

**Staff Response  
To the Committee of Visitors (COV) Report**

**Math and Science Partnership (MSP) Program**

COV Meeting of May 5-6, 2008

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

The MSP program very much appreciates the external lens brought to its work by the members of the COV. Their expertise and experience are valuable resources in assisting the program to be of the highest quality possible. All concerns and suggestions of the COV, as well as its commendations, are taken very seriously, with the intent to be as responsive as possible.

During the period covered by the COV, the MSP program was comprised of three distinct components: *Comprehensive* and *Targeted Partnerships*, *Institute Partnerships: Teacher Institutes for the 21<sup>st</sup> Century* and *Research, Evaluation and Technical Assistance (RETA)* awards. Collectively, the MSP portfolio at the end of FY 2007 included 89 projects representing an investment of \$604 million. During the FY 2005-07 period reviewed by the COV, the program received only \$4 million in federal appropriations for new awards in FY 2006, resulting in nine awards, with four of these being for new Institute Partnerships; the others were RETA awards, with three of these constituting a single project as a collaborative proposal submitted by three separate institutions.

A summary of the COV's comments (italicized) and responses from the staff follow.

NOTE: Any COV naturally requests data and information. All the information an NSF program provides to a COV has to be retrieved from the 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 is not available in the EIS system. The MSP Program does keep its own database, which contains many more details and is of a finer grain than the NSF database. This data will be used where possible in the staff response.

**A.1 Quality and Effectiveness of Merit Review Process**

**A.1.3 COV Recommendation:**

*COV suggests paying close attention to the quality of the reviewers' comments to make sure they're helpful to both the PIs and the POs.*

**Response:**

The program concurs that the quality of reviewers' comments is very important. In general, all MSP proposals are reviewed by 5 or 6 reviewers, chosen to have diverse backgrounds and expertise. All reviewers are fully informed prior to a panel about the importance of high quality reviews to provide the best possible feedback to NSF and Principal Investigators. In written communications, and in orientation sessions held immediately before the panels convene, program officers (POs) specifically address the necessity of reviewers conveying that the proposals meet the NSF review criteria as well as MSP-specific review criteria and including any

recommendations for improvements. It is also stressed that the narrative should be aligned with the rating. In FY 2008, MSP Webinars were introduced to provide additional opportunities for reviewers to receive help and advice prior to the panel meetings.

**A.1.4 COV Recommendation:**

*NSF needs to address inconsistencies in the panel summaries -- extensive explanations of strengths and weaknesses vs. vague references. Redesign the summary section so that reviewers must provide adequate feedback to submitters and speak to the two criteria.*

Response:

The program concurs with the recommendation that panel summaries should provide a clear analysis of the strengths and weaknesses of a proposal, speak to the two NSF review criteria, as well as to the special MSP criteria, and make recommendations for improvements in the proposal where appropriate. The program also concurs with the recommendation to avoid inconsistencies in the quality of the panel summaries and will continue to exert ongoing vigilance in all stages of review. Consistent with NSF policy, there is no defined format for the panel summaries other than that intellectual merit and broader impacts are to be addressed. As noted above, in written communications, and in orientation sessions held immediately before the panels convene, POs specifically address the necessity of reviewers conveying that the proposals meet the NSF review criteria as well as MSP-specific review criteria and including any recommendations for improvements. It is also stressed that the narrative should be aligned with the rating. In FY 2008, MSP Webinars were introduced to provide additional opportunities for reviewers to receive help and advice prior to the panel meetings.

**A.1.8 COV Recommendation:**

*Based on our review of site visit reports there is unevenness of the quality and the substance from those visits. Key program components need to be consistently addressed across site visits reports.*

Response:

The program concurs with the recommendation that high quality and consistency in site visit reports is necessary. MSP POs are joined by reviewers external to the program and external to NSF on site visits, and, since the second year of the NSF MSP program, the consistent lens for viewing all projects has been the 5 Key Features of the program. MSP will continue to have each site visit report address the 5 MSP Key Features, with special attention to the relation of the 5 Features to the project goals. Together with the information submitted in Annual Reports and in the Management Information System, this will not only provide more coherence and consistency in the reporting but will also serve to provide more information about what makes an MSP project successful.

**A.2 Selection of Reviewers**

**A.2.2 COV Recommendation:**

*It is feasible and desirable to have more K-12 teachers on panels.*

Response:

The program concurs with the COV on the importance of reviewing any Partnership proposal through the lens of K-12 practitioners and administrators. Given the 5 MSP Key Features, knowledge and understanding of all aspects of K-12 mathematics and science education is needed. Review panels for Partnership proposals require a broad range of expertise, i.e., STEM faculty, mathematics and science education faculty, education researchers, K-12 teachers

and/or administrators, business and informal science representatives, evaluation and research methodology experts, etc. In addition, every effort must be made to broaden impact. To keep the number of reviewers and panel costs within reason, individuals who have in their career gained knowledge and expertise in more than one domain are sought. In the FY 2006 panels, 40% of the reviewers had experience in K-12 teaching.

### **A.2.3 COV Recommendation:**

*The panel of reviewers may need to include more people with knowledge of psychometrics, methodology, and cognition.*

#### Response:

The program concurs that for proposals submitted to a research and development effort, expertise in psychometrics, research methodology, evaluation and cognition may be required to review the research design. In the FY 2006 panels, nine experts were recruited for 10 panels. As the program has enhanced its emphasis on research methodologies, more effort needs to be taken to evaluate these methodologies. As noted above, however, the need to keep panel costs within reason and to have the range of expertise needed to evaluate complex projects means that there may only be one or two research methodologists on a panel.

