Educational Quality through Instructional Partnerships (EQuIP): Assessing the Efficacy of Collaboratively Implemented Guided Inquiry Design on K-12 Student Learning

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Abstract

In this Research into Practice exploratory project, Dr. Lucy Santos Green at the School of Library and Information Science, University of South Carolina, requests **$376,107** from the Laura Bush 21st Century Library program for a three-year empirical study to identify the specific components of Guided Inquiry Design units, collaboratively designed and implemented by school librarians and classroom teachers, that lead to higher academic achievement and student mastery of K-12 learning outcomes. This study employs a mixed-methodology approach where a robust quantitative design is supported by contextual qualitative data. The application of this design has intentionally been selected to address the challenging combination of 1) a lack of quantitatively identified high-impact variables in school library research, and 2) context-dependent institutional structures, professional practices, and student learning needs found in individual K-12 schools and school library programs. This research project positions school libraries as promoters of **Lifelong Learning** supporting "cross-disciplinary and inquiry-based methods of learning" (IMLS Goal 1, Objective 2). The project asks: How does student completion of a Guided Inquiry Unit, designed and delivered by EQuIP-trained school library-classroom teacher instructional partners, affect student mastery of target curricular learning outcomes? By answering this question, the proposed study will contribute to theoretical and practical knowledge on highly-effective targeted interventions that when implemented by school librarians and classroom teachers, lead to student mastery of academic content, and student development of lifelong inquiry skills.

The research project goals are as follows; **Goal 1:** Offer four GID Summer Institutes over the lifetime of the grant. **Outcome:** Establish a critical mass of geographically-diverse GID-trained school library practitioners with strong classroom teacher instructional partners. Develop, implement, and evaluate "programming models and tools that provide cross-disciplinary and inquiry-based learning," supporting rich partnerships between librarians and K-12 schools. **Goal 2:** Assess the efficacy of collaboratively designed and implemented GID units on K-12 student learning outcomes. **Outcome:** Share results of data collected and analyzed in peer reviewed journals, practitioner publications, conference presentations, and social media, with emphasis on communication to stakeholders outside of the school library profession, leading to "demonstrable improvement in library services" for libraries serving K-12 students **Goal 3:** Contribute quantitative data to an open-access data repository for continued research on school library programs, school librarian pedagogical practices, GID, and student achievement. **Outcome:** Generate a larger dataset that encourages identification of impactful variables, and future research examining the effect of school librarian pedagogical practices on K-12 student academic achievement in quantifiable ways, and identification of ways "library services [outside of school libraries] impact patron [K-12 teacher and student] learning." **Goal 4:** Develop a fully online community-of-practice, under the supervision of the Instructional Specialist, that supports long-term Guided Inquiry Design implementation in ways identified by the research project as being most impactful and effective in K-12 learning settings. **Outcome:** Establish a free database of GID units that reflect research findings on best practices for timing of stages, skill development, co-teaching structure, distribution of responsibilities, and pedagogical strategies, developing "mutually beneficial relationships between researchers and practitioners."

Researchers will benefit from a national dataset for investigating relationships between school library programs, school librarian pedagogical practices, instructional partnerships, and student academic achievement. Educators will benefit from the use of a research-based inquiry model for co-designing and co-teaching information problem-solving using student-centered and real-world based techniques. School library educators will benefit from research that informs the types of pedagogical practices that should be part of preservice school library candidate preparation. The impact will also be felt among youth library services who partner with school library programs, share a collection with the school library, or service communities with no school library programs. Finally, academic librarians who work with Colleges of Education and educator preparation programs will benefit from the resources and findings of this study, applying these to collection development, and instructional collaborations with faculty to model application of GID in higher education classrooms.

Educational Quality through Instructional Partnerships (EQuIP): Assessing the Efficacy of Collaboratively Implemented Guided Inquiry Design on K-12 Student Learning

In this Research into Practice exploratory project, Dr. Lucy Santos Green at the School of Library and Information Science, University of South Carolina, requests **$376,107** from the Laura Bush 21st Century Library program for a three-year empirical study to identify the specific components of Guided Inquiry Design units, collaboratively designed and implemented by school librarians and classroom teachers, that lead to higher academic achievement and student mastery of K-12 learning outcomes. This study employs a mixed-methodology approach where a robust quantitative design is supported by contextual qualitative data. The application of this design has intentionally been selected to address the challenging combination of 1) a lack of quantitatively identified high-impact variables in school library research[1], and 2) context-dependent institutional structures, professional practices, and student learning needs found in individual K-12 schools and school library programs[2]. This research project positions school libraries as promoters of **Lifelong Learning** supporting "cross-disciplinary and inquiry-based methods of learning" (IMLS Goal 1, Objective 2). The project addresses the following research question: How does student completion of a Guided Inquiry Unit, designed and delivered by EQuIP-trained school library-classroom teacher instructional partners, affect student mastery of target curricular learning outcomes? By answering this question, the proposed study will contribute to theoretical and practical knowledge on highly-effective targeted interventions that when implemented by school librarians and classroom teachers, lead to student mastery of academic content, and student development of lifelong inquiry skills. Research outcomes will address a large gap in school library research (i.e. quantifiable impact of school library and classroom partnerships on K-12 student learning) and establish a critical mass of geographically-diverse school library and teacher practitioners trained in Guided Inquiry Design.

Statement of Broad Need

Positive correlations have been found between inquiry skills and complex problem-solving, as well as between school librarian-classroom teacher instructional partnerships and student standardized scores[7-8]. However, while these correlational studies exist, there is a paucity of research directly linking specific pedagogical approaches such as GID, developed and delivered through school librarian and classroom teacher instructional partnerships, to student academic achievement, measured in quantifiable ways[1]. The lack of research in this area, as determined by an extensive systemic review of ten years of research on school librarianship, is troubling and dangerous[1]. More than a decade ago, Neuman[9] identified the relationships between school library programs and student achievement as "an area of singular importance to the field." Research conducted in the decade since Neuman's call took an "evidence-based approach to practice" exploring how school libraries and librarians were instrumental in student success by asking students how the school library helped them succeed[10]. While findings indicated students valued instruction from the school librarian, these types of self-reported studies had "minimal effect on decisions and legislation related to the support of school library media programs and personnel"[11]. The proposed research project addresses the gap in causal school library research and lack of stakeholder investment in school librarianship by quantitatively measuring the impact of inquiry instruction through co-teaching structures on student academic achievement.

The last ten years in school library research also concluded that a fundamental shift in the instruction provided by school librarians is needed; one that not only helps students find information, but develops students' abilities to interact with, and learn from, information, engaging with it in critical ways[10]. Guided Inquiry Design (GID) is an instructional design framework that scaffolds student-driven inquiry through activity sequencing, information resource use, and problem-solving; using elements such as educator facilitation, tech-enabled learning, and curation of information resources[3]. In GID (see Figure 1), student inquiry, guided by an instructional partnership* made up of the school librarian and classroom teacher, helps students gain meaningful understanding and develop a personal perspective by exploring, comparing, and contrasting multiple information sources[4].

