ESSER III School Proposal Template

Due April 4, 2022

School: Laing Middle School of Science and Technology
Date: April 4, 2022

Please complete this document for your school's proposal for funding activities under the American Rescue Plan (ESSER III) to achieve the vision that **all students will read on grade level by 5th grade by spring of 2027.** As you are completing this document, please adhere to and consider the following:

1. Completed plans should be emailed to ESSERIIISchoolPlans@charleston.k12.sc.us.
2. As a part of the planning process, there will have to be community/parent engagement. There must be proof of this submitted with your plan.
3. Plans should focus primarily on Pillar III (Wraparound Services). Please refer to the Pillar attachments to see examples of what these are. Pillars I & II, are being supported primarily by the District Office. Items being supported under these umbrellas can be found in the Guardrails attachments as well.
4. This is funding for approximately two years, which means that the final year of funding would be the 2023-2024 school year. Your approved funding amount would be for the two years (22-23 & 23-24) combined.

ESSER III Pillar(s) Addressed:

RIGOROUS GRADE-LEVEL INSTRUCTION	**x**
HIGH-QUALITY TEACHERS/LEADERS	**x**
WRAP-AROUND SERVICES	**xx**

Year(s) of Implementation: ***(Plans can be submitted for the Summer 22 and 22-23 and 23-24 school years. You may have a plan that you would like to implement for consecutive years, but please be advised that data will be utilized before moving forward with an additional year).***

Summer 22	**x**
2022-2023	**x**
2023-2024	**x**

Statement of Intended Outcome – State your intended outcome of the your proposal

The intended outcomes of this project are:

1. To develop, document, and extend products that will enable middle school students to read at grade level;

2. To improve academic performance among students at all levels of achievement in all core middle school subjects; and
3. To improve the STEM workforce pipeline, with particular attention to improving the participation of groups that are presently under-represented in STEM careers.

We wish to emphasize that while the initial focus of this project is on Laing Middle School, project products will be available to all schools at no additional cost, for many years following the project's conclusion.

This project focuses primarily on ESSER Support Pillar III (Wraparound services), but project outputs will also positively impact the quality of instruction in reading and other core academic subjects (Pillars I and II).

Research – Please provide research to support your proposal. Place research here that supports the item(s) that you will be focusing on and how they will have a positive impact on scholar outcomes.

While the principal objective of many STEM education efforts has been to increase the number of STEM professionals, the primary motivation of this proposal is different: We intend to use STEM tools to improve instructional effectiveness by increasing student curiosity, engagement, and motivation. We also expect that this strategy will increase the number of students interested in STEM careers, and this is one of our intended outcomes; but the immediate purpose is to improve academic performance among underachieving students, and provide enrichment opportunities to students who do not struggle academically.

For the past decade, there has been increasing emphasis on "STEM education," largely driven by growing demand for science, technology, engineering, and mathematics (STEM) knowledge[1] and recognition that the U.S. education system has not prepared enough students to meet this demand.[2, 3] In 2011, the National Research Council[1] described new strategies for increasing the number of students to fill occupations requiring STEM knowledge, most prominently specialized STEM high schools. Erdogan and Stuessy[4] compared the college readiness of STEM school graduates with that of graduates from traditional high schools. Using 11th grade students' high-stake test results in reading, mathematics, and science, they concluded that students' success with reading, mathematics, and science does not differ by school type. These results, however, did reveal success in another dimension: because the STEM schools in the study were mostly populated by students from historically underrepresented populations, the finding that these students' performance was similar to students in traditional schools suggests that intentional exposure to STEM content had a positive impact on academic performance.

Key elements of this proposal are:

- Using STEM tools to evoke student engagement that enhances middle school academic performance; and
- Improving the STEM workforce pipeline by addressing known causes of underrepresentation of females and minorities in STEM careers.

