TEMPLATE 07/15/2011

Consolidated COV Recommendations and Program Responses

(Program responses are in blue and italicized.)

Math and Science Partnership (MSP) Program

COV Meeting of April 28-29, 2011

Initial Comments from the MSP Program:

The MSP Program is most appreciative of the insight, perspective and recommendations that the external lens of the Committee Of Visitors (COV) members brought to bear in 2011. The MSP Program was most fortunate to have the breadth of expertise and experience represented among the COV membership, in addition to their keen professional dedication and interest in advancing NSF's endeavors. All concerns and suggestions of the COV, as well as its commendations, are taken very seriously. It is the intent of MSP Program staff to be as responsive as is possible to the COV recommendations and suggestions as well as to continue advancing those aspects deemed to be well attended to within the MSP Program.

During the period covered by the COV, FY2008 through FY2010, the MSP Program included four types of Partnership projects — Targeted, Teacher Institutes for the 21st Century, MSP-Start, and Phase II — as well as opportunities for non-partnership endeavors through Research, Evaluation and Technical Assistance (RETA) projects that develop tools to assess partnerships' progress and make their work more strategic, build evaluation capacity and conduct focused research. From its inception until the end of FY2010, the MSP portfolio included 162 projects from federal appropriations of $813.12 million. During the FY2008-2010 period reviewed by the COV, the Program received $192.08 in federal appropriations, which resulted in 70 awards from a pool of 381 proposals submitted. In addition to the funding of these new projects, the MSP Program also funded 75 supplements to existing awards. The majority of these supplements were associated with Teacher Leaders and were supported by additional funds provided by Congress to the Robert Noyce Teacher Scholarship Program.

A summary of the COV's comments (in black) and responses from the NSF staff (in blue italics) follow. The MSP Program chose to respond to both recommendations and to suggestions. The Program found that considering both was useful as we are in the midst of developing the next solicitation and attendant management plan.

NOTE: All COVs naturally rely on data. The majority of these data are retrieved from NSF's Enterprise Information System (EIS) database, the Foundation's official source of data. This database is set up to satisfy the requirements of an agency that is mainly engaged in funding fundamental scientific research. Therefore, some of the data associated with education projects requested by the COV are not available in the EIS system. The MSP Program also keeps its own database, as well as a Management Information System (MIS) to which funded Partnerships submit data. These sources of data also provided information to the COV.

PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

A.1 Quality and Effectiveness of Merit Review Process

A.1.3 COV Recommendation:
The COV recommends that NSF provide panel members with more detailed information and expectations for developing the intellectual merit and broader impact sections. This information should be delivered in several formats and across time frames (e.g., webinar PowerPoint, delivery of review materials, beginning of panel meeting, etc.). Additionally, the COV recommends that efforts be made to further educate reviewers through varied means (webinars, written materials, podcasts) prior to the convening of the panel. (This represents COV comments associated with A.1.3 and A.1.8)

Response:

The Program agrees with the importance of vigilance in regards to the quality and substance of the written comments of panelists associated with NSF's two Merit Review criteria. We will continue to seek to be explicit as to expectations in our written instructions to reviewers, during webinars in advance of panels and at the orientation session for reviewers. The Program's persistent interest in engaging new reviewers enhances our attentiveness to providing clarity in this regard. However, this commitment to engaging new reviewers will continue to contribute to some unevenness in the quality of the reviews, as we are unsure about the depth of written reviews until an initial set has been submitted.

A.1.4 COV Recommendation:
The COV recommends that panel summaries include information about the status of the proposal as highly competitive, competitive, or not competitive.

Response:

The Program appreciates this recommendation; however, this practice was tried in the past by the MSP Program and was not found to be particularly useful for program staff or the proposers. When resources are limited and it is not possible to fund all the proposals indicated as highly competitive, proposers are sometimes confused and frustrated when they are not funded. It has also been observed that panelists spent valuable time deciding the category of a proposal, when this time would have been more useful in discussion of strengths and weaknesses of the proposals, as well as being attentive to the detail of language in the written reviews and panel summary. Finally, the individual ratings provide program staff with an indication of how the reviewers perceived the proposals. This is very useful as proposals are assigned for review to subpanels which will vary in their ratings and what they perceive as highly competitive within the subset of proposals which they examine.

A.2 Selection of Reviewers

A.2.1 COV Recommendation:
The COV recommends that an attempt be made to include a higher proportion of reviewers with expertise in policy and research methodology as these categories of expertise are highly relevant to the review of MSP proposals of all types. The COV noted the welcome and desirable

increase of representation from K-12 settings from 13% in 2008 to 21% in 2010 and encourages continuous attention to maintaining this level of K-12 participation.