*In this document **instructional partnerships** are defined as long-term collaborative relationships between school librarians and classroom teachers where both educators work together to co-design, co-teach, and co-assess a lesson or a unit of study.

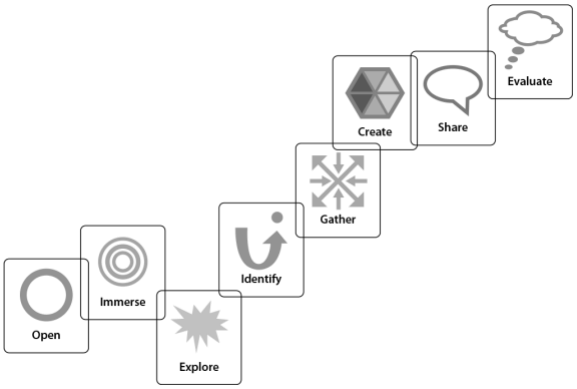

Figure 1: Guided Inquiry Design

Students who participate in these types of activities, under the supervision of a school librarian, are described by teachers as inquisitive, imaginative, and motivated to solve real problems that can help real people[5]. This is because when students learn through inquiry, they learn "in the information environment of the 'real world' where everyday tasks require learning from information. Through guidance, students personalize the inquiry process recognizing that 'this is my process, this is the way I learn'"[4].

The ability to engage in personal inquiry is a foundational requirement for tackling ill-structured information problems, a life-long skill essential for successful participation in a global economy[6]. GID units are educational processes well-suited to support K-12 student growth in ill-structured information problem-solving, self-awareness of learning patterns, innovation, and design[7, 3]. Although students engaged in inquiry should be able to observe, experience, reflect, and struggle with ill-defined information problems, opportunities to practice problem-solving skills of any nature are difficult to come by in formal K-12 schooling settings[7]. The proposed research project addresses this challenge by qualitatively 1) examining the varied instances of GID implementation (i.e. lesson scheduling, length of stages, depth of student interaction with content, selected activities, student scaffolding, co-teaching structure and strategies) in elementary, middle, and high schools across four states, and 2) determining the most practical and effective application of this pedagogical model, by school library programs, within the time and curricular constraints of 21st century K-12 education.

Examination of the instructional partnership structure in this proposed research study is a key component, building on several studies that found it was more than just the presence of a certified school librarian that made a difference in student academic growth. Literature in this area strongly suggests student growth is influenced by the activities the school librarian undertakes, especially those related to collaboration with classroom teachers[12-14]. The presence or lack of instructional partnerships between a school librarian and his or her teacher colleagues, directly affects the quality of inquiry and information literacy instruction K-12 students receive. Newell[15] discovered classroom teachers, when not collaborating with a school librarian, focused exclusively on location skills, even when information literacy standards clearly outlined information seeking, access, evaluation, use, and communication. In a later study, Newell[16] determined students who completed inquiry units with a classroom teacher only, scored lower on measurement of learning gains. He discovered that in the absence of an explicit model for information problem solving, students spent precious time and cognitive effort developing processes to address information challenges instead of developing an actual research project or product. The proposed research study prioritizes measuring the impact of a school librarian-classroom teacher instructional partnership on the quality of instruction provided by 1) quantitatively parceling out the role of the school librarian in student inquiry skill development through factor analysis, and 2) qualitatively examining school librarian and classroom teacher interactions during GID unit planning, design, and delivery.

Addressing the Challenge. Ultimately, the proposed research heeds the call made by Todd[10] when he expressed a "need for school librarians to be able to state with greater precision the learning outcomes and impacts of school library initiatives." It builds on recent IMLS funded efforts *on design-based action research to investigate the viability of implementing GID* in K-12 school curricula through school library programs. First,

it will address the severe gap in research that examines the effect of pedagogical practices for fostering inquiry (in the case of this project, Guided Inquiry Design) when these are applied within the context of instructional partnerships between school librarians and classroom teachers. Second, it will support instructional partnerships that enable researchers to potentially identify the variables that lead to successful collaborative projects (success determined by student mastery of learning outcomes). Third, it will establish a public database of GID Units spanning various content areas in elementary, middle, and high school, aligned to both Common Core/State Content Standards and the 2019 American Association for School Librarians Standards, and tested in a variety of cultural and socioeconomic regions [Research Product 1]. Fourth, it will create an open-source dataset facilitating continued future research that closely examines the impact of school librarianship on student academic achievement, using quantifiable measures [Research Product 2].

Project Design

Alignment with IMLS Goals. The goals of the proposed research in service to practice study align with the IMLS Strategic Plan Goal 1: Promote Lifelong Learning, "the agency will explore the body of research on dynamic learning environments and inquiry-based methods of learning;" Objective 2 "Support cross-disciplinary and inquiry-based methods of learning within museums and libraries." Goals for this proposal are: **Goal 1:** Offer four GID Summer Institutes over the lifetime of the grant. **Outcome:** Establish a critical mass of geographically-diverse GID-trained school library practitioners with strong classroom teacher instructional partners. Develop, implement, and evaluate "programming models and tools that provide cross-disciplinary and inquiry-based learning," supporting rich partnerships between librarians and K-12 schools. **Goal 2:** Assess the efficacy of collaboratively designed and implemented GID units on K-12 student learning outcomes. **Outcome:** Share results of data collected and analyzed in peer-reviewed journals, practitioner publications, conference presentations, and social media (e.g. professional Twitter chats such as #TLChat), with emphasis on communication to stakeholders outside of the school library profession (e.g. educational leadership, state education agencies, community leaders, parents), leading to "demonstrable improvement in library services" for libraries serving K-12 students **Goal 3:** Contribute quantitative data to an open-access data repository for continued research on school library programs, school librarian pedagogical practices, GID, and student achievement. **Outcome:** Results of the proposed study will generate a larger dataset that encourages identification of impactful variables, and future research examining the effect of school librarian pedagogical practices on K-12 student academic achievement in quantifiable ways, and identification of ways "library services [outside of school libraries] impact patron [K-12 teacher and student] learning." **Goal 4:** Develop a fully online community-of-practice, under the supervision of the Instructional Specialist, that supports long-term Guided Inquiry Design implementation in ways identified by the research project as being most impactful and effective in K-12 learning settings. **Outcome:** Establish a free database of Guided Inquiry Design units that reflect research findings on best practices for timing of stages, skill development, co-teaching structure, distribution of responsibilities, and pedagogical strategies, developing "mutually beneficial relationships between researchers and practitioners."

