

Findings from Educational Research

LEARNER

Self-Concept

All learners need opportunities to feel successful because learners' attitudes and beliefs about themselves as learners have an impact on learning (Chu et al. 2011). As F. Guay, W. Marsh, and M. Boivin and others studied, achievement has an effect on self-concept (skill-development model), and academic self-concept has an effect on achievement (self-enhancement model) in a reciprocal relationship (2003; Marsh and Yeung 1997; Marsh, Hau, and Kong 2002; Marsh et al. 2005; Marsh and O'Mara 2008; Muijs 1997; Skaalvik and Hagtvet 1990). This reciprocal effect may also be a consideration when grouping learners. For example, high achievers placed in a group with other high achievers may have a lower self-concept as they compare themselves to others in the group (Pinxten et al. 2010). However, A. Helmke and M. A. Van Aken's sample of 697 learners from fifty-four German elementary school classes found that prior self-concept does not significantly contribute to the

prediction of future achievement (1995). B. E. Kurtz-Costes and W. Schneider also found the relationship of self-concept and achievement did not hold over time (1994). These studies suggest the relationship may be malleable and subject to change.

Inclusive Learning

Research findings suggest that particular interventions may have different impacts for different groups of learners. For example, while effective teachers impact learner achievement, effective educators are a particularly important factor in lower socioeconomic status schools (Konstantopoulos 2009; Nye, Konstantopoulos, and Hedges 2004). Peer-assisted learning, a type of inclusive learning where learners work with a partner, is effective for all learners (Fuchs, Fuchs, et al. 1997), but M. D. Ginsburg-Block, C. A. Rohrbeck, and J. W. Fantuzzi found peer-assisted learning was more effective for low-income learners versus higher-income learners, urban versus suburban-rural learners, minority versus nonminority learners, and grades 1–3 versus grades 4–6 learners (2006). With younger grades, C. A. Rohrbeck, M. D. Ginsburg-Block, J. W. Fantuzzo, et al. found peer-assisted learning was particularly effective for minority, urban, and low-income learners (2003). The most economically disadvantaged learners gained the most from access to a supply of books for summer reading (Allington et al. 2010). A well-specified curriculum for preschool learners had a significant impact on reading achievement for learners from low-income families but not as much for those from high-income families (Assel et al. 2007). While many of these differences are not malleable, instruction and educator actions should be responsive to learner differences and personalize learning for individual learners.

SCHOOL LIBRARIAN

Many best practices identified by T. Seidel and R. J. Shavelson in a meta-analysis relate to the Include Shared Foundation: time for learning, differentiation or adaptive instruction, reinforcement, cooperative learning, and feedback (2007).

Knowledge of Learners

Learning Trajectories. Attention to the trajectories of learners as they move through grade levels is an important aspect of personalization; learner achievement is significantly improved when educators in subsequent grades are knowledgeable of early interventions and trained to follow up (Clements and Sarama 2007). J. Sarama et al. presented positive impacts of a mathematics curriculum that included attention to student learning trajectories (2008). Research suggests that interventions may change trajectories for learners to improve educational outcomes. Early interventions may be particularly important. The quality of teacher-child relationships from preschool through grade three have a significant effect on learner achievement in third grade (O'Connor and McCartney 2007). Learners identified with behavioral problems in first grade continue to have lower test scores at least through fourth grade (Alexander, Entwisle, and Dauber 1993). Early grade learners who participate in short-term, highly responsive instruction delivered by an expert can disrupt the trajectory of low literacy achievement, produce accelerated gains, and enable learners to catch up to their peers and sustain achievement at grade level into the future (May et al. 2013). Early interventions to improve test anxiety has also been suggested as a means for improving later

performance (Hembree 1988). In mathematics, A. Klein et al. found an early intervention that sent materials home for parents to use with their children was effective (2008).

Educator Perception of Learners. Educator perceptions of learner competence may be slow to change. J. R. Nelson et al. found that while reading interventions for struggling kindergarteners showed statistically and educationally significant gains in their beginning reading skills, the intervention did not improve their educator ratings of classroom competence, emotional and behavioral self-control, and self-confidence (2005). Physical attractiveness is one type of diversity that rests on perceptions. L. A. Jackson, J. E. Hunter, and C. N. Hodge demonstrated some relationship with attractiveness and competence in learners (1995). Educator perceptions of learner attractiveness have been shown to have an impact on educator judgments, particularly of learner social skills but less so for academics (Ritts, Patterson, and Tubbs 1992). Educators may also base judgments on race and culture. H. R. Tenenbaum and M. D. Ruck found different expectations for Asian American, European American, and African American learners, with more positive speech directed at European American learners (2007). These findings may be important to observe how children form perceptions that impact their interactions with one another as well as how educators may be implicitly biased regarding particular learner characteristics.

Individualized Instruction. Individualizing reading instruction, including the amount of instruction, has been shown to improve learners' literacy outcomes (Connor et al. 2009). One type of personalization, attention to learning styles, has shown some benefits (Dunn and

Griggs 1995; Lovelace 2005). Formative assessment is a key component of individualized learning. Learners achieved significantly better outcomes in mathematics when educators in elementary and middle schools used continuous monitoring in math to differentiate instruction for individual learners (Ysseldyke and Bolt 2007). Mastery learning, which includes attention to formative assessment, and individualized pacing improve student learning outcomes (Guskey and Piggot 1988; Kulik and Kulik 1992; Kulik and Kulik 1987; Kulik, Kulik, Bangert-Drowns 1990). When educators are trained to implement a program with “flexible fidelity,” they can adapt instruction to the needs of individual learners (Kemple et al. 2008).

SCHOOL LIBRARY

Opportunity to learn, including access to resources and time on instruction, is an important component of individualized learner learning.

Opportunities to Learn

Access to Resources. An international study of science achievement found that access to resources was important to learner achievement (Chiu 2007). In a cross-country comparison of five countries (Australia, Japan, Scotland, Singapore, United States), researchers found that the availability of educational resources at home strongly predicted learners' science achievement at the learner and classroom levels (Kaya and Rice 2010). R. L. Allington et al. found access to a supply of books over three summers improved reading outcomes for disadvantaged learners (2010). R. J. Sampson, P. Sharkey, and S. W. Raudenbush found that living in a severely disadvantaged neighborhood reduced the verbal ability of

Conjecture Map: Library Access and Reading Achievement

Conjecture: Economically disadvantaged kindergarten learners provided daily access (around fifteen minutes whole class) to the school library during the first nine weeks of kindergarten for book selection and check-out will perform higher on measures of reading achievement and interest compared with similar learners given school library access as usual. *Early grade learners who participate in short-term, highly responsive instruction delivered by an expert can disrupt the trajectory of low literacy achievement, produce accelerated gains, and enable learners to catch up to their peers and sustain achievement at grade level into the future (May et al. 2013).*

Embodiment

- **Participant structures:** Kindergarten learners come with the whole class to the school library every day to select and check out books (increased time and access to materials increases opportunities to learn).
- **Discursive practices:** The educator and the school librarian talk with learners about books and the learners' book selections. *Collections are not sufficient (McGill-Franzen et al. 1999); talk about books increases reading comprehension and interest (Fisher, Lapp, and Flood 2001; Pinnell et al. 1994; Saunders and Goldenberg 1999; Stevens and Durkin 1992).*
- **Tools and materials:** Access to collections, including predictable and well-structured texts for new readers. *Targeting materials including predictable or decodable texts is important for new readers (Box and Aldridge 1993; Jenkins et al. 2004).*

Black children by a year or more of schooling (2008). A gender effect was found in science achievement among middle school boys and girls in a one-to-one laptop classroom, with boys outperforming girls (Dunleavy and Heinecke 2007). K. K. Wijekumar et al. also found gender differences in a computer-based intervention in reading (2012).

Access to Instruction. Access to instruction may overcome other challenges for learners. In a critical meta-analysis of evaluations of preschool programs, W. S. Gilliam and E. F. Zigler found modest support for positive impacts on future school attendance and performance, with some impacts sustained for several years beyond preschool (2000). Teen

Mediating Processes

- Learners talk about themselves as readers (self-concept and achievement are reciprocal).
- Books of potential interest to a diversity of learners are on display, included in book talks and other promotions, and shared in read-alouds (collections are not sufficient). *Readers benefit from practice reading with real and engaging texts (Stevens and Durkin 1992; Vadasy, Sanders, and Peyton 2005).*

The school librarian and educator share observations about learner tastes, interests, abilities (where teams share information learner achievement improves). *Broad benefits in reading achievement have been demonstrated in elementary schools where educators plan cooperatively (Stevens and Slavin 1995).*

CONJECTURE: Economically disadvantaged kindergarten students provided daily access (around fifteen minutes whole class) to the library during the first nine weeks of kindergarten for book selection and check-out will perform higher on measures of reading achievement and interest compared with similar students given library access as usual.

DESIGN CONJECTURES	MEDIATING PROCESSES	OUTCOMES
<p>Tools & Materials Collection includes predictable and well-structured texts.</p> <p>Participant Structures Daily whole class library visits for book check out.</p> <p>Discursive Practices Talk about books.</p>	<p>Observable Interactions</p> <ul style="list-style-type: none"> • Students talk about books and reading. • Teachers and librarian share information about student reading interests and behaviors. <p>Artifacts:</p> <ul style="list-style-type: none"> • Book displays • Book talks and read-alouds 	<p>Improved reading achievement and interest.</p> <p>Benefits extend beyond the intervention.</p>

TABLE 3. Conjecture map related to library access and reading achievement.

mothers who received more than eighteen weeks of education were more likely to earn a GED than those who did not (Quint, Bos, and Polit 1997). Perceived gender differences may be more about access to experiences and training. For example, M. Baenninger and N. Newcombe found no gender differences in responses to training in spatial ability,

suggesting the differences are not innate but amenable to instructional interventions (1989). Learners who were provided access to Algebra I online when their school did not offer the course improved their algebra achievement without any negative impacts on overall mathematics achievement, and doubled the likelihood that they would

take future advance mathematics coursework. (Heppen et al. 2011). Learners may be denied access to appropriate instruction because of language differences. For example, J. Wang and P. Goldschmidt concluded non-English speakers and English language learners should be directed into more-demanding pathways in mathematics (1999).