Response:

The Program concurs with the importance of involving reviewers with expertise in policy and in educational research methodology. The Program specifically invites individuals with multiple areas of acumen, when possible, in order to address the inclusion of a wider range of expertise. Such expertise is not always reflected in the NSF EIS which limits the information that may be included. For example, an individual may be coded as Chemistry, but may also be a dean of a college of arts and sciences, thus bringing policy capacity to the effort. The MSP will make a concerted effort to increase such reviewers when possible, but this consideration is matched by equally powerful needs to have reviewers with backgrounds in K-12 and higher education, with disciplinary expertise in mathematics and several sciences (physics, chemistry, biology, earth sciences, etc.), with STEM educational acumen, in evaluation, etc. The Program will continue to be attentive to the representation of the K-12 sector on review panels.

A.2.2 COV Recommendation:
The COV recommends increasing the participation of faculty from two-year institutions.

Response:

The Program concurs with the importance of having representation from two-year institutions. However, this consideration is matched by equally powerful needs to have reviewers with backgrounds in K-12 and four-year institutions, with disciplinary expertise in mathematics and several sciences, with STEM educational acumen, in evaluation and/or educational research, in policy etc.

A.3 Resulting Portfolio of Awards

A.3.1.a COV Recommendation:
The COV recommends that, as needed, MSP projects supplement state assessments with a wider variety of assessments that give equal weight to procedural fluency and conceptual understanding. The COV notes that there is more to be learned about the impact of the MSP program on student learning than can be revealed by standardized state assessments. Finding ways to undertake investigations that extend beyond scores on state tests should be a priority. The COV recognizes that such an investigation is challenging, requires longer time frames, and would not be possible for all MSP projects. (This represents COV comments associated with A.3.1.a., B.2 and C.1.)

Response:

The Program is in full agreement and will seek to emphasize the use of a wide variety of assessments appropriate to the intents of the proposed work. In MSP solicitations, the framing of Key Features related to Challenging Courses and Curriculum and Evidenced-Based Design and Outcomes does not limit MSP projects to student outcomes on state assessments.

A.3.1.b COV Suggestion:
The COV suggests that the MSP program encourage projects to conduct theory-based evaluations of the models for supporting instructional improvement that they are implementing.

Response:

The Program is in full agreement and will seek to emphasize this in future solicitations.

A.3.1.c COV Suggestion:
The COV encourages continued emphasis on sustainability at all stages of the MSP projects.

Response:

The Program appreciates the recognition by the COV that the MSP Program is explicit in its expectation that "sustainability must be built into project designs from the outset rather than addressed as an afterthought." We concur with the COV and will continue to emphasize the necessity of sustainability throughout the lifespan of a project.

A.3.5 COV Suggestion:
The COV suggests that future priorities should encourage more interdisciplinary (not-solely multidisciplinary) projects.

Response:

While an interesting idea, this could prove difficult for the K-12 STEM educational system – even new Common Core State Standards for Mathematics and proposed Next Generation Science Standards do not call for interdisciplinary learning. However, the MSP Program encourages innovation that will advance student learning; therefore, sound proposals that provide a research and development endeavor promoting interdisciplinary approaches that lead to improved student outcomes would be well-received.

A.3.9 COV Suggestion:
The COV encourages the MSP staff to review their strategies to ensure that all minority-serving institutions are provided with the needed and appropriate technical assistance to develop and submit a proposal to the program.

Response:

The Program has been proactive in its efforts to engage MSIs in the MSP program. The launch of the MSP-Start track during the COV period was a specific strategy in this regard. In addition, an award to QEM to provide technical assistance to MSIs has been provided by the Program during the COV period. We will continue our efforts to identify mechanisms for supporting MSIs in submissions to the MSP program. Among the strategies we will attempt is reaching out to professional organizations and affinity groups, as well as directly to MSIs, through technical assistance webinars on future solicitations.

A.3.10 COV Suggestion:
The COV encourages a greater focus on engineering, as this is an underserved but important area with respect to education research and K-12 schools. The COV encourages funding of additional partnerships that focus on engineering. (The COV noted that there are few engineering-focused MSPs.) The COV encourages funding of additional partnerships that focus on engineering. Given the potential increased attention to engineering in K-12 as suggested by the Conceptual Framework for the New Science Education K-12 Standards, it will be necessary to develop effective teacher professional development, instructional materials, assessments, and school structures to support the teaching of engineering.