Research Question and Theoretical Framework. The proposed research project assesses the efficacy of collaboratively designed and implemented GID units on K-12 student learning outcomes. To that end, it asks: How does student completion of a Guided Inquiry Unit, designed and delivered by EQuIP-trained school library-classroom teacher instructional partners, affect student mastery of target curricular learning outcomes? The Standards for Effective Pedagogy (SEP) is a teaching and learning theory that defines pedagogy as a system of instructional activity[17]. The five standards are considered critical components for success in classrooms where students struggle with cultural, linguistic and/or economic issues. The first standard calls for collaborative efforts between educators and students where these share a common goal. The second requires that activities tie the language of instruction and academic content to literacy. Activities based on students' connections between instruction and their own communities fulfill the third standard. The fourth standard speaks to the alignment of instructional activities and assessment, with clearly defined expectations and consistent feedback. The last standard is the use of goal-directed instructional conversations between educators and small clusters of students[18].

Pulling from Vygotsky's *Zone of Proximal Development*, SEP considers excellent pedagogy to be practices that enable educators to scaffold students in their zones of proximal development, encouraging them to interact and collaborate with peers. A wide range of research studies bolsters the practicality and application of SEP in inquiry-based learning activities[19-23]. Due to its substantiation by research studies examining similar phenomena, SEP was used to develop this study's research question. It provides a theoretical rationale for exploration of the research question, a frame of reference for observations, definitions of concepts, and data interpretation and analysis, and a guide for identifying logical, precisely defined relationships among variables.

Methodology. The proposed research will be a mixed methods study, emphasizing collection of both qualitative and quantitative data, highlighting complex and interdisciplinary phenomena present in educational settings, so that results further inform each type of data set[24]. This study situates mixed methodology under a *conceptual* research framework that reorganizes data collection and analysis in social and behavioral sciences "by de-emphasizing the terms quantitative and qualitative research and, instead, subdividing research into exploratory and confirmatory methods"[25]. Within this framework, quantitative data analysis techniques such as descriptive statistics and exploratory factor analysis, and qualitative data collected during traditional thematic analysis are labeled as exploratory. Confirmatory methods include quantitative data-analytical techniques such as inferential statistics, and qualitative thematic analyses attempting to determine the "replicability of previous emergent themes (i.e. research driven) or, test an extant theory (i.e. theory driven)"[25]. Since the goal of this study is to examine and potentially identify variables in implementation of Guided Inquiry Design by school librarian and classroom teacher instructional partnerships, the exploratory method will be applied.

Participants. Participants for the proposed research project comprise 60 school librarians (20 elementary, 20 middle, 20 high school), 60 classroom teachers (20 elementary, 20 middle, 20 high school) for a total of 120 participants in the treatment group; and 60 classroom teachers (20 elementary, 20 middle, 20 high school) for a total of 60 participants in the control group. Participants represent four major geographical regions and will be organized in groups of 3 (1 school librarian in treatment group, 1 teacher in treatment group, 1 teacher in control group per participating school). The study will also examine data collected from K-12 students (ranging in number from 2000 to 6000 dependent upon parental consent and school district policy) affiliated with all treatment and control group participants. Participants are recruited using a combination of direct contact, recruitment emails, and modified snowball sampling. Using professional connections, and following a list of participant criteria described in the diversity plan section of this document, the PI directly contacted school librarians nationwide using phone calls and emails. An *explanation of research* document was shared with each one. From that point, the PI applied a modified snowball sampling approach, asking interested school librarians to help recruit classroom teachers, and procure school system support. Presently, school systems in all four targeted states have submitted letters of support and interest (see supporting documents).

Quantitative Data. The proposed project will apply two types of statistical designs; 1. pre- and post-test GID knowledge scores for treatment participants (attending GID institutes), as well as pre- and post-test content mastery scores for all K-12 students associated with both treatment and control participants, and 2. a factorial design containing two independent variables, the treatment (GID training) and instructional partnerships, and one continuous variable (student academic achievement). A factorial analysis of variance allows the PI to determine if average student achievement scores differ significantly across treatment conditions, if the average student achievement scores differ significantly between groups taught by instructional partners or groups taught by a single classroom teacher, and finally, if there is a measurable effect of GID training on student achievement scores whether the librarian and teacher employ GID or co-teach using a separate unit structure[26].

Qualitative Data. A subset of GID summer institute participants will be selected for participation in focus groups. Focus groups will be recorded, transcribed, and the text analyzed using a context-dependent and inductive approach. Student artifacts of learning will be collected during the life of the project. Collected artifacts will be analyzed and coded for steps in the inquiry process and student mastery. Documents are strong qualitative artifacts as these are based on the contexts they represent, reflect the natural language of K-12 students, and can be analyzed and re-analyzed without modification[27]. Observation of school librarian-classroom teacher delivery of instruction in their respective schools will be recorded by the PI using field notes,

transcribed video recordings and an observation protocol (a fillable form). The combination of student artifacts, observations, field notes, and video recordings allows for data collection without distracting the study subjects. It also allows for the cyclical relationship between preliminary data analysis, data triangulation, and observation[28]. Data analysis for this phase of the study will apply the constant comparative method for grounded theory research. The constant comparative method is appropriate to a K-12 environment because it provides the researcher with the ability to revisit errors made in initial categorization of data[29].

Proposed Work Plan. Pre-Grant (Summer 2019): The PI obtains IRB, and, with the guidance of the advisory team, reviews and finalizes participant recruitment to ensure a diverse and committed group in States 1 and 2. The PI also completes school system approvals for States 1 and 2. The Instructional Specialist designs the **EQuIP** GID summer institutes. The Instructional Specialist and the Advisory Team representatives for States 1 and 2 finalize workshop logistics.

Year 1 (Fall 2019 and Spring 2020): Participants in States 1 and 2 select instructional unit topics, content standards, and grade levels for their respective schools. Phase 1A of data collection begins in States 1 and 2 (Librarian-Teacher 1 co-teach the selected unit; Teacher 2 independently teaches the selected unit; associated K-12 students are pre and post tested on unit knowledge to establish a baseline for comparison in Phase 2A). The Statistician begins analyzing quantitative data collected in Phase 1A for States 1 and 2. The PI analyzes qualitative data collected in Phase 1A (student work product, transcribed videos, field notes, observation protocols). The Instrument Designer develops and validates pre/post tests and focus group questions for workshop participants in States 1 and 2.

Year 1 (Summer 2020): Treatment group participants from States 1 and 2 attend the GID institute in their respective states. They are pre and post tested on GID knowledge to establish a baseline for comparison with other locations. The PI conducts focus groups with a representative sample of participants to further explore their understanding of GID, as well as their pedagogical beliefs. With the guidance of the advisory team, the PI reviews and finalizes participant recruitment in States 3 and 4. The PI also completes school system approvals for States 3 and 4. The Instrument Designer makes any needed adjustment to pre and post workshop tests and focus group questions for the next round of workshops in States 3 and 4. The Instructional Specialist establishes the online community of practice (*project goal 4*) for States 1 and 2 to run during the Fall 2020-Spring 2021 academic year (detailed in the digital products form). The Instructional Specialist and the Advisory Team representatives for States 3 and 4 finalize workshop logistics.