## **A.3 Resulting Portfolio of Awards**

### **A.3.1 COV Questions and Comments related to Assessment Research & Project Evaluation:**

*[Overall quality of the research and/or education projects supported by the program. (PAGES 10-11 ON FINAL COV DOCUMENT, NOTED AS "DATA NOT AVAILABLE")]*

*The COV had difficulty determining the overall quality of the research-based projects given the data that were provided. The COV received a listing of MSP-PE manuscripts and publications covering the program; however, the COV did not receive a listing of published presentations or publications from individual projects.*

*Very few manuscripts from the MSP-PE have been published. The Peabody Journal of Education will publish a series of nine manuscripts in an upcoming issue. This journal has six others under review. The COV could not find an explanation about why The Peabody Journal of Education constitutes the main source to disseminate the information. Without seeing the breadth and depth of information and data in the papers, it is difficult to provide a broader evaluation of the quality of the science and education that is part of the MSP program. The COV noted that dissemination of results from the MSP program is beginning to appear. While encouraging, it is too early to assess the full impact of the MSP program.*

*The projects supported by the program are more extensively developed as "education projects" and are for support of the infrastructure of the partnerships. The research pieces that could be part of the projects have not been fully developed. A similar statement applies to evaluation and assessment. Evaluation focuses mostly on tracking information (e.g., numbers of students and faculty involved) but there is much less information on the quality of the interactions that are part of the projects.*

*The COV recommends developing both broader and deeper formative evaluations of project progress.*

#### Response:

To ensure quality of the federal investment in MSP projects, the MSP program has, since its inception, verified that each project receives strong formative and summative evaluation and also planned for overall program evaluation which would begin after the first cohorts of projects began implementation of their strategic actions.

At the project level, conceptions of evaluation begin even at the stage of proposal submission when leadership teams are asked – through the MSP solicitation (e.g., NSF 06-539) – to outline an evaluation plan, identify an independent objective evaluator or team of evaluators, and lay out goals, benchmarks and expected outcomes. These are components of one of the five Key Features (Evidenced-based Design and Outcomes) which are described in every MSP solicitation. If questions about these elements of the proposal arise during the review process – either during peer merit review in panels or during NSF staff review – the project team is asked to elaborate during the negotiations phase, and this is documented in the eJacket files for each potential awardee. After awards are made, awardees for Partnership projects are required (within 6 months of the start date) to prepare and submit a Strategic Plan which includes a full Evaluation Plan, and this must be approved by the cognizant MSP program officer. The evaluation is expected to encompass, at a minimum, objectives related to project impacts on students, teachers, and higher education faculty as well as relevant impacts on the institutional partners and the partnership itself. Implementation of these Plans is then followed with Annual Reports that are submitted in FastLane and thus accessible in eJacket. The Annual Report for each project includes a response by the leadership team to evaluators' findings, thus indicating how evaluation is used formatively by the project.

MSP has sought to create a community of evaluators and project personnel for the sharing of approaches across projects. Since FY 2002, when MSP began with high expectations that a major federal investment would lead to important findings and models for the field of STEM education, NSF has stressed that projects need to wonder about what constitutes “evidence” for the field and this inevitably led to considerations of project evaluation and educational research. Our history with this includes:

- a. The inaugural Learning Network Conference in January 2003, just weeks after the first MSPs were announced, focused on “Building a Culture of Evidence;”
- b. Requirements for Strategic Plans and Evaluation Plans for partnership projects;
- c. Funding of 2 RETA projects – one to Utah State University and the other to the University of Wisconsin-Madison – to provide technical assistance in evaluation to the Partnership projects;
- d. Convening of a workshop, in October 2004, for principal investigators and evaluators of Cohort 1 and 2 Comprehensive and Targeted Partnership projects to formulate a statement that would guide effective project-level evaluation in the context of a national R & D effort;
- e. Through the workshop discussions, subsequent discussions by the MSP community at its January 2005 Learning Network Conference, and a considerable amount of additional work by a team of experienced evaluators, the MSP community produced the document *Evidence: An Essential Tool – Planning for and Gathering Evidence using the Design-Implementation-Outcomes (DIO) Cycle of Evidence* (NSF 05-31);
- f. Evaluation Summits, framed by the 2 RETA projects, in September 2005 and October 2006 (many of the presentations and subsequent publications from these Summits are available on MSPnet);
- g. The January 2008 Learning Network Conference on “Claims-Based Outcomes: What do we know? How do we know what we know? What do we still need to know?” and the use of structured abstracts as a means of having MSP projects: (a) place their work in the context of STEM education, (b) state a claim or hypothesis being studied in some

- aspect of their MSP work, (c) outline the design for the evaluation/research of that aspect of their work, including discussions of data collection and analysis, (d) discuss results from the evaluation/research and knowledge learned, and (e) offer conclusions and/or discuss implications of the findings (presentations from the Conference are available on MSPnet in a Virtual Poster Hall); and
- h. Engaging a research team from the University of Wisconsin-Madison to study how the MSP community responded to the January 2008 Learning Network Conference, with a complete Report of that study to be made available on MSPnet.

At the MSP program level, MSP had an open competition, in FY 2004, to select a contractor to design, lead and conduct, with subcontractors, the external MSP Program Evaluation (MSP-PE). Ultimately, the contract went to COSMOS Corporation, in alliance with faculty from Brown University, George Mason University and Vanderbilt University. The approach designed for the evaluation of a large and complex program such as MSP was a series of approximately twenty studies to evaluate different aspects of the program. For example, for student achievement (as reported in the 2007 National Impact Report and included in the papers available to the COV), the MSP-PE is conducting three distinct sub-studies based on (1) longitudinal data on student proficiency on state mathematics and science assessments as collected annually from projects in MSP's online Management Information System, (2) comparative data of student performance at the school level as obtainable from public databases and comparing MSP schools and schools matched on eight different demographic features, and (3) case studies utilizing archival information (e.g., Annual Reports, Evaluators' Reports, presentations, publications) and site visits by members of the MSP-PE team for the qualitative assessment of higher education and K-12 partnerships. The start of the first MSP projects in Fall 2002 and the award of the MSP-PE contract in 2004 led to the implementation of various sub-studies by the MSP-PE and to actual preliminary findings in publication formats in 2006-2008. Given the complex nature of these studies, the MSP program believes that program evaluation findings are appearing at an appropriate pace and notes that many more results will be appearing soon.