Interdisciplinary Instruction

When combined with ongoing training and coaching for teachers and school leaders, instruction inclusive of multiple disciplines often leads to higher achievement. This approach often includes teams of teachers collaborating across different disciplinary perspectives. When educators, especially teams of educators from different subjects, implemented an experiential approach in which learners conducted research projects to share with outside audiences, learners—especially Hispanic and English language learning—experienced a positive and statistically significant impact on learner achievement in reading and mathematics (Nichols-Barrer and Haimson 2013). J. Kemple, C. Herlihy, and T. Smith found when interdisciplinary teachers were trained to work together to co-plan and exchange information about ninth-grade learner success, learners were more successful (2005). Professional

development focused on integrating academic literacy instruction with content-area coursework on educator instructional practices and learner achievement in reading and high school biology and U.S. history was effective at improving test scores in history, especially for Hispanic and Asian learners compared with White and Black learners (Greenleaf et al. 2011). In their meta-analysis of effective teaching practices, T. Seidel and R. J. Shavelson found cognitive teaching was an effective teaching strategy, particularly when it was domain specific, suggesting the need to integrate metacognitive strategies with disciplinary content (2007). When grade-8 social studies educators included reading comprehension strategies in teaching social studies, learners scored significantly better in reading and in social studies (Vaughn et al. 2013). Similarly, second graders who were provided reading comprehension instruction as part of science instruction performed better on measures of reading with no loss of science content (Williams et al. 2009) and when math concepts were integrated with career and technical education (CTE) instruction, learners performed significantly better in mathematics with no loss of CTE content (Stone, Alfeld, and Pearson 2008). M. M. Hurley's findings were mixed regarding integrating math and science instruction, and the author suggests attending to the manner of integrating content (2001).

Queries for Research and Practice

- Are there patterns in how subgroups respond to school library instruction, activities, etc.? Learner differences, socioeconomic status, racial, cultural, linguistic, etc.?
- How does a school library intervention (increased access to curated materials, integrated school library instruction, interactive storytime, access to makerspace or other materials/experiences) impact learners from lower socioeconomic backgrounds?
- How does a school librarian's knowledge about individual learners and grade-level curricula impact educator planning to differentiate instruction?
- Do learners in schools in lower-socioeconomic neighborhoods with increased staffing and hours (after-school, weekends, vacations, summers) perform differently on reading assessments than similar learners from similar neighborhoods with practice as usual (open only during school hours)?
- How do learners who receive information skills instruction integrated with disciplinary content compare with similar learners who do not receive information skills instruction integrated with content or who receive no information skills instruction on measures of information skills and measures of disciplinary content?
- Do learners in a school with a school library staffed with a professional school librarian have increased opportunities to learn compared with learners who do not have a school library or a school library but no school librarian?
- Do learners who are introduced to diverse characters in diverse literature express increased empathy toward people with diverse characteristics? Can diverse literature disrupt bias?

SHARED FOUNDATION

Collaborate

Collaborative learning involves groups of learners working together to solve a problem, complete a task, or create a product.

When learners collaborate they:

- broaden their ideas and achieve common goals, often in new and innovative ways;
- think critically to solve problems they would not be able to solve independently;
- negotiate new and shared meanings;
- solicit and respond to feedback from others; and
- adapt their thinking to new ideas and situations. (AASL 2018, 29)



SYNTHESIS OF RESEARCH CLASSIFIED WITH THE COLLABORATE SHARED FOUNDATION

OVERVIEW

This Shared Foundation focuses on learners and school librarians collaborating and working with others, such as peers. In the case of the school librarian, this Shared Foundation encompasses working with colleagues such as co-teaching and acting as a professional developer, mentor, and leader.

In education research, collaboration may be seen a bit differently than school librarians often consider. For example, educators may consider working with parents as collaboration. In some schools, a building-wide commitment to collaborative decision making is a form of collaboration. While collaboration is a frequently discussed and researched topic in school librarianship, it has not been the focus of many causal research studies.

Findings from the Educational Research

LEARNER

Shared Learning Experiences

Collaboration is heralded as a key academic success and life skill. For learners, collaboration may involve working with a partner or groups of peers. Higher achievement and more-positive peer relationships were associated with cooperative, rather than competitive or individualistic, goal structures. Learners do better when they understand and share learning goals (Roseth, Johnson, and Johnson 2008).

Grouping may be done in a variety of different ways. For example, R. E. Slavin examined the effectiveness of ability grouping (1987). While the Slavin meta-analysis documented that whole-class grouping is not effective, grouping learners within the class for small-group math instruction was effective, thus suggesting that group work is more appropriate for some curriculum areas over others. For reading, Joplin grouping (where learners are grouped for reading based on ability but not grade level) was an effective model. In general, Slavin

Queries for Research and Practice

- What are the features unique to school librarianship that enhance collaborative relationships? How large of a part of the successful collaborative relationship are these features?
- How and why does school librarian-educator collaboration improve learners' experiences? How do these advantages compare to educator-only instruction?
- What are the differences between collaborations with classroom teachers that include school librarians who were former teachers and collaborations with school librarians who were not? How does classroom teaching experience improve or impede successful school librarian-educator collaborations?
- In schools without a collaborative culture, how do school librarians contribute to learning?

concluded the heterogeneous grouping of learners with regrouping for math or reading was recommended (1987). J. F. Pane et al. affirmed that educator-directed teaching collaborative problem-solving learner groups was associated with higher learner achievement, regardless of curriculum flaws (2010). However, the researchers acknowledged that many educators find group facilitation and teaching difficult to implement.

SCHOOL LIBRARIAN

Educators, as well as learners, can benefit from collaborative relationships in instruction, leadership, mentoring, and providing professional development (Pane et al. 2010).

Co-Planning and Co-Teaching Strategies

Primary 4 learners from a Hong Kong school were guided through group projects using an inquiry project-based learning (PBL) approach that involved the collaboration of three kinds of educators (general studies, language, and information technology) and the school librarian (Chu 2009). The comparison of group project grades revealed significantly higher scores for the collaboratively taught groups that used PBL ($p < 0.05$), over collaboratively taught groups that did not use PBL. Surveys showed learners were perceived to have improved in eight dimensions of learning, with no significant differences ($p > 0.05$) between learners, parents, and educators. Although PBL increased educators' workload, learners enjoyed the projects and perceived them to be relatively easy, regardless of gender or academic ability. Chu also documented that collaborations between teaching staff was most effective when supported by school administration, inquiry learning experts, and

parents (2009). With the school librarian's help, these educators were also effective at improving learners' information literacy and information technology skills (Chu et al. 2011).

Professional Developer, Mentor, and Leader

Educators who engage in summer professional development have access to materials and manipulatives (i.e., a hand-held learning resource like blocks) and receive in-school support are significantly better able to implement math and science achievement improvement initiatives (Newman et al. 2012). In confirmation, another group of researchers documented that professional development is most effective on an educator-by-educator basis because educator-level change is more linked to learner outcomes than school administration-level change (Nye, Konstantopoulos, and Hedges 2004). While teacher coaching can significantly improve teaching practices and learner achievement, little is known about specific features of effective coaching programs (Blazar and Kraft 2015).

SCHOOL LIBRARY

Leadership

Whole-school leadership is effective in some contexts. Schools can affect the outcomes of their learners independently of their learner composition and context (size) through school practice, such as school-wide commitment to cooperation, M. C. Opdenakker and J. Van Damme suggested (2007). Similarly, J. A. Supovitz, P. Sirinides, and H. May concluded that principals and educator-leaders can change educator practice in English language arts through collaborative culture (2010). As with other studies in this area, J. A. Nunnery, C. J.

Yen, and S. M. Ross suggested that the school librarian can act as a leader who works with all grade levels to support standards-based, data-driven, effective practices, and instill a professional learning community (2011). This type of distributed leadership, over time, builds the academic capacity of schools as a means of improving learning outcomes. Shared leadership reinforces academic goals throughout learning experiences (Heck and Hallinger 2009). When a school librarian works with other educators to reinforce classroom goals, learning improves. School-wide leadership practices include school librarian-valued practices such as providing resources for teaching, communication, outreach, resources, and knowledge of curriculum (Waters 2003). Cooperative learning and heterogeneous grouping were found to be especially effective in urban schools, suggesting that leadership efforts may need to be tailored to organizational features (Shouse 1998).

Parent Involvement

The results of a randomized controlled trial suggested that low-income Hispanic middle school learners benefited from an integrated program of 1) parent involvement, including feedback from teachers directly to parents; training parents to address behavior and learning issues; helping parents and learners use supportive community services; 2) attendance monitoring; 3) learner training in social and learning task problem-solving skills; and 4) deep involvement with school counselors (Larson and Rumberger 1995). School librarians are often the bridge between the classroom and home; strategies to effectively collaborate with both groups is sure to benefit learners.



COLLABORATE

Field Study

A Continuum of Care: A Model of Collaboration for New Teachers

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Executive Summary

School librarians occupy a unique position to offer supports for first-year teachers to build resilience, reduce burnout, and ensure retention. The field researchers used resilience theory to develop the Continuum of Care model, which begins with mentoring and moves toward a collaborative partnership. Fifteen school librarians in one urban district recruited twenty-six new educators in their schools to form the treatment group. All new educators in the district were surveyed to establish their initial level of resilience and collect demographic information. At the start of the school year a comparison group of twenty-six new educators were matched by scores on a resilience scale by school level and by Title I school status. The treatment group received interventions using the Continuum of Care model over the course of the following four months. Post-treatment, the comparison group and treatment group were surveyed for level of resilience, burnout, and retention. ANOVA was used to find change in resilience over time for the treatment group. ANCOVA was used to compare resilience and burnout scores for the comparison and treatment groups. Binary logistic regression was used to compare retention of the comparison and treatment groups. Interviews of three school librarian-new educator pairs brought forth the participants' lived experiences. Findings showed that new educators in the treatment group received significantly higher levels of mentoring and collaboration than new educators in the comparison group. There was a significant effect for the interaction between level of resilience for the treatment group and age. School librarians and new

educators valued their relationship and voiced the relationship's effect on resilience, burnout, and retention. Reaching out to new educators to bridge the gap between the school library and classroom may be considered a best practice for school librarians. This exploratory research study laid the groundwork for further study of the role of the school librarian to support new educator resilience in the authentic school setting.