Year 2 (Fall 2020 and Spring 2021): States 1 and 2 treatment participants co-teach the developed Guided Inquiry Design units, addressing the same topics, content standards, and grade levels from the previous school year. Phase 2A of data collection begins in States 1 and 2 (Librarian-Teacher 1 co-teach the Guided Inquiry Design unit; Librarian-Teacher 2 co-teach the selected unit using a traditional collaborative structure; associated K-12 students are pre and post tested on unit knowledge and scores compared to Phase 1A). Participants in States 3 and 4 select instructional unit topics, content standards, and grade levels for their respective schools. Phase 1B of data collection begins in States 3 and 4 (Librarian-Teacher 1 co-teach the selected unit; Teacher 2 independently teaches the selected unit; associated K-12 students are pre and post tested on unit knowledge to establish a baseline for comparison in Phase 2B). The Statistician analyzes quantitative data collected in Phase 2A for States 1 and 2, and Phase 1B for States 3 and 4. The PI analyzes qualitative data collected (student work product, transcribed videos, field notes, and observation protocols) in Phase 2A and 1B (focus group transcripts, observation protocols, student work product, video recordings). The free repository of GID units is established and populated with units from States 1 and 2. Dissemination of preliminary findings begins.

Year 2 (Summer 2021): Treatment group participants from States 3 and 4 attend the GID institute in their respective states. They are pre and post tested on GID knowledge to establish a baseline for comparison with other locations. The PI conducts focus groups with a representative sample of participants to further explore their understanding of GID, as well as their pedagogical beliefs. All data analysis for States 1 and 2 is finalized and made ready for comparison with States 3 and 4. The Instructional Specialist establishes the online

community of practice for States 3 and 4 to run during the Fall 2021-Spring 2022 academic year. Research products for States 1 and 2 are made available. Figure 2 explains the staggering of quantitative data collected.

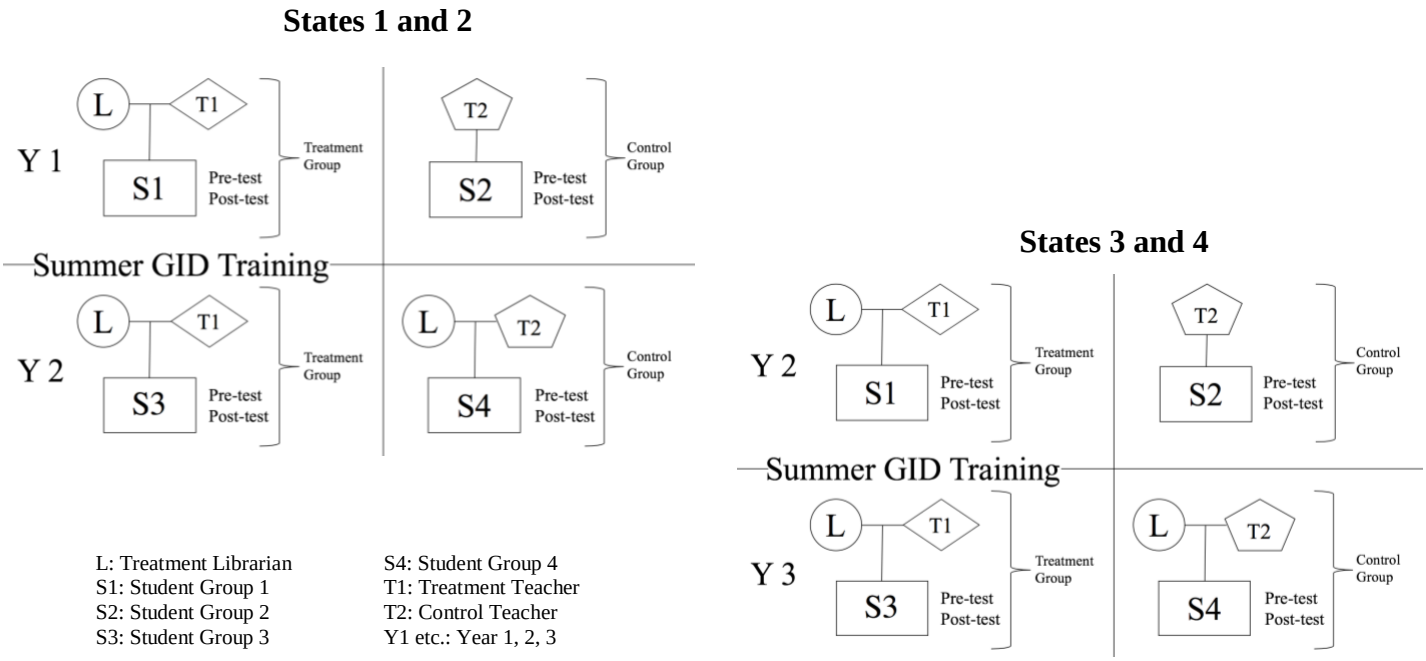

Figure 2: Quantitative Data Collection Plan for K-12 Settings

Year 3 (Fall 2021 and Spring 2022): States 3 and 4 treatment participants co-teach the developed Guided Inquiry Design units, addressing the same topics, content standards, and grade levels from the previous school year. Phase 2B of data collection begins in States 3 and 4 (Librarian-Teacher 1 co-teach the Guided Inquiry Design unit; Librarian-Teacher 2 co-teach the selected unit using a traditional collaborative structure; associated K-12 students are pre and post tested on unit knowledge and scores compared to Phase 1B). The Statistician analyzes quantitative data collected in Phase 2B for States 3 and 4. The PI analyzes qualitative data (student work product, transcribed videos, field notes, and observation protocols) collected in Phase 2B (observation protocols, student work product, video recordings). The free repository of GID units is populated with units from States 3 and 4. Data findings from all four states are examined and compared.

Year 3 (Summer 2022): Research products for States 3 and 4 are made available. Dissemination of study findings continues. Research data uploaded to the Inter-University Consortium for Political and Social Science Research Data Repository through the University of South Carolina. The final report for IMLS is completed.

Potential Risks to Project Participants. Potential risks to participants and to associated K-12 students will be minimal and largely mitigated by a rigorous IRB process following both the University of South Carolina protocols and criteria set forth in the respective school systems' internal approval processes. All potentially identifying information will be removed from public-access documents, as well as presentations and publications, and all individuals and schools will be anonymized to ensure privacy and confidentiality, due to the fact that most schools have only one school librarian. Guided Inquiry units designed as part of this study will be topically developed at the discretion of the school librarian and classroom teacher, aligned with K-12 student curricular needs and expectations, and embedded in the regular school day. Parental consent forms will be obtained before any student data is collected. All student data will be anonymized and/or numerically coded by the classroom teacher before going to the PI. Written agreements and participant payment schedules will minimize the risk of turnover in school system participation.

