University of West Georgia & University at Buffalo

Rural Engagement to Advance Learning In STEM Digitally (REALISD) in School Libraries

Abstract

Our Proposal: With direct support from IMLS of $386,569, The University of West Georgia (UWG) and the University at Buffalo (UB) will develop and deliver a three-year collaborative **project** (October 2017 - September 2020), entitled the Rural Engagement to Advance Learning In STEM Digitally (REALISD) in School Libraries Program, to **continue the education of rural school librarians**. The project seeks to improve the applied digital knowledge, skills, and abilities of K-12 school librarians for supporting STEM learning in their respective rural schools by providing rich and comprehensive professional development (PD) experiences. This project is directly relevant to the IMLS strategic plan goal to create engaging experiences for learners in libraries that prepare them to be full participants in their local communities and a global society. Over the 3-year project period, a partnership between STEM educators, school library leaders, and digital resource experts will deliver PD learning experiences for 80 school librarians from **rural areas** of the southeast (SE), spanning the states of Georgia, Alabama, Mississippi, and Louisiana, and the upper midwest (MW)/western northeast (WNE) areas of New York, Pennsylvania, Michigan, Ohio, and Indiana. Rural areas here comprise some of the lowest socioeconomic indices and hardest hit postindustrial economies of the US. Responding to the project category of **Community Anchor**, this project seeks to build new knowledge and skills of school librarians to address STEM needs and facilitate learning in their schools and within the larger rural communities**.**

Project Addresses a Field-Wide Need: Research finds that STEM education equips students with the skills needed to take advantage of career pathways in their regions, strengthens local workforce development, and increases employment opportunities and entrepreneurship. Educating students in STEM areas not only prepares them for successful careers and advanced technical studies, but also for life.

Rural schools in particular face formidable challenges with STEM initiatives, such as tight budgets, lack of sufficient technological infrastructures, struggles with recruiting and retaining great teachers in STEM areas, and a lack of PD opportunities for teachers. STEM education "does not just inspire our future scientists but also elevates the prospects of all rural students, including those at small schools with limited resources – who, without STEM education, have fewer options," and is therefore vital in these rural areas (Carnegie Science Center, 2014, p. 4).

School librarians equipped with advanced digital skills coupled with applied STEM content knowledge can engage students and support teachers by facilitating meaningful use of digital tools and providing real-world collaborative learning opportunities. Yet, despite opportunities for school librarians to become actively involved in STEM collaborations and initiatives, research finds that school librarians do not have confidence in their content knowledge of STEM areas or their applied digital skills and abilities, and are thus less inclined to engage in opportunities to support the STEM needs of students and teachers (Johnston, 2017).

Project Outcomes:

(1) The professional development experience of the REALISD in School Libraries Program, comprised of a series of modules for both face-to-face and continued online participatory learning;
(2) The recruitment and enrollment of 80 rural K-12 school librarians, as participants, into the REALISD in School Libraries Program through an exhaustive and targeted two-year recruitment plan;
(3) The delivery of the REALISD in School Libraries Program professional development experience to prepare 80 K-12 rural school librarians to leverage digital resources for supporting teachers and engaging students in STEM learning in their local rural context;
(4) The open dissemination of comprehensive project information and digital works, materials, and products of the REALISD in School Libraries Program through formal and informal channels and OER Commons/Creative Commons licensing; and
(5) Publications and presentations of practice-oriented research about the school librarian and interrelated factors in the planning and support of STEM learning in rural contexts.

Rural Engagement to Advance Learning In STEM Digitally (REALISD) in School Libraries

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Narrative

The **Rural Engagement to Advance Learning In STEM Digitally (REALISD) in School Libraries Program** is a proposed three-year collaborative **project** (October 2017 - September 2020) between the University of West Georgia (UWG) and University at Buffalo (UB) to **continue the education of rural school librarians**. This project seeks to increase the applied digital knowledge, skills, and abilities of K-12 school librarians for designing, managing, and facilitating STEM learning in their respective rural schools through a rich and comprehensive professional development (PD) experience. This project is directly relevant to the IMLS strategic plan, specifically in support of the goal of creating engaging experiences for learners in libraries that prepare them to be full participants in their local communities and a global society. Over the 3-year project period, a team of STEM educators, school library leaders, and digital resource experts will deliver PD learning experiences for 80 school librarians from **rural areas** of the southeast (SE), spanning the states of Georgia, Alabama, Mississippi, and Louisiana, and the upper midwest (MW)/western northeast (WNE) states of New York, Pennsylvania, Michigan, Ohio, and Indiana. Rural areas here comprise some of the lowest socioeconomic indices and hardest hit postindustrial economies of the US. Addressing the **Community Anchor** category of the Laura Bush 21st Century Librarian Program (LB21) of the Institute for Museum and Library Services (IMLS), this project seeks to build new knowledge and skills of school library professionals to improve their ability to address STEM needs and facilitate lifelong learning in their schools and the larger rural communities.

1. Statement of Need

Research finds that STEM education equips students with the skills needed to take advantage of career pathways in their regions, strengthens local workforce development, and increases employment opportunities and entrepreneurship. STEM education has been defined as an "interdisciplinary approach to learning where academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy" (Tsupros, Kohler, & Hallinen, 2009). Educating students in STEM areas not only prepares them for successful careers and advanced technical studies, but also for life, by teaching how to think critically and analytically through collaborative, hands-on, problem-solving, and project-based approaches. The US Department of Commerce estimates that by 2018, the US will have 1.2 million unfilled jobs in STEM fields because the workforce will not possess the necessary skills to fill them, demonstrating a critical need to increase student achievement and career entry that will advance US competitiveness and economic growth (US Office of Science and Technology, 2016). Despite national STEM-focused initiatives, students in the US continue to rank lower in science and math compared to their counterparts in other countries. US students rank 17th out of 33 in science literacy and 25th in math literacy among developed countries (OECD, 2015), raising further concerns that US schools are not preparing students to enter STEM fields (e.g., Desilver, 2017; Heim, 2016; Randazzo, 2017).

Rural schools in particular face formidable challenges with STEM initiatives, such as tight budgets, limited technological infrastructures, struggles with recruiting and retaining great teachers in STEM shortage areas, and few professional development opportunities for teachers (Johnson, Mitchel, Rotherman, 2014; Randazzo, 2017; Smith, 2015). Even in rural areas with resources and access to technology, there is a lack of educators who possess the necessary content, technological, and pedagogical knowledge to facilitate applied STEM learning (Ossala, 2014). The report *Why Rural Matters* finds that there are over 9.7 million students enrolled in rural school districts; of those, two in five students live in poverty (Johnson, Showalter, Klein, & Lester, 2014). Furthermore, the rural areas targeted by this proposed project rank near the bottom nationally on National Assessment of Educational Progress science and math scores. STEM education "does not just inspire our future scientists but also elevates the prospects of all rural students, including those at small schools with limited resources – who, without STEM education, have fewer options," and is therefore vital in rural areas (Carnegie

Science Center, 2014, p. 4). Yet, schools in these rural areas of the US have not yet been recipients of federal STEM education funding (e.g., Carnegie Science Center; *Huffington Post*, *U.S News & World Reports*). Other projects, such as *School Librarians Advancing STEM Learning* (ISKME, 2015) and *STEM-ALL* (Dow, 2015) have acknowledged the importance of training school librarians to support STEM education. However, this project will provide progress toward such initiatives by focusing on a unique population comprised of school librarians serving in some of the nation's rural and most challenged communities.