### **A.3.1 COV Questions and Comments related to the Assessment of Student Learning:**

*[Overall quality of the research and/or education projects supported by the program. (PAGES 10-11 ON FINAL COV DOCUMENT, NOTED AS "DATA NOT AVAILABLE")]*

*MSP projects would benefit from a deeper assessment of student learning outcomes, an important aspect of the projects. The COV recommends identifying suitable approaches for developing valid and reliable assessments that tap different aspects of student learning and achievement in mathematics and science. Since the MSP program has been in operation for several years, more information is available about the strategies used to assess student learning and achievement across projects (e.g., types of assessments, types of items, types of knowledge tapped). Information may be easily shared and traced in such a way that new MSP projects can learn from other projects. The COV suggests sharing information across projects about the development and technical evaluation of the assessment approaches used to evaluate the impact of the interventions on student learning outcomes. If expertise on assessment, development and psychometrics is not found within the MSP team, the COV recommends placing a separate group with the necessary expertise in charge of this aspect of the projects. The COV further recommends paying more attention to the research on assessment across projects to pursue cumulative knowledge about the development of high quality assessments. The MSP projects represent tremendous research opportunities but these have not been fully explored.*

*The COV does not underestimate the challenge of developing valid and reliable assessments of student learning; however, the partnerships and the evaluation and assessment projects funded to date could prove to be even greater sources of learning.*

Response:

The MSP program agrees with the COV comment that “deeper assessment of student learning outcomes [is] an important aspect of the projects” reflecting an important goal for the MSP Program that is to improve achievement in mathematics and science for all students. The program concurs that assessments (formative and summative) to tap different aspects of student learning are an important aspect of achieving this goal. Each Partnership proposal is required to submit baseline data on student achievement and to “link assessments (classroom, local and state) with their accountability measures” (NSF 06-539). Individual projects have their own assessment design for student achievement based, minimally, upon their partner school districts’ accountability measures and given the requirements of NCLB that K-12 school and district partners are bound to use the state mandated tests required to demonstrate Annual Yearly Progress (AYP). As noted above, this disaggregated data is used by the MSP-PE as one means of looking at student achievement, and results from this analysis were part of an MSP Impact Report published in January 2007 (NSF Press Release 07-007) as well as two other Press Releases (07-005 and 07-080) available on the NSF/MSP website [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5756&org=DUE&from=home](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5756&org=DUE&from=home) and were available to the COV.

It is important that MSP projects assess the classroom environment and student achievement via other measures that are appropriate to their strategic actions and evaluation designs. For example, William Schmidt (PI of the MSP Comprehensive project at Michigan State University; award #0314866) notes that “[t]he state level assessment data in Michigan and Ohio do not allow for specific sub-scores that could be enormously helpful in illuminating the particular subject matter areas or grade levels where students are well prepared or where there are weaknesses.” Thus, many individual MSP projects design their own research-based assessments. Schmidt has used TIMMS internationally benchmarked achievement tests, which provide 20 sub-scores in mathematics and 17 in science. These tests have provided fine grained data on over 180,000 students in the project which spans two states. The assessments are matrix sampled and will permit classroom, school and district level summaries. In-depth professional development allows teachers to gain the knowledge and skills necessary to analyze and interpret data to change their instructional emphases and practices to improve student achievement to demonstrate project success. Other examples are available for projects that emphasize student gains in inquiry skills and in advancing into challenging mathematics courses with the Advanced Placement and International Baccalaureate programs.

**A.3.3 COV Recommendation:**

*A question is whether the duration of funding thus far is adequate to achieve sustainability or to demonstrate transformative change. One approach by the NSF could be to select certain projects for enhanced funding and an extended project period in order to determine if the project outcomes are transformative.*

Response:

The MSP program agrees and, based upon findings and evaluation results from prior funded projects, initiated new program components in the FY 2008 MSP competition. One of the new components was introduced, in NSF 08-525, as follows: “The solicitation includes an opportunity for Phase II Partnerships for prior MSP Partnership awardees to focus on specific innovative areas of their work where evidence of significant positive impact is clearly demonstrated and

where an investment of additional resources and time would produce more robust [research] findings and results.” Phase II awards are for up to 3 years and for up to \$2.1 million.

**A.3.5 COV Recommendation:**

*The COV encourages the funding of more science projects.*

Response:

Out of the 76 total partnership projects in the portfolio, 28 are focused on both Mathematics and Science, 28 on Mathematics only, and 20 on Science only. While we agree with the recommendation, our data reflects that we have been successful in our efforts to attract a full range of math and science partnership projects.

**A.3.7 COV Recommendation:**

*Only 5 of the 31 funded projects are led by new PIs. Providing similar statistics for “unfunded” programs as a comparison would be helpful. Identifying new institutions would also be important for comparative purposes.*

Response:

The 31 projects was the random sample selected from all active awards for the years FY 2005-2007. There was a single solicitation in FY 2006 and a total of 9 awards were made. Of these 9, 5 were awarded to new PIs, i.e., over 50%.

**A.3.9 COV Recommendation:**

*We encourage the NSF to provide a summary or full description of the involvement of all IHEs in the various partnerships.*

Response:

In its database, NSF only keeps track of the lead institution, i.e., the fiscal agent. The MSP Program Keeps track of all the IHEs involved in each Partnership. The full description was available during the COV process in the compendium of data drawn from the Management Information System, and will be summarized for future COVs.

**A.3.11 COV Questions and Comments on Underrepresented Groups’ Participation:**

*Of program awards, only five projects involved Historically Black Colleges and Universities, seven involved Hispanic-serving institutions, two involved tribal colleges and five were at minority post secondary institutions. In only a few cases is the minority institution the lead for the project.*