Response:

The Program endorses the desire to support engineering education as expressed by the COV. However, we are uncertain as to the suggestion that the Program increase its focus in this domain. No other program in EHR has invested more related to engineering education at the K-12 level over the past three years. During the COV period, the MSP Program received 19 proposals that either focused specifically on engineering education or strongly engaged engineering faculty in order to incorporate engineering applications in the teaching of mathematics and/or science; of these proposals, MSP made eight award commitments for $52.49 million. As of September 2011, the MSP has funded 19 Partnerships incorporating elements of engineering education for a total investment of $149.49 million; five of these partnerships (a commitment of $38.76 million) focus exclusively on issues of K-12 engineering education, and three of these are co-funded with the Division of Engineering Education and Centers of NSF's Directorate for Engineering. In truth, the MSP Program could be considered out in front of this educational curve as there are currently less than a handful of states that have implemented engineering education at the K-12 level. Therefore, engineering is probably over-represented relative to the number K-12 curricula/standards devoted to the discipline. However, the MSP Program is in concurrence with the COV related to the July 2011 release by the National Academy of Sciences of A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas in which a level of prominence is given to the ideas and practices of engineering. Therefore, the MSP Program will continue to support and fund strong proposals that advance the nation's understanding of the teaching and learning of engineering principles and concepts at the K-12 level.

A.4 Management of Program

A.4.3 COV Suggestion:
The COV noted the declining numbers of participants in the QEM workshop over the COV period. It therefore seems important to assess the value of this strategy as a vehicle to increase participation.

Response:

Assessing the impact of various mechanisms, as well as exploring new strategies has always been an interest of the MSP Program staff. It will continue to be so. The MSP Program is most appreciative of the COV's recognition of the explicit effort related to diversifying the range of states, institutional types, populations and PIs involved in the MSP. We are also most grateful to QEM for the concerted effort that they have demonstrated in engaging minority serving institutions in the opportunities of the MSP. While the number of teams participating in 2009 was 17 and in 2010 was 10, it is notable that only four institutions were the same each year. Therefore, a total of 23 different MSIs were involved over the two year period. Moreover, none of the team members were the same, so a total of 80 different individuals benefitted from the QEM workshops over the two years. We are pleased with the number of institutions and individuals impacted by QEM. The MSP Program will continue to consider new and more effective ways to build the capacity of MSIs for success in grant submissions to the MSP program.

PART B. RESULTS OF NSF INVESTMENTS

B.1 Outcome Goal for Discovery

COV Suggestion:
The COV is concerned that some MSP proposals do not acknowledge gaps in the research base or reference the existing relevant research and indicate how the project intends to build on what is already known. Meetings (similar to the planned meeting among the PI/co-PI professional learning community) on issues such as high-quality teacher professional development, coaching and school instructional leadership in mathematics and/or science might pay dividends.

Response:

The Program concurs with the need to be vigilant related to the importance of the research base, as well as the need to acknowledge gaps in the research and to contribute to generating new understandings in regards to areas important to the STEM education community. Indeed, past MSP solicitations have stated that Partnership project proposals must include "theoretical foundations that are tied to the appropriate research and literature in mathematics and science education." Further, MSP solicitations state the following related to the RETA component: "Discuss the current state of knowledge relevant to the proposed work, including a brief review of the relevant literature, and the gap(s) in the base of current knowledge or practice to be addressed by the proposed work." However, many of the Partnerships are less focused on gaps in the research. We will seek new opportunities, including conferences and augmentations to solicitation language, as well as working with other EHR programs that have similar concerns, to maintain the focus on this issue. The MSP annual Learning Network Conferences (LNC), NSF MSP Program staff and funded projects participation in the U.S. Department of Education's annual regional MSP meetings each year, and the NSF's MSPnet.org website are current mechanisms by which the Program works to maintain the focus on the research base and the R&D nature of the MSP program. Ultimately, this issue of gaps in the educational research is an area of increased emphasis in all of EHR to which the MSP Program is well-positioned and eager to contribute.

B.2 Outcome Goal for Learning

See A.3.1.a above

B.3 Outcome Goal for Research Infrastructure

COV Recommendation:
Additional studies are needed to learn what each party (institutions of higher education and schools/districts) contributes to successful partnerships and to identify the factors that differentiate successful partnerships from those that are less successful. The COV is concerned about the sustainability of such connections [partnerships between institutions of higher education and K-12 programs], and recommends study of the elements that lead to sustainability beyond the end of the MSP grant period. The COV believes this goal of sustainability is laudable but very challenging. (This represents COV comments associated with B.3 and C.2.)