Evaluation of Research Project Success. Project success will be determined by the extent to which the project goal outcomes listed above are met and documented in the final IMLS grant project report, and by the creation of the two research products listed in the proposal goals: 1. a public database of GID Units spanning various

content areas in elementary, middle, and high school, aligned to both Common Core/State Content Standards and the 2019 American Association for School Librarians Standards, and 2. an open-source dataset facilitating continued future research that closely examines the impact of school librarianship on student academic achievement, using quantifiable measures and, potentially, causal-comparative models. As is appropriate for mixed-method studies, data collection and analysis will be iterative and additional quantitative and qualitative models may be applied if the researcher and the statistical team determine different data needs are necessary.

Personnel for Planning, Implementing, and Managing. The personnel for **EQuIP** has the necessary experience in instructional design, school library and educator training, school library research, school library practice, grant administration, large scale data collection and analysis, and academic writing related to the goals and outcomes for the proposed research study. The PI, the Instructional Specialist, the Instrument Designer, the Statistician, and the Advisory Board will work closely and collaboratively throughout the lifetime of **EQuIP** so that all study components align and support each other appropriately. Percentages of effort for project personnel are detailed in the budget narrative:

Lucy Santos Green, Ed. D. (PI/Project Lead and Researcher), Associate Professor in the School of Library and Information Science at the University of South Carolina, has almost twenty years of experience as a classroom teacher, school librarian, teacher trainer, a school library educator, and an internationally recognized researcher in mixed-methodology with publications in technology-integration for K-12 settings, instructional design in school library settings, guided inquiry in STEM, and innovative pedagogical practices. She has served on advisory councils for other IMLS grants with a current advisory role in "Rural Engagement to Advance Learning in STEM Digitally (REALISD) in School Libraries." Dr. Green is the chair of the Educators of School Librarians Section for the American Association of School Librarians, and a research mentor for the National Science Foundation Sponsored Early Career Symposium, through the Association for Educational Communications & Technology. Dr. Green will be responsible for: supervising the core and advisory teams, collecting quantitative data, collecting and analyzing qualitative data, managing the project budget, approving expenditures, authoring yearly grant reports, completing IRBs and internal school district approval processes, and disseminating research findings through publication and presentation venues.

Leslie Maniotes, Ph. D. (Instructional Specialist), Founder and Senior Consultant at BLV Consulting, Arvada, CO, is the co-creator of Guided Inquiry Design. A specialist in curriculum in instruction with over 15 years of experience designing and leading professional development, she has presented Guided Inquiry workshops to school librarians and classroom teachers from Australia, Canada, China, Japan, Sweden, and the United States. She currently serves as an advisory board member for the IMLS grant "Learning in Libraries: Guided Inquiry, Making, and Learning in School Libraries." Dr. Maniotes will be responsible for: designing and refining the Guided Inquiry Design summer institutes, establishing workshop locations and managing workshop logistics, developing and maintaining the Community of Practice for institute participants, maintaining the free database of Guided Inquiry Design units developed by research participants, and disseminating research findings through publication and presentation venues.

Melissa P. Johnston, Ph. D. (Instrument Designer), Associate Professor in the College of Education, University of West Georgia and Co-Editor of School Library Researcher, provides research expertise in the area of school librarianship, the application of research methods in library and information science, as well as thirteen-years practical experience as a school librarian. A former research fellow for The Partnerships Advancing Library Media (PALM) Center at Florida State University, she currently serves as PI for the REALISD Project, an IMLS funded grant; Grant Evaluator on the IMLS funded grant, Creating Data Literate Students; and Curriculum Designer for the IMLS funded grant, Media Smart Libraries. Dr. Johnston will be responsible for: designing pre/post-tests and focus group questions for workshop participants, and developing qualitative observation protocol instruments for teaching observations.

Ismahan Arslan-Ari, Ed. D. (Statistician), Assistant Professor in the College of Education, University of South Carolina, and Director of the South Carolina Center for Assistive Technology and Educational Research, is the methodologist and statistician for the proposed research project. Dr. Arslan-Ari is an experienced quantitative

researcher who specializes in developing and implementing explanatory and experimental statistical models in K-12 settings. With a doctorate in Instructional Technology and Design, and a Master's in Special Education, Dr. Arslan-Ari is uniquely qualified to not only design the statistical tests for this project, but to objectively interpret and analyze the data collected, applying the conceptual and methodological frameworks selected for this study – addressing a recommendation by the initial preliminary proposal reviewers to include researchers outside of LIS for objective analysis and interpretation of research findings. Dr. Arslan-Ari will be responsible for: developing and overseeing implementation of statistical models for the lifetime of the project, and analyzing all quantitative data collected. She will also oversee identification and validation of pre/post-unit tests for K-12 students in both treatment and control groups.

The Advisory Team includes four professionals who bring a wealth of experience in school librarianship, teacher training, and K-12-university research partnerships, and reflect the IMLS round one reviewer recommendations for practitioner/professional leaders. The advisory team will be responsible for: aiding the Instructional Specialist in tailoring the GID summer institutes to the unique needs of school librarians and teachers in their respective geographical locations, serving as liaisons between PI and local school systems, supporting workshop logistical planning for their assigned states, and assisting with the selection of summer institute participants throughout the recruitment process. They are: 1. **Jennifer Laboon**, President of the Texas Library Association, and Coordinator of Library Technology for the Fort Worth Independent School System, Fort Worth, TX; 2. **Lisa Bakanas**, Immediate Past-President of the New Jersey Association of School Librarians, and school librarian at Lenape Regional High School District, Burlington County, NJ; 3. **Christy James**, Chair of the Information Technology Committee for the South Carolina Association of School Librarians, and Library and Media Services Specialist for the Charleston County School District, Charleston, SC; 4. **Michelle Folk**, AASL Presidential Task Force member and co-developer of the annotated resource-guide, *School Librarians as Learning Leaders: An Administrator's Guide*, and school librarian at School District of Fort Atkinson, Fort Atkinson, WI.