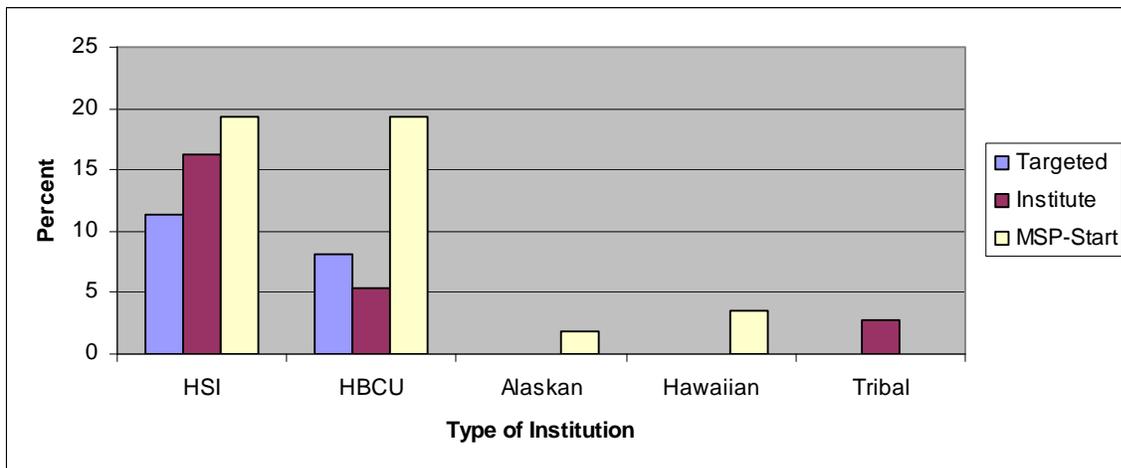
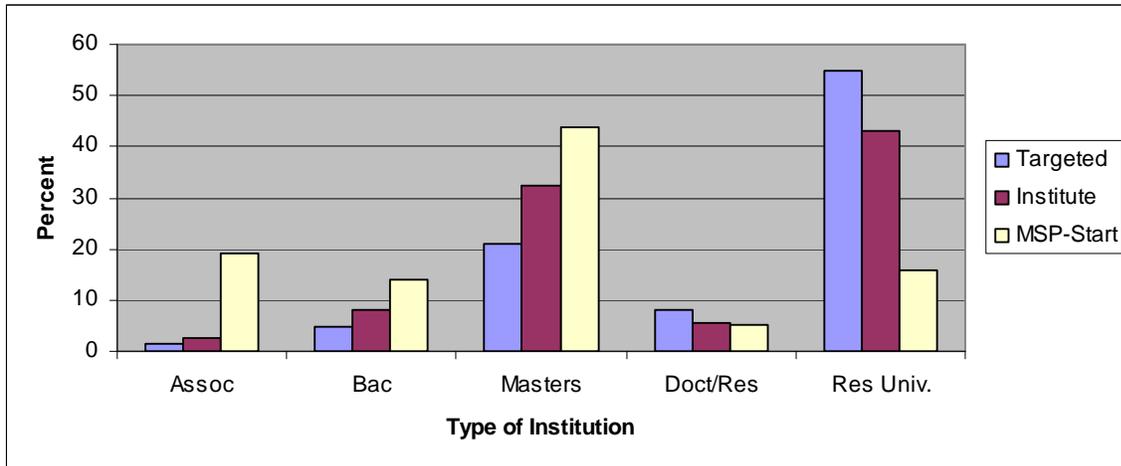
*Over 700 K-12 school districts are partners in the MSP grants. Summary documents on the COV website do not describe the participation of underrepresented groups in the student or teacher populations.*

*It is difficult to answer the question of whether “appropriate” participation has been achieved without having explicit goals identified for the numbers or percentages of underrepresented groups in the projects.*

*Peer review panelists tried to weigh the merits of the proposal and consider whether the proposals would have an impact on the underrepresented groups or high-need schools but had difficulty in judging both criteria.*

Response:

The MSP program has sought to ensure that this major federal investment is a model for NSF's efforts to broaden participation. As the COV noted, minority-serving institutions are partners in 19 of the first 52 MSP projects. Still, the MSP program seeks even broader institutional representation and initiated the MSP-Start track in the most recent Solicitation (NSF 08-525) as a means of enabling nascent partnerships to develop. Together with active outreach on all MSP tracks, the program was extremely successful (see following figures) in expanding the portfolio within institutional types as seen in the following tables of proposals received for the inaugural MSP-Start competition:

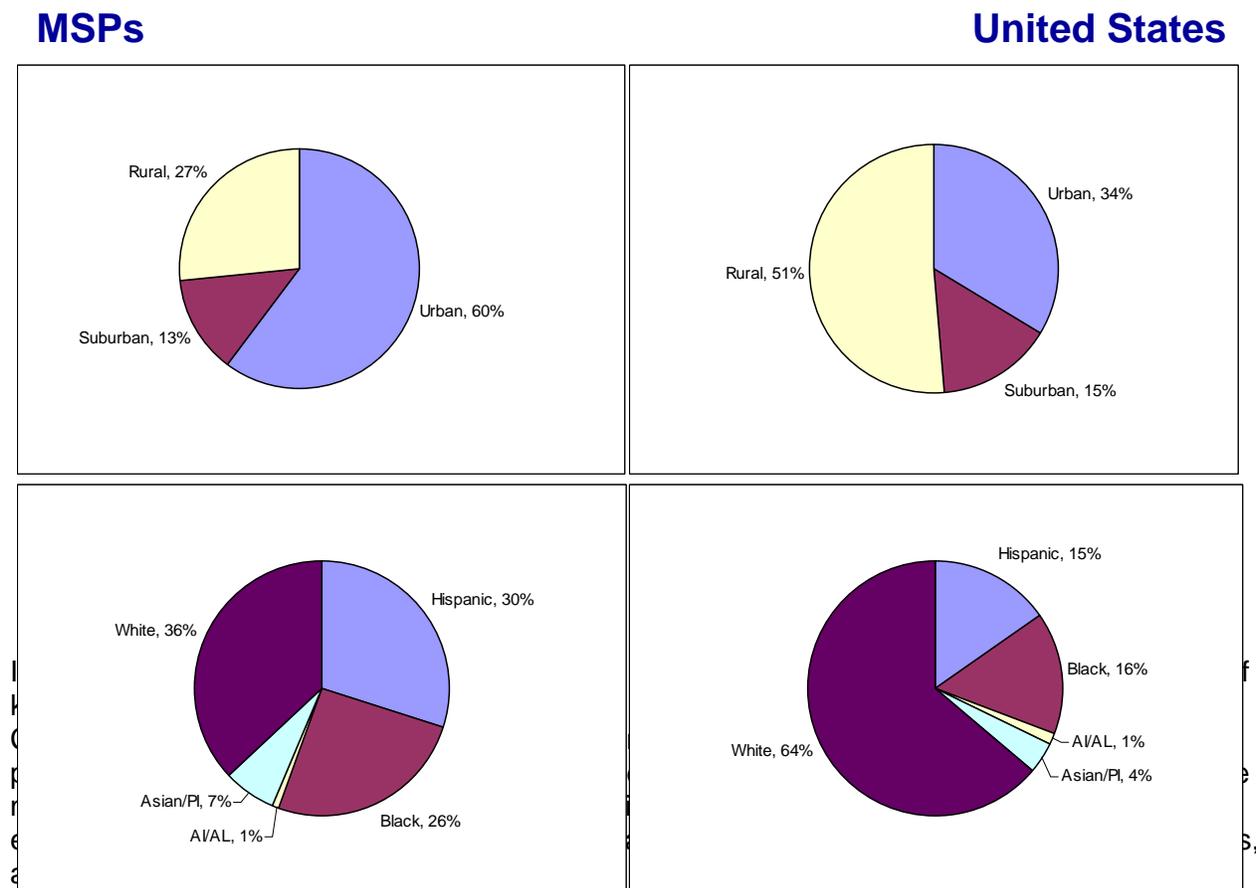


Moreover, actual awards were made as follows:

- Targeted = 2 of 8 were to HBCUs as lead institutions
- Institute = 1 of 4 was to an HIS as lead institutions
- MSP-Starts = 3 of 9 were to HBCUs, 1 of 9 was to an HIS, and 2 of 9 were to Community Colleges as lead institutions
- Of these 21 new Partnership awards, 8 have lead institutions from EPSCoR states

Regarding school districts involved in the MSP program, there is considerable disaggregated data available indicating that the MSP's projects include schools that are equal, and in some ways exceed, the national demographic of students in the public school system, both in numbers of students from urban settings and in percentages of students underrepresented in

the STEM fields. As seen in the following figures, this was shown in a preliminary study of the MSP-PE (Wong et al.) that set the stage for the comparative sub-study of student achievement.



**A.3.12 COV Questions and Comments on Program Relevance:**

*The program is synergistic with a number of relevant national and related agency priorities. The program plays a critical role in addressing one of the NSF’s strategic goals to integrate research and education. The program aligns well with at least two major pieces of federal legislation - No Child Left Behind (2001) and the America Competes Act 2007.*

*The MSP program is highly relevant to national priorities for improving the quality of math and science education. It is an ambitious project that is clearly consistent with recommendations in the NRC report Rising Above the Gathering Storm (2007) and Foundations for Success: Report of the National Mathematics Advisory Panel (2008). Those recommendations create a direct tie between teacher training and student impact. The importance of the project can be demonstrated only with data on outcomes. It is insufficient to describe the numbers of projects, the numbers of teachers, students and school districts involved, etc. Demonstrating the impact of the MSP program requires careful attention to a conception of what is meant by outcomes: (e.g., student performance, teacher performance, the behavior of arts and sciences and education faculty and the actual interactions of all of the project participants).*

*The MSP program is consistent with the agency’s mission; however, the program description differs in depth from many other NSF programs. **The COV suggests calling attention to strengths and results of the MSP program. For example, what has the NSF learned about***

***the structure of successful partnerships? Is a project clearly identified to address this topic? What results have been transformative and for whom?***

*The NSF would benefit from developing a list of the key questions addressed through the MSP program and a description of the methodology used to address each question. While each individual project has goals and anticipated outcomes, the NSF cannot evaluate the effectiveness of the project as a whole from general highlights emanating from the individual projects. For example, if the NSF takes an interest in the level of interaction among individuals in the partnerships, why not require information on the topic in annual reports and project completion reports? The key questions will drive reporting to the NSF, allowing the NSF to obtain answers to its questions in addition to researching results that develop from the individual projects. These requirements will be most helpful in developing an integrated summary of accomplishments of the MSP program consistent with its goals embedded in the program solicitations.*

**Response:**

Strengths and results of the MSP program have been brought to the attention of stakeholders in multiple formats, including the 2007 National Impact Report, Press Releases, and Highlights. In addition, MSPnet is an active means of disseminating project and program results. For example, for the realm noted by the COV – partnerships – the MSP program staff has produced a initial module on MSPnet called “What We Are Learning” that assembles information from the MSP-PE (Scherer et al.), from a RETA project (Kingsley et al.), and from other resources. Other modules are be planned for future inclusion at this resource. A Knowledge Management and Dissemination project, jointly managed by Horizon Research and EDC, is collecting and sharing information on multiple aspects of teacher quality – see <http://www.mspkmd.net/>.

The COV notes that there would be “benefit from developing a list of the key questions addressed through the MSP program.” MSP staff advocates that the 5 Key Features of the MSP program serve this role. These 5 Key Features are highlighted in MSP Solicitations, are an organizing principle in the way that qualitative and quantitative data are entered annually in the Management Information System by awardees, are a means by which projects receive feedback from site visits and reviews of Annual Reports, and are domains being studied by the MSP Program Evaluation.

**A.3.13 COV Recommendation:**

*Develop stronger ties with REESE and other directorate programs.*

**Response:**

The MSP Program agrees with the COV that the program should make every effort to collaborate with programs across the directorate and across NSF. It is worth noting that there has been success in the portfolio of the Division of Research on Learning for study of MSP work: Award #0554566, “System-wide Change: An Experimental Study of Teacher Development and Student Achievement in Elementary Science” and Award #0632161, “Reform Math Students’ Transition from High School to College.” An additional mechanism for NSF collaboration across the Foundation is co-funding of proposals that are of interest to more than one program. This promotes the sharing of information and avoids duplication of projects. MSP has co-funded with the Division of Research on Learning in EHR, with the Directorate for Engineering, and with EPSCoR.

**A.3.13 COV Recommendation:**

*No change occurred in the HBCU leadership area.*

While the COV notes that “no change occurred in the HBCU leadership area” during the single, small competition in FY 2006 (when only four Institute Partnership awards were made, one to a Tribal College), MSP aggressively sought to broaden institutional types in the FY 2008 competition as indicated above. Among a variety of success, two new awards for Targeted Partnerships are led by HBCUs.

**A.3.13 COV Recommendation:**

*The COV encourages the NSF to continue to monitor the participation of scientists, engineers, and mathematicians and to develop an understanding of how to do this most effectively.*

Response:

As an explicit emphasis area of the MSP program, there is strong follow through on the inclusion of STEM faculty in all aspects of MSP and this is strongly monitored, and will continue to be so. Partnerships are required when submitting a proposal to include the number of STEM faculty and the names of STEM faculty who are likely to be involved in the work, as well as clear details of their roles and commitment. (NSF 06-539, Section V, Partnership Management/Governance Plan.)