Findings

Preliminary Analysis. On average, participants in the treatment group ($n = 26$) did receive significantly more mentoring and collaboration than those in the comparison group ($n = 26$), $t(50) = 5.094$, $p < .001$, $d = 1.42$, a very large effect size.

- Providing a model of interventions directly affects the professional development of new educators.

General Findings:

- New educators and school librarians saw a mentoring and collaborative relationship as valuable for new educators.
- Mentoring was implemented more readily than collaboration.
- School librarians in secondary schools faced greater challenges implementing the Continuum of Care model than those in elementary schools.
- School librarians in the district who served as building chairs for mandated state testing found connecting with their new educators to be more difficult than expected.
- The mentoring and collaboration process would have been more effective if interventions started during pre-service week.
- To further define the Continuum of Care model, a randomized control trial with a larger sample size in more diverse settings with more data points over several school years would shed light on the role of the school librarian in providing mentoring and collaboration to support resilience for new educators.
- In general, qualitative results show that new educators appreciated their professional relationship with their school librarians. There were four themes developed by the researcher from the interview data, including Isolation/Connection, Provision of Resources, Modeling Teaching Behavior, and Looking Back/Looking Forward.

Research Question 1: To what extent do new educators who receive standardized interventions from the school librarian differ in their scores on a resilience scale from October to March of a school year?

- Quantitative results show that there was not a significant difference between resilience scores for the treatment group from October to March of a school year.
- A significant interaction between resilience over time and age was found. The results of this study point to the need to consider age in years as a factor for new educator resilience.

- Resilience scores show that the new educators in the treatment group did evidence a slight increase in resilience. This increase was not significant, and the effect size was small, but the new educators' resilience scores did move in a positive direction.
- Given a longer time frame, it may be possible to move the new educators' levels of resilience to a greater degree, and even to make a significant difference.

Research Question 2: To what extent do new educators who receive standardized interventions from the school librarian differ in scores on a resilience scale as compared to new educators not formally supported by the school librarian in March of a school year?

- Quantitative results show that there was not a significant difference between comparison group and treatment group scores on the resilience scale.
- Interview responses show that new educators and school librarians did not differentiate between resilience over time (Research Question 1) and resilience of treatment versus comparison groups (Research Question 2).

Research Question 3: To what extent do new educators who receive standardized interventions from the school librarian differ in scores on a burnout inventory as compared to new teachers not formally supported by the school librarian in March of a school year?

- Quantitative results show that there was not a significant difference between the comparison group and treatment group scores on the burnout inventory.
- Through mentoring and collaboration, the school librarians were able to influence burnout in new educators by sharing their expertise and institutional knowledge and through friendly professional interactions.
- The school librarian reaching out to the new educators with extrinsic and intrinsic motivators and a shared sense of humor helped to mitigate the stresses of the daily life of the classroom teacher.

Research Question 4: To what extent do new educators who receive standardized interventions from the school librarian differ in their intent to return to their current teaching position as compared to new teachers not formally supported by the school librarian?

- No significant differences were found for intent to return between the comparison group and treatment group.
- The qualitative data showed that school librarians can play a role in reducing attrition of those new to the field, contributing to a more-cohesive school environment and better quality of teaching.
- Rather than being "stuck on an island" of loneliness, the new educators felt supported through their personal connection to the school librarian.

- Through mentoring and collaboration, the new educators had a knowledgeable partner to turn to in times of need, which influenced their decision-making process when considering their future employment status.

Isolation/Connection:

- The school librarians and new educators spoke to their belief that their personal connection under the Continuum of Care model made a difference in their professional lives.
- A close relationship to the school librarian gave the new educators greater access to the school library's resources as well as the school librarian's expertise and institutional knowledge, both during the study and for the future.
- The essence of new educator resilience may lie in the personal and professional connections established during the first year.
- The pivotal role of the school librarian in providing interventions for new teachers under the Continuum of Care model provides the opportunity to build resilience in new educators.
- Relationships developed under the model contribute to the personal welfare and efficacy of the new educators who receive these interventions.

Provision of Resources:

- The role of the school librarian as the provider of resources "for resilience" appeared several times in the qualitative data. The new educators in the treatment group appreciated those interventions, which included gathering materials for their classroom lessons. They saw this not only as a reduction of their workload, but also as targeted support from an expert in the field who has a "backpack" or a "toolbox" to pull from.
- When curating resources for interventions, the least helpful action by the school librarian was disseminating a long list of resources, which the new educators found overwhelming.
- The most helpful assistance came from providing one or two carefully selected resources at the point of need. This pinpointed approach was most successful when the new educator's needs were met in a timely fashion to support specific content learning objectives.

Modeling Teaching Behaviors:

- A shared subject area between the school librarian and new teacher did make a difference for burnout.
- All the school librarians in this study were licensed in at least one other subject area; the educational background and subject-area experience of the school librarian may provide even more opportunity for reducing burnout when implementing the Continuum of Care model.

Looking Back/Looking Forward:

- New educators should not necessarily be expected to put into practice those skills generated by the Continuum of Care model in their first year. As they reflect on their practice from one school year to the next, new educators may revisit the skills and knowledge learned in their first year to apply them in following school years.
- The relationship developed between the school librarian and the new educator in the first year opens up the opportunity for further collaborations in the years to come.

Causal Research in the Field:

- The school librarians who served as interventionists added a level of complexity to the process because they have professional priorities unrelated to the research.

Recommendations

- Greater accessibility and availability of the school library and school librarian allowed for more flexibility in the relationship.
- Physical, digital, and metaphorical proximity to the school library contributed to building a closer personal relationship and strengthened the bond between the classroom teacher and the school librarian.
- Providing a comfortable, non-threatening environment to advise and answer questions benefited new educators seeking a safe space for mentoring.
- School librarians who serve in mentoring and collaborative roles should avoid behaviors that may be seen as administrative or evaluative. Stepping over that line may alarm the new educator and set up additional barriers to future mentoring and collaboration.
- The allotment of time makes a difference to successful collaborative relationships, whether more time during the school day to consult or a planned event for the school librarian to meet with several new educators together. In cases of only one new educator in the school, flexibility of meet-ups would be more effective, but where there were several new educators, even in one department, a more-collaborative approach would enhance the experience.
- The evidence points to opening up the application of the Continuum of Care model to early career educators in their second or even third year under contract, which would set a more reasonable pace for the interventions to occur.
- It is possible that growth in resilience may proceed at varied paces among individuals and over time. Expanding the time frame of this study to several years with more data points would provide the opportunity to compare the pace of development of resilient qualities between the two groups.

Challenges and Limitations

There were several challenges in this study, mainly because it was located in the authentic school setting:

1. Identifying the new educators in the district was a challenge for two reasons. First, there is a hazy definition of “new teacher,” but the researchers focused on new educators in their first contracted year. The data provided by the district included everyone who attended new teacher orientation, including not only first-year teachers, but also experienced educators who had moved to the district, retired teachers who were filling temporary vacancies, long-term substitutes, and even paraprofessionals. Another list of faculty new to the district provided by human resources included educators, school librarians, nurses, school psychologists, and other non-classroom positions. In the end, the school librarians were the best resource to identify first-year educators to complete the questionnaires.
2. Another challenge related to the personal identifier used to match questionnaire responses for October 2017 and March 2018. Some respondents confused the date of their birthday with the month of their birthday. This problem could be corrected by having participants enter their birth month by name. Some respondents also appeared to have entered different middle names for the two questionnaires. In some cases, it seemed that they were confusing middle names and maiden names. These issues prevented matching between some pre-test and post-test data. A much larger sample size might help to resolve this problem.
3. An additional challenge related to the school librarian’s ability to implement the interventions on the calendar provided and diffusion of the treatment into the comparison group. Although in most cases the new educators reported high levels of mentoring and collaboration with their school librarian, in at least three cases there was a serious lack of intervention. This absence was due to one school librarian with three new educators in her school reporting that she did not implement the interventions because she was the standardized testing chair for her school. Also, a higher-than-expected number of weather-related school closings seriously disrupted the interventions for the month of January. Given the unrelenting pace of the school calendar, opportunities for interventions lost were frequently not recoverable.
4. A final challenge related to diffusion of the treatment into the comparison group. Nine of twenty-six new educators in the comparison group received some form of mentoring and collaboration from their school librarian. It is not surprising that this support occurred, but it may have affected the results when comparing the two groups.

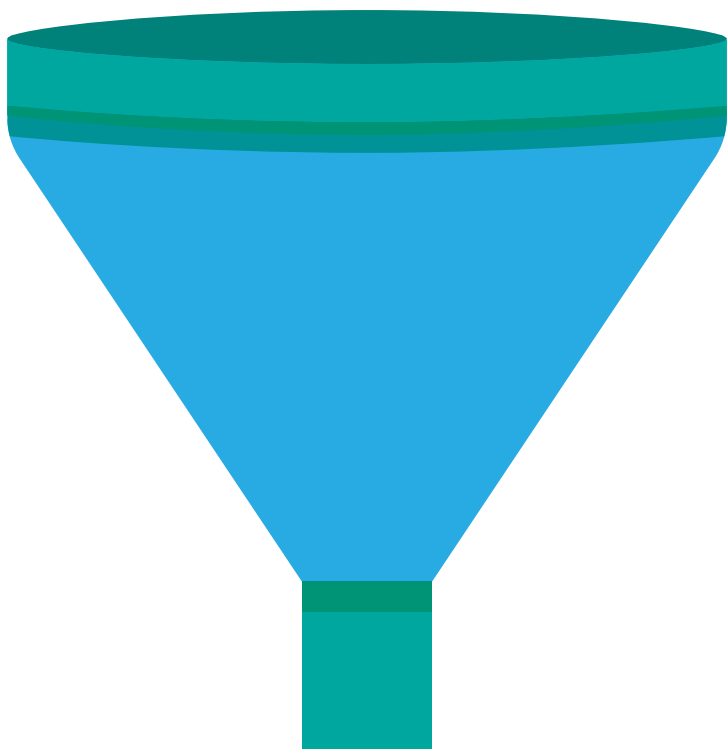
SHARED FOUNDATION

Curate

Curating resources involves the collection, organization, description, and sharing of resources to make meaning for the learner and others.

