U.S. Department of Education - EDCAPS
G5-Technical Review Form (New)

Status: Submitted
Last Updated: 08/13/2023 12:41 PM

Technical Review Coversheet

Applicant: Michigan State University (S411B230030)
Reader #1:   **********

		Points Possible	**Points Scored**
Questions			
Selection Criteria			
Significance			
1. Significance		15	15
Strategy to Scale			
1. Strategy to Scale		40	31
Quality of Project Design			
1. Project Design		15	8
Quality of the Project Evaluation			
1. Project Evaluation		30	0
	Sub Total	100	54
Priority Questions			
Competitive Preference Priority			
Competitive Preference Priority 1			
1. Promoting Equity		5	5
	Sub Total	5	5
	Total	105	59

Technical Review Form

Reader #1: **********

Applicant: Michigan State University (S411B230030)

Questions

Selection Criteria - Significance

1. **The Secretary considers the significance of the proposed project. In determining the significance of the proposed project, the Secretary considers the following factors:**

Reader's Score: 15

> **Sub**
>
> 1. **The extent to which the proposed project involves the development or demonstration of promising new strategies that build on, or are alternatives to, existing strategies.**
>
>   **Strengths:**
>
>   The proposed project has the potential to address a critical educational need of developing science and engineering knowledge and skills in rural districts in the southeastern United States (p. e16). The Crafting Engaging Science Environments (CESE) intervention is designed to be innovative through its foundation in project-based learning to address the K-12 Science Education framework and the Next Generation Science Standards (pp. e17-e18). Additionally, CESE is designed as a system by including curriculum, professional learning, and assessments (p. e18). A compelling argument is made for why this intervention addresses a high-need population (secondary students in the rural south) through increased access to rigorous culturally-responsive curricula in science and engineering, delivered through real-world projects (pp. e18-e20).
>
>   **Weaknesses:**
>
>   None noted.

> **Reader's Score:** 15

Selection Criteria - Strategy to Scale

1. **The Secretary considers the strategy to scale the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 31

> **Sub**
>
> 1. **(1) The extent to which the applicant identifies a specific strategy or strategies that address a particular barrier or barriers that prevented the applicant, in the past, from reaching the level of scale that is proposed in the application.**

Sub

Strengths:

The applicant identified four barriers to scaling the intervention and provided sufficient rationale for why they are likely to be barriers (e.g., Review of the curriculum led to concern about the cultural relevance to the lives of adolescents in different areas of the United States) (p. e20). Most strategies for overcoming the barriers are carefully designed and likely to be effective (e.g., testing the intervention with diverse student groups to inform decisions in improving the curriculum's cultural responsiveness) (p. e21).

Weaknesses:

The proposed strategy for overcoming the barrier of technology access involves purchasing devices and working with districts and other partners to improve internet access. While this will be successful for the proposed project, it is likely to be insufficient to address this barrier at scale due to the uncertainty if districts will have the funds to purchase the required devices (p. e22).

Reader's Score: 8

2. **(2) The adequacy of the management plan to achieve the objectives of the proposed project on time and within budget, including clearly defined responsibilities, timelines, and milestones for accomplishing project tasks.**

Strengths:

Personnel are experienced and qualified to assume the project-related roles specified in the proposal, such as Professor Elizabeth Tipton, who is highly experienced in leading randomized control trial studies (pp. e24-e25). The project timeline is broken out by year and season, with associated activities, providing a clear sequence of when and how the project may be implemented successfully and on time (pp. e118-e121). The roles and responsibilities of each person associated with the project are discussed and increase the likelihood that each activity will be completed as planned (p. e117).

Weaknesses:

No mention is made of how and when communication will take place across organizations and how frequently project-related meetings will occur to ensure the project is on track and able to be adjusted (pp. e118-e121).

Reader's Score: 3

3. **(3) The applicant's capacity (e.g., in terms of qualified personnel, financial resources, or management capacity) to bring the proposed project to scale on a national or regional level (as defined in 34 CFR 77.1(c)) working directly, or through partners, during the grant period.**

Strengths:

A clear explanation is provided for how existing highly-qualified personnel will have the capacity to work on the proposed project (e.g., a professor has been given 27% released time to lead the project) increasing the likelihood the project can be accomplished by the identified personnel (p. e24). The partner organizations are well-resourced and likely to have the capacity to support the implementation of the project activities (p. e24).

Weaknesses:

No justification is provided for the applicant's ability and past experience in scaling an intervention to a national or regional scale, making it unclear if there is sufficient expertise in this area to meet this goal (pp. e24-e25). District partnerships are not confirmed, making it unclear if the planned settings will be feasible if the project is awarded (p. e25).

Reader's Score: 8

4. **(4) The mechanisms the applicant will use to broadly disseminate information on its project so as to support further development or replication.**

   Strengths:

   The applicant discusses explicit strategies for disseminating project-related products and research findings through simple and attainable methods, increasing the likelihood of strong dissemination (e.g., public access through Creative Commons to curricular material and professional learning videos) (p. e26). The three-tiered strategy is likely to inform practitioners and researchers about the project, increasing the likelihood that others may successfully replicate it (p. e26).

   Weaknesses:

   Specific conference names and publication titles are not discussed, making it unclear if the applicant has identified the most suitable audiences to inform about the project (p. e26).

   Reader's Score: 8

5. **(5) The likely utility of the products (such as information, materials processes, or techniques) that will result from the proposed project, including the potential for their being used effectively in a variety of other settings.**

   Strengths:

   The lessons, materials, and activities are already being used in a variety of settings, both in the United States and internationally, making it likely that the existing products are useful in a variety of settings (p. e26). Unit plan samples are provided which are likely to be useful to science instructors since they tie big ideas to standards and key concepts (pp. e122-e130).

   Weaknesses:

   The applicant states that the lessons, materials, and activities are already accessible on a website, making it unclear if new/revised products will be created and shared in the same manner (p. e26). The lack of a detailed description of the new products makes it uncertain if they will be useful (p. e26).