Financial Resources Needed. $376,107 is requested for the expertise of the core and advisory teams, travel, resources and materials, and research study participants (treatment group, and control group). The budget for **EQuIP** reflects a fair, balanced, and cost-effective financial profile for a large-scale, national study. A full breakdown is included in the budget narrative, but a summary is presented below:

- Salaries for the Primary Investigator, Instructional Specialist, Instrument Designer, Statistician, and Advisory Team: $158,172 including fringe and benefits for 3 years;
- Travel Support for data collection, institute delivery, and dissemination of findings: $42,909;
- Participant costs including workshop fees, materials, resources, and stipends: $114,750;
- Indirect costs calculated at 26% for a total of $60,276

Dissemination and Communication Plan. Throughout the lifetime of the proposed research project, study progress, preliminary results, and final research conclusions will be shared through submission to peer-reviewed journals such as *School Library Research* and *The Journal of the Association for Information Science and Technology*; submission to practitioner friendly publications such as *School Library Connection, Knowledge Quest,* and *Teacher Librarian*; as well as presentations and pre-conferences at annual and biannual conferences such as the American Association of School Librarians (AASL), and the Association for Library and Information Science Education (ALISE). Efforts will be made to present findings at conferences outside of the field of librarianship and attended by stakeholders such as the Association for Supervision and Curriculum Development (ASCD). Leveraging the large, interconnected professional network and national leadership standing of the core and advisory team, findings will also be shared via social media, state conferences, and pre-service school library and teacher education programs. The proposed study will generate two research products. The first research product will be a free database of Guided Inquiry Design units that reflect research findings on best practices for timing of stages, skill development, co-teaching structure, distribution of responsibilities, and pedagogical strategies. Organized by grade-level and subject, this resource will be accessed through a permanent portal hosted by the College of Information and Communications (where SLIS resides) on a stable sc.edu URL. The portal will be designed and maintained by the CIC webmaster, Patty Hall, using a custom

management system (example). The second research product will be a publicly available dataset that encourages identification of impactful variables, and future research examining the effect of school librarian pedagogical practices on K-12 student academic achievement in quantifiable ways. Data made available will include focus group transcripts (pending participant permission), aggregate K-12 student unit scores, and anonymized field notes and video transcriptions (pending school system permission). The University of South Carolina is an institutional member of various external disciplinary and general data repositories. Because of its focus on social science research, ICPSR, the Inter-University Consortium for Political and Social Science Research – specifically its openICPSR repository – has been deemed the best fit for this proposal. It will provide public-use study data access free to any data user: data citations; compliance and utilization reporting; professional metadata review and enhancement; long-term electronic storage of published files; continuous computing/cloud capabilities; immediate availability of published bit-level data; and dissemination of restricted-use data via openICPSR's Virtual Data Enclave.

Diversity Plan

Four states representing suburban Northeast (Summer Institute held at New Brunswick, NJ pop. 56,910), rural and suburban Midwest (Summer Institute held at Fort Atkinson, WI pop. 12,482), urban West (Summer Institute held at Fort Worth, TX pop. 874,168), and rural and urban South (Summer Institute held at Charleston, SC pop. 134,875). These areas comprise richly diverse geographical, socioeconomic, ethnic, and cultural populations so as to maximize generalizability of the research project's findings. At each of the Guided Inquiry Design Institute Workshops, treatment group participants (15 school librarians and 15 classroom teachers in each state) will work closely with the Instructional Specialist to develop units immediately applicable to local schools' curricular goals. This alignment between GID units and study participants' curricular goals ensures the unique instructional needs of each K-12 student impacted by school librarian and teacher involvement in this research project are addressed.

Strategic sampling is a key element in the viability and applicability of the data collected and analyzed for the proposed research project. Successful participant recruitment will result in 120 treatment group participants (60 instructional partner teams made up of one school librarian and one classroom teacher per participating school), and 60 control group participants (one classroom teacher per participating school). The Primary Investigator has already begun working closely with the Instructional Specialist to recruit participants representing racially, ethnically, socioeconomically, and culturally diverse school sites from all three levels: 5 elementary, 5 middle, 5 high school, at each of the four target states. Recruitment efforts involve direct contact with school systems, school library system coordinators, and state-level AASL affiliates, leveraging pre-existing contacts between the PI, the IS, and the advisory team, including an application process. The application process will contain a commitment document, as well as a requirement for support letters from administration, to ensure that selected participants receiving financial support from EQuIP, are talented and dedicated educators who participate in all aspects of the research project, and have the full cooperation of their local administration for the lifetime of the study. The following table breaks down unique recruitment efforts and letters found in *Supportingdoc3.pdf*:

Recruitment Effort	New Jersey	Wisconsin	Texas	South Carolina
Focus Region	urban/suburban	rural/suburban	urban	rural/urban
Demographics	White/Asian	White	Hispanic/ELL	African American
Socio-Economic	diverse	diverse	diverse	diverse
Participant Number	30 treatment, 15 control	30 treatment, 15 control	30 treatment, 15 control	30 treatment, 15 control
School Systems	Multiple	Multiple	1 Urban: 146 schools	Multiple

Table 1. Break Down of the Unique Recruitment Efforts Applied at Each Study Region

While K-12 students will not be directly recruited, collection of their data is a key factor in this study. Therefore, in addition to completion of IRB through the University of South Carolina, and any internal school system approval process for research, parent consent letters for all students associated with treatment and control group participants will be obtained and kept on file for the lifetime of the study.

Broad Impact

School library and other educational researchers will benefit from the proposed project's creation of a national dataset for continued investigation of relationships between school library programs, school librarian pedagogical practices, instructional partnerships, and student academic achievement. School librarians and classroom teachers will benefit from the use of a research-based inquiry model for co-designing and co-teaching information problem-solving, using student-centered and real-world based techniques, that can be applied to their current learning setting. School library educators will benefit from research that informs the types of pedagogical practices and inquiry models that should be part of preservice school library candidate preparation. The impact will also be felt among youth library services, as these often partner with school library programs, or schools in communities where the school library needs additional resources, shares a collection with the public library, or is non-existent. Finally, academic librarians who work with Colleges of Education and educator preparation programs will benefit from the resources and findings of this study, applying these to collection development, and potential instructional collaborations with faculty to model application of GID in higher education classrooms.

Establishing a critical mass of geographically-diverse Guided Inquiry Design school library practitioners with strong classroom teacher instructional partners, is most likely to create systemic change in the instructional role of school librarians, youth services librarians, and academic librarians who work with Colleges of Education and educator preparation programs. The results of the proposed research project have the potential to support the role of librarians as instructional partners and leaders in the development of information literacy, critical thinking, and inquiry learning, transforming library pedagogical practice through data-driven decision making and resource/time allocation. Further, sharing recommendations, timelines, resources, and tools that can be used to foster the integration of GID units in K-12 school library programs and curricula will incentivize professional exchanges on Guided Inquiry and student achievement. Sharing the results of data collected and analyzed in peer-reviewed journals, practitioner publications, conference presentations, and social media, emphasizing communication to stakeholders outside of the library profession will help to make a compelling case for administrative and financial support of student-centered, school library scaffolded, pedagogical practices for inquiry learning and information literacy development. Ultimately, the provision of empirical findings will encourage future research on the relationship between school librarian pedagogical practices and K-12 student academic achievement. Growth in this area of school library research is sorely needed, and the results of this study will further incentivize this effort.