After receiving an award, the involvement of STEM faculty is monitored in two online surveys of the Management Information System. One survey is completed by higher education partners and the other is actually filled out by individual faculty involved in the MSP work. Information from these surveys is aggregated in the compendium of key findings (available to the COV in print form) that is delivered to NSF annually. These data also serve as one of the sources of information for a RETA study (Award #0335905; the Westat annual report noted by the COV) which also includes site visits to MSP sites to interview STEM faculty and to understand more deeply the opportunities and challenges for their involvement in the MSP work. Further analysis, at the program level, of the STEM faculty involvement in MSP is being done by additional studies by Westat, by substudies of the MSP Program Evaluation (e.g., “*Research Mathematicians Engaged with K-12 Teachers*”), and by the knowledge management and dissemination supplement to the University System of Maryland for CASHE (supplement to Award #0227325; *Change and Sustainability in Higher Education*).

**A.4.2 COV Recommendation:**

*The COV recommends making sure that instruments developed by other projects (e.g., RETA projects) tap what needs measuring, show alignment to the needs and characteristics that MSPs have, and can provide information needed not only by the MSPs but also by NSF. NSF must take care that all the RETA projects awarded align to the MSPs needs and interests and form a coherent set of projects tapping relevant and critical information.*

Response:

In general, staff agree that RETA projects need to be aligned primarily with MSP goals and projects. However, the projects also contribute to the broader area of educational research. For the FY 2009 solicitation (NSF 09-507), MSP will focus the RETA track on understanding the impacts of particular MSP activities within and across projects on teacher and student learning. The findings will definitely help other MSPs, but will also contribute to knowledge about how to study large scale implementations similar to MSP.

**A.4.3 COV Recommendation:**

*COV suggests that NSF reconsider some characteristics of the program planning and the prioritization process in the implementation of the MSP program. For example, it would be more*

*appropriate to require that MSPs be implemented in stages, giving opportunity to each MSP to learn from their own experience and from formative evaluation before fully implementing the project. Early stages should allow MSPs to tune their intervention in a way that it can be tested more formally at later stages.*

*The COV recommends development of an approach/model that can be adapted and implemented by each MSP. Focusing on critical issues about the programs and providing specific information facilitates additional learning about what makes an MSP more or less successful.*

Response:

The MSP Program concurs with the substance of this recommendation and, in fact, has already implemented it. For our large Partnerships, projects are asked for strategic and implementation plans in order to have them roll out in a logical fashion. Moreover, the largest projects – the Comprehensive Partnerships in the early years of the MSP program – had Year 2 “critical” site visits that brought external review to the implementation/proof of concept stage of the work before activities were fully implemented. More recently, the MSP program initiated two new components, MSP-Start and MSP Phase II, in the FY 2008 solicitation (NSF 08-525). The MSP-Start initiative recognized the need that some institutions have for extensive planning before initiating any activities. Phase II awards are meant to enable mature partnerships to create and enact a powerful research design on some innovative aspect(s) of their work, to thus study the work and contribute significantly to the STEM education literature.

**A.4.4 COV Recommendation:**

*A question from the 2005 COV report asked, “Did EHR continue to develop its own concepts of the merit review criteria, continue to educate the field about the nature and meaning of the criteria and disseminate a broad view of merit review criteria to prospective applicants and panelists?” The RFP and the NSF website cover these criteria. The EHR appears to continue to address this issue; and we recommend that you continue to address how the MSP proposals deal with intellectual merit.*

Response:

We recognize the importance of this and will continue to address the issue of intellectual merit consistent with NSF guidelines.

**PART B. RESULTS OF NSF INVESTMENTS**

**B.1 OUTCOME GOAL for Discovery**

**COV Recommendation:**

*One approach to describing fundamental and transformational educational practice outcomes is to have individual projects propose what they consider to be transformative. Another approach would be for the NSF to try to identify key project outcomes and share them with the broader community with the question in mind of describing models considered to be transformative. The COV encourages the NSF to consider embarking on this kind of project, which has the potential for maximizing the impact of the project and the vetting of the results within a broader community.*

Response:

Since FY 2004, MSP Solicitations (i.e., NSF 06-539, NSF 08-525) have included the specific statement. "All MSP projects incorporate a depth and quality of creative strategic actions that extend beyond commonplace approaches to improve K-12 science and mathematics education." In addition to the two NSF review criteria of Intellectual Merit and Broader Impacts, MSP program specific review criteria called upon external reviewers to recognize and recommend proposals that exemplified innovative partnerships, strategies and/or approaches.

In 2006 only 4 out of 91 Partnership proposals were funded and these were the ones judged by both external experts on review panels and NSF program staff to be the best and most innovative. Because the MSP Program has always been highly competitive (less than 10% of proposals have been funded) only those proposals that promised unique solutions to the challenges facing the nation in mathematics and science education have been awarded. Given the large dollar amounts (from \$5-\$35 million), some of the awards met the criterion of high risk. However, because of the research and development nature of the MSP program, high risk proposals were seen as justified and in some cases essential if progress was to be made in improving the achievement of all students in mathematics and the sciences.

From the portfolio, there have emerged over the years projects that might be considered transformative. For example, whereas the 2008 National Math Panel made the explicit call for the introduction of elementary mathematics specialists, the MSP program – in FY 2004 – funded a partnership between Virginia Commonwealth University, University of Virginia and Norfolk State University entitled "Virginia's Mathematics Specialists." The faculty at the three universities developed a Teacher Institute to establish a master's degree in mathematics for elementary math specialists and has been generating cadres of such individuals for the Commonwealth of Virginia. As this MSP project draws to its close, the templates of the program are being disseminated to other institutions of higher education across the state that produce elementary mathematics teachers, and will also be available for national replication.

## **B.2 OUTCOME GOAL for Learning**

### **COV Recommendation:**

*Explore the use of technology to improve learning. Research in mathematics and science education supports the use of technology for teaching. Proposals in the future could ideally include specific calls for the use of the Internet, telephone technology, YouTube, podcasting and specifically spreadsheets because of their usage around the world to see how they could be effectively used for delivery of material and learning concepts. The wise use of this technology can effectively improve scientific literacy of all citizens.*

Response:

The MSP program is sensitive to the appropriate use of these rapidly changing technologies, and will continue to encourage their use by projects and collect information on projects' use of technology to improve teaching and learning through the Management Information System. There are strong examples of technology across the MSP portfolio such as through on-line learning for students and in teacher professional development, on-line mentoring of teachers, technology-enabled instruction in mathematics (e.g., GeoGebra, Geometer's Sketchpad, graphing calculators), technology-enabled instruction in science (e.g., GPS technology, science probes, modeling, simulations), and support of evaluation (e.g., learning logs, report and analysis of classroom observations).