Learners who curate:

- evaluate information;
 - describe resources so that they may be found and understood by others;
 - integrate new information into their existing knowledge;
 - share knowledge with others; and
 - integrate resources into larger learning networks.
- (AASL 2018, 30)



SYNTHESIS OF RESEARCH CLASSIFIED WITH THE CURATE SHARED FOUNDATION

OVERVIEW

The Curate Shared Foundation involves the effective use of ideas and information as a result of finding, evaluating, and selecting resources appropriate to a given task. A vital component of this foundation is providing access to resources, along with the ability to evaluate and select appropriate resources for the information task. Organizing these resources, conceptually and strategically, involves assessing the authority, currency, relevancy, scope, and relationship to other items collected to satisfy an information need. What the school librarian does to curate a collection of resources for the school's information and curricular needs is scaled to the learner's level of need to evaluate and select resources.

Findings from Educational Research

LEARNER

The learner Domains and Competencies related to the Curate Shared Foundation embrace equipping the learner to identify and think about an information need, gather information to address that need, share information as needed, and organize information for others to use. Understanding how learners learn, under which conditions, and the effect that the provision of resources has on learning all contribute to developing a strong foundation for acting on an information need.

Thinking Skills and Strategies

Concept Mapping. In comparison to activities such as reading text passages, attending lectures, and participating in class discussions, concept mapping activities are more effective for attaining knowledge retention and transfer (Nesbit and Adesope 2006). Learners at levels ranging from grade 4 to postsecondary used concept maps to learn in domains such as science, psychology, statistics, and nursing. Across several instructional conditions,

settings, and methodological features, the use of concept maps was associated with increased knowledge retention.

Visual Skills. In a study that examined how learners learn, K. Burger and E. Winner explored whether reading skills could be enhanced by instruction in the visual arts (2000). The results demonstrated a moderate degree of transfer from art to reading readiness, where the transfer is near (from visual skill to visual skill), but no transfer from art to reading achievement, where the transfer is far (from visual skill to linguistic skill). But, “as an entry point into reading, art projects may be effective: However, these studies cannot be generalized reliably to future studies and do not reveal whether the positive association found has anything specifically to do with art. Perhaps other nonverbal and engaging activities would have the same effect” (Burger and Winner 2000, 290).

Queries for Research and Practice

- What nonverbal and engaging activities could enhance reading skills through instruction in the visual arts?
- Which curation skills can the school librarian model for learners to impact student learning?

Skill Development. Strategies to further assist student learning through skill development include behavior competency, language development, literacy skills, and note-taking skills. In a study of forty-four Head Start programs with four-year-old children, K. L. Bierman et al. introduced an intervention that involved brief lessons with hands-on extension activities and teaching strategies that promoted social-emotional competencies and language development and emergent literacy skills (2008). To further support skill development, take-home materials, including a modeling videotape with parenting tips and learning activities to use at home, were mailed to parents. Results revealed significant differences favoring children in the enriched intervention classrooms on measures of vocabulary, emergent literacy, emotional understanding, social problem solving, social behavior, and learning engagement. An important outcome is that while learners benefited as learners, educators benefited “by organizing skill presentation along a scope and sequence, reducing teacher preparation time, and providing teachers with a platform for skill coaching throughout the day” (Bierman et al. 2008, 16).

Note-Taking. Two skill development articles included meta-analyses studies examining the use and impact of note taking on learner learning with high school learners; both showed positive results (Kobayashi 2005, 2006). Providing instruction and examples of procedures will increase the benefits of note-taking, with a particular larger intervention effect when the instructor’s notes are provided and when learners are at a lower high school academic level.

SCHOOL LIBRARIAN

The role of the school librarian in the Curate Shared Foundation relates to challenging learners, promoting information gathering, contributing to and guiding information resource exchange, and showing learners how to select and organize information.

Challenging Learners

Youth Development Model. B. Dietsch, L. J. Bayha, and H. Zheng found that a literature-based character education program among randomized fourth-grade classrooms that used a youth development model where teachers are critical referents along with a focus on cognitive development, yields positive changes in academic performance, attendance, and citizenship (2005). Learners were able to reflect on stories from the literature and applied the messages to everyday situations.

Educator-Led Strategies. P. B. Horton et al. conducted a meta-analysis demonstrating that top-down instructional strategy of concept mapping, based on Ausubelian Learning theory, has had generally medium positive effects on learners' achievement, especially in biology (1993). Davis Ausubel's theory of assimilation centers on meaningful learning composing the blending of 1) the learner's relevant prior knowledge; 2) the educator constructing meaningful material; and 3) the learner choosing to use meaningful learning. Ausubel's theory also encompasses having the educator lead the construction of concept maps to bring these three components together. Educator-led mapping was even more effective than learner-led

mapping because educators helped learners construct meaning.

Using a meta-analysis, the results of sixty studies were combined to determine the effectiveness of mathematics instruction with manipulative materials (Sowell 1989). Learners ranged in age from kindergarteners to college-age adults and studied a variety of mathematics topics. Results showed that mathematics achievement is increased through the long-term use of concrete instructional materials and that learners' attitudes toward mathematics are improved when they have instruction with concrete materials provided by educators knowledgeable about their use. Instruction with pictures and diagrams did not appear to differ in effectiveness from instruction with symbols.

Expert Curation

Researchers who set out to conduct an experimental study to test the effects of decoding tutoring on learners' reading found no lasting effect of tutoring; however, they did demonstrate that learners' comprehension from reading highly decodable storybooks was more than 70 percent higher than when reading books that were not highly decodable (Jenkins et al. 2004). These findings suggest that books for elementary school libraries must be selected by trained school librarians who are aware of the reading needs in the school community.

Researchers found statistically significant effects on the educational outcomes of kindergarten learners enrolled in the

Conjecture Map: Curation Skills and Impact on Learners

Conjecture: Grade-five learners provided with the curation skills of collecting, organizing, and sharing resources of personal relevance by the school librarian for science lessons will perform higher on measures of achievement and interest compared with learners given no instruction. *A professionally trained educator can engage the learning community in exploring resources (McGill-Franzen et al. 1999); books for elementary school libraries must be selected by trained school librarians who are aware of the reading needs in the school community (Jenkins et al. 2004). In comparison to activities such as reading text passages, attending lectures, and participating in class discussions, concept mapping activities are more effective for attaining knowledge retention and transfer (Nesbit and Adesope 2006).*

Embodiment

- **Participant structures:** A class of grade-five learners come with their whole class to the school library to select and check out books for a science project (increased time and access to materials increases opportunities to learn).
- **Discursive practices:** The educator and the school librarian talk with learners about organizing resources for a science project: books, website, and the makerspace materials. *Collections are not sufficient (McGill-Franzen et al. 1999); talk about books increases reading comprehension and interest (Fisher, Lapp, and Flood 2001; Pinnell et al. 1994; Saunders and Goldenberg 1999; Stevens and Durkin 1992).* Instruction and examples of note-taking procedures and concept mapping are demonstrated, including sharing the school librarian's notes. *Providing instruction and examples of procedures will increase the benefits of note-taking, with a particular larger intervention effect when the instructor's notes are provided and when learners are at a lower high school academic level (Kobayashi 2005, 2006); educator-led mapping was even more effective than learner-led mapping because educators helped learners construct meaning (Horton et al. 1993).*
- **Tools and materials:** Media-rich and curriculum-related collection. *Curated collection of resources needed for curricular instruction is an important asset for a school library (Fisher, Lapp, and Flood 2001; Penuel et al. 2009; Oreopoulos and Dunn 2013); multi-media technology learning environments using a well-researched underlying method, such as structure strategy, can produce improvements in learning (Wijekumar, Meyer, and Lei 2012).*

Mediating

- Learners talk about themselves as curators (self-concept and achievement are reciprocal).
- Learners share the collection they developed for their science project, including books, online resources, and manipulatives. *The use of online information had a positive effect when purposely distributed rather than simply made available (Oreopoulos and Dunn 2013).*
- The school librarian and the educator share observations about learner process, interest, and collections (educators help learners construct meaning). *Educators benefited by organizing skill presentation along a scope and sequence, reducing teacher preparation time and providing educators with a platform for skill coaching throughout the day (Bierman et al. 2008); technology-rich environments must also include engaged educators (McCollister et al. 1986; Mitchell and Fox 2001).*

Outcomes

- Learners perform better on assessments of achievement and interest compared with those receiving no instruction.
- Learners continue to perform better beyond the nine weeks of intervention (through the school year, into subsequent grades).

CONJECTURE: Grade-five learners provided with the curation skills of collecting, organizing, and sharing resources of personal relevance by the school librarian for science lessons will perform higher on measures of achievement and interest compared with learners given no instruction.

DESIGN CONJECTURES	MEDIATING PROCESSES	OUTCOMES
<p>Tools and Materials Collection is media rich and curriculum related</p> <p>Participant Structure Whole class visits the school library for a science project</p> <p>Discursive Practice Talk about organizing resources: books, websites, and the makerspace materials</p>	<p>Observable Interactions</p> <ul style="list-style-type: none"> • Talk about the processes of organizing resources • Instruction and examples of note-taking and concept mapping; share notes • Learners share reflection • Learners share collection • School librarian and educator share observations <p>Artifacts</p> <ul style="list-style-type: none"> • Book displays • Curated websites • Makerspace materials 	<p>Improved science achievement and interest</p> <p>Benefits extend beyond the intervention</p>

TABLE 4. Conjecture map related to impact on learners.

classrooms of educators who received a large supply of high-quality children's books and who participated in teacher development training (McGill-Franzen et al. 1999). Kindergarten children who were taught by educators who had a well-stocked classroom library and who had participated in a series of training sessions on the display and use of books in kindergarten classroom lessons achieved significantly higher scores on every measure of literacy development when compared with children who were taught by educators who were provided with a well-stocked classroom library but no professional development support. Simply providing educators with a generous supply of children's books had little effect on the educational outcomes of learners. However, a professionally trained educator can engage the learning community in exploring resources.