Technology and media play an important role in effective STEM education. Students engage in STEM learning in many ways and through an array of different digital resources that provide authentic experiences. Digital resources may include, but are not limited to, digital videos, audio, graphics, games, online assessments, scientific datasets, virtual manipulatives and simulations, and other forms of media. Students learn concepts through these interactive digital resources, all of which enrich student learning by enabling them to comprehend, visualize, and explain difficult concepts (e.g., Mardis & Payo, 2010; Perrault, 2007; Subramaniam, Ahn, Fleischmann, & Druin, 2012; Subramaniam & Edwards, 2014; Subramaniam et al. 2013; Young, 2013). Students need exposure to emerging technologies for STEM learning through both formal and informal instruction on how to use digital tools and resources to "communicate, solve problems, and access, manage, integrate, evaluate, and create information to improve learning in all subject areas and to acquire lifelong knowledge and skills in the 21st century" (AASL, 2009). As an information specialist, the school librarian is charged with ensuring that learners are equipped with the knowledge and skills needed to succeed in the digital society of the 21st century by "introduce[ing] and model[ing] emerging technologies, as well as strategies for finding, assessing, and using information" (AASL, 2009). Research finds that teachers continue to have difficulty locating appropriate digital content and are uncomfortable integrating digital resources (Project Tomorrow, 2015). School librarians not only teach students how to use digital tools, but also support teachers in locating digital resources and co-teaching with them to integrate them into instruction. A school librarian with STEM domain knowledge, applied digital proficiencies, and educational understandings can both engage students and assist teachers to facilitate STEM learning (Johnston, 2017; Subramaniam et al., 2013).

Despite these opportunities for school librarians, the preliminary research of this project finds that school librarians struggle with supporting STEM education efforts in their schools. Co-PI Johnston conducted needs assessment research within the targeted populations to gain preliminary understanding of the different and interrelated factors affecting this project and the PD of K-12 school librarians for STEM. School librarians continually expressed that they did not feel prepared to support STEM education in their schools. Specifically, it was found that school librarians do not have confidence in their content knowledge of STEM areas or their digital skills and abilities, and are therefore less inclined to engage in opportunities to support STEM needs. Rural school librarians also spoke about the importance of making community connections and utilizing local resources to help students establish connections between their learning, communities, and possible future career opportunities available to them (see Supportingdoc3 for overview of findings). A school librarian equipped with advanced digital information skills coupled with applied STEM knowledge can engage students and support teachers by facilitating meaningful use of digital resources and, in turn, providing real-world collaborative learning opportunities for STEM learning. The REALISD in School Libraries Program addresses the Community Anchor project category by providing an educational opportunity that will build new knowledge and skills of school library professionals to improve their ability to address STEM needs and facilitate lifelong learning in their schools and the larger rural communities.

2. Project Design

The REALISD in School Libraries Program Experience: The REALISD in School Libraries Program will ultimately develop and deliver PD experiences to a total of 80 K-12 school librarians working in the targeted rural areas of the project. Completing the experience will equip school librarians to support STEM education in their schools. As part of the PD experience, participants will register for and earn a three-credit hour course at either UWG or UB, depending on the summer face-to-face session in which they will participate in. These credits can be applied toward certification renewal, as required for certified school librarians, usually every 5-10 years. Overall, the REALISD in School Libraries Program will offer a blended PD experience delivered through

both intensive face-to-face sessions held onsite at either The STEM Fusion Center on the UWG campus or STEM Instructional Spaces at UB, followed by an online participatory learning component. The timeline for all tasks involved in the development and delivery of the PD experience is presented here and in the attached *Schedule of Completion.*

Goals and Outcomes of the Project: The overall goal of the project is that project investigators and the expert Advisory Team will collaboratively develop, deliver, and evaluate the REALISD in School Libraries Program, which will provide a comprehensive PD experience for school librarians in rural underserved areas to increase their knowledge, skills, and abilities for facilitating STEM education within their own respective schools. The project addresses the IMLS Agency-Level Goal of Learning and its individual Performance Goals to 1) train and develop museum and library professionals and 2) develop and provide inclusive and accessible learning opportunities.

The project's outcomes will include:

(1) The professional development experience of the REALISD in School Libraries Program, comprised of a series of modules for both face-to-face and continued online participatory learning;
(2) The recruitment and enrollment of 80 rural K-12 school librarians, as participants, into the REALISD in School Libraries Program through an exhaustive and targeted two-year recruitment plan;
(3) The delivery of the REALISD in School Libraries Program professional development experience to prepare 80 K-12 rural school librarians to leverage digital resources for supporting teachers and engaging students in STEM learning in their local rural context;
(4) The open dissemination of comprehensive project information and digital works, materials, and products of the REALISD in School Libraries Program through formal and informal channels and OER Commons/Creative Commons licensing; and
(5) Publications and presentations of practice-oriented research about the school librarian and interrelated factors in the planning and support of STEM learning in rural contexts.

Overarching Assumption: The REALISD in School Libraries Program will facilitate a positive and wide-reaching change in how school librarians can and will support STEM education in rural K-12 schools using applied digital skills and abilities.

Potential Risks: Project buy-in among the selected participants and rural schools in these areas are imperative for successfully achieving and sustaining project outcomes. Otherwise, risks to project outcomes may include 1) lack of interested school librarians, 2) loss of interest and confidence among participants throughout and beyond the project, 3) lack of supportive and collaborative teachers and/or school administrators, and 4) lack of sufficient local school resources and accommodating priorities.

Efforts have been put into place throughout the Project Design to mitigate these potential risks and to maximize success, such as an aggressive recruitment plan, an administrator buy-in form, a participant commitment form, and the delivery of an expert-developed PD experience that will provide participants the necessary knowledge, skills, and abilities to confidently support STEM education in their schools.

Success of the project is primarily defined as meeting the Project-Level Performance Goals, as detailed below in *National Impact*, which will demonstrate progress toward the IMLS Agency-Level Goal of Learning. Success will be evaluated based on the impact of the project, with indicators of Project-Level Performance Goals and the corresponding benefits.