   Reader's Score: 4

Selection Criteria - Quality of Project Design

1. **The Secretary considers the quality of the design of the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 8

1. **(1) The extent to which there is a conceptual framework underlying the proposed research or demonstration activities and the quality of that framework.**

   Strengths:

   The Logic Model includes resources, activities, and outputs that are likely to result in the long-term outcomes of increasing enrollment in postsecondary education and enrollment in STEM majors (p. e96). Project-based learning is an evidence-based approach to learning and is likely to engage learners of all types in science and engineering coursework (p. e27). Thirty hours of professional development is likely to provide necessary learning for teachers to increase the effectiveness of instruction (pp. e28-e29). National frameworks such as the Next Generation Science

Standards underlie the development of the intervention, supporting the design of the activities (p. e27).

Weaknesses:

None noted.

Reader's Score: 5

2. **(2) The extent to which the goals, objectives, and outcomes to be achieved by the proposed project are clearly specified and measurable.**

Strengths:

Five short-term goals are stated (e.g., engagement in science classes) (p. e29).

Weaknesses:

The goals provided are not measurable as stated (e.g., engagement in science class) (p. e29). The outcomes referenced in the Logic Model are not measurable since they are written in general terms (e.g., Increase in formative science achievement) (p. e96). Without the identification of the assessments being used to measure this and a numerical threshold to quantify growth, the outcome is too general (p. e96). The measures are not named and no evidence is provided that the measures are valid or reliable, so the goals, objectives, and outcomes are underdeveloped, making it unclear if the evaluation will yield useful and valid data (p. e96).

Reader's Score: 1

3. **(3) The extent to which the design of the proposed project is appropriate to, and will successfully address, the needs of the target population or other identified needs.**

Strengths:

The project plan is to implement the intervention in rural south secondary science classrooms to increase access to rigorous and engaging science and engineering project-based learning (p. e29).

Weaknesses:

Without clear identification of the specific settings for the project and commitment from those settings, it is unclear if the target population will actually be addressed through the proposed project (pp. e29-e30). No explanation is provided for the criteria to be used to recruit participants, and how the applicant will overcome barriers to recruitment (pp. e29-e30).

Reader's Score: 2

Selection Criteria - Quality of the Project Evaluation

1. **The Secretary considers the quality of the evaluation to be conducted of the proposed project. In determining the quality of the evaluation, the Secretary considers the following factors:**

Reader's Score: 0

1. **(1) The extent to which the methods of evaluation will, if well implemented, produce evidence about the project's effectiveness that would meet the What Works**

Sub

Clearinghouse standards without reservations as described in the What Works Clearinghouse Handbook (as defined in 34 CFR 77.1(c)).

Strengths:

Weaknesses:

Reader's Score:

2. **(2) The extent to which the evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.**

Strengths:

Weaknesses:

Reader's Score:

3. **(3) The extent to which the evaluation plan clearly articulates the key project components, mediators, and outcomes, as well as a measurable threshold for acceptable implementation.**

Strengths:

Weaknesses:

Reader's Score:

4. **(4) The extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.**

Strengths:

Weaknesses:

Reader's Score:

Priority Questions

Competitive Preference Priority - Competitive Preference Priority 1

1. **Competitive Preference Priority 1:**

Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers

**and Partners
(up to 5 points)**

Under this priority, an applicant must demonstrate how the project will be implemented by or in partnership with one or more of the following entities:

- **(a) Community colleges (as defined in the NIA)**
- **(b) Historically Black colleges and universities (as defined in the NIA)**
- **(c) Tribal Colleges and Universities (as defined in the NIA)**
- **(d) Minority-serving institutions (as defined in the NIA)**

Strengths:

The applicant formed partnerships with two Historically Black universities, which will implement the intervention in their respective states, to test the impact of the intervention with new student populations (e.g., Alabama A&M University will implement the intervention in Alabama public secondary schools) (pp. e15-e16). Both of the partnering universities meet the criteria for the Competitive Preference Priority and will play key roles in the proposed project to support culturally responsive revisions to the intervention (pp. e15-e16). A sample Memorandum of Understanding is provided between Winston-Salem State University and district partners (pp. e84-e86).

Weaknesses:

None noted.

Reader's Score: 5

Status: Submitted
Last Updated: 08/14/2023 11:57 AM

Technical Review Coversheet

Applicant: Michigan State University (S411B230030)
Reader #2:   **********

	Points Possible	Points Scored
Questions		
Selection Criteria		
Significance		
1. Significance	15	0
Strategy to Scale		
1. Strategy to Scale	40	0
Quality of Project Design		
1. Project Design	15	0
Quality of the Project Evaluation		
1. Project Evaluation	30	26
Sub Total	100	26
Priority Questions		
Competitive Preference Priority		
Competitive Preference Priority 1		
1. Promoting Equity	5	0
Sub Total	5	0
Total	105	26

Technical Review Form

Panel #3 - EIR Mid-phase - 3: 84.411B

Reader #2:   * * * * * * * * * *

Applicant: Michigan State University (S411B230030)

Questions

Selection Criteria - Significance

1. **The Secretary considers the significance of the proposed project. In determining the significance of the proposed project, the Secretary considers the following factors:**

Reader's Score: 0

    Sub

    1. **The extent to which the proposed project involves the development or demonstration of promising new strategies that build on, or are alternatives to, existing strategies.**

    Strengths:

    NA

    Weaknesses:

    NA

    Reader's Score: 0

Selection Criteria - Strategy to Scale

1. **The Secretary considers the strategy to scale the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 0

    Sub

    1. **(1) The extent to which the applicant identifies a specific strategy or strategies that address a particular barrier or barriers that prevented the applicant, in the past, from reaching the level of scale that is proposed in the application.**

    Strengths:

    NA

    Weaknesses:

    NA

Sub

Reader's Score: 0

2. **(2) The adequacy of the management plan to achieve the objectives of the proposed project on time and within budget, including clearly defined responsibilities, timelines, and milestones for accomplishing project tasks.**

    Strengths:

    NA

    Weaknesses:

    NA

    Reader's Score: 0

3. **(3) The applicant's capacity (e.g., in terms of qualified personnel, financial resources, or management capacity) to bring the proposed project to scale on a national or regional level (as defined in 34 CFR 77.1(c)) working directly, or through partners, during the grant period.**

    Strengths:

    NA

    Weaknesses:

    NA

    Reader's Score: 0

4. **(4) The mechanisms the applicant will use to broadly disseminate information on its project so as to support further development or replication.**

    Strengths:

    NA

    Weaknesses:

    NA

    Reader's Score: 0

5. **(5) The likely utility of the products (such as information, materials processes, or techniques) that will result from the proposed project, including the potential for their being used effectively in a variety of other settings.**

    Strengths:

    NA

    Weaknesses:

    NA

    Reader's Score: 0

Selection Criteria - Quality of Project Design

1. **The Secretary considers the quality of the design of the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: **0**

    Sub

1. **(1) The extent to which there is a conceptual framework underlying the proposed research or demonstration activities and the quality of that framework.**

   Strengths:

   NA

   Weaknesses:

   NA

   Reader's Score: **0**

2. **(2) The extent to which the goals, objectives, and outcomes to be achieved by the proposed project are clearly specified and measurable.**

   Strengths:

   NA

   Weaknesses:

   NA

   Reader's Score: **0**

3. **(3) The extent to which the design of the proposed project is appropriate to, and will successfully address, the needs of the target population or other identified needs.**

   Strengths:

   Weaknesses:

   Reader's Score:

Selection Criteria - Quality of the Project Evaluation

1. **The Secretary considers the quality of the evaluation to be conducted of the proposed project. In determining the quality of the evaluation, the Secretary considers the following factors:**

Reader's Score: 26

1. **(1) The extent to which the methods of evaluation will, if well implemented, produce evidence about the project's effectiveness that would meet the What Works Clearinghouse standards without reservations as described in the What Works Clearinghouse Handbook (as defined in 34 CFR 77.1(c)).**

   Strengths:

   The evaluation plan includes a Randomized Controlled Trial (RCT) that meets What Works Clearinghouse (WWC) standards without reservations if well implemented. The application addresses all four major considerations of the WWC standards (pages e41 to e42). The application has identified an independent evaluator to conduct the evaluation with the appropriate background and experience to conduct the evaluation (page e24 to e25).   The evaluators' role in project activities is well defined (page e30). Institutional Review Board (IRB) approval will be supported by project facilitators (page e32) and the research administrator who will be hired for the project (page e229). Teachers in the control group will receive the treatment professional development in the maturation study to be conducted in Period 4 of planned actitives (page e35). Data from their students will be used for the maturation study (page e35). The application incudes four sets of research questions (pages e31 to e32) with details on the data to be collected from participating teachers and their students (pages e34 to e35). The application includes details about the model to be used for the full impact study (page e38) and the impact study on fidelity of implementation (page e40). It also describes methods of data anaysis for these two studies and two additional studies, the exploratory treatment effect on secondary outcomes and mediator analyses (page e39). The application includes examples of surveys to be modifed for cultural responsiveness (Appendix J) and plans to make these modifications are included in Period 1 (page e118).The applicaton also includes plans to analyze reliability and validity of these measures during Period 2 (page e118) with the support of experts in culturally responsive teaching (page e21). Data on students' social and emotional learning will be collected using a modified experience sampling method (ESM) using phones (page e21). The application includes details about the timing (page e118) and content (page e22) of teacher professional development. The randomization process is well described (pages e32 to e33). The application includes a timeline for data collection throughout the project period (page e225). The application includes plans to collect data on the business as usual teaching in the control group (page e31).

   Weaknesses:

   The application does not provide any details about the maturation effect study, to differentiate between treament and maturation on student outcomes.   The application does not provide details about how data will be collected by ESM from students who do not have a phone when the data is collected. The application might be improved with more detail about the qualifications and training for the teacher facilitators (page e34) and classroom observers (page e34).

Reader's Score: 13

2. **(2) The extent to which the evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.**

   Strengths:

   The application indicates plans to make data for replication and reproducability available (page e26). It also indicates that an electronic code book will be made available along with the data (page e42). The project has the potential to provide information regarding improved science teaching in the rural south that share student characteristics with other parts of the country (e.g. proportion living below the poverty line, proportion of students that qualify for special education, etc.) (page e15). The cost effectiveness study (pages e42 to e43) also has the potential to also support replication in other settings.

Sub

Weaknesses:

More detail about the professional development (PD) program for teachers is needed to support replication. The application might be improved with more detail about how and where teacher PD is conducted suitable for replication in other settings.

Reader's Score: 4

3. **(3) The extent to which the evaluation plan clearly articulates the key project components, mediators, and outcomes, as well as a measurable threshold for acceptable implementation.**

Strengths:

The application provides ample detail concerning key project components (page e16: to provide culturally responsive high quality science instruction, to conduct a field test of the culturally responsive modifications to course materials and outcomes assessment, and test the effectiveness). It also provides detail about a mediator analysis (page e39) and details about project project outcomes (improved science instruction and learning and increased proportion of students planning on secondary education or science careers). Acceptable level of implementation will be assessed through teacher surveys and attendance in professional learning (page e42).

Weaknesses:

The application might be improved with an indication of professional learning attendance requirements (e.g., number of sessions attended, proportion of teachers reaching that level of attendance) to demonstrate acceptable implementation.

Reader's Score: 4

4. **(4) The extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.**

Strengths:

Feedback data will be collected from from districts, administrators, teachers and students (page e21). The Project Schedule and Milestones timeline includes plans to obtain feedback from teachers and students during Period 1 (page e119). The application indicates plans to continue virtual meetings every other week with project partners, to share data and analyses and to review project designs (page e24).The evaluation team will monitor data collection on a weekly basis in order to notifiy project facilitators (page e34).

Weaknesses:

None noted.