SCHOOL LIBRARY

In the Curate Shared Foundation the school library “includes a professionally curated collection of resources selected based on their authority, currency, relevance, scope, and relationship to other items in the collection” (AASL 2018, 55). As a result, the school library can provide problem-based learning experiences, promote selection of appropriate resources, facilitate the contribution and exchange of information, and engage the learning community in exploring resources (AASL 2018, 62).

School Library as Instructional Resource

B. Fuller conducted a meta-analysis of third-world research and identified the school library as another instructional resource that may significantly influence pupil achievement (1987). For example, “The number of books on loan from a school library was significantly related to learner achievement levels in Argentina, Mexico, and Brazil. Learners who reported that they used the library more frequently performed at higher levels (as always, controlling for pupils' family background)” (Fuller 1987, 279). Fuller makes distinctions between third-world research and research in Europe and the U.S., but asks the same questions of both arenas: What are the management practices and social structures found in schools and classrooms that lead to higher achievement? What are the processes through which these social and pedagogical practices boost achievement? The differentiation of family backgrounds is worth further exploration.

Access to Resources

An international study of science achievement found that access to resources was important to learner achievement (Chiu 2007). R. L. Allington et al. found access to a supply of books over three summers improved reading outcomes for disadvantaged learners (2010).

Douglas Fisher, Diane Lapp, and James Flood examined elementary learners' access to print via a community library (2001). Knowledge of authors, words,

books, and magazines was compared between the learners who accessed the community library and learners who used the school library. In addition, standardized achievement scores were compared for the two groups of learners. Findings indicated the learners who visited community libraries outperformed learners who did not. However, both groups improved significantly as a result of having access to books. Notable differences between the community library and the school library included: the school library limited checkout to one book whereas learners could check out multiple books when they visited the community library; the school library had very few newer books and a limited number of books overall in comparison with the community library; and the community librarian engaged the learners when they arrived and remembered their individual preferences. Before visiting either library, the educator would either talk with learners about a topic or book as they walked to the community library or talk with the school librarian about topics of interests for the learners.

Online Information. Teaching high school learners to use a financial aid calculator and exposing them to a video on the cost-benefit analysis of attending college increased the learners' understanding of the personal benefit of going to college and less anxiety about the cost (Oreopoulos and Dunn 2013). The use of online information had a positive effect when purposely distributed rather than simply made available.

Queries for Research and Practice

- Will the effect of a one-to-one laptop program impact learner learning in subjects where content-specific applications are provided by the school library?
- Will the effect of a one-to-one laptop program impact student learning in subjects where the school librarian is included in the selection and introduction of online resources?
- What school library learning environment changes could help promote science achievement?

Media Rich and Curriculum Related. The provision of resources can range from print through a variety of digital and technological applications; integrating these resources with a curricular focus has demonstrated benefits for learners. In a randomized experiment of preschoolers from economically disadvantaged communities in early childhood education centers, W. R. Penuel et al. found that providing a media-rich environment that combined public television video and games into classroom instruction developed early literacy skills critical for success in school (2009). The foundational skills included: being able to name letters, knowing the sounds associated with those letters, and understanding basic concepts about stories and print. The improvement

of these foundational skills was statistically significant. This study provides strong evidence of a positive impact when digital media is “thoughtfully integrated with teacher-led interactive activities” (Penuel et al. 2009, 15). J. Roschelle et al. examined three studies that evaluated an approach integrating interactive representational technology, paper curriculum, and educator professional development (2010). Analyses revealed statistically significant main effects that support the conclusion that this approach enables educators to extend learner learning to more advanced mathematics for middle schoolers. K. K. Wijekumar, B. J. F. Meyer, and P. Lei found that support for multi-media “technology learning environments that use a well-researched underlying method, such as structure strategy, can produce improvements in learning” (2012, 1011). The structured strategy included a heavy focus on text structure and signal words such as “compare.”

A. A. Zucker et al. explored the use of handheld devices and probeware with a National Science Foundation (NSF) project titled Technology Enhanced Elementary and Middle School Science (TEEMSS) in grades 3–8 for eight units of study and found significantly more achievement for half the units but no differences for the others (2008). No clear reason was found as to why the technology improved outcomes for some and not for others, but the suggestion is that some topics lend themselves more to probes and graphing. The researchers did find that technology was important in some units. Having a curated collection of resources needed for curricular instruction

is an important asset for a school library. A study by G. B. Ramani and R. S. Siegler identified that preschoolers who play linear number board games demonstrated enhanced understanding of numerical magnitudes, improved counting, and improved numerical identification (2008). A link to resources at home exists since many preschoolers also play board games at home.

Access to Computers. Not all resources provided have significant effects. M. Dunleavy and W. F. Heinecke investigated the effect of one-to-one laptop to learner ratios on math and science achievement in at-risk middle school learners (2007). The results showed significant effects for science but none for mathematics. Further, the effects showed a gender difference with boys outperforming girls in science. An important feature of this study is the goal for introducing laptop instruction: the laptop program was intended to increase the efficiency of the curricular delivery and was “not related to major changes in the philosophy of teaching and learning at the school” (Dunleavy and Heinecke 2007, 10).

T. S. McCollister et al. examined using computers as an effective method for teaching elementary learners mathematical skills (1986). Computers alone seemed to work best for learners who had numeral recognition; however, educator assistance was necessary for ordinal and arithmetic tasks. This finding suggests that computers alone are not enough to improve learning; technology-rich environments must also include engaged educators. This finding is also supported by M. J. Mitchell and B. J. Fox, who found that low-progress kindergarten and first-grade readers’

phonological awareness improved as a result of specific software that included instructional components and that was facilitated by an educator (2001). These results are vastly superior to those from children left to explore software on their own. With the increasing emphasis on the use of technology as a basic instructional delivery system, it is imperative that software applications be accompanied by instructional components.

Resources at Home. In a cross-country comparison of five countries (Australia, Japan, Scotland, Singapore, United States), researchers found that the availability of educational resources at home strongly predicted learners' science achievement both at the learner and classroom levels (Kaya and Rice 2010). While there are limits to the impact that educators can have on learners' home environments, improving school and classroom environments could help in promoting science achievement.



SHARED FOUNDATION

Explore

When learners explore, they consider their existing knowledge, formulate authentic questions, experiment with physical and intellectual pursuits, collaboratively investigate answers, self-assess progress, and openly receive constructive feedback to strengthen their skills.



As a result of investigating new ideas through authentic exploration learners can:

- engage in learning in deeper ways;
- do more-complex thinking;
- conceptualize ideas; and
- understand issues in greater depth. (AASL 2018, 30)

SYNTHESIS OF RESEARCH CLASSIFIED WITH THE EXPLORE SHARED FOUNDATION

OVERVIEW

The Explore Shared Foundation is driven by curiosity and discovery as learners read broadly, tinker and investigate with a variety of concrete materials and symbolic representations, and develop a growth mindset. Studies in the CLASS aggregation supported the use of manipulatives, real-world materials, and other hands-on explorations and models related to learning in content areas like math, science, or social studies. Reading as “the core of personal and academic competency” (AASL 2018, 13) is also explicitly addressed in the Explore Shared Foundation: “Learners develop and satisfy personal curiosity by reading widely and deeply in multiple formats and write and create for a variety of purposes” and “[s]chool librarians foster learners’ personal curiosity by encouraging learners to read widely and deeply...” (AASL 2018, 104). A significant number of studies from educational research and identified in the CLASS aggregation concern learning to read. This section includes a synthesis of the research regarding experiential learning as well as research related to reading.

Findings from Educational Research

LEARNER

Opportunities to Explore with Concrete Materials

Hands-on learning includes non-linguistic activities and problems such as those represented visually through drawings, graphs, or symbols or through real-world materials and activities. Learners may benefit from the inclusion of these kinds of experiences. For example, learners who experienced an enriched intervention that included hands-on extension activities and take-home materials for parents to use with four-year-olds revealed significant differences on measures of vocabulary, emergent literacy, emotional understanding, social problem solving, social behavior, and learning engagement (Bierman et al. 2008). Preschoolers who played linear number board games demonstrated enhanced understanding of numerical magnitudes, improved counting, and improved numerical identification (Ramani and Siegler 2008). In a mathematics curriculum that presented math as an “active science of patterns,” was problem-based,

included experimentation and exploration, and incorporated graphics calculators, learners performed better on conceptual understanding and contextual problem solving (Schoen and Hirsch 2002). M. Resendez and M. Azin also found that learners who were provided with real-world connections performed better at mathematical problem solving (2008).

STEM Learning. Evidence suggests these kinds of experiences may improve student learning outcomes related to content learning, particularly in science and mathematics. C. M. Schroeder et al. found alternative teaching strategies that included connecting content to real-world examples were more effective in raising science achievement (2007). A learner-centered, hands-on, and phenomenon-based intervention in chemistry resulted in increased content knowledge and engagement with the subject (Pyke et al. 2004). A meta-analysis found mathematics achievement and attitudes toward the subject was increased through the long-term use of concrete materials (Sowell 1989).

Technology-Aided Instruction. In the National Science Foundation (NSF) Technology Enhanced Elementary and Middle School Science (TEEMSS) project in grades 3–8, instructors used handheld probes with learners for eight science units and found significantly higher achievement for half of the units, but no differences for the others, suggesting some content may be more amenable to this application of technology (Zucker et al. 2008). Technology-aided instruction also aids in mathematics learning (Haas 2005), specifically with the inclusion of animations (Roschelle et al. 2010).