The REALISD in School Libraries Program Schedule of Work:

October 2017 – May 2018: The focus of this time period will be module development, participant recruitment, and participant selection. Project Co-PIs and the expert Advisory Team will work together virtually to create the PD modules and develop the REALISD website as the primary channel for recruitment and project dissemination. Co-PIs will recruit the first group of 40 participants (20 in each of 2 Summer 2018 sessions) through comprehensive efforts that include the REALISD website, Co-PI attendance at state library conferences, as well as AASL conferences, posts to listservs, and direct email to contacts in the field. The Advisory Team will assist in the review of applications and selection of participants.

A) Module Development Plan: At the very outset of the project, Co-PIs and the expert Advisory team will meet virtually, using online collaboration tools (e.g. Google Hangout), to plan and discuss module development. Virtual meetings will be held bi-monthly throughout the fall, winter, and spring to discuss progress on module development. A total of five PD modules will be developed by the Co-PIs in collaboration with the expert Advisory Team over year one of the project (2017-2018). These modules will build upon existing STEM learning projects (e.g. *STEM-ALL*), needs assessment research, the literature, and individual expertise. There will also be a focus on connecting to and drawing from the *Next Gen Science Standards* and the *Common Core State Standards.* All modules will build successively off of one another in order to provide holistic knowledge of STEM learning through use of the digital tools and resources most applicable for rural contexts (see Curriculum attachment for overview of module content). Since participants will include school librarians serving at different levels in K-12 (i.e. elementary, middle, and high), tailored activities and groups will be strategically incorporated into the sessions. The modules, as based on the established *TPACK Framework* by Koehler and Mishra (2009), will include:

- *Module 1. Content Knowledge: STEM Disciplines in K-12 Education* - In this module, participants will learn about the content areas of science, technology, engineering, and math, along with the curricular standards that guide each area. The focus will be teaching the school librarians about the underlying principles of STEM education so they can map instruction to science, technology, engineering, and math principles.
- *Module 2. Technological Content Knowledge: Digital STEM Tools and Resources* - Building on the content knowledge of Module 1, participants will learn about the types of technologies and digital resources that are best suited for addressing STEM learning in the target areas and methods for effective integration for instruction.
- *Module 3. Technological Pedagogical Content Knowledge: Applied STEM Teaching and Learning* - In this module, participants will build upon Modules 1 and 2 to learn effective ways to partner with teachers for teaching and integrating technology based on sound pedagogical principles, inquiry-based learning, and content knowledge.
- *Module 4. Community Connections: Enriched STEM Learning with Civic and Cultural Organizations* - Participants will learn about making community connections. In rural communities, there are many partnerships that can be established with civic and cultural organizations to bring real world learning opportunities to the students.
- *Module 5. Implementation in Context: STEM in Practice* - This module is a required online component that will continue throughout the following school year. Participants will have bi-weekly obligations for engaging with other participants, Co-PIs, and the Advisory Team, for ensuring progress toward a final STEM in Practice plan that takes into account their individual contexts. These STEM in Practice plans will be used to assess progress toward Module objectives and can ultimately serve as a "roadmap" for participants to build STEM activities in their own libraries.

B) Recruitment Plan: Recruitment is a critical activity of the Project Design and highly influential to ultimate achievement of project outcomes. Recruitment activities will successfully attract a total of 80 rural K-12 school librarians from the targeted areas for participation in a full PD experience of the REALISD in School Libraries Program.

Recruitment efforts will commence October 2017. The particularly heavy recruiting periods will occur during the first two years of the project. First, the REALISD in School Libraries Program website will be developed to serve as a primary channel for recruitment and dissemination of all information regarding participation (e.g. application, current opportunities, procedures, and processes). Website development and maintenance will be led by Albertson, who has managed many similar efforts, including for projects that have developed and disseminated learning modules for the purposes of technology literacy among populations of need.

In addition, recruitment will include both Co-PIs separately attending different state school library conferences (or larger state library conference) in the targeted states during the first two years of the project.

Here, poster displays, brochures, presentations, and personal networking (e.g. at booths and/or sessions) will be used to promote opportunities for potential participants.

Opportunities will also be advertised on relevant listservs to reach different groups including current practicing school librarians, professors of library science programs (for reaching recent alumni located in rural areas), and school principals. Additionally, direct communications to established contacts and to different social media outlets will be utilized.

As part of the participation requirements of the REALISD in School Libraries Program (full details are described below), participants will be required to publicly blog about their experience over the course of the school year and to share their blogs with others to provide additional "soft" marketing for the project.

When needed, the Advisory Team, many of whom are strategically located in target areas, will be consulted on how to reach the rural K-12 school librarians. Additionally, Johnston (Co-PI), in her needs assessment research, conducted interviews with practicing K-12 rural school librarians, which helped establish professional contacts in these areas. Recruitment will be a responsibility of all project personnel.

C) Participant Selection Plan: The application process to participate in and receive financial support from the REALISD in School Libraries Program will be competitive to ensure that the reach of the project is sufficient and to enroll talented participants who aspire to integrate digital resources that can best support STEM learning in their rural K-12 schools. Participants will apply to the program through the project website. Applications will require prospective participants to address their interests in STEM areas along with self-perceptions of their own unique situation, their strengths and weaknesses in supporting STEM areas, and the opportunities where they see themselves having a positive impact. A participant commitment form, along with an administrator consent form, will be required as a part of the application process; these forms will help ensure the necessary level of commitment among both participants and school administrators for fulfilling project requirements and supporting the final STEM in Practice Plans. Co-PIs and the Advisory Team will meet virtually to review applications to ensure that diverse and devoted groups are selected.

June 2018 – August 2018: The official launch and delivery of the four-day onsite PD sessions will take place in the summer of 2018.

Face-to-Face Sessions of the REALISD in School Libraries Program Plan: Modules 1 through 4 of the PD experience will be delivered in four-day face-to-face sessions at either The STEM Fusion Center at UWG or STEM Instructional Spaces at UB (depending on group). The first round of 2 separate face-to-face sessions with 20 participants each - for a total of 40 participants per year for 2 years - will take place in Summer 2018. The next round of sessions will occur in Summer 2019, again, with 2 sessions of 20 participants. One session will be held at each university both summers. The total number of participants in the project will be 80.

The individual face-to-face sessions (in summer 2018 & 2019) will be administered by the project Co-PI of the local host institution, after collaborative development and finalization by both Co-PIs and Advisory Team. Oversight and administration of participants' PD experiences will be equally divided among the institutions for project management purposes; there will be no substantial content differences in the experience regardless of the institution where participants are administratively managed and earn credit. Tuition and other student support expenses (e.g. travel, accommodations, and food) will be supported financially through direct funds of IMLS. Financial support for participation and three graduate credit hours, which can be applied for certification renewal purposes, will be a significant advantage for drawing and recruiting 80 devoted participants. Most certified school librarians are required to obtain PD credits for recertification every 5-10 years.