## **B.3 OUTCOME GOAL for Research Infrastructure**

**COV Recommendation:**

*Considerable yet untapped opportunities exist for the development and deployment of new tools for tracking and exploring what is happening in educational projects using tools currently beginning to appear in network theory, modern web technology (blogs, facebook, secondlife, texting, YouTube), and remote communication. We recommend making sure the program remains sensitive to opportunities in these areas.*

**Response:**

The MSP program concurs that it should remain sensitive to all new research based tools and discoveries that have the potential to improve mathematics and science education. The program actively seeks innovative ideas and approaches to solving the critical problems in the solicitation, i.e., “all projects incorporate a depth and quality of creative, strategic actions that extend beyond commonplace approaches to improve K-12 mathematics and science education.” (NSF 06-539) Awards are made to the Partnerships that promise to implement novel approaches and to incorporate new tools and technologies that are likely to serve as inspired and innovative ways to improve teaching and learning.

**PART C. OTHER TOPICS****C.1 COV Recommendation:**

*The COV encourages the MSP program to develop a set of key questions to apply to all projects. These questions can provide a framework for a meta-analysis of results across the program as a whole.*

*The COV recommends a matrix approach to identifying similarities among projects and perhaps suggesting projects that can be considered together and those that may be contrasted. Develop strategic questions that will fall in a particular hierarchical order. The MSP program might consider hosting a focus group of current PIs and other individuals who could help create the questions to be addressed. The questions then become the organizing frame for communication of results from the MSP program. Rather than conducting a retrospective analysis, the COV recommends performing analyses while the projects are still underway.*

*The COV encourages the MSP program to keep an eye on what works and does not work in various settings. What are the lessons? What works, for whom and under what circumstances?*

**Response:**

Launched in FY 2002, the Math and Science Partnership (MSP) program at the National Science Foundation is a research and development effort to build capacity and integrate the work of higher education, especially its STEM disciplinary faculty, with that of K-12 to strengthen and reform mathematics and science education. MSP seeks to improve student outcomes in mathematics and science for all students, at all K-12 levels. The overarching research question is: Does the involvement of STEM faculty in the work of K-12 have an impact on student achievement? With this research question in mind, MSP Program Staff devised a framework upon which ALL Partnership proposals design their projects, which consists of the 5 Key Features (NSF 06-539, Front Page and Section II, Program Description). Each Partnership must incorporate all Key Features in their evidence/research based project design; however, different projects may emphasize different features to varying extents (NSF 06-539, Section V, Proposal Preparation Instructions). To answer challenges such as “*What are the lessons?*”

*What works, for whom and under what circumstances?," the Management Information System annually collects information reflecting the 5 Key Features from all MSP projects and the MSP Program Evaluation includes substudies along dimensions of each of the Key Features.*

**C.1 COV Recommendation:**

*MSP should provide a clear communication strategy for results undergoing development from the program.*

Response:

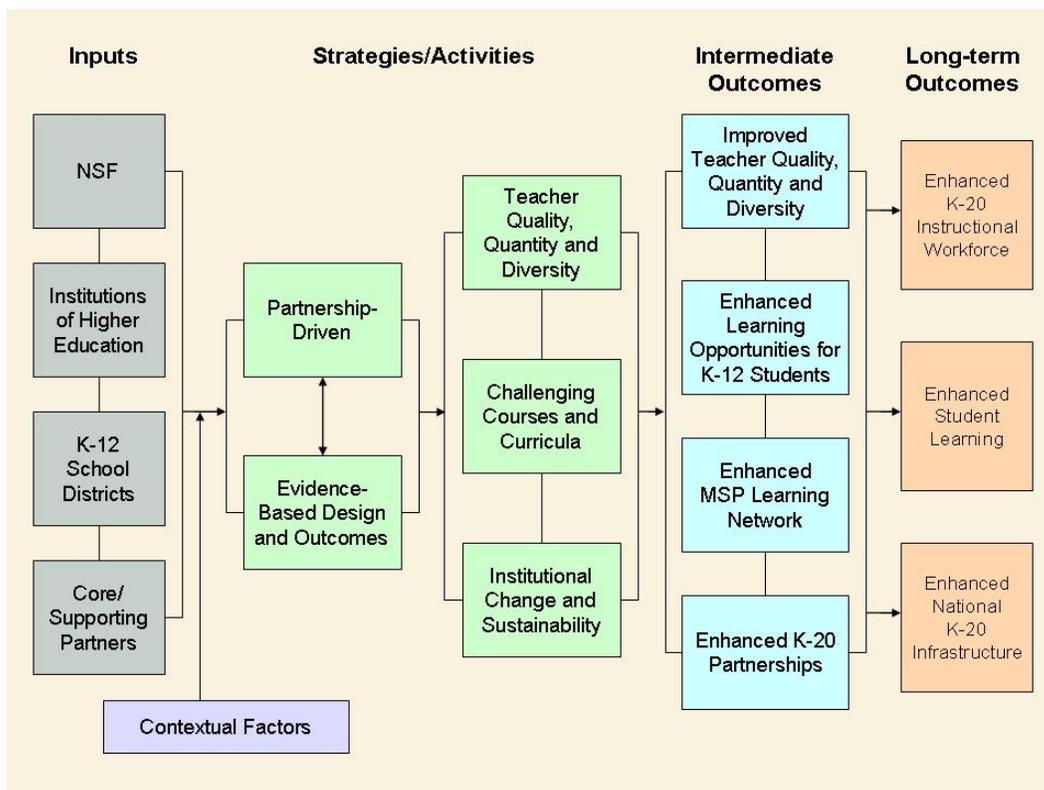
The MSP Program from the outset has placed great emphasis on communication with and between projects. "MSP projects contribute to the MSP Learning Network, a network of researchers and practitioners studying, documenting and evaluating promising strategies to improve K-12 student achievement in mathematics and science. ...The work of the MSP Learning Network fosters greater national collaboration and informs our understanding..." (as referred to in NSF 06-539, but drawn from earlier solicitations). The MSP program makes a substantial effort to ensure that all findings from projects are presented through MSPnet, a site that has drawn over 1,300,000 million visitors since 2004, as well as at the annual Learning Network Conferences which is accompanied by a Virtual Poster Hall so that Conference presentations are presented throughout MSPnet as well as to Conference attendees.