SCHOOL LIBRARIAN

Interventions Disrupt Low Reading Achievement under School Librarian

Early interventions with struggling readers delivered by an expert can disrupt a trajectory of low literacy achievement (May et al. 2013; Pinnell et al. 1994). One means for an early intervention is read-alouds. Best practices for read-alouds with learners include vocabulary instruction, higher-order questioning, and support for comprehension of texts (Goodson et al. 2010), concepts of print and story elements (Penuel et al. 2009); and texts with features such as predictability (Box and Aldridge 1993). These can be shared through rich conversations (Rosenshine and Meister 1994; Wasik and Bond 2001; Whitehurst et al. 1994) or songs (Marquez et al. 2014). When media are used as part of storytime, the educator should watch videos with learners and involve them in active viewing that includes discussion and related activities (Penuel et al. 2009). Vocabulary instruction should include, when possible, concrete objects (Wasik and Bond 2001).

Integrating Reading with Content. One way readers encounter new vocabulary is through expository texts related to content areas. One strategy to improve comprehension involves teaching learners to generate questions about what they are reading (Rosenshine, Meister, and Chapman 1996). Broad benefits in reading achievement have been demonstrated in elementary schools where educators plan cooperatively (Stevens and Slavin 1995). Integrating reading instruction with disciplinary content has been shown to improve learner achievement in reading (Greenleaf et al. 2011; Nichols-Barrer and Haimson 2013; Vaughn et al. 2013; Williams et al. 2009) rather than as

a stand-alone program (May et al. 2013). J. P. Williams et al. used a randomized controlled trial design in a study where second graders were provided reading comprehension instruction as part of science instruction (2009). The learners performed better on measures of reading with no loss of science content. In particular learners were provided with instruction about structure of compare-contrast texts, including clue words, graphic organizers, and trade books. The learners demonstrated transfer of these skills to new texts as well as less well-structured texts. A reading intervention might also provide benefits in learning mathematics (Hedges et al. 1986) and science (Guzzetti et al. 1993). Interdisciplinary research projects, planned collaboratively, can have a positive impact on middle school learner achievement in reading and mathematics and may be particularly effective when shared with an authentic, outside audience (Nichols-Barrer and Haimson 2013).

Talking about Reading. Talk about books and reading is an important component of making meaning from text or reading contribution. When readers engage in conversations about books they become stronger readers (Fisher, Lapp, and Flood 2001; Pinnell, et al. 1994; Saunders and Goldenberg 1999; Stevens and Durkin 1992). Learners working with peers can be effective as peer tutors (Fuchs, Fuchs, et al. 1997) or with peer review (Pritchard and Marshall 1994). Reciprocal teaching where the educator models and eventually relinquishes the guided talk about reading is one particularly effective model (Rosenshine and Meister 1994).

Modeling Reading. Readers also benefit from adult modeling and interactions such as parent reading (Bus, Van Ijzendoorn, and Pellegrini 1995; Whitehurst et al. 1994) and repeated

reading to an adult who can provide feedback (Therrian 2004). For those learners experiencing difficulty learning to read, one-to-one tutoring by trained volunteers is very effective (Baker, Gersten, and Keating 2000; Elbaum et al. 2000; Morrow-Howell et al. 2009; Vadasy, Sanders, and Petyon 2005). Learners are often pulled out of class for this intervention. While training was an important component of the intervention's effectiveness, the one-to-one aspect suggests personalization and a relationship between the learner and tutor. Peer tutoring is also a promising practice (Fuchs, Fuchs, et al. 1997; Stein et al. 2008). One to one is also a hallmark of Reading Recovery, a program shown to be effective with struggling readers (D'Agostino and Murphy 2004; Pinnell et al. 1994).

SCHOOL LIBRARY

Space for Social Learning

Many hands-on interventions include a social aspect of working with others to solve problems. In a meta-analysis comparing cooperative and competitive group structures for problem solving, Z. Qin, D. W. Johnson, and R. T. Johnson found cooperative groups were particularly successful in problem solving with non-linguistic problems where a variety of linguistic skills can be accommodated and multiple solutions are generated (1995). Shared read-alouds were part of an intervention that improved vocabulary, both on book-related vocabulary and on standardized tests of vocabulary (Wasik and Bond 2001).

Readers Need Practice

A key concern of educational research into reading is the new reader recognizing print and learning to decode letter sounds, including explicit teaching of phonological structures

Queries for Research and Practice: Experiential Learning

- How do school libraries facilitate hands-on learning through the provision and access to various materials, simulations, and models in the collection?
- How do school libraries facilitate hands-on learning through the integration of various materials, simulations, and models integrated with instruction?
- How do school libraries facilitate hands-on learning through the provision of spaces for exploration and discovery such as makerspaces?

(Byrne and Fielding-Barnsley 1991; Ehri, Nunes, Stahl, et al. 2001; Ehri, Nunes, Willows, et al. 2001; Foster et al. 1994; Rashotte, MacPhee, and Torgensen 2001; Slocum, O'Connor, and Jenkins 1993; Swanson et al. 2003). Learning to read is a complex endeavor and while many factors have been identified as important such as phoneme identity (Byrne and Fielding-Barnsley 1991), rapid naming (Swanson et al. 2003), blending and segmenting (Slocum, O'Connor, and Jenkins 1993), researchers often concluded that these isolated skills were necessary but not sufficient. There is also evidence that word study alone is not sufficient, but readers also need practice reading with real and engaging texts (Stevens and Durkin 1992; Vadasy et al. 2005).

Reading builds stronger readers. As learners read more, especially new material with unfamiliar vocabulary, they incidentally acquire new vocabulary, learning the meaning of about 15 percent of the new words encountered while reading (Swanborn and de Glopper 1999). Vocabulary is important to reading comprehension and can also be explicitly taught. Such instruction is most effective with multiple exposures including opportunities to engage with the vocabulary in context such as interactive read-alouds (Stahl and Fairbanks 1986; Wasik and Bond 2001; Whitehurst et al. 1994).

Reading Is Learned Outside of School. Teaching, assessment, and learner proficiency in reading remain fundamental concerns and purposes of education. Several comprehensive studies examining large-scale interventions with intended effects on both mathematics and reading have found significance of the intervention in mathematics but not reading (Nye, Konstantopoulos, and Hedges 2004; Peterson and Chingos 2009), leading at least one research team to suggest reading “is likely to be learned (in part) outside of school and thus the influence of school and teacher on reading is smaller or there is less variation in how (or how well or how much) reading is taught in school” (Nye, Konstantopoulos, and Hedges 2004, 247).

Access to Reading Materials. Access to a wide selection of reading materials is an important aspect of reading achievement (Allington et al. 2010; Fisher, Lapp, and Flood 2001). Summer school is an effective intervention for early elementary learners (Zvoch and Stevens 2013). The provision of books for summer reading is particularly effective for learners identified as economically disadvantaged (Allington et al. 2010). Providing classrooms with collections of books is not sufficient (McGill-Franzen 1999). Targeting materials including predictable or decodable texts is important for new readers (Box and Aldridge 1993; Jenkins et al. 2004).

Queries for Research and Practice: Reading

- How do the reading activities and materials provided by professional librarians through the school and public library contribute to student learning outcomes?
- How might the practice of read-alouds by the librarian be enhanced through attention to phonemic and phonological structures, word study, and vocabulary through authentic texts?
- How do guided inquiry projects planned collaboratively with teachers and led by the school librarian contribute to learner reading skills of expository material? In particular if the projects include instruction and modeling for the extraction of relevant information from a variety of texts? If they include an authentic, outside audience?
- What is the impact of guided inquiry projects on reading, mathematics, and disciplinary content and skills?
- Do educators who collaborate with the school librarian employ a greater variety of texts related to disciplinary content? More authentic texts targeted for stages of learning to read such as decodable or predictable texts for new readers?
- How does an intensive intervention through the school library impact the trajectories of new and/or struggling readers? Including more frequent access to school library activities such as read-alouds and multimedia and library materials? Including more interactive storytimes or use of media with opportunities for dialogue, singing, explicit instruction in vocabulary, questioning, concepts of print, story elements, and concrete objects?
- Do tutoring interventions located in the school library or with training involving the school librarian have a different impact than those held elsewhere?
- What is the impact of one-on-one conversations between the school librarian and learners on reading interests, motivation, and achievement?
- What is the impact of summer access to the school library, library materials, and/or a school librarian on retention and improvement in reading achievement?
- What is the impact of training provided to classroom teachers by the school librarian regarding book displays, book talks, and interactive read-alouds?
- What impact does participation in a book club or discussion group held in the school library and led by the school librarian have on reading comprehension?



EXPLORE

Field Study

Elementary and High School Learners' STEM Learning Experiences through the Use of a Transmedia Book

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This project sought to increase elementary and high school students' STEM learning experiences through a transmedia book. School librarians exposed learners to a storyline where a newly graduated engineer sought to help a former middle school classmate save a family farm. The text was written to incorporate project-based learning activities to enhance the skills needed to be an engineer. The book also contained QR codes and links to web resources that served as extenders to explore aspects of STEM careers.

Digital fabrication is cited as a technology that will provide future employment opportunities. Activities that utilized fabrication with 2D and 3D printers were integrated into the book's content. Activities learners explored included ancient irrigation practices and cisterns and objects of art with a utilitarian purpose. Constructs measured included changes in attitudes toward STEM, reading fluency and comprehension, and STEM knowledge.

Data was collected before teaching the unit and immediately after completing it to determine the effectiveness of teaching the transmedia book and the accompanying instructional unit. The instruments included:

- Trends in International Mathematics and Science Study (selected items, TIMSS L): This is an academic assessment created from previously released quantitative questions from the TIMSS assessment (National Center for Education Statistics 2017).
- Career Interest Inventory: Twelve Likert questions that reflect three areas: the "perception of a supportive environment for pursuing a career in science, interest in pursuing educational opportunities that would lead to a career in science, and perceived importance of a career in science" (Tyler-Wood, Knezek, and Christensen 2010, 8).
- STEM Semantic Survey: Designed to assess student perceptions of STEM careers. It consists of twenty-five Likert-scale questions that ask about STEM careers, science, math, engineering, and technology.