September 2018 - May 2019: Following the onsite PD sessions, participants will continue participation online from their home schools throughout the following school year, according to the requirements of Module 5. The academic year following the delivery of the first two face-to-face sessions will also include tracking the project's progress by analyzing the results of the participant pre- and post-session survey responses from the face-to-face sessions and revising modules based on participant feedback. Additionally, comprehensive and continuous communication will be essential, and Co-PIs will follow a rigorous plan for communicating results

and sharing discoveries for field-wide reach and impact. Co-PI Johnston will lead these efforts based on her expertise translating research into practice. Also, following the same procedure as described above, 40 more participants from the target areas will be recruited and selected to participate in the second round of onsite sessions in the Summer of 2019 (as followed in the 2018 plans above).

A) Continued Online Component of the REALISD in School Libraries Program Plan: An online participatory component, required of all participants, will continue throughout the school year following the face-to-face sessions. Ultimately, the online component will enable participants to make collaborative progress toward a final implementation "STEM in Practice" plan, which can be used to propose new ideas and activities for STEM learning. The development of a final executable STEM in Practice implementation plan, as required of all participants, will 1) demonstrate mastery of new skills and best practices, addressing the goals of each module, and 2) serve as a basis for proposing the integration and use of digital resources for the purposes of STEM learning, taking into account their own local situation, interests, and other interrelated factors.

As part of this collaborative online component, participants will have bi-weekly obligations of one hour of applied work toward development of their final STEM in Practice implementation plan and another hour of online participation requirements, e.g. blogging, posting to discussion boards, and other collaborative work with participants. Topics of the online component will be both pre-designed by project personnel in conjunction with the Advisory Team and adapted as needed based on current situations, experiences, and other developments emerging from the participants and field of STEM education. However, a majority of the topics for collaborative learning will coincide with the theme "facilitating digital STEM learning in context" with topics envisioned to include, but not limited to, working with existing resources, community connections (school, local, and of practice), teacher collaborations, tools and resources, marketing services, local advocacy, stakeholders, personal growth and awareness, celebrating demonstrable successes, and experiences across the different STEM areas. Commitment to the online component is a requirement for consideration for financial support; participants will not be admitted unless there is a clear commitment to participate online over the full following school year. Online participation combined with a face-to-face session will provide each participant sufficient contact and work hours to earn three-graduate credits from one of the participating institutions. Both UWG and UB provide comprehensive technical support for all faculty and students of online courses.

B) Tracking Project Progress - Formative Evaluation Plan: Formative evaluation of the face-to-face sessions will begin with collection of both quantitative and qualitative data from participants through surveys as administered by project evaluator, Dr. Nancy Everhart. A pre-session survey will be given to participants during the enrollment process, with the corresponding post-session survey following the completion of face-to-face summer sessions. The pre/post-session survey will assess and measure effects of the face-to-face sessions on participants' knowledge of STEM education, content areas, and the digital resources for supporting STEM learning. The post-session survey will also ask participants for feedback about the content of the modules and delivery of the face-to-face materials. Dr. Everhart will meet with the Co-PIs and the Advisory Team to review and discuss survey results. The feedback gained from the participants will then inform the enhancement of the modules and the (re)delivery of face-to-face PD sessions the following summer.

Throughout the online component, Dr. Everhart will periodically monitor and review the online discussion forums, participants' blogs, and participants' STEM in Practice plans. At the conclusion of each online component, Dr. Everhart will conduct online interviews with participants to gather perceptions of 1) the overall PD experience, 2) the online component, 3) the quality and feasibility of their own respective STEM in Practice implementation plans, 4) active collaborations, and 5) future intentions. To gain further insights, a survey will be sent to the principals of the schools to learn their perspectives of the participants' growth and eagerness in supporting STEM learning. Dr. Everhart will then again meet virtually with Co-PIs and the Advisory Team to discuss findings. The Co-PIs, with input from the Advisory Team, will formally evaluate

the final STEM in Practice plans of participants based on a rubric of quality, clarity, thoroughness, and overall feasibility.

C) Plan for Communicating Results and Sharing Discoveries for Field-Wide Reach and Impact: Comprehensive communication throughout the full project lifecycle is essential. The primary audience of project-related communications is K-12 school librarians; other related audiences include, but are not limited to, school administrators, STEM-area educators, instructional technologists, researchers, and other communities of stakeholders and partners. Due to the highly interconnected nature of the school librarian community, an abundance of existing established channels can be leveraged to communicate project information, including national and state listservs, social media groups, and both face-to-face and online professional forums. The project website will be a communication channel designed to reach all audiences and to disseminate all project-related information and digital works and materials. Communications from project participants, including blogs, webinars, and formal presentations of individual experiences, will be instrumental for reaching both the primary audience and other communities of interest. Participants, along with the Co-PIs, will be expected to conduct a REALISD in School Libraries webinar that will be offered free to school librarians across the country. During these webinars, participants will present their STEM in Practice plans and talk about their experiences with the PD sessions. As described in the Digital Product plan, all modules and other digital works and materials will be openly disseminated in different file formats and contributed to a variety of hosting sites for open access and preservation. Also, the Advisory Team, comprised of highly visible professionals with many established connections to the field of school librarianship, will serve as stewards for this project in promoting it through their own professional and scholarly communications. Finally, Co-PIs will share project progress and findings throughout the project on the REALISD in School Libraries website, in periodic webinars, and in education and school library conferences and journals. In order to reach a broader audience, STEM conferences, science and math educator conferences, and school administrator conferences will also be targeted for sharing results of this project.

June 2019 – August 2019: The second round of the four-day onsite PD sessions (one session at UWG and another at UB) will take place in the summer of 2019.

September 2019 – September 2020: Following the summer onsite sessions, the next group of participants will continue participation online from their home schools throughout the 2019-2020 academic year. After the final 2019 summer sessions, the focus will also be on continued and final project evaluation for reporting to IMLS, continued activities to communicate results and share discoveries with the field (see above), and making the PD modules accessible to the larger field.

A) Project Evaluation & Performance Measurement Plan: Success will be evaluated based on the impact of the project, as indicated by the achievement of the Performance Goals and corresponding benefits, as detailed below in *National Impact*. As discussed above, there will be formative evaluation taking place throughout the project. Project data corresponding to the PD experience will be analyzed to determine if there was an increase in participants' knowledge, skills, abilities, and thus overall potential to transform practice through the integration of digital tools and resources to support STEM learning. Reach of the project will be evaluated by monitoring numbers of resource access and use, and examining other projects and efforts having applied or adapted project modules and materials for their own purposes.

B) Plan for Making Modules Accessible to the Larger Field: The REALISD in School Libraries Program will be of great benefit to the field of school librarianship and other efforts involved in supporting STEM education. At the end of the funded project period, the modules and all supplemental materials, including participant blogs, the archived webinars, and participant-created STEM in Practice plans, will be openly available on multiple hosting sites (e.g., WebJunction, OERcommons.org (STEM Literacy Hub), Curriki.org, the REALISD in School Libraries Program website, UWG SLMS wiki, and others) to facilitate continued access and long-term sustainability. Additionally, the modules and knowledge gained will be utilized to create a STEM-focused graduate level course that will be added to the school library preparation curriculum at UWG and at UB, and openly shared with other preparation programs in the US. Creative Commons

licensing, as described in the Digital Product plan, will facilitate expanded sharing across the profession. Project Co-PIs are knowledgeable of other potential online resources to use related to school libraries and STEM, such as the School Librarians Advancing STEM Learning OER site, in order to further address both dissemination and sustainability.