Reader's Score: 5

Priority Questions

Competitive Preference Priority - Competitive Preference Priority 1

1. **Competitive Preference Priority 1:**

Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners (up to 5 points)

Under this priority, an applicant must demonstrate how the project will be implemented by or in partnership with one or more of the following entities:

(a) **Community colleges (as defined in the NIA)**
(b) **Historically Black colleges and universities (as defined in the NIA)**
(c) **Tribal Colleges and Universities (as defined in the NIA)**
(d) **Minority-serving institutions (as defined in the NIA)**

Strengths:

NA

Weaknesses:

NA

Reader's Score: 0

Status: Submitted
Last Updated: 08/14/2023 11:57 AM

Status: Submitted
Last Updated: 08/12/2023 10:24 PM

Technical Review Coversheet

Applicant: Michigan State University (S411B230030)
Reader #3:   **********

		Points Possible	**Points Scored**
Questions			
Selection Criteria			
Significance			
1. Significance		15	15
Strategy to Scale			
1. Strategy to Scale		40	32
Quality of Project Design			
1. Project Design		15	9
Quality of the Project Evaluation			
1. Project Evaluation		30	0
	Sub Total	100	56
Priority Questions			
Competitive Preference Priority			
Competitive Preference Priority 1			
1. Promoting Equity		5	5
	Sub Total	5	5
	Total	105	61

Technical Review Form

Panel #3 - EIR Mid-phase - 3: 84.411B

Reader #3: **********

Applicant: Michigan State University (S411B230030)

Questions

Selection Criteria - Significance

1. **The Secretary considers the significance of the proposed project. In determining the significance of the proposed project, the Secretary considers the following factors:**

Reader's Score: 15

> **Sub**

> 1. **The extent to which the proposed project involves the development or demonstration of promising new strategies that build on, or are alternatives to, existing strategies.**

>   **Strengths:**

>   The applicant proposes to expand a high school physical science intervention that has moderate evidence of effectiveness to high-needs rural students in Alabama and North Carolina. The project narrative clearly indicates that treatment students significantly outperformed control students on a state standardized science test in a previous randomized clinical trial of the intervention, with a large effect size of 0.2. (e14)

>   The proposed intervention clearly demonstrates a promising new strategy of implementing a project-based high school science program aligned with the Next Generation Science Standards that serves all high school chemistry and physics
>   students, not just those in advanced placement or honors programs. (e14)

>   The applicant adequately explains that the proposed project is designed to fill the research gap on evidence-based curricula and lessons that align with the Next Generation Science Standards for high school chemistry and physics and the National Research Council science recommendations. (e18)

>   **Weaknesses:**

>   No weaknesses noted

> **Reader's Score: 15**

Selection Criteria - Strategy to Scale

1. **The Secretary considers the strategy to scale the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 32

1. **(1) The extent to which the applicant identifies a specific strategy or strategies that address a particular barrier or barriers that prevented the applicant, in the past, from reaching the level of scale that is proposed in the application.**

   Strengths:

   The applicant clearly identifies and discusses four key barriers and related strategies to address them, such as revision and sustainability to the curriculum, technological supplements, promotion of access and equity, and collaborative work with local communities. (e20-e24)

   In order to address potential technology barriers, the applicant distinctly describes working with school districts and local companies like Google to assist in the purchase of chrome books for students, and improve wifi coverage and speed in the schools especially in low-income rural areas. (e22)

   Weaknesses:

   The applicant indicates that one of the barriers is collaborative work with local communities, but they do not adequately describe how they will work with local communities, districts, and schools to incorporate their expertise and feedback about the intervention. (e23-e24)

   Reader's Score: 8

2. **(2) The adequacy of the management plan to achieve the objectives of the proposed project on time and within budget, including clearly defined responsibilities, timelines, and milestones for accomplishing project tasks.**

   Strengths:

   The applicant provides a detailed management and staff matrix that clearly identifies the staff from each partner university and their roles and responsibilities for the project. (e117)

   The applicant presents a detailed project management plan that clearly delineates the project activities and milestones every 3-4 months throughout the five years of the grant. These activities include recruitment of schools and teachers, teacher professional learning sessions, collection of student and teacher data, and submitting project technical and outcomes reports. (e118-e121)

   The applicant provides a detailed data collection schedule for student, teacher, and other evaluation assessments and data throughout all five years of the grant, with a clear delineation of the timelines for treatment and control measures. (e225)

   Weaknesses:

   None of the management plans include timelines and milestones for project leadership and partner meetings that discuss the feedback and continuous improvement of the project. (e117-e121)

   The applicant does not provide specific information on the content and format of the teacher professional learning sessions. The application could be strengthened by sharing whether or not the sessions are live, online, or hybrid. (e28-e29)

   Reader's Score: 4

3. **(3) The applicant's capacity (e.g., in terms of qualified personnel, financial resources, or management capacity) to bring the proposed project to scale on a national or regional**

Sub

level (as defined in 34 CFR 77.1(c)) working directly, or through partners, during the grant period.

Strengths:

The applicant presents a strong case for ensuring the cultural responsiveness of the proposed intervention by seeking out expert advice from and collaborating with two different HBCUs and having a co-PI (co-principal investigator) who is a former physics teacher whose research and scholarship are centered on culturally relevant and responsiveness of teachers. (e21)

The proposed project brings together highly qualified education staff, academic and university partners, and external evaluators with strong and established educational and professional backgrounds and expertise to implement the project. The applicant has shown that they have the capacity to expand and develop partnerships on the local, regional, and national levels. (e24-e25, e53-e81)

Weaknesses:

The budget narrative does not specifically address or account for the technology needs in rural areas, such as potential wi-fi or other accessibility issues. The costs for Chromebooks for the students are not included in the budget, which can create a major roadblock for students and teachers to execute the curriculum with fidelity. (e22, budget narrative)

Reader's Score: 8

4. **(4) The mechanisms the applicant will use to broadly disseminate information on its project so as to support further development or replication.**

    Strengths:

    A major strength of the project dissemination plan is that the applicant intends to make the project restricted data files available for replication, reproducibility, and other analyses. (e26)

    The applicant identifies several mechanisms and outlets for disseminating the project materials and learning videos on open access websites, social media, and scholarly outlets such as journals, reports, publications for widespread public circulation, and presentations at scientific meetings. (e26)

    Weaknesses:

    The application narrative does not identify specific conferences, meetings, or organizations related specifically to rural districts, rural schools, and science teachers for the sharing and dissemination of project materials and outcomes. (e26)

    Reader's Score: 8

5. **(5) The likely utility of the products (such as information, materials processes, or techniques) that will result from the proposed project, including the potential for their being used effectively in a variety of other settings.**

    Strengths:

    Given that project materials and resources are posted on open access websites, they are accessible and can be used in other settings with the capacity and infrastructure to implement the curriculum and teacher professional learning with fidelity. (e23)

    The project materials and videos can clearly be used in various school contexts and settings, with topics and content that are relevant and relatable for all chemistry and physics students on local, state, and national levels. (e123-e130)

Sub

Weaknesses:

It is not clear if and how the new materials and products that will be developed during the proposed project will be available on open-source websites. This could increase the utility and accessibility of the updated CESE curriculum and support its use in a variety of other local and state educational settings. (e23, e26)

Reader's Score: 4

Selection Criteria - Quality of Project Design

1. **The Secretary considers the quality of the design of the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 9

Sub

1. **(1) The extent to which there is a conceptual framework underlying the proposed research or demonstration activities and the quality of that framework.**

Strengths:

The applicant thoroughly discusses the rationale for the proposed intervention and elaborates on how it is grounded in two national reports focused on science education. The first report is A Framework for K-12 Science Education by the National Research Council, and it describes a vision of science learning that focuses on solving real world problems through three-dimensions of scientific knowledge, which include science and engineering practices (SEPs), crosscutting concepts (CCCs), and disciplinary core ideas (DCIs). The second set of national guidelines are the Next Generation Science Standards, which provide a set of standards for science learning that describe performance expectations which identify what students should know and be able to do. (e17-e18)

The applicant presents a logic model that clearly delineates the resources, activities, outputs, and outcomes of the project and shows how they are aligned to each other. (e96)

Weaknesses:

No weaknesses noted

Reader's Score: 5

2. **(2) The extent to which the goals, objectives, and outcomes to be achieved by the proposed project are clearly specified and measurable.**

Strengths:

The applicant clearly identifies five major short, mid, and long-term goals, such as increasing student engagement in science classes and science learning and understanding throughout the school year, increasing student science achievement on standardized tests and interest in college and STEM, and increasing student enrollment in postsecondary education and STEM majors. (e29)

Sub

Weaknesses:

The identified project goals are not measurable, and there are no clearly delineated objectives, activities, and outcomes that are specific and measurable with quantitative baseline or target measures. The project goals, objectives, and outcomes are not aligned to the project activities in the management plan or the logic model. (e29, e96)

Reader's Score: 1

3. **(3) The extent to which the design of the proposed project is appropriate to, and will successfully address, the needs of the target population or other identified needs.**

Strengths:

The proposed project materials clearly incorporate project-based learning in chemistry and physics rural high school classes to address STEM needs and to make science education more engaging, relevant, and culturally responsive. (e29)

The updated project materials are specifically designed to address the technological and material needs of the target population, such as enhancing internet access, assessing social emotional learning, and increasing interest in science education and career paths. (e30)

Weaknesses:

Given that the applicant has not clearly identified the specific school districts or schools in Alabama and North Carolina that it will be serving, it is difficult to fully determine how the proposed project will successfully address the needs of the target population. This holds especially true for assessing science achievement gaps for the students to be served or the technology needs for each school. (e29-e30)

Reader's Score: 3

Selection Criteria - Quality of the Project Evaluation

1. **The Secretary considers the quality of the evaluation to be conducted of the proposed project. In determining the quality of the evaluation, the Secretary considers the following factors:**

Reader's Score: 0

Sub

1. **(1) The extent to which the methods of evaluation will, if well implemented, produce evidence about the project's effectiveness that would meet the What Works Clearinghouse standards without reservations as described in the What Works Clearinghouse Handbook (as defined in 34 CFR 77.1(c)).**

Strengths:

Weaknesses:

Sub

  Reader's Score:

2. **(2) The extent to which the evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.**

    Strengths:

    Weaknesses:

    Reader's Score:

3. **(3) The extent to which the evaluation plan clearly articulates the key project components, mediators, and outcomes, as well as a measurable threshold for acceptable implementation.**

    Strengths:

    Weaknesses:

    Reader's Score:

4. **(4) The extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.**

    Strengths:

    Weaknesses:

    Reader's Score:

Priority Questions

Competitive Preference Priority - Competitive Preference Priority 1

1. **Competitive Preference Priority 1:**

    Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners (up to 5 points)

    Under this priority, an applicant must demonstrate how the project will be implemented by or in partnership with one or more of the following entities:

    (a) **Community colleges (as defined in the NIA)**
    (b) **Historically Black colleges and universities (as defined in the NIA)**
    (c) **Tribal Colleges and Universities (as defined in the NIA)**
    (d) **Minority-serving institutions (as defined in the NIA)**

Strengths:

The applicant clearly describes the importance and the aim of partnering with local Historically Black Colleges and Universities (HBCUs) in the two states that will implement the project intervention. The applicant developed partnerships with Alabama A&M University (AAMU) and Winston Salem State University (WSSU) to implement the Crafting Engaging Science Environments (CESE) intervention in a new rural high-needs population and to ensure that revisions to the curricula are culturally responsive for students in public secondary schools. (e15-e16, e21)

Weaknesses:

No weaknesses noted

Reader's Score: 5

Status: Submitted
Last Updated: 08/12/2023 10:24 PM

Status: Submitted
Last Updated: 08/13/2023 01:41 PM

Technical Review Coversheet

Applicant: Michigan State University (S411B230030)
Reader #4:   **********

		Points Possible	**Points Scored**
Questions			
Selection Criteria			
Significance			
1. Significance		15	0
Strategy to Scale			
1. Strategy to Scale		40	0
Quality of Project Design			
1. Project Design		15	0
Quality of the Project Evaluation			
1. Project Evaluation		30	28
	Sub Total	100	28
Priority Questions			
Competitive Preference Priority			
Competitive Preference Priority 1			
1. Promoting Equity		5	0
	Sub Total	5	0
	Total	105	28