Response:

The Program concurs that there are many important facets of the MSP enterprise that would benefit from longitudinal study including factors that contribute to and distinguish successful Partnerships from less successful ones. The RETA component of the MSP program allows for longitudinal studies and may be a useful vehicle for exploring this Partnership dimension. It is also worth noting that the MSP Program's interest in sustainability is not limited to or specific to the sustainability of the Partnership itself. Rather, the MSP Key Feature of Institutional Change and Sustainability focuses on the interest in changes in policies, procedures, programs and practices at both the post-secondary and K-12 level which will sustain the intents of the work of the MSP projects beyond the funding period.

PART C. OTHER TOPICS

C.1 COV Recommendation:
One issue that appears to be in the interest of the entire program would be an external assessment of the entire portfolio of the MSP program: to identify what systemic outcomes, components, and models emerge as leading contenders for widespread dissemination and implementation. The COV encourages the MSP program to analyze and synthesize the outcomes from various projects. Comparison of MSPs can help the field identify structures, processes, and strategies that lead to strong outcomes. The COV recommends consideration of an effort to conduct this external assessment, with a view to providing feedback for future funding directions as well. This could involve, for example, the development of a knowledge base on teacher development and sustainability models. (This represents COV comments associated with C.1 and C.7.)

Response:

The Program agrees with the importance of disseminating what is being learned from the MSP investment. The MSP-Program Evaluation is an external examination that looks across the funded work to glean what is being learned. In addition, MSPnet.org is an electronic repository for what is being generated by the various MSP projects. These resources, as well as the individual project reports, all of which have project evaluations and the majority of which have research agendas, serve to inform the Program as it considers future funding opportunities for the STEM education community. As the MSP Program looks to develop the next Statement of Work for the new MSP-Program Evaluation, the Program will seek to reinforce our keen interest in analyzing projects and synthesizing what is being learned. In addition, the MSP Program is looking for creative mechanisms for dissemination of what is being learned through the MSP investment, especially in collaboration with significant STEM education efforts of the U.S. Department of Education.

C.1 COV Suggestion:
The COV encourages investigation of the validity of using standardized test improvement as the only indicator of effectiveness of individual projects in order to guard against false success indicators for interventions simply caused by attention being focused on the issue (i.e., the Hawthorne effect). (This represents COV comments associated with A.3.1a., B.2 and C.1.)

Response:

The Program is in full agreement with the importance of using various indicators of success and will seek to emphasize the use of a wide variety of assessments appropriate to the intents of the proposed work. It is also noted that the results of state tests have not been the only indicator of success in the MSP projects. Other types of assessment instruments (such as released items from TIMSS, Force Concept Inventories, American Chemical Society items, AP exams, etc.), increased numbers of students enrolling in and succeeding in advanced science and mathematics course work, increased graduation rates, reduction in students requiring remedial coursework upon entering college, changes in student motivation, and increased numbers of students participating in extra-curricular science/mathematics activities are examples of varied indicators that currently funded projects are choosing to use to look at impact on student outcomes. However, as schools, districts, and states are held accountable for demonstrating that students are learning and progressing, a default common indicator in the current era of standards and related assessment are state assessment tests. These state tests are looked upon by local communities as useful metrics for comparing how their schools and districts are doing in comparison to others in the state. Therefore, Partnerships find them useful as an indicator of the impact of their work that is well accepted by their local stakeholders. Moreover, Partnerships must "do no harm" when working with schools/school districts subjected to standardized testing; therefore, the implementation of additional measures of impact must be thoughtful, strategic, useful to local schools and school boards, and readily understandable by stakeholders, including students and parents.

C.2 COV Recommendation:
It appears to the COV that the MSP program is producing important and useful results. Some additional roadmaps for potential users might be helpful to make these results more easily accessible. The COV recommends additional efforts to develop guides for the results and consideration of other channels for communication; perhaps a vehicle like MSPnet for practitioners nationwide could be created.

Response:

The Program is in full agreement. We are currently exploring possibilities with other programs within EHR, as well as our colleagues at the U.S. Department of Education to develop creative mechanisms for dissemination of what is being learned through the MSP investment and other STEM education research efforts at NSF.

C.3 COV Suggestion:
Additional mechanisms for achieving greater uniformity in aligning reviewers' comments with their designated scores would be useful to consider.