Personnel for Planning, Implementing, and Managing the Project: The REALISD in School Libraries Program personnel has the necessary experience in grant management and within the subject areas related to the project. The project Co-PIs already have a positive and highly productive research collaboration, as demonstrated from recent research outputs on science teachers and educational video digital libraries (e.g. Albertson & Johnston, 2014). Both investigators will be fully engaged in all aspects of the REALISD in School Libraries Program. For organizing and reporting purposes, there are certain activities and tasks which are appropriate to designate to one of the project Co-PIs as the primary overseer, as described above. Project personnel includes:

Melissa P. Johnston, PhD (Co-PI / Project Lead and Director at UWG), Associate Professor in the College of Education, UWG, provides research expertise in the area of school librarianship and technology integration, as well as thirteen-years practical experience as a school librarian. Dr. Johnston is a former research fellow for The Partnerships Advancing Library Media (PALM) Center at Florida State University, where her doctoral studies were the result of IMLS funding, which enabled her to work as the grant's research assistant. She has participated in other grants from IMLS, the Library of Congress, and several state-based organizations. Her research focuses on the areas of integration of technology and digital resources for teaching and learning and the education of future school librarians; she also serves at the Co-Editor of *School Library Research*. Dr. Johnston has a background in instructional design and has significant contacts within the school library profession throughout the US.

Dan Albertson, PhD (Co-PI / Project Director at UB), Associate Professor in the Department of Library and Information Studies, UB, has taught extensively on topics related to digital libraries and information management, and has disseminated an array of research about digital libraries, including from the context of science education. He has significant IMLS grant management experience, serving as Project Manager from 2004 to 2007 for the collaborative Digital Library Education Program (DLEP) between Indiana University and the University of Illinois Urbana-Champaign. Here, Albertson was involved in all aspects of project management including outcomes-based evaluation, reporting, program promotion, recruitment, research, and others. He has been PI on other major contracts including those from the National Library of Medicine and the Association of Library and Information Science Education.

The Advisory Team is composed of experienced personnel with a variety of expertise in STEM education and pedagogy, school library practice, school library education, digital tools and resources, online learning, and developing and conducting PD throughout multiple contexts. The Advisory Team consists of: Terry E. Young, Coordinator, retired, Jefferson Parish Public School System, LA, a well published former science educator and practicing school librarian; Melissa Jacobs, Coordinator, New York City School Library System, with expertise from practice that encourages school librarians to support STEM learning through PD as funded by an IMLS National Leadership Grant; Professor Kristin Fontichiaro, data literacy, maker education, school librarian PD expert, and IMLS grant recipient, Dr. Lucy Santos-Green, school librarian educator and member Institute for Interdisciplinary STEM Education; Dr. Mega Subramaniam, STEM and the school librarian researcher; Dr. Gail Marshall, Master STEM teacher and PD consultant, and Dr. Richard L. Lamb, STEM educator/researcher. Also, school librarian educator and award winning researcher Dr. Nancy Everhart will serve as project evaluator (Resumes/CVs of the Advisory Team are provided in the Resumes attachment).

Financial Resources for Success: Support as requested for the expertise, resources, and opportunities for participants of the REALISD in School Libraries Program reflect fair, cost-effective, and appropriate decision-making for an undertaking of this size. The direct costs of the budget will be used to support: 1) efforts of the Co-PIs over summer months, including both salaries and fringe, 2) consulting fees for STEM area experts of the Advisory Team and the project evaluator, 3) tuition and fees for all 80 participants, 4) travel and accommodations for 80 participants to attend the face-to-face summer sessions, 5) necessary travel for

recruitment and project dissemination purposes by both project Co-PIs and select program participants, 6) supplies and printing cost, and 7) indirect costs on direct funds at rates as negotiated by each institution.

3. Diversity Plan

Diversity is at the very center of the proposed project and present in all project goals, activities, and anticipated outcomes. Rural areas of the southeastern US are very diverse and heavily comprised of underserved minority populations. Specifically, Alabama, Georgia, Louisiana, and Mississippi are all among the states experiencing some of the largest increases in the number of diverse students and families in rural areas, including students who qualify for special education services and free or reduced priced meals (Johnson et al., 2014). Rural upper midwest/west northeast target areas of the project represent another dimension of diversity, one of lost manufacturing and agricultural jobs and difficulties of a postindustrial economy, which is resulting in stagnant or dwindling populations and thus declining or decaying resources as compared to their suburban counterparts. Outreach and educational programs directed to these areas ensures diversity as integral to the services provided and the students ultimately reached. Both UWG and UB are strategically located and are knowledgeable of these surrounding rural communities and the challenges they face with regards to public education and other services. As a result, both participating institutions are highly experienced in, involved with, and committed to providing community-based research and outreach to these areas. The participants recruited and selected for the REALISD in School Libraries Program will mirror the rural diverse communities they serve. Recruitment efforts will involve local, state, regional, and national professional organizations in order to focus on identifying a diverse mix of school librarian participants from rural communities.

4. National Impact

The REALISD in School Libraries Program will bolster field-wide school library practice by developing and offering a comprehensive PD program that will equip rural school librarians with the digital skills and abilities to support STEM learning in their schools. Direct measures of each Project-Level Performance Goal will demonstrate progress toward Performance Goals 1 (train and develop library professionals) and 3 (develop and provide inclusive and accessible learning opportunities) of the IMLS Agency-Level Goal 1 (Learning). Accomplishing the Project-Level Performance Goals will indicate both immediate and sustained impacts, which will benefit diverse constituencies in the rural school libraries across the target areas. The Project-Level Performance Goals include:

Project-Level Performance Goal 1. With the expertise of project staff and the Advisory Team, develop the comprehensive professional development experience of the REALISD in School Libraries Program.

Project-Level Performance Goal 2. Recruit and enroll 80 practicing K-12 school librarians from the target rural and culturally diverse areas into the REALISD in School Libraries Program.

Project-Level Performance Goal 3. Formally deliver the professional development experience of the REALISD in School Libraries Program to the 80 selected K-12 school librarians in the target rural areas.

Project-Level Performance Goal 4. Disseminate openly available information of the REALISD in School Libraries Program, including all digital works, instructional materials, and products, using both formal and informal channels.

Project-Level Performance Goal 5. Develop, complete, and report practice-oriented research about STEM learning and rural K-12 school librarians.