Research Design

An experimental design was implemented using a high school and two elementary schools. The curriculum was implemented at one elementary school with fourth-grade learners, and another elementary school provided a control group of learners in the fourth grade. The experimental and control groups at the high school consisted of eleventh- and twelfth-grade students. For each instrument, ANOVA-Repeated Measures determined if there were changes over time and changes between the pre-test and post-test scores among groups. Pre-test scores were compared to post-test scores for each instrument. Group assignment was used as the independent variable, and the scores on the various instruments were the dependent variables. For each analysis, there were three levels for the “group” variable:

- Group 1 = contrast (i.e., control group that received no intervention)
- Group 2 = partial intervention (i.e., the unit was taught, but digital fabrication was not an activity included)
- Group 3 = full intervention (i.e., the unit was taught using digital fabrication)

Findings

- For the high school, an analysis was run to determine if the STEM Semantic Survey scores improved. A one-tailed test revealed that the partial intervention group scores improved after completing the unit.
- The high school results also indicate that the full intervention group maintained their interest in a science career. The partial and control groups had larger gaps in their scores. It is not uncommon for the post-assessment scores of students to decrease. These results suggest that participating in the intervention helped the full intervention group maintain their scores.
- Regarding the elementary school participants, overall, the intervention improved the students’ science and math scores. The male students in the full implementation group also had significantly higher academic achievement scores. Finally, the partial intervention group had significantly higher scores on their post-STEM academic achievement assessment.

Limitations

Several limitations impacted the implementation of the study. K–12 school environments present circumstances that can be volatile for the management of experimental studies. Initially, the study was going to be implemented at a single middle school site. After the summer break, the librarian decided to withdraw due to job responsibilities. The school’s withdrawal caused the researchers to look for new study participants after the school year started. The elementary school participant started approximately one month into the school year. The students were scheduled to participate in the lessons each week. However, there were several interruptions to the schedule, including school events, the librarian’s absence for professional

development, holidays, and testing. The grant principal investigator served as an assistant for the librarian on most days during the project implementation.

A high school librarian agreed to participate, and the lessons began in January. These students spent less time than the elementary students completing the lessons because of the January start date. Like many high school librarians, the librarian did not have a weekly scheduled class with the students. With support from the principal, she collaborated with elective teachers to participate in the study. The researchers were not able to visit the high school. However, the teachers remained nearby while the librarian taught the unit.

While the high school participants attended one school, the elementary school librarian later decided to include the entire fourth grade. It took at least a month to identify another school to serve as a control group and update the institutional review paperwork. Therefore, the elementary control group was not tested until one and a half months after the full and partial implementation groups started the project. At that stage, they were more academically advanced than the other groups.

The high school students began the project with four and a half months remaining in the school year. The twelfth-graders were expecting to graduate and were likely distracted. The results show that the intervention was more effective for the elementary students. The researchers believe that the time that the students spent on the lessons affected the results. The scores for the high school students might have been higher if they began the study earlier.

Practical Implications

School Librarians as STEM Role Models

The study results assist with visualizing the role of school librarians as STEM educators and role models. The school library environment presents students with informal opportunities for learning that can be misconceived as insignificant. As shown in this case, students can acquire STEM skills and experiment with equipment that may not be available in their homes. Students from underrepresented populations in STEM need role models to relate to in friendly settings that champion exploration. Role models such as school librarians have the potential to make STEM education accessible.

Low-Stakes Relatable STEM Opportunities

Students need to be able to envision themselves in STEM positions. In the case of this research, the participants were reminded that they were engineers making essential decisions. They completed STEM activities associated with realistic problems. For instance, some elementary students mentioned that they enjoyed the unit because they lived on farms or had families with farms. They recognized the implications of saving farms and adopting sustainable living practices. The students participated in hands-on projects that reinforced that becoming an engineer is an achievable goal. More opportunities like this unit are needed in schools through low-stakes engagement opportunities. STEM careers provide upward economic mobility and a better quality of life for people who can attain them.

Research Implications

Providing Evidence of School Library Effectiveness

The role of school librarians continues to evolve. School librarians need to document effective practices as job expectations change. Research already affirms that school librarians are vital for technology implementation in schools (SLJ Staff 2020). This technology implementation goes beyond watching hardware and installing software. Emerging technology such as 3D printers have become intertwined with school curriculums and supporting STEM learning.

Similar to this study's process, STEM activities in school libraries will continue to mature in complexity over time. Often, school librarians provide activities without determining if their results are statistically significant. Nevertheless, more school librarians facilitate STEM activities each year. The intricacies of their jobs necessitate them being taught how to create engaging units supported by evidence-based practices. School librarians should be trained in data literacy and mixed methods research skills to be more effective after their educational programs. More research would likely exist to document school libraries' effectiveness if data literacy skills were a component of preparation programs. The school librarians that implemented the transmedia book were key participants, and the study would not have been possible without them.

Future Research

This study offers evidence that using transmedia text can support academic achievement. In the future, the team plans to conduct additional research on transmedia texts for STEM learning in school libraries. Transmedia texts based on STEM topics designed to target specific populations may resonate with these populations. For example, the text in this study used a female in a rural area. When the study is replicated, the researchers plan to include open-ended questions during survey data collection to maximize feedback. Finally, since the male students in the full intervention group in the elementary school showed the most academic achievement, it is necessary to understand what makes STEM intervention activities fulfilling for female students. Then school library researchers and practitioners can collaboratively design activities for optimal achievement.

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SHARED FOUNDATION

Engage

Engagement is the degree of attention, curiosity, interest, optimism, and passion that learners show when they are learning or being taught
(Abbott 2017).

When learners engage they:

- develop dispositions that allow them to participate ethically and respectfully in communities of practice;
- produce materials based on valid information;
- act ethically and responsibly in their sharing of information; and
- extend learning by personalizing their use of information.
(AASL 2018, 31)



SYNTHESIS OF RESEARCH CLASSIFIED WITH THE ENGAGE SHARED FOUNDATION

OVERVIEW

The Engage Shared Foundation is the most outward facing and pertains to learners' engagement outside of school. Learner engagement has affective, attitudinal, and socio-emotional dimensions, and matters of behavior are included in this Shared Foundation. From a school librarian and school library perspective, this Shared Foundation also encompasses relationships with parents and community organizations, including extracurricular, service, and informal learning. Though Engage encompasses a wide range of topics pertaining to communicating with external stakeholders, the ESSA strong and moderate evidence focused on several themes.

Findings from Educational Research

LEARNER

Strong and moderate evidence in the learner framework related to strategies to improve learner behavior and learning centered on life beyond school.

Socio-Emotional Learning

Parent Involvement. The causal research related to Engage related to the learner was centered on behavior. When educators engaged with parents to systematically address problematic first-grade learners' behavior by providing appropriate, consistent discipline; warm, positive involvement; and involvement with the school, learner outcomes improved. When educators and parents worked together, all learners' social, emotional, and academic skills; peer interaction concerns; and conduct problems improved, regardless of gender, race, and study cohort (Conduct Problems Prevention Research Group 1999). Affirmingly, H. M. Walker et al. found that a three-month, structured early intervention in grades 1–3 that included a school and a parent component and conducted by a behavioral coach (counselor,

social worker, etc.) had moderate positive effect size related to educator and parent ratings of behavior and social skills (2009). While learners' tested academic success did not necessarily improve, these researchers suggested that working together, educators and parents improve learners' socio-emotional outcomes.

Educators' trust in learners and parents is critical to school success in fourth-grade mathematics and reading (Goddard, Tschannen-Moran, and Hoy 2001). Using survey data collected on 452 educators and data on achievement in reading and mathematics and on socioeconomic status of 2,536 fourth-grade learners in forty-seven urban elementary schools, R. D. Goddard, M. Tschannen-Moran, and W. K. Hoy showed that trust varied greatly among the elementary schools and that this variation was strongly related to differences among schools in socioeconomic status (2001). The results of the study showed that even after accounting for variation among schools in learner demographic characteristics, prior achievement, and school socioeconomic status, educators' trust of parents was a significant positive predictor of differences among schools in learner achievement.

Self-Perception. Parents' important contribution to learner success is likely related to their ability and need to reinforce learners' positive self-perceptions. J. C. Valentine, D. L. DuBois, and H. Cooper conducted a meta-analysis that revealed that learners' self-beliefs about intelligence have a small but significant impact on achievement, particularly if those beliefs are aligned with the learning domain or subject area (2004). However, when high school and middle school learners with

fixed self-beliefs learn to develop learning goals and positive beliefs about effort, they have better socio-emotional and academic outcomes (Blackwell, Trzesniewski, and Dweck 2007; Yeager et al. 2014). Relative to children in control schools, pre-kindergarten and kindergarten children in schools in which parents were taught to support self-regulation had higher kindergarten achievement test scores. Early childhood population-level intervention that enhances both home and school environments shows promise to advance academic achievement among minority children from disadvantaged, urban neighborhoods (Brotman et al. 2013).

Structured Curricula. Structured efforts to improve learner behavior and self-concept have also been effective outside of school. Almost 1,000 third-grade learners and forty-six educators participated in a curriculum grounded in Bandura's Social Learning theory (Hall and Bacon 2005) and focused on developing personal and interpersonal skills to solve conflict non-violently and resist social influences that led to violence among learners in the treatment group. Via survey, educators reported observing learners more-frequent use of personal and social skills and prosocial behaviors after program delivery. Even after five months, learners evidenced more positive scores in the areas of emotional competency skills, social and resistance skills, and communication skills. When learners are encouraged and given tools to self-regulate and communicate, their behavior improves. Children improved their ability to avoid violent situations and solve problems nonviolently by strengthening their social relations with peers, learning how to interpret behavioral cues, and improving conflict resolution.

Schoolwide positive behavioral interventions and supports are a part of a universal, schoolwide prevention strategy that is currently implemented in more than 9,000 schools across the nation to reduce disruptive behavior problems through the application of behavioral, social learning, and organizational behavioral principles (Bradshaw, Mitchell, and Leaf 2010). Schoolwide positive behavioral interventions and supports are aimed at altering school environments by creating improved systems and procedures that promote positive change in learner behavior by targeting staff behaviors. C. P. Bradshaw, M. Mitchell, and P. J. Leaf used data from a five-year longitudinal randomized controlled effectiveness trial of schoolwide positive behavioral interventions and supports conducted in thirty-seven elementary schools to examine the impact of training in these activities on implementation fidelity as well as learner suspensions, office discipline referrals, and academic achievement (2010). School-level longitudinal analyses indicated that the schools trained in schoolwide positive behavioral interventions and supports implemented the model with high fidelity and experienced significant reductions in learner suspensions and office discipline referrals.