Response:

The Program agrees with the importance of vigilance with regard to the alignment of the ratings reviewers assign to a proposal with their written comments. Indeed, the program staff often repeat the following statement to Reviewers: "When I read your written review, I should be able to guess at your rating." We will continue to seek to be explicit as to expectations in our written instructions to reviewers, during webinars in advance of panels and at the orientation session for reviewers. The Program's persistent interest in engaging new reviewers demands our attentiveness to providing clarity in this regard. However, this commitment to engaging new

reviewers will continue to contribute to some unevenness in the quality of the reviews, as we are unsure about the depth of written reviews until an initial set has been submitted.

C.4 COV Suggestion:
A more generic question that does not seem to be addressed in the MSP program, or anywhere else in NSF to our knowledge, is whether the interventions and techniques being used work equally well for schools that serve particular ethnic or socioeconomic groups, or whether some techniques work better for some subcultures than others. This could be increasingly important for the STEM workforce of the future as minority and disadvantaged populations increase.

Response:

The Program concurs that learning whether particular interventions work equally well with different populations, as well as whether there are some strategies that are even more effective with certain populations, is a significant matter. As an R&D effort, the MSP does not direct that projects implement any specific interventions, rather allowing Partnerships to identify the strategies they view as most promising for their students in their local context. Therefore, wide-scale comparisons are limited. The MSP does ask that projects report disaggregated data so that it can be determined for whom improvement is occurring and at what degree. MSP solicitations have been explicit in the expectation that Partnerships will "raise the achievement levels of all students and significantly reduce achievement gaps in mathematics and science performance of diverse student populations." The Program will look to increase the focus on learning what aspects work for whom and in what contexts. Moreover, EHR programs such as REESE and DR K-12 may also allow for concentrated focus on comparison studies of strategies targeting subpopulations, whereas the MSP Program may be better situated to provide information as to whether a combination of strategies employed through a Partnership effort works well for the population of students that the project seeks to serve.

C.6 COV Suggestion:
Perhaps the MSP program should require that the grantee develop a plan with expectations on how the partnerships will be sustained.

Response:

While the Program concurs with value of the Partnership in the MSP endeavor, we interpret sustainability somewhat differently. The MSP Program's interest in sustainability is not limited to or specific to the sustainability of the Partnership itself. Rather, the MSP Key Feature of Institutional Change and Sustainability focuses on the interest in changes in policies, procedures, programs and practices at both the post-secondary and K-12 level which will sustain the intents of the work of the MSP projects beyond the funding period. If the partnership, per se, is important to partners, they need to make this determination and then chart a strategy for sustaining it. The program will look to collect data regarding sustainability in the future.

C.7 COV Recommendation:
The COV was pleased to learn of the strong collaboration already underway with the Department of Education and recommends the strengthening of that collaboration as well as joint funding of projects related to MSP developments. (This represents COV comments associated with C.1 and C.7.)

Response:

The Program agrees with the importance of the on-going collaboration with the U.S. Department of Education (ED). The constraints on ED's MSP funds are such that they are block-granted down to states, which limits the opportunity for joint funding of actual MSP Partnerships. However, we are most pleased that many of the NSF-funded projects have collaborated within their states to garner ED State-MSP funds allowing for the expansion of the Partnership to include additional districts. In addition, a number of the NSF-funded MSP Partnerships of the past few years have had their roots in ED State-MSP funded projects. NSF and ED are currently working to identify next steps in this strategy of collaboration, particularly related to creative mechanisms of dissemination of findings in ways that are increasingly accessible to practitioners and STEM education researchers alike.

C.7 COV Suggestion:
Additional areas that the MSP program could promote/stimulate:

- Implementation of learning progressions in STEM teacher development, curriculum and instruction, and assessment;
- Provide models for improving test scores in ways that value and encourage good teaching; and
- Develop tools to assess and promote STEM educator effectiveness, not in the evaluation context, but in the context of identifying and using tools to promote effectiveness.

Response:

The Program is appreciative of the overall interest of the COV to promote R&D for approaches that are useful in advancing the teaching and learning of STEM at the K-12 level, as well as tools for assessing impact:

- *The MSP has funded projects involving learning progressions and we will continue to fund meritorious proposals that advance our understanding of this strategy*
- *Encouraging good teaching that results in consequential learning by students which can be demonstrated in multiple ways will continue to be promoted by the MSP Program*
- *Two long-term efforts – Learning Mathematics for Teaching (LMT) and Mathematical Knowledge for Teaching (MKT) (Ball, Hill, Bass, et al) – have been significantly funded by the MSP Program (as well as other EHR programs) and have just begun to be used in educator effectiveness models funded by the Institute of Education Sciences at ED and the Gates Foundation. However, it has taken over a decade for the LMT/MKT work to reach this point, thus demonstrating the complexity of educational research funding, the evolution of ideas, and the eventual impact at large scales.*