The measurable indicators of each of these Project-Level Performance Goals in relation to their perceived benefit and corresponding Agency-Level Performance Goals for Learning include:

Project-Level Performance Goal 1. The benefit will be a tested program developed by a team of experts, which, in turn, can also serve as a model for other programs seeking to implement similar experiences for librarians that focus STEM learning. The development and accessibility of the PD experience, including all digital works, materials, and products of the REALISD in School Libraries Program, will serve as indicators, in addition to program and module evaluation to gauge project effectiveness, such as participants' increased understanding of STEM education and learning.

Project-Level Performance Goals 2 and 3. The primary benefit of these Project-Level Performance Goals will include a group of 80 practicing K-12 school librarians representing diverse rural communities becoming trained and developed on skills and abilities for supporting STEM learning through digital tools and resources. Participants' ability to apply these new skills will be demonstrated within their STEM in Practice Plans at the completion of the program. In turn, the STEM in Practice Plan will guide participants through best practices for supporting STEM learning using available and sustainable digital resources that demonstrate promise for their own respective school context. Professional growth of participants will be assessed using quantitative and qualitative measures by project personnel and the evaluator. Collaboration and involvement with others at the local and regional level, such as practicing librarians, surrounding communities, and other stakeholders, will sustain the benefits of the REALISD Program and demonstrate potential to promote systematic positive change from adaptation into other communities.

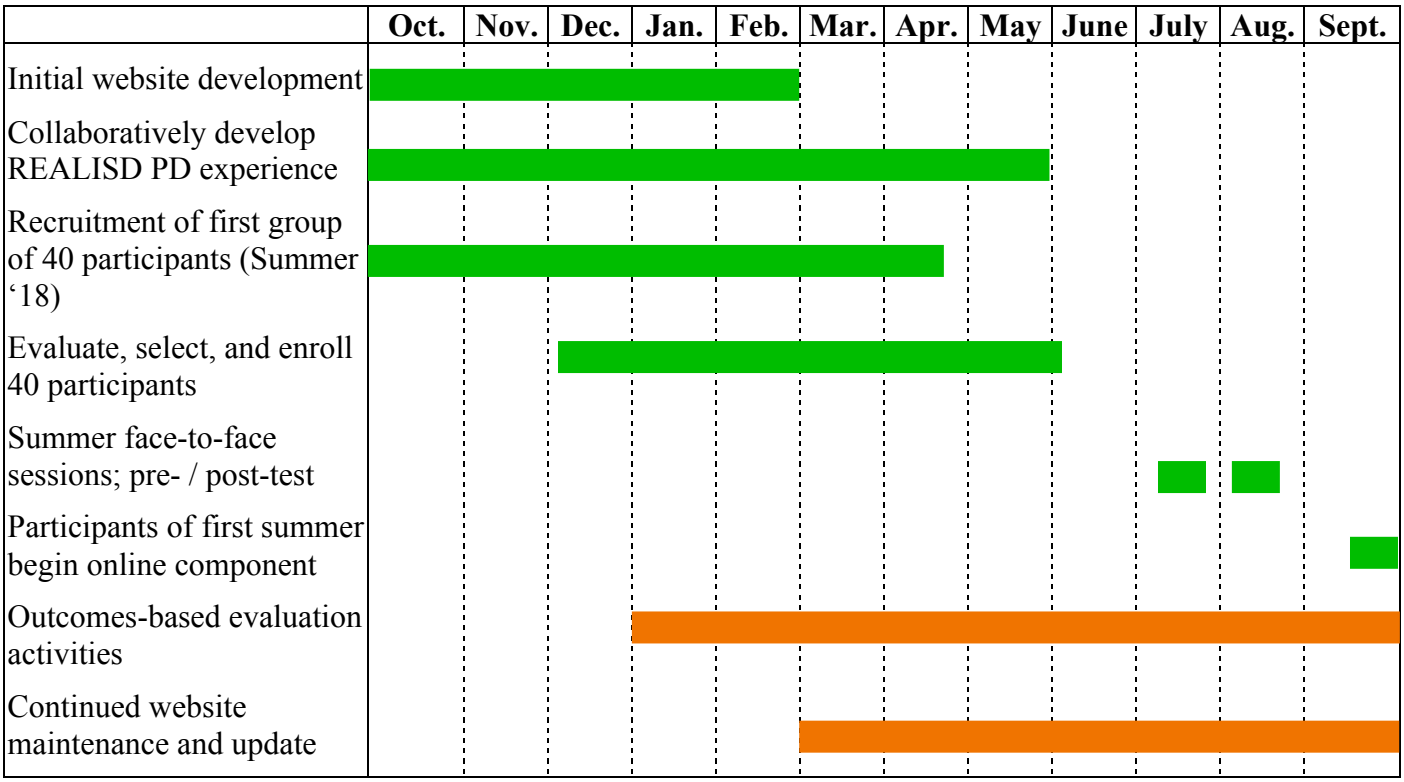
Project-Level Performance Goal 4. The benefit for field-wide school library practice will include all digital outputs of the REALISD in School Libraries Program being made openly available using Open Educational Resources (OER) and Creative Commons licensing. Application of the digital resources and materials by others will be the primary indicator of this Project-Level Performance Goal for gauging impact and sustained benefit beyond the immediate project period. Performance measurement of this Project-Level Goal will also incorporate analysis of participatory and communication requirements for participants of the online component. Further, communications of project personnel and participants at face-to-face and online forums (e.g. state library conference, webinar, etc.) will further inform the performance measurement of this goal and in turn market project resources for sustained use by others. Individual measures will include, but not be limited to, numbers of 1) active communicators and participants, 2) venues, audiences, and local communities reached, 3) project-related communications, and 4) communication channels as employed for project dissemination.

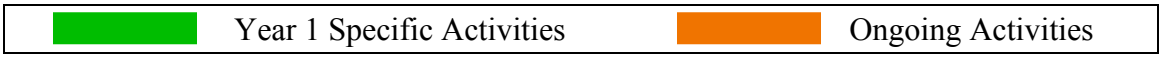
Project-Level Performance Goal 5. The research to be developed, completed, and disseminated will have a continued benefit by advancing knowledge of the professional development, opportunities, and role of K-12 school librarians to support STEM learning through use of digital tools and resources. Findings will benefit practice by establishing an evidence-based foundation with potential to stimulate future STEM-related activities and/or programs across other contexts. Further, new research into community-related factors which examine community participation and buy-in will be highly informative to the adoption and incorporation of STEM initiatives at the local level. Also, research goals of the REALISD in School Libraries Program, where applicable, will coincide with program evaluation; project investigators will methodically examine and report implications of the formal evaluations of project activities, such as professional growth of the participants. Indicators for Performance Goal 5 will include research datasets and both quantity and quality of publications, presentations, and future research proposals.