Technical Review Form

Panel #3 - EIR Mid-phase - 3: 84.411B

Reader #4:   **********

Applicant: Michigan State University (S411B230030)

Questions

Selection Criteria - Significance

1. The Secretary considers the significance of the proposed project. In determining the significance of the proposed project, the Secretary considers the following factors:

Reader's Score: 0

> **Sub**
>
> 1. The extent to which the proposed project involves the development or demonstration of promising new strategies that build on, or are alternatives to, existing strategies.
>
>   **Strengths:**
>
>   N/A
>
>   **Weaknesses:**
>
>   N/A
>
>   **Reader's Score:**   0

Selection Criteria - Strategy to Scale

1. The Secretary considers the strategy to scale the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:

Reader's Score: 0

> **Sub**
>
> 1. (1) The extent to which the applicant identifies a specific strategy or strategies that address a particular barrier or barriers that prevented the applicant, in the past, from reaching the level of scale that is proposed in the application.
>
>   **Strengths:**
>
>   N/A
>
>   **Weaknesses:**
>
>   N/A

Sub

Reader's Score: 0

2. **(2) The adequacy of the management plan to achieve the objectives of the proposed project on time and within budget, including clearly defined responsibilities, timelines, and milestones for accomplishing project tasks.**

    Strengths:
    N/A

    Weaknesses:
    N/A

    Reader's Score: 0

3. **(3) The applicant's capacity (e.g., in terms of qualified personnel, financial resources, or management capacity) to bring the proposed project to scale on a national or regional level (as defined in 34 CFR 77.1(c)) working directly, or through partners, during the grant period.**

    Strengths:
    N/A

    Weaknesses:
    N/A

    Reader's Score: 0

4. **(4) The mechanisms the applicant will use to broadly disseminate information on its project so as to support further development or replication.**

    Strengths:
    N/A

    Weaknesses:
    N/A

    Reader's Score: 0

5. **(5) The likely utility of the products (such as information, materials processes, or techniques) that will result from the proposed project, including the potential for their being used effectively in a variety of other settings.**

    Strengths:
    N/A

    Weaknesses:
    N/A

    Reader's Score: 0

Selection Criteria - Quality of Project Design

1. **The Secretary considers the quality of the design of the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: **0**

     Sub

1. **(1) The extent to which there is a conceptual framework underlying the proposed research or demonstration activities and the quality of that framework.**

     Strengths:

     N/A

     Weaknesses:

     N/A

     Reader's Score: **0**

2. **(2) The extent to which the goals, objectives, and outcomes to be achieved by the proposed project are clearly specified and measurable.**

     Strengths:

     N/A

     Weaknesses:

     N/A

     Reader's Score: **0**

3. **(3) The extent to which the design of the proposed project is appropriate to, and will successfully address, the needs of the target population or other identified needs.**

     Strengths:

     N/A

     Weaknesses:

     N/A

     Reader's Score: **0**

Selection Criteria - Quality of the Project Evaluation

1. **The Secretary considers the quality of the evaluation to be conducted of the proposed project. In determining the quality of the evaluation, the Secretary considers the following factors:**

Reader's Score: 28

    Sub

1. **(1) The extent to which the methods of evaluation will, if well implemented, produce evidence about the project's effectiveness that would meet the What Works Clearinghouse standards without reservations as described in the What Works Clearinghouse Handbook (as defined in 34 CFR 77.1(c)).**

   Strengths:

   The applicant clearly understands What Works Clearinghouse (WWC) requirements without reservations (pg. e41). The applicant fully addressed most of all the WWC without reservations requirement. The applicant will utilize, per the WWC without reservations required, a randomized control trial (RCT) research design approach for determining the cause and effect of an intervention based on a treatment and control group. The RCT is cluster-level randomization at the school level, which will mitigate contamination among teachers within the same school building (pg. e32). The applicant has determined acceptable power at the appropriate research level of .80. The power analysis was also based on minimal detectable effect size (MDES) based on similar interventions (pg. e33). The power analysis yielded 60 schools, with 30 treatment and 30 control schools. In addressing attrition, the applicant is oversampling based on previous attrition rates from their previous efficacy study (pg. e33). The applicant discussed sufficiently attrition at the cluster and individual level (pg. e42). The applicant addressed confounding factors as required by WWC without reservations (pg. e41). Their RCT will be designed to ensure no confounding factors. In managing joiners and leavers within the sample, which can present compositional changes, the applicant will use the WWC without reservations recommended statistical analysis approach, Intent To Treat (pg. e42). Finally, regarding the outcome measure, there is face validity, acceptable KR-20 reliability greater than the WWC requirement of .39, and ensuring consistent data collection procedures. The applicant's intervention will be in two different states, and the applicant is astutely using the same science assessment in both states to avoid equating and normalization issues with the intervention scores (pg. e41).

   Weaknesses:

   The only concern is related to the outcome measure. The applicant mentions on (pg. e36) that an exploratory factor analysis was conducted to determine the number of factors and reliability. It was unclear why the applicant did not provide statistical details related to a confirmatory factor analysis afterward, which is required to determine the final construct factor structure and reliabilities for the summative science assessment. Exploratory factor analysis is insufficient.

   Reader's Score: 14

2. **(2) The extent to which the evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.**

   Strengths:

   The applicant addresses how they will ensure the evaluation will guide replication in other settings. The applicant is creating an electronic codebook, including all of the interventions' data protocols (pg. e42). Furthermore, the intervention's instruments and relevant data will be available utilizing the procedures defined by the Institute of Educational Sciences (IES). Using these IES procedures will ensure everything required for replication is available for replication in other settings.

   Weaknesses:

   There were no weaknesses noted.