Gruber, Gelman, and Ragnath[5] have described neurological effects of curiosity that enhance the brain's ability to learn and retain information; even if the information is not related to the things that evoked the curiosity. In the words of Evie Malaia[6], an assistant professor at the Southwest Center for Mind, Brain and Education: "Curiosity really is one of the very intense and very basic impulses in humans. We should base education on this behavior."

Moulding, Songer, and Brenner[7] document the extensive research that demonstrates the positive impacts of STEM-based instruction on student learning (e.g., Hirsch et al.[8], Duschl and Osborne[9], Miller and Krajcik[10], Krapp and Prenzel[11], Watkins et al.[12]). In summary, students learn by doing. STEM-based instruction provides opportunities for students to *do*. Research studies show that deeper engagement leads to stronger conceptual understandings than what is demonstrated through more traditional, memorization-intensive approaches. The inclusion of engineering design in K–12 classrooms presents an opportunity for students to learn yet another way of interacting with the natural and designed world around them. Learning is more meaningful when investigation and design are relevant to student lives. Investigation and design that are connected to students' culture and place tend to increase student interest in learning.

Integration of experiences with STEM tools into core academic instruction can also be a strategy for addressing serious deficiencies in our STEM workforce pipeline. As noted previously, the increasingly severe shortage of critical talent needed by some of the nation's most important businesses and industries is well-documented. South Carolina is no exception, and this is having serious impact on the state's ability to attract new businesses.[13] Recent reports [14] emphasize that:

> "Business leaders in South Carolina cannot find the science, technology, engineering and mathematics (STEM) talent they need to stay competitive."

Diversity and equity are also part of the problem:

> "not enough students--least of all minorities--are exposed to challenging content to prepare them for college and careers."
>
> "females and minorities make up more than half of South Carolina's population, yet they are much less likely to earn STEM degrees or become STEM professionals." [14]

Improving the STEM workforce pipeline conveys compelling benefits to students. Between 2017 and 2027, STEM jobs are projected to grow by 13%, while the projected growth for all other jobs is 8%. Projections are even higher for advanced manufacturing (16%) and computing (17%) jobs. Median earnings for STEM jobs in South Carolina are $33.84/hr while median earnings for all other jobs are $16.41. Unemployment rates are also lower for STEM jobs in South Carolina: 2.2% vs 5.9% for all other jobs.[14]

Such benefits are particularly meaningful to students in minority and underrepresented populations; and these populations are equally important to a robust STEM workforce. Research has shown that diverse groups of problem-solvers outperform less diverse groups, even if individuals in the latter groups have relatively greater problem-solving abilities.[15]

An effective strategy to build a STEM workforce pipeline must address known obstacles to diversity and equity. Kelly, Ernst, and Clark[16] identified "hidden STEM" careers that have low minority representation and high levels of projected growth over the decade 2017–2027. These careers have particularly high potential impact for underrepresented groups. Research by Microsoft Philanthropies[17] on reasons that girls lose interest in STEM careers provides a useful starting point for developing curricular means to engage underrepresented students in STEM career paths. This research found that

- More exposure is needed to role models, STEM jobs, and career awareness and planning
- Participation in STEM clubs and activities outside of school increases interest in pursuing STEM subjects
- Encouragement from teachers and parents enhances interest in STEM
- Educators can foster a "growth mindset" by tapping into students' willingness to work hard for results.

STEM professionals from other underrepresented populations also emphasize the importance of role models, positive reinforcement, personal STEM experiences, and intentional actions to improve equity:

> " There's a lot of pressure when you're the only person who looks like you." [18]
>
> " It wasn't just my race and my background but also my experience that made me feel super different. And those are all intertwined." [19]
>
> "Learning environments that emphasize academic language and school-based, English-only ways of speaking can disenfranchise emergent multilingual students and/or students from non-dominant communities by not incorporating their ways of talking and sensemaking." [20]
>
> "Many students, especially those who don't identify as being 'good at STEM,' have learned to fear failure. It is key to create physical and social environments that feel safe for youth to take the intellectual and creative risks and to learn from moments of design failures" [21]

To date, efforts to improve the STEM workforce pipeline have focused largely on high school and post-secondary programs. Middle schools, though, have a critical but often ignored role in solving the workforce pipeline dilemma: research has shown

that students' career interests begin to gel during middle school years, and many students (especially girls) lose interest in careers that involve science, engineering, and mathematics between the fourth and sixth grade.[19] Programs at the high school and college level cannot recapture that interest; the damage is done much earlier.