REALISD in School Libraries Program

Schedule of Completion

Year 1: October 2017-September 2018

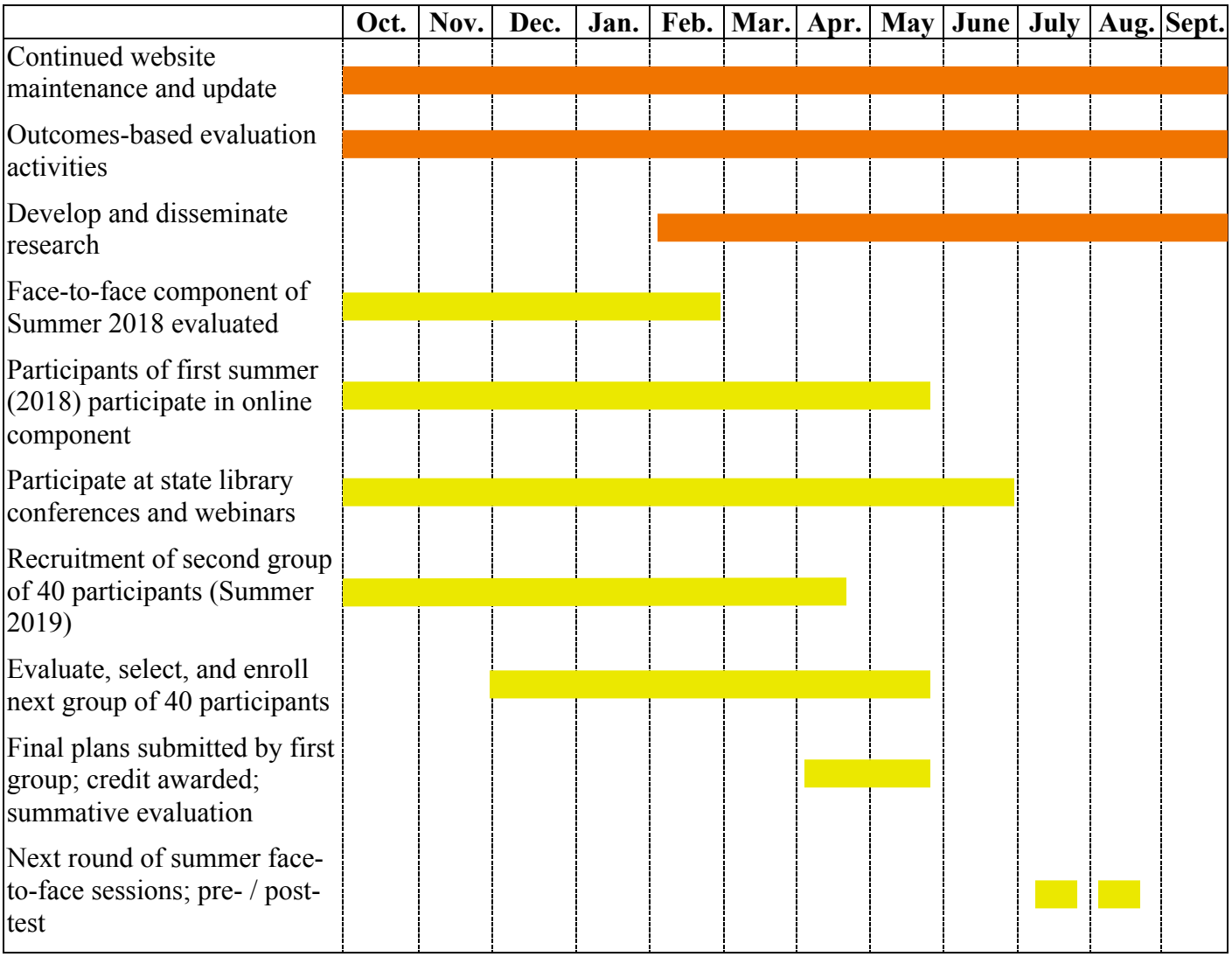




REALISD in School Libraries Program

Schedule of Completion

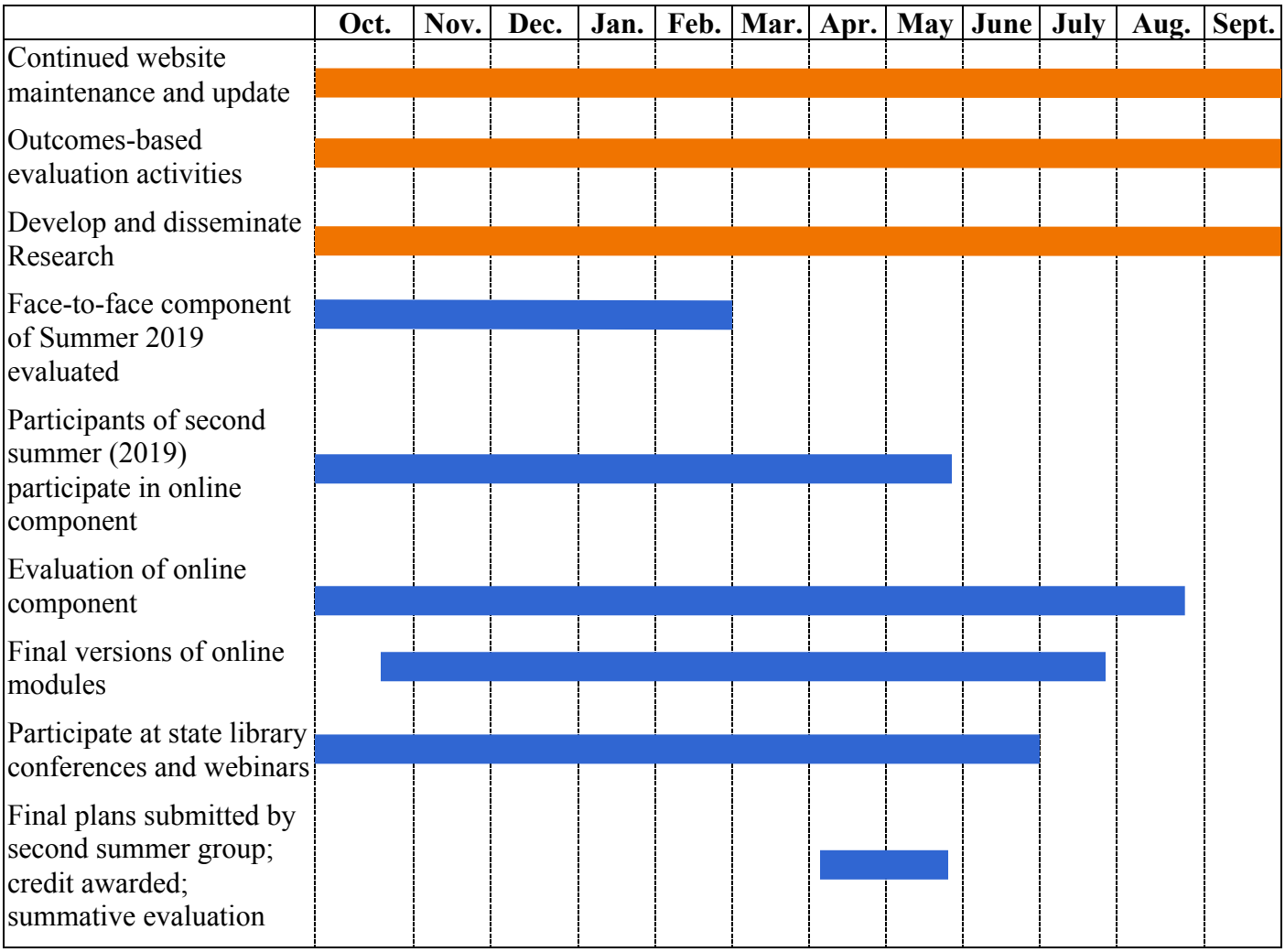
Year 2: October 2018-September, 2019



REALISD in School Libraries Program

Schedule of Completion

Year 3: October 2019-September, 2020



DIGITAL PRODUCT FORM

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

Instructions
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.