**C.2 COV Recommendation:**

*A priority recommendation is to develop an approach/model that guides the data collection across MSPs as well as the external evaluation. The model proposed by Yin (2007) does not seem to address, at least in the figure provided (p. 30), critical information that can help learn what moderates and/or mediates the effectiveness of the MSPs. This complex program needs a model that addresses critical "third variables" and information on critical indicators that can be collected within and across MSPs. The model also should provide clear indicators of the critical MSP components that could guide the diverse methods of review mechanisms (e.g., site visits, reverse site visits). Although the review mechanisms are appropriate, their implementation lacks consistency and should specify what critical information, program components and implementation require the most focus and what can be learned from the MSPs.*

Response:

At a coarse level, Westat – in developing the online surveys of the Management Information System – represented the MSP program and its 5 Key Features in the following logic model:



Finer grain inspection of the interrelationships between cells in the logic model enables the sorts of studies and searches for “third variables” envisioned by the COV. For example:

Evidence-Based Activities related to Partnership-Driven includes examinations of:

- disciplinary faculty involvement in partnership
- K-12 involvement in partnership
- other core partner involvement in partnership

Evidence-Based Activities related to Teacher Quality, Quantity and Diversity includes examinations of:

- efforts to recruit quality and diverse pre-service students
- pre-service preparation efforts
- in-service retention efforts
- efforts to enhance the quality, quantity, and diversity of in-service teachers

Evidence-Based Activities related to Challenging Courses and Curricula includes examinations of:

- student preparation for challenging courses
- student access to challenging courses
- student success in challenging courses (e.g., analyze passing/failure rates)
- efforts to encourage K-12 student participation in challenging courses
- rigor/quality of challenging curricula

Evidence-Based Activities related to Institutional Change and Sustainability includes examinations of:

- K-20 redirection of resources
- K-20 efforts to design and implement new policies and practices
- efforts to reward IHE disciplinary faculty for K-12 involvement and strengthened teaching practices
- efforts to recognize and reward K-12 contributions to improved mathematics and science learning and teaching

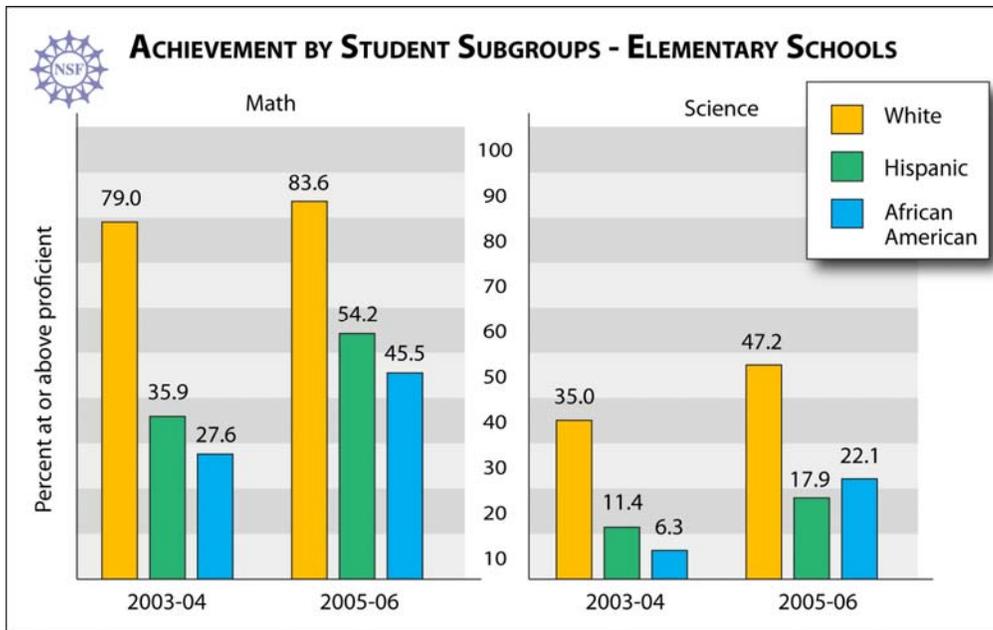
The 5 Key Features serve as a common structure/approach for submittal and review of proposals, strategic actions by awarded projects, annual collection of data in the Management Information System, reviews by NSF staff and site visitors, and program evaluations.

**C.3 COV Recommendation:**

*While improving proficiency in the performance of all students, it is critical that MSP monitor, evaluate and learn from its investments so that it addresses the persistent achievement gap among subpopulations.*

Response:

The MSP Program concurs that endeavoring to address the achievement gap is an important portion of the MSP effort that has been inculcated in communications of the program since its inception. Awardees remain informed of the seriousness of this intention by the annual collection of disaggregated data. In Press Release NSF 08-075, “Closing the Achievement Gap in Math and Science,” the MSP Program Evaluation offered the following data to demonstrate some of the fruits of the MSP effort concerning the closing of the achievement gap:



MSP will continue to monitor, evaluate and learn from its investments regarding the closing of the achievement gap. For example, there is some evidence – collected through the Management Information System – that some MSP projects are producing gains for special education students, as follows:

	2002-03 Number taking assessment	2002-03 Percent scoring at or above proficient	2003-04 Number taking assessment	2003-04 Percent scoring at or above proficient	2004-05 Number taking assessment	2004-05 Percent scoring at or above proficient	2005-06 Number taking assessment	2005-06 Percent scoring at or above proficient
Total special education students	3,427	26.7	23,657	22.0	31,390	25.5	50,756	31.0
Elementary school special education students	1,140	35.4	4,769	29.9	6,873	42.2	15,585	49.2
Middle school special education students	1,966	18.4	10,569	19.7	14,275	21.6	25,204	23.3
High school special education students	321	46.4	8,319	20.6	10,242	19.8	9,967	22.3
Number of projects	8		24		28		29	
Number of schools	92		568		666		1,032	
Number of assessments	177		1,313		1,773		3,440	

*meeting.*

*Provide a Webinar 2-3 weeks in advance. Cross link to access information of the same kind across projects. Notify the COV of this availability a minimum of 2 weeks in advance.*

**Response:**

The MSP program concurs, apologizes for the lateness, and will strategically address this recommendation for the next COV.