Besides evoking states of curiosity and engagement that enhance academic performance, integrating STEM tools into core instruction can also provide middle school students with opportunities to discover individual interests and skills in STEM careers. These discoveries can help provide motivation for academic success that is often lacking among underachieving students, and are equally important to students who do not struggle academically. Besides discovering individual interests and skills, STEM-infused instruction can provide high achievers with more challenging work that helps build problem-solving abilities that are essential to many 21st century careers. Providing these opportunities at the middle school level may also have positive impacts on important initiatives at the secondary level, such as CCSD's Centers for Advanced Studies.

Over the past ten years, Laing Middle School has implemented a variety of STEM-infused initiatives which have been described to national audiences[22, 23, 24] and have resulted in national recognitions (e.g., Top STEM Middle School in the U.S. (Future of Education Technology Conference, 2017) and Program Excellence Award (National Technology and Engineering Educators Association, 2018)). These initiatives have included extensive community input from parents and local businesses (e.g., U.S. Navy Systems Center Atlantic, Charleston Defense Contractors Association, BP Cooper River Plant). The proposed project will allow us to leverage this experience in the production of STEM-infused instructional enrichment products targeted toward the core middle school curriculum.

References

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Goals, Strategies & Performance Measures – Please use the area below to add the goals, strategies and performance metrics for your plan. Add as many goals and objectives as necessary. Identify external resources you believe would be effective in accomplishing strategies. A list of organizations that you may use to support your initiatives is listed here. You may use other organizations as well if they align with your plan. What Works Clearinghouse is a good source to find research-based ideas/strategies as well.

Goal 1:	Strategies:	Progress Monitoring:	Performance Metrics:
Improve student engagement and academic performance in middle school core curriculum subjects. **External Resources:** Technical Support and External	**Strategy 1:** Develop STEM-infused unit enhancement modules (SUEMs) that will connect the content of selected core curriculum units to hands-on engineering and design activities that stimulate students' curiosity	Project month 1–3 (June 2022 – August 2022) Activities: SUEMs development workshops for Phase I	Project month 4 (September 2022) -- Draft SUEMs developed for at least two curriculum units in each content areas, and published as online Flexbooks available to any

Review: Daniel Kelly, Phd; Assistant Professor of STEM Education, Texas Tech University William Havice, PhD; Professor and Associate Dean, Clemson University Host Site and Technical Support for Online Content: CK-12 Foundation (https://www.ck12.org) Online Resources for Potential Hands-On Activities: Teach Engineering (www.teachengineering.org) Try Engineering (https://tryengineering.org/) Instructables (https://www.instructables.com/)	and engagement. **Strategy 2:** Validate and refine STEM-infused unit enhancement modules by incorporating them into core content instruction at Laing Middle School during the 2022-23 and 2023-24 school years.	Project month 4–12 (September 2022 – May 2023) Activities: Classroom trials of draft Phase I SUEMs Project month 13–15 (June 2023 – August 2023) Activities: SUEMs development workshops for Phase II Project month 16–24 (September 2023 – May 2024) Activities: Classroom trials of draft Phase I and Phase II SUEMs	educator Project month 13 (June 2023) -- Results from Phase I classroom trials of draft SUEMs summarized, including assessment results and necessary modifications. Draft SUEMs developed for at least two additional curriculum units in each content areas, and published as online Flexbooks Project month 24 (May 2024) -- Results from Phase II classroom trials of draft SUEMs summarized, including assessment results and necessary modifications.
Goal 2: Increase students' awareness of and interest in STEM careers, particularly students from groups that are presently underrepresented in the STEM workforce	Strategies: Include components in SUEMs that intentionally address known obstacles to participation of underrepresented groups in the STEM workforce.	Progress Monitoring: Project month 4–24 (September 2022 – May 2024) Activities: SUEM components that address known obstacles to participation in the STEM workforce	Performance Metrics: Project month 13 (June 2023) -- Results from STEM Career Interest assessments during Phase I summarized and evaluated Project month 24 (May 2024) -- Results from STEM Career Interest assessments during Phase II summarized and evaluated
Management Plan w/ Major Project Activities – The management plan should be realistic and achievable. Detail activities, responsibilities, and timelines as related to project goals, strategies, and performance measures listed above. Add additional goals and strategies as necessary.			
Goal 1			
Strategy 1:	**Implementation Steps:**	**Implementation Dates:**	**Person(s) Responsible:**