   Reader's Score: 5

3. **(3) The extent to which the evaluation plan clearly articulates the key project components, mediators, and outcomes, as well as a measurable threshold for acceptable implementation.**

Strengths:

The applicant addresses all of the components for this criterion. The logic model (pg. e96) provides the key project components that align with the narrative discussion. The applicant thoroughly discusses which factors will be mediators for their intervention (pg. e39-e40). The most apparent mediator for education interventions is the quality of implementation of the intervention. The applicant will be assessing this by investigating research question three. Furthermore, the applicant will be modeling the mediating variable of implementation in statistical analysis using hierarchical linear modeling. The applicant's primary outcome variable has face validity and reliability. Finally, the applicant provided a measurable threshold for acceptable implementation (pg. e42). For instance, the applicant considers teaching at least one of the intervention units and attending professional learning acceptable implementation.

Weaknesses:

There were no weaknesses noted.

Reader's Score: 5

4. **(4) The extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.**

Strengths:

The applicant discusses the methods of evaluation that should permit periodic assessment of progress as related to the project (pg. e21, e118-e121). The applicant is planning on a field test first and foremost to get feedback from all key stakeholders, such as, administrators, teachers, and students. This will help to refine all aspects of the intervention before the actual rollout of the intervention. Furthermore, the applicant is planning several rounds of teacher observations, which will allow for determining what is working and not working (pg. e118). Also, throughout the project, the applicant will file quarterly reports based on collecting formative data (pg. e119). Finally, there will be a cost-effect analysis that will also inform components of the intervention that worked and did not.

Weaknesses:

The applicant in the narrative did not discuss this criterion in the evaluation section but throughout the entire grant in different areas. It was challenging to put all the formative pieces together, as it was not discussed in a cohesive manner. Furthermore, the applicant mentions filing quarterly reports, but there was no discussion about when formative meetings would occur and with whom.

Reader's Score: 4

Priority Questions

Competitive Preference Priority - Competitive Preference Priority 1

1. **Competitive Preference Priority 1:**

Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners (up to 5 points)

Under this priority, an applicant must demonstrate how the project will be implemented by or in partnership with one or more of the following entities:

(a) **Community colleges (as defined in the NIA)**
(b) **Historically Black colleges and universities (as defined in the NIA)**
(c) **Tribal Colleges and Universities (as defined in the NIA)**
(d) **Minority-serving institutions (as defined in the NIA)**

Strengths:

N/A

Weaknesses:

N/A

Reader's Score: 0

Status: Submitted
Last Updated: 08/13/2023 01:41 PM

Technical Review Coversheet

Applicant: Michigan State University (S411B230030)
Reader #5:   **********

		Points Possible	Points Scored
Questions			
Selection Criteria			
Significance			
1. Significance		15	15
Strategy to Scale			
1. Strategy to Scale		40	31
Quality of Project Design			
1. Project Design		15	9
Quality of the Project Evaluation			
1. Project Evaluation		30	0
	Sub Total	100	55
Priority Questions			
Competitive Preference Priority			
Competitive Preference Priority 1			
1. Promoting Equity		5	5
	Sub Total	5	5
	Total	105	60

Technical Review Form

Reader #5:   **********

Applicant: Michigan State University (S411B230030)

Questions

Selection Criteria - Significance

1. **The Secretary considers the significance of the proposed project. In determining the significance of the proposed project, the Secretary considers the following factors:**

Reader's Score: 15

    Sub

    1. **The extent to which the proposed project involves the development or demonstration of promising new strategies that build on, or are alternatives to, existing strategies.**

    Strengths:

    The current proposal extends a project-based physics and chemistry program to a new geographic area and will extend the intervention to be more culturally responsive (p. e11). The previous clinical trial showed an improvement in science learning, and this project will be extended to rural schools and be more culturally responsive, which makes this new proposal innovative. The program will be more inclusive, serving all high school students (p. e14). The curriculum will be based on crosscutting concepts, and disciplinary core ideas and will reflect the next generation science standards (p. e17). Project-based learning and creation of student artifacts are other components of the curriculum (p. e18). Teacher supports include digital programs on cellphones that will capture student feelings during instruction (p. e22).

    Weaknesses:

    There were no weaknesses found in this area.

    Reader's Score: 15

Selection Criteria - Strategy to Scale

1. **The Secretary considers the strategy to scale the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 31

    Sub

    1. **(1) The extent to which the applicant identifies a specific strategy or strategies that address a particular barrier or barriers that prevented the applicant, in the past, from reaching the level of scale that is proposed in the application.**

Sub

Strengths:

The application identifies several potential barriers (p. e20). These include the lack of a culturally responsive curriculum, lack of technology, and lack of materials. One strategy is to ensure that partner districts have a Google suite of applications as well as inexpensive devices (p. e22). Another strategy is to utilize a project partner to supply schools with materials (p. e22). These strategies are likely to be effective in addressing barriers.

Weaknesses:

It is unclear what relationships have been established at the community level to overcome identified barriers (p. e23). It is difficult to determine the barriers or needs of participating districts, in terms of materials and technology, without letters of support or other evidence such as baseline science achievement data. The applicant alludes to raising additional financial support for technology, but no specifics are detailed in the plan (p. e30).

Reader's Score: 8

2. **(2) The adequacy of the management plan to achieve the objectives of the proposed project on time and within budget, including clearly defined responsibilities, timelines, and milestones for accomplishing project tasks.**

Strengths:

The application contains a good management plan with roles and responsibilities of key personnel (p. e117). Milestones, activities and timelines are also included in the plan (p. e118). The milestones are delineated by year as well as by season. The personnel are well qualified. The role of the project director is to supervise all of the university and school activities (p. e117).

Weaknesses:

More specifics about management communication and coordination are needed. It is unclear how often the project management team will hold meetings. It is also unclear how the partners will coordinate and communicate during the life of the grant.

Reader's Score: 3

3. **(3) The applicant's capacity (e.g., in terms of qualified personnel, financial resources, or management capacity) to bring the proposed project to scale on a national or regional level (as defined in 34 CFR 77.1(c)) working directly, or through partners, during the grant period.**

Strengths:

It is likely that the applicant has capacity to bring the proposal to scale. The project director has experience in science education and administration (p. e53). The project director has experience bringing research projects to scale (p. e25). The key personnel are well-qualified in the areas of science education, the focus of the project, as evidenced by resumes included in the application (pp. e53-81). They also have experience in culturally-relevant practices. The project director has experience directing large grants, and the personnel have experience with project-based learning (p. e24).