Works, materials, and other products which are a result of project activities will be licensed under Creative Commons: Attribution-NonCommercial-NoDerivatives License. Future users will not be permitted to change materials for distribution, but only transmit **unaltered** copies, and all digital materials will be appropriately attributed and made freely-accessible with non-commercial intentions. Copyrighted materials or works of project participants will be honored as expressed.

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.

Works, materials, and other products of the project will be jointly owned by the participating institutions, and joint copyright to works and materials will be held. Through the selected Creative Commons License, as described above, conditions of use will be imposed; justifications for these conditions have been explained (see above). The Creative Commons labeling system (see below) will be utilized to notify potential users of the terms and conditions for use of all materials.

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.

No activities or work of the REALISD in School Libraries Program are anticipated to raise any concerns for privacy or cultural sensitivities. If ever deemed necessary, appropriate permission for participation will be obtained from all individuals and approved by all participating institutions.

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

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

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

This project will result in the development of learning modules and other digital learning resources. Learning modules will be formatted and distributed in both PDF and HTML; versions will be tailored for each format accordingly. Multimedia or recorded-live content, anticipated to be initially captured using a form of VOIP software, will be subsequently generated or converted in open source formats, such as MPEG, mp3, or mp4, as deemed appropriate for a given recorded session. Open source media formats of recorded content will ensure compatibility with all browser and media player software, and will therefore provide the capability to be hosted and disseminated through the project website and other educational resource sites.

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

Microsoft Office and HTML web editors will be the primary tools used to create and format learning modules and other (digital) textual materials for dissemination. Blackboard (or equivalent) webinar tools will be used to deliver, record, and output any live session. The project website will be created and hosted using a common web development platform, such as Wordpress or Weebly, or using available server space at one of the participating institutions.

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).

There will be PDF and HTML versions of the digital learning modules and other textual educational resources, and mp3 and mp4 or MPEG will be the format of any multimedia recordings, depending on the content, using default resolutions of webinar recording software.

B. Workflow and Asset Maintenance/Preservation

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

REALISD Website: An experienced web designer will lead development efforts for the project website. The initial design period will occur in the first six month of the project which will include targeted evaluations such as discount usability tests to ensure suitable levels of basic metrics are met.

Modules: The initial versions of the digital learning modules will be collaboratively developed throughout the entire first year of the project by the PIs and the Advisory Team. After delivery, all learning modules and other digital materials, including both face-to-face and online content, will be formally evaluated and revised using multiple tiers of feedback from participants, the Advisory Team, and other evaluations as conducted. Accordingly, digital works, materials, and other products prepared for online dissemination in multiple formats can be updated and enhanced periodically and/or as needed over the course of the project.

Webinars / Other Multimedia Content: Blackboard tools (or equivalent) are anticipated to be employed to deliver and capture live multimedia content. Recordings can either be generated or converted to open source multimedia formats. However, on a reoccurring basis, the PIs will consult the Instructional Technology Services at each participating institution to review the adoption or use of any new or alternative distance educational tool for live sessions and recordings. Quality of content will be informed through collaborative input from the Advisory Team and participants at the end of their PD experience. Final recordings will be reviewed for appropriateness and edited as needed for improving quality.

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

All digital works, materials, and other products will be deposited on hosting sites available at the time of their development and completion. The REALISD project website will be the primary site for disseminating project content; however, other resources will be employed for the purposes of sustainability and preservation of digital works and materials, which may include WebJunction, Slideshare.net, YouTube.com, Vimeo.com, TeacherTube.com, OERCommons.org, and the UWG and UB institutional repositories (when available).

C. Metadata

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

Project personnel possess the expertise in information organization and metadata. Therefore, effective decisions can be made as needed on the creation of metadata structures and content whether using existing standards or specialized approaches for either internal use (if needed) or for repository systems. Practices that involve metadata will need to follow existing metadata standards of any hosting sites ultimately selected to store and disseminate digital works and materials as listed in section B.2.

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

Metadata for digital content are expected to persist after the grant period without additional need for direct intervention or preservation.

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

Project staff will routinely monitor developments and consult with other experts in the area of digital resource preservation and access both during and beyond this proposed project period. Accordingly, appropriate steps will be taken to ensure the creation and compatibility of metadata for any new systems or tools selected to serve as a repository for digital works and materials.

D. Access and Use

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

The REALISD website will be an open channel for disseminating project-related information and digital works, materials, and products to the public. The website will be developed using a common web development platform, such as Wordpress or Weebly, in order to ensure high levels of compatibility across browsers and their respective versions. Other strategically selected resources, such as WebJunction, Slideshare.net, YouTube.com, Vimeo.com, TeacherTube.com, and OERCommons.org, which demonstrate sufficient levels of cross-platform compatibility, will be employed for making available digital works to include both textual and multimedia content. Digital works will also be deposited at other free hosting sites that are available at the time of their completion.

The anticipated formats of digital content, including modules, recorded-live sessions, implementation plans, and supplemental materials, will ensure unrestricted public access by using multiple open and available formats. Formats will include versions for each PDF and the HTML for maximum compatibility across machines (i.e. hardware) and

platforms. The formats of the multimedia content will be open source to prevent incompatibility of resources.

The resources and formats for disseminating information were selected for ensuring both quality of presentation along with open access using standard web browsers that do not require any significant customization.

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

Albertson was the Manager of the Association for Library and Information Science Education (ALISE) Statistical Report Project, which uses custom built web applications and databases to collect and store statistical data from all ALA-accredited schools of library and information science (LIS). The URL to the online survey and report is found at:

http://alise.slis.ua.edu (login required)

Further, Albertson was PI on a research project that examined video use and sharing for the purposes of decision-making of autism cases in rural areas of Alabama. The URL to the prototype online video digital library:

http://autism.slis.ua.edu (currently in maintenance mode)

Albertson has performed web development work for other major projects including the project website to a sizable IMLS funded project. (URL has since expired.)

Part III. Projects Developing Software

N/A: This project is not creating any software

Part IV: Projects Creating Datasets

N/A: This project is not creating a dataset