Positive Action, a comprehensive, school-based social-emotional and character development program for middle schoolers, includes a series of lessons, parental training, and teacher training (Bradshaw, Mitchell, and Leaf 2010). Similar to schoolwide positive behavioral learning interventions and supports, learners who participated in the Positive Action program improved behavior and academic achievement, as measured by school-level indicators, learner self-reports, and educator ratings; the effects were statistically significant and the effect sizes were meaningful.

Life beyond School

Mentored Learning. From the school-to-work perspective, P. Z. Schochet, J. Burghardt, and S. Glazer found that the JobCorps for youth age 16–24, which provided basic education, vocational training, counseling, and residential services, positively affected employment, earnings, and GED completion and reduced criminal activity; however, it did not lead to increased college attendance or completion (2001). At-risk youth particularly benefit from a highly structured, mentored learning environment in which they engage with life preparation activities (Millenky, Bloom, and Dillon 2010). These environments tend to enable youth to obtain a high school diploma or a GED certificate; earn college credits; be engaged in productive activities; and be less likely to have been convicted of a crime or have engaged in certain delinquent acts.

Adventure-Based Curricula. Older learners benefited from opportunities to engage beyond the classroom. Adventure programs are a common means to informal learner engagement in the summer and after school. These programs, many nature based, can obtain notable outcomes and have particularly strong, lasting effects, though not all adventure programs are inherently good, with much variability in outcomes between different studies, programs, and individuals. A twenty-to twenty-six-day adventure program can have substantial effects relative to other educational experiences, and the effects are long lasting and often increase over time. The instructional processes that make the difference to outcomes in adventure programs (such as challenge, risk taking, feedback, mutual group support) are similar in regular classrooms, and educators of in-class educational experiences may learn

Conjecture Map: Engaging with Career Stakeholders

Conjecture: Learners with librarians who help them to identify and gain access to career professionals develop communication confidence and ability to see themselves in a career. *Learner-educator-scientist partnerships improve learners' knowledge of career opportunities, especially in science (Houseal, Abd-El-Khalick and L. Destefano 2013). Hands-on activities increase learner confidence (Young, House, Wang, Singleton, et al. 2011). Many learners suffer from communication apprehension in traditional learning environments (Bourhis and Allen 1992).*

Design Conjectures

Tools and materials: Chamber of Commerce and other local professional materials; computers for web searching, e-mail, video conferencing and editing; video editing software; presentation software.

Participant structures: Learners work in pairs; five class visits to school library.

Discursive structures: Discussion of career interests, contact approaches, interview question and style, video editing, and presentation format; identification of professionals.

Mediating Processes

Observable interactions: Discussion related to career interests; e-mails and phone calls to career professionals; video interviews with career professionals.

Artifacts: Search results; interview protocol; edited video recording; presentation.

Through this school librarian-facilitated interaction with career professionals, learners will decrease communication apprehension; articulate connections between academic and

much from noting the effectiveness of these factors in out-of-class experiences such as adventure programs (Hattie et al. 1997). However, D. Cason and H. L. Gillis's 1994 meta-analysis of 96 adventure programming studies and J. Hattie et al.'s 1997 meta-analysis of 79 adventure programming studies demonstrated that adolescents who

attended adventure programming improved self-concept, behavioral assessments, attitudes, locus of control scales, grades, and school attendance than those who did not participate. While combining various populations and outcomes resulted in an overall effect that could be considered small by some accounts, the studies did

real-world content; and increase their understanding of knowledge and skills required to successfully engage in careers. *Real-world and career-based opportunities reinforce and complement traditional instruction (Freeman 1997). Learner-led activities significantly improve career and science knowledge, especially among learners of diverse backgrounds who live in large urban areas (Young, House, Wang, Singleton, et al. 2011).*

CONJECTURE: Learners with school librarians who help them identify and gain access to career professionals develop communication confidence and ability to see themselves in a career.		
DESIGN CONJECTURES	MEDIATING PROCESSES	OUTCOMES
<p>Tools and Materials</p> <ul style="list-style-type: none"> • Chamber of Commerce and other local professional materials; and • Computers with software for web searching, e-mail, video conferencing and editing, presentation <p>Participant Structures</p> <ul style="list-style-type: none"> • Learners work in pairs; and • Five class visits to school library <p>Discursive Practices</p> <ul style="list-style-type: none"> • Discussion of career interests, contact methods, interview questions and style, video editing, and presentation format • Identification of professionals 	<p>Observable Interactions</p> <ul style="list-style-type: none"> • Discussion related to career interests; • E-mails and phone calls to career professionals; and • Video interviews with career professionals <p>Artifacts</p> <ul style="list-style-type: none"> • Search results; • Interview questions; • Editing video recording; and • Career interest presentation 	<p>Learners will:</p> <p>Decrease communication apprehension</p> <p>Articulate connections between academic and real-world content; and</p> <p>Increase their understanding and knowledge of skills required to successfully engage in the identified careers</p>

TABLE 5. Conjecture map related to career exploration.

point to major problems with current research and offers some opportunities for future researchers to explore. Adventure programming was not shown to be significantly more effective with adjudicated adolescents than with other adolescent populations; it was equally effective.

SCHOOL LIBRARIAN

The school librarian’s role in Engage is multi-faceted, including modeling and teaching ethical behavior, providing opportunities for learners to connect with external stakeholders, and ensuring that learners understand, respect, and practice ethical information practices. Often,

though, the choice of opportunity is strongly linked to educators' preferences, beliefs, and experiences. Indeed, educators' perceptions of the utility of these external relationships is key to their motivation to making these relationships happen.

Experts in the Field

In a moderate ESSA evidence level, quasi-experimental study, A. K. Houseal, F. Abd-El-Khalick, and L. Destefano examined the effects of engaging K–12 learners in learner-educator-scientist partnerships, a type of science-based, experiential, authentic inquiry supportive of many current science education reform efforts (2013). The researchers documented significant positive shifts in educators' attitudes regarding science and scientists, as well as shifts in their pedagogical choices. Learners gained significant content knowledge gains and increased positive attitudes regarding their perceptions of scientists. The findings indicate that learner-educator-professional partnerships enhance educator and learner understandings of and about scientific inquiry and improve educator and learner attitudes toward science and scientists.

SCHOOL LIBRARY

For many learners, the school library provides another learning space, an environment in which they have additional opportunities to learn—an important concept with implications for school library.

Opportunities to Lead and Communicate

For eighth-grade science, content exposure, selection of resources, and expanded instructional time and time with resources

improve learning (Wang 1998). One possible explanation is that many learners in traditional classrooms experience high communication apprehension, which puts them at a distinct learning disadvantage. A meta-analysis of causal communication apprehension studies demonstrated a statistically negative correlation between communication apprehension and cognitive performance (Bourhis and Allen 1992). An implication of the findings is that further research is needed for educators to better understand how to align learning tasks with learning styles and the learning environment.

When a learning environment is structured around school goals and enables learners to make real-world connections, they thrive. Inclusive, open enrollment STEM academies had small, statistically significant positive effects in math for grade 9 and in math and science for grade 10 (Young, House, Wang, Singleton, et al. 2011). This learning environment includes small class sizes, rigorous academic curricula, real-world and career-based opportunities, access to accelerated STEM curriculum, and personalized learning supports. M. P. Freedman reinforced the positive influence of the learning environment in a study of hands-on laboratory experiences as complements to traditional instruction (1997). The study concluded that when learners engaged in learner-led activities, their attitudes toward science improved and science knowledge increased—both significantly. These achievements were especially effective with learners of diverse backgrounds who live within large urban centers.

Support for College Success

Early college high schools give reluctant learners experiences designed to increase high school and postsecondary enrollment and success (Edmunds

et al. 2012). This study includes results from a federally funded experimental study of the impact of the early college model on grade-9 outcomes. Results show that, as compared to control group learners, a statistically significant and substantively higher proportion of treatment group learners were taking core college preparatory courses and succeeding in them. Learners in the treatment group also have statistically significantly higher attendance and lower suspension rates than learners in the control group.

Many learners struggle to engage with life beyond school because they face college application barriers. A pair of experimental studies relating to using personal assistance to increase participation in applying for college and financial aid suggest that when learners are offered immediate assistance and a streamlined process to complete the Free Application for Federal Student Aid (FAFSA), learners and their parents substantially increased their FAFSA submissions and the likelihood of college attendance, persistence, and aid. In particular, high school seniors whose parents received the treatment were 8 percentage points more likely to have completed two years of college during the first three years following the experiment. Families who received aid information but no assistance with FAFSA did not experience improved outcomes (Bettinger et al. 2012). Likewise, when low-income learners received information about and application fee waivers for college, they changed their attitudes and behavior toward college attendance (Hoxby and Turner 2013).

School Day Configurations

C. C. Tuttle et al. examined learner outcomes from schools designed to improve math,

Queries for Research and Practice

- Which theories explain the value of learners' engagement with the community beyond the school?
- What is the role of external engagement and awareness of the world beyond school in digital literacy teaching and learning?
- How can school counselors and school librarians work together to ensure that learners understand their post-graduation options?

reading, science, and social studies achievement (2013). The Tuttle team noted that school day and time usage had particular benefits, and these benefits were particularly noticeable in schools that had implemented a comprehensive behavioral system (2013).

The benefits of longer school days begin early. The effects of full-day kindergarten on learner achievement have been mixed. Some researchers found beneficial effects of full-day kindergarten on learner achievement as opposed to half-day kindergarten, while other researchers failed to find any significant difference. One meta-analysis looked deeply into the evidence of both approaches and found that, overall, learners who attended full-day kindergarten had significantly greater achievement than did learners who attended half-day kindergarten (Fusaro 1997).

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