Develop STEM-infused unit enhancement modules (SUEMs) that will connect the content of selected core curriculum units to hands-on engineering and design activities that stimulate students' curiosity and engagement.	Modules will be developed by a group of middle school educators who teach English language arts (ELA), mathematics, science, and social studies curricula. Specific units associated with these modules will be identified by the participating educators, except for ELA in which the initial target units will be those associated with developing reading skills. Module development will take place during a series of workshops led by the STEM Coach at Laing Middle School. The overall format for these workshops is similar to that described by Ernst et al.[25], and will include: • Orientation to potential STEM-infused activities based on Laing's ten years of experience with integrated STEM activities; • Discussion on the use of formative and embedded assessments; • Identification of critical content within each instructional unit that will be the focus of SUEMs (Critical content is defined here as concepts, factual material, and/or skills that are essential to student mastery and that are typically problematic for students); • Iterative brainstorming to identify potential STEM-infused activities that have strong potential to stimulate students' curiosity and engagement; • Identification of cross-curricular opportunities; and • Prototyping SUEMs. Each SUEM will include an introduction, an everyday uses section, specific content interspersed with self-checks, hands-on activities, and optional extensions. The latter section is	SUEM development workshops for Phase I core content will be held during the summer of 2022. Development workshops for Phase II core content will be held during the summer of 2023.	Melvin Goodiwn, PhD STEM Coach Laing Middle School

	intended to serve students who do not typically struggle with unit content, and who may benefit from more challenging activities. SUEMs will also include suggestions for formative and embedded assessments (the term embedded assessment refers to formative assessments that are integrated into an instructional sequence (Penuel and Shepard[26]). The primary delivery vehicle for SUEMs will be online packages using CK-12 Flexbooks (CK-12 Foundation, 2022), together with appropriate tools and supplies which will be provided to workshop participants. This vehicle is chosen because it is open-source, no-cost, accessible to multiple browsing devices, and provides the opportunity to easily link our SUEMs to other instructional resources if desired. In addition, this vehicle is easily updated and readily available for extension to other users during the second phase of the project (2022-23). After initial evaluation and revision of SUEMs during the workshops, the Project Leader will prepare online versions (Flexbooks) for classroom trials.		
Strategy 2: Validate and refine STEM-infused unit enhancement modules by incorporating them into core content instruction at Laing Middle School during the 2022-23 and 2023-24 school years.	**Implementation Steps:** Educators who participate in Phase I SUEM development workshops will implement modules that are relevant to their curricular content during the 2022-23 school year. Although the intent of SUEMs is to enrich existing instruction, educators will be encouraged to use information from formative and embedded assessments to adapt and improve their existing instruction and to ensure that	**Implementation Dates:** Project month 4–12 (September 2022 – May 2023) Activities: Classroom trials of draft Phase I SUEMs Performance Indicator(s): Results of formative, embedded, and post-instruction assessments Project month 16–24	**Person(s) Responsible:** Melvin Goodiwn, PhD STEM Coach Laing Middle School