Weaknesses:

Some of the information about the partners is unclear or missing. There is no evidence that partners have experience scaling up projects to the national level. It is unclear who the local partners are, as only one district has provided a letter of support (p. e83). In addition, the budget narrative does not mention Chromebooks and wireless networks, which will be important for access to technology for rural schools in order to bring the project to scale (p. e227).

Sub

Reader's Score: 8

4. **(4) The mechanisms the applicant will use to broadly disseminate information on its project so as to support further development or replication.**

    Strengths:

    The applicant has a good dissemination plan. The applicant will allow public access to curricular material, professional leaning videos and unit assessments (p. e26). The project will also use social media and partner websites to describe events and presentations related to the study (p. e26). The key personnel will also submit journal articles and conduct presentations at scientific conferences (p. e26).

    Weaknesses:

    The application does not list specific organizations and conferences in the dissemination plan (p. e26). Teacher organizations related to science or secondary education organizations are likely to be key to the dissemination of the project findings.

    Reader's Score: 8

5. **(5) The likely utility of the products (such as information, materials processes, or techniques) that will result from the proposed project, including the potential for their being used effectively in a variety of other settings.**

    Strengths:

    The application makes a strong case for the utility of its products. Several countries have adopted materials from similar studies (p. e26). Videos and assessments will be posted for teacher use (p. e26). The application includes a sample unit of instruction with notes about cultural relevancy (pp. e123-125). It is likely that the lessons, materials, and activities from the project will be utilized.

    Weaknesses:

    As many of the materials are already online (p. e26), it is unclear what new products will be made available. The narrative does not describe how the materials will be adapted and updated to be more culturally responsive, which would make them more likely to be used in additional settings.

    Reader's Score: 4

Selection Criteria - Quality of Project Design

1. **The Secretary considers the quality of the design of the proposed project. In determining the quality of the design of the proposed project, the Secretary considers the following factors:**

Reader's Score: 9

Sub

1. **(1) The extent to which there is a conceptual framework underlying the proposed research or demonstration activities and the quality of that framework.**

    Strengths:

    The proposal contains a highly developed conceptual framework. The application includes a logic model, with resources, activities, outputs and outcomes (p. e96). Short-term outcomes include increased student engagement, and more project-based learning (p. e96). The narrative supports the logic model, with examples of how

Sub

instructional units are formed, structured and assessed (p. e27). National science standards, NGSS (Next Generation Science Standards), are the basis of the design (p. e27). Citations are provided to demonstrate the quality of the framework (p. e27).

Weaknesses:

There were no weaknesses in this area.

Reader's Score: 5

2. **(2) The extent to which the goals, objectives, and outcomes to be achieved by the proposed project are clearly specified and measurable.**

   Strengths:

   The application includes short term and midterm goals. The goals of the project are to increase the student achievement on standardized science exams and engagement in science class (p. e29).

   Weaknesses:

   The goals, objectives and outcomes are not clearly specific or measurable. For example, one outcome of the project is teachers shifting to project-based learning, but there is no measurement associated with this change (p. e96).

   There is no baseline data about science achievement. The measures and goals are not linked with project activities that may increase student achievement.

   Reader's Score: 1

3. **(3) The extent to which the design of the proposed project is appropriate to, and will successfully address, the needs of the target population or other identified needs.**

   Strengths:

   The application defines high needs students as low SES (socioeconomic status) students and rural students (p. e11). The applicant notes that the areas where the project is to be implemented have many multiple educational challenges (p. e15). As the applicant asserts, it is likely that the project will influence more schools to offer the intervention and more students to take Chemistry and Physics classes (p. e30).

   Weaknesses:

   Although some graduation and coursework data are provided (p. e16), the application does not give baseline science achievement data to show the need for the project among rural or low SES students. Baseline data for the geographic area to be served is also not included. No recruitment mechanism of teachers and schools is described (p. e29) and the lack of letters of support from rural schools causes uncertainty as to whether the target population will be served.

   Reader's Score: 3

Selection Criteria - Quality of the Project Evaluation

1. **The Secretary considers the quality of the evaluation to be conducted of the proposed project. In determining the quality of the evaluation, the Secretary considers the following factors:**

Reader's Score: **0**

    Sub

1. **(1) The extent to which the methods of evaluation will, if well implemented, produce evidence about the project's effectiveness that would meet the What Works Clearinghouse standards without reservations as described in the What Works Clearinghouse Handbook (as defined in 34 CFR 77.1(c)).**

    Strengths:

    Weaknesses:

    Reader's Score:

2. **(2) The extent to which the evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.**

    Strengths:

    Weaknesses:

    Reader's Score:

3. **(3) The extent to which the evaluation plan clearly articulates the key project components, mediators, and outcomes, as well as a measurable threshold for acceptable implementation.**

    Strengths:

    Weaknesses:

    Reader's Score:

4. **(4) The extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.**

    Strengths:

    Weaknesses:

    Reader's Score:

Priority Questions

Competitive Preference Priority - Competitive Preference Priority 1

1. **Competitive Preference Priority 1:**

   Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners (up to 5 points)

   Under this priority, an applicant must demonstrate how the project will be implemented by or in partnership with one or more of the following entities:

   - **(a) Community colleges (as defined in the NIA)**
   - **(b) Historically Black colleges and universities (as defined in the NIA)**
   - **(c) Tribal Colleges and Universities (as defined in the NIA)**
   - **(d) Minority-serving institutions (as defined in the NIA)**

   Strengths:

   The application has two minority-serving institutions as partners (p. e11). The narrative supports the applicant's assertion that it is partnering with the HBCUs (Historically Black colleges and universities) and will develop interventions with them (p. e15). Funding is allocated to the minority-serving institutions (pp. e238-239) and some of the key personnel are from these institutions (p. e24).

   Weaknesses:

   There were no weaknesses found in this area.

   Reader's Score: 5

Status: Submitted
Last Updated: 08/14/2023 09:11 AM