After the conclusion of this research project, the Primary Investigator will continue to research specific pedagogical practices, such a Guided Inquiry, within the context of school librarian-classroom teacher instructional partnerships. The Instructional Specialist will build upon the population of GID librarians and teachers, refine the summer institute, and deliver the training nationally. The database of GID Units will continue to be frequently updated with new unit additions, and will remain live on a stable sc.edu URL, hosted by the University of South Carolina. The existence of database will be shared by the Instructional Specialist at each GID workshop, at Educators of School Librarians Section national meetings during American Library Association conferences, and with all AASL, YALSA, and ALSC state affiliates to spread awareness. The dataset generated by this study will be available in perpetuity to any researcher who would like to further investigate relationships between school library programs, practice, and student academic achievement. The data collected and analyzed for this project will be promoted on the project website, on social media and communication channels for the College of Information and Communications and its faculty, at conferences and through research publications. Spreading awareness of this research product will encourage its use to identify new research questions that address gaps in school library research. After the project's conclusion, findings will also inform candidate preparation, as results of this proposed study will help faculty at the University of South Carolina's School of Library and Information Science design instruction on inquiry models that help future LIS professionals focus on best practices for this type of learning approach.

References found in Supportingdoc1.pdf

Schedule of Completion

Pre-Award (June-August 2019)												
Activites	**Jun**	**Jul**	**Aug**									
Project Management												
Secure IRB Project Approval												
Project website launched at sc.edu URL												
Schedule Ongoing Consulttions with Advisory Team												
Finalize participants for States 1 and 2												
Secure School System Internal IRBs for States 1 and 2												
Instructional unit topics finalized by States 1 and 2												
Workshop design and logistics finalized for States 1 and 2												

Year 1 (2019-2020)												
Activites	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Project Management												
Instruments for workshops in States 1 and 2 designed												
Advisory Team meets												
Finalize participants for States 3 and 4												
Secure School System Internal IRBs for States 3 and 4												
Instructional unit topics finalized by States 3 and 4												
Workshop design and logistics finalized for States 3 and 4												
Data Collection												
Phase 1A of data collection begins in States 1 and 2												
Phase 1A Quant Data for States 1 and 2 analyzed												
Phase 1A Qual Data for States 1 and 2 analyzed												
Data collected at GID institutes for States 1 and 2												
Guided Inquiry Training												
States 1 and 2 attend GID institutes												
Online Community of Practice established												

Schedule of Completion

Year 2 (2020-2021)												
Activites	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Project Management												
Instruments for workshops in States 3 and 4 designed												
Advisory Team meets												
Data Collection												
Phase 2A of data collection begins in States 1 and 2												
Phase 1B of data collection begins in States 3 and 4												
Phase 2A Quant Data for States 1 and 2 analyzed												
Phase 2A Qual Data for States 1 and 2 analyzed												
Phase 1B Quant Data for States 3 and 4 analyzed												
Phase 1B Qual Data for States 3 and 4 analyzed												
Data collected at GID institute for States 3 and 4												
Guided Inquiry Training												
States 3 and 4 attend GID institutes												
Online Community of Practice expanded												
Research Dissemination												
Conference Presentations												
Research Product 1: GID Unit Database populated												

Schedule of Completion

Year 3 (2021-2022)												
Activites	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Project Management												
Advisory Team meets												
IMLS Final Report												
Data Collection												
Phase 2B of data collection begins in States 3 and 4												
Phase 2B Quant Data for States 3 and 4 analyzed												
Phase 2B Qual Data for States 3 and 4 analyzed												
Findings from all four States are examined												
Research Dissemination												
Conference Presentations												
Research publications submitted												
Research Product 1: GID Unit Database expanded												
Research Product 2: Data uploaded to I-UCPSSR												

DIGITAL PRODUCT FORM

Introduction

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

Instructions

All applications must include a Digital Product Form.

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

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

Part I: Intellectual Property Rights and Permissions

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

The main research products are divided into three categories: *database of GID units* and *project website*, *data products*, and *research publications and presentations*.

The *database of GID units* will be freely accessible and hosted on the *project website.* The website will be hosted by the U of SC's College of Information and Communications (CIC) - the college where the School of Library & Information Science (SLIS) is located. All units uploaded to the database will be licensed under a Creative Commons Attribution 4.0 license, allowing the project's audience (librarians, classroom teachers, school library educators, researchers) to access, publish, share, and readapt materials to suit their instructional contexts. Units will include attribution to the PI, the IS, the authoring librarians and classroom teachers, and IMLS for supporting the project. The PI will provide a detailed overview of the license details including attribution and how the GID units can be re-used.

The *data products* include qualitative products: focus group transcripts, field notes, and quantitative products: GID workshop aggregate data on participant understandings of GID, and aggregate student academic achievement data on instructional units completed during the course of the study. With participant and in the case of K-12 students, parent and school system consent, qualitative data will be made available to facilitate re-use. In cases where consent is not given, the PI will note the data is not available. Qualitative data will be housed in the U of SC's Scholar Commons repository and will be available pending access protocols for protection of participant confidentiality, from both USC's IRB office and school system internal approval processes. Quantitative data will be completely anonymized and organized in aggregate form (subdivided by state and grade-level). It will be hosted on the Inter-University Consortium for Political and Social Science Research – specifically its openICPSR repository – which has been deemed the best fit for this product. It will provide public-use study data access free to any data user: data citations; compliance and utilization reporting; professional metadata review and enhancement; long-term electronic storage of published files; continuous computing/cloud capabilities; immediate availability of published bit-level data; and dissemination of restricted-use data via openICPSR's Virtual Data Enclave.

Research publications and *presentations* will be published in open-access venues when possible, with a copy of each being added to the U of SC's Scholar Commons repository. When open access is not possible, the PI will pursue agreements to publish pre-print versions.

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

The University of South Carolina has ownership of the *database of GID units*, data *products* and *project website*. Access to the *database of GID units* and *data products* located in Scholar Commons and in openICPSR will be detailed on the *project website* so that all users are aware of licensing and access procedures. As detailed under A.1., access protocols for *data products* will follow access protocols set by the U of SC's IRB office and school system internal IRBs to protect participant confidentiality. Ownership of *research publications* and *presentations* will vary based on agreements with publishing venues. The PI and research stakeholders will promote access to the project through meetings, conferences, and social media.

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

All data, pending participant, parental, and school system consent, will be de-identified, pseudonyms will be used on qualitative transcripts, and all potentially identifying information will be redacted. The PI will limit access to data products (along with following USC IRB and school system internal IRB access protocols). The PI will share aggregate data and project notes that contain no sensitive information. Other research products (*database of GID units*) contain no sensitive information.