	learning environments are inclusive (Moulding, Songer, and Brenner[7]). In addition to customary summative academic assessments, the impact of SUEMs on student engagement and interest in STEM careers will be assessed using evaluation instruments developed in consultation with external STEM education experts (please see External Resources, above). While it is anticipated that participants will exchange experiences with SUEMs throughout the classroom trial timeframe, periodic conferences also will be held to document these experiences and exchange ideas on desirable modifications and best practices. During months 11 or 12, a one-day workshop will be held to summarize the experiences, assessment results, and identify needed modifications. Educators who participate in Phase II SUEM development workshops will implement modules that are relevant to their curricular content during the 2023-24 school year. Details of implementation will be informed by the implementation experience of the preceding year. Assessment, communication, and summary activities will be similar to those described above.	(September 2023 – May 2024) Activities: Classroom trials of draft Phase I and Phase II SUEMs;	
Goal 2			
Strategy 1: Increase students' awareness of and interest in STEM careers, particularly students from groups that are presently underrepresented in the STEM workforce	**Implementation Steps:** Include components in SUEMs that intentionally address known obstacles to participation of underrepresented groups in the STEM workforce. These components will include: • Exposure to role models; • Information about STEM jobs	**Implementation Dates:** Project month 4–24 (September 2022 – May 2024)	**Person(s) Responsible:** Melvin Goodiwn, PhD STEM Coach Laing Middle School

	related to hands-on activities included in SUEMs, including jobs that do not require a baccalaureate degree; • Availability of extracurricular enrichment opportunities involving STEM skills; • Creating opportunities to showcase student achievements with STEM activities to foster encouragement from educators and parents; • Emphasizing the importance of iteration and a positive strategy for managing failure to build stamina and encourage a "growth mindset."		
Budget Analysis – Outline activities that require funding to successfully implement initiatives associated with the program. Add additional activities as necessary.			
Activity 1: Summer workshops to develop STEM-infused Unit Enhancement Modules	**Specific Components of Activity:** Phase I: 2 workshops, 5 days each, plus 5 additional days; 8 Educators @ $1,315/week Phase II: 2 workshops, 5 days each, plus 5 additional days; 24 Educators @ $1,315/week *NOTE: Compensation to participating educators is ONLY for time spent outside of normal contractual hours. Formal contracts will be executed for all participating educators.*	**Cost:** $126,240	
Activity 2: Classroom validation of draft SUEMs	**Specific Components of Activity:** Phase I: 2 hours per week additional to normal contract hours x 38 weeks x 8 Educators @ $32/hr Phase II: 2 hours per week additional to normal contract hours x 38 weeks x 24 Educators @ $32/hr Materials and supplies $80,000	**Cost:** *$*157,824	
Activity 3: External consultants for evaluation and technical review	**Specific Components of Activity:** Review draft SUEMs including formative assessments; develop and analyze evaluations to assess extent to which intended outcomes are achieved; provide technical expertise and review on STEM infusion activities	**Cost:** $50,000	
Activity 4: Project Management and Technical Support	**Specific Components of Activity:** Design and deliver SUEM development workshops; prepare online Flexbooks for each SUEM; provide technical expertise on STEM activities throughout the term of the project; provide	**Cost:** $160,000	

	overall coordination and supervision of project activities as detailed above; prepare reports as required by fundor; 24 months; based on CCSD FY2022 Salary Schedule - 240 Days DBM “DCTR”, step 10	
TOTAL:	[redacted]	**$494,064**

Sustainability – What will you do to sustain your plan? For instance if you are hiring staff what will you do at the end of two years when ESSER funding has been exhausted? Please be specific.

At the conclusion of this project, STEM-infused Unit Enhancement Modules will be developed and available online to any educator who wishes to use them. In addition, results of classroom assessments and consequent recommendations to users will also be available. No additional investment will be needed to sustain the availability of these resources.

If additional funding is available, we would propose to offer a series of workshops for educators from other CCSD schools to acquaint them with SUEMs and ways to use them. We would also offer workshops on the use of fabrication tools such as 3D printers, laser cutters, and computer-controlled milling machines.

Application Due Date	Approval Status Date
April 4, 2022	