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

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

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

Asset	Description	Quantity	Format
Project Website	Project information; link to *database of GID units*, resources and recommendations, guidance on access to all research products	1 website	html
Database of GID units	Guided Inquiry Design units organized by grade-level and subject	1 database	html
Focus Group Data	Table host notes, observational notes, audio recordings	4 sets of each: table host notes, observational notes, and audio recordings	PDF, MPEG4, xlsx
Field Notes	Observation protocols, researcher notes	240 observation protocols, 240 notes	PDF
Video Recordings	Recordings of units taught during the lifetime of the project	240 recordings	mp4
Student work product	Student artifacts of learning completed during the lifetime of the project	TBD	JPEG, PNG, PDF
Research publications/ presentations	Publications and conference presentations	TBD	PDF, html

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

Microsoft Office products will be used to create the observation protocol and note-taking templates, as well as research publications and presentations. Focus groups will be recorded as MPEG-4 audio files using a TASCAM DR-05 recorder. Student work products will be scanned as JPEGs, PNGs, or PDFs. Notes will be handwritten then typed. The project website will be hosted by U of SC's CIC on the University domain (sc.edu).

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

All documentation will be at or above relevant quality standards.

Workflow and Asset Maintenance/Preservation

A.4 Describe your quality control plan. How will you monitor and evaluate your workflow and products?

The PI will manage all project deliverables and review data products before publication. The Instructional Specialist, Instrument Designer and Statistician will also review products as these are synthesized. The PI and Statistician will work in tandem to ensure quality and anonymization of collected data.

A.5 Describe your plan for preserving and maintaining digital assets during and after the award period of performance. Your plan may address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

U of SC's CIC will permanently host the project website on a stable sc.edu URL. Research output, including publications, presentations, and qualitative data products will be hosted in U of SC's Scholar Commons repository. Quantitative data will be permanently hosted in openICPSR.

B. Metadata

B.1 Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata. Specify which standards you will use for the metadata structure (e.g., MARC, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

The U of SC Scholar Commons, as well as openICPSR repository interface assign metadata to research and data products. In Scholar Commons the metadata is flexible and customizable based on dissemination needs. All of the metadata fields, whether or not these are patron-facing, are targeted to promote search discoverability. openICPSR also provides professional metadata review and enhancement. The PI will consult with U of SC librarians who maintain both repositories on appropriate metadata standards and content, based on the goals for dissemination – established throughout the duration of this project.

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

U of SC's Scholar Commons and openICPSR repositories will support metadata for both data and research products after the award period.

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

U of SC Scholar Commons works with all of the highly-used regular and academic search engines to push repository content to the top of result lists. Scholar Commons is part of Digital Commons, the institutional repository provider of over 500 institutions, and allows for easy cross-searching from within the platform. PlumX metrics are automatically added to most research. ICPSR is also an institutional repository provider of long-term electronic storage of published files; continuous computing/cloud capabilities; immediate availability of published bit-level data; and dissemination of restricted-use data via openICPSR's Virtual Data Enclave for hundreds and hundreds of institutions worldwide. Both repositories will be promoted by the PI and the research team during dissemination of research

products, including at conferences, meetings, and via other communication channels.

C. Access and Use

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

Access will be available through the project website, accessible using standard web browsers, as well as deposited in the repositories identified in this proposal.

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

Example of a project site created by CIC web developer, Patty Hall: http://scloccivilrights.com/

Example of project website hosted by U of SC's CIC: http://www.sc.edu/study/colleges_schools/cic/research/journalism_and_mass_communications/pr_strat_comm_research_group/index.php

USC Scholar Commons: https://scholarcommons.sc.edu

ICPSR: https://www.icpsr.umich.edu/icpsrweb/

Part III. Projects Developing Software

A. General Information

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

N/A

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

N/A

B. Technical Information

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

N/A

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

N/A

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

N/A

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

N/A

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

N/A

C. Access and Use

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

N/A

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

N/A

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

Name of publicly accessible source code repository:

N/A

URL:

N/A

Part IV: Projects Creating Datasets

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

In all three years of the project, the following qualitative data will be collected: focus group transcripts, video recording transcripts, observation protocols, researcher field notes, and student products of learning. The following quantitative data will be collected: pre and post tests on treatment group participant knowledge of guided inquiry design, and K-12 student pre and post tests on unit academic content for students associated with both treatment and control group participants. Collection of both qualitative and quantitative data will highlight complex and interdisciplinary phenomena present in educational settings, so that results further inform each type of data set. All data will contribute to scholarly publications and presentations, as well as to the creation of the project website, and the database of guided inquiry design units.

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

An IRB will be submitted to the University of South Carolina for this grant project within the first two months of grant approval. The PI will re-apply as directed by the U of SC IRB. During the first two months of grant approval, internal approval or internal IRB for school systems in States 1 and 2 will be submitted. During year one of grant approval, internal approval or internal IRB for school systems in States 3 and 4 will be submitted.

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

All project participants will be assigned numerical codes. Any identifying information will be redacted from collected data such as focus group transcripts, video recording transcripts, observation protocols, and field notes. All K-12 student identifying information will be removed by the classroom teacher before student work products are accessed by the PI. The PI will limit access to data products (following U of SC IRB and school systems internal approval processes). The PI will share aggregate data and project materials that contain no sensitive information. All data collected and analyzed during the project will be stored on secure, password-protected machines, to which only the project staff will have access.

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

Project staff who have passed U of SC Human Subjects training will administer informed consent to all research participants (in the case of K-12 students, parental consent forms), and collect signed, paper consent forms. A random three-digit numerical code preceded by a two-letter data type prefix, will be assigned to each participant

(e.g., AB007). The PI will create a spreadsheet matching each code to the participant's name and project pseudonym. This file will be kept in a password protected folder only accessible to project staff. Consent and school system agreements will be scanned and stored in this same folder. Print copies of agreements will be kept in a locked file cabinet for at least three years after the study's end (according to U of SC IRB requirements). Once recordings (audio and video) have been transcribed, their corresponding audio and video files will be destroyed to avoid any identifiable voice information. All data sources will be in password protected (if digital) or locked (if physical) storage.

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

Audio/video/pictorial qualitative data will be collected using a TASCAM D-05 recorder, a video camera, and photographed. All audio and video files will be transcribed into .docx and .pdf files. Observational protocols and researcher field notes can either be taken digitally or transferred from pen and paper to a digital format (either .docx or .pdf). Qualitative data will be analyzed using Excel, and codebooks will be generated as .xlsx files. All raw data will only be visible to the research team. Quantitative data will be collected using pre and post tests and analyzed with SPSS.

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

Codebooks, coding reports, project memos, SPSS printouts, field notes, transcripts, photographic evidence, will be created and stored on local, secure machines as .docx, .pdf, .jpeg, and .png files. An established naming convention indicating the data collection type will be used to label these documents as necessary.

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

All sharable data sets will be shared in U of SC's Scholar Commons and ICPSR.

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

Name of repository:

Scholar Commons

ICPSR

URL:
http://scholarcommons.sc.edu
https://www.icpsr.umich.edu/icpsrweb/

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

The data management plan will be evaluated monthly by the PI, and bi-annually in project meetings with the research team. The PI will monitor compliance with the plan as well as new institutional and technological developments that might warrant modification of the plan. Datasets will be curated and preserved in accordance with repository standards.