

APPALACHIAN MATHEMATICS AND SCIENCE PARTNERSHIP

RESEARCH AND EVALUATION STRAND

REQUEST FOR PROPOSALS

Program Overview

The Appalachian Mathematics and Science Partnership (AMSP) engages in several initiatives designed to improve mathematics and science education in the Central Appalachian region. The partnership utilizes the expertise of personnel from 9 institutions of higher education and 51 school districts in Kentucky, Tennessee, and Virginia (for more information on the project see the AMSP website www.appalmsp.org). Research and evaluation are important elements of the AMSP project. This request for proposals (RFP) invites independent researchers to apply for support in addressing questions that are central to the AMSP Research Agenda. Through this initiative AMSP aims to:

- Support high-quality independent research projects that address topics central to the AMSP Research Agenda
- Create training opportunities for emerging mathematics and science education researchers
- Promote collaborative research activities among AMSP partners
- Support involvement in AMSP research within and beyond the academic community of partners

Research Questions

The AMSP Research Agenda contains six (6) broad research questions. A specific proposal for support of a research project is expected to investigate a more specific question or critical issue

which is strongly related to one of the six broad research questions. The results of projects that are funded should contribute to the body of research in mathematics and science education and inform future initiatives of AMSP and similar projects. Under each of the six broad research questions that follow, specific research questions are provided as bulleted items to reflect the research priorities of AMSP. Although these specific research questions are of special interest to AMSP, they do not represent a comprehensive list. Researchers are encouraged to identify other research questions and issues under each broad research question.

1. What critical attributes allow partnerships to develop and flourish in a specific context?

- What can be learned from comparing AMSP partnerships that appear to be successful with some that appear to be unsuccessful or only marginally successful?
- What are the characteristics of successful models of partnering between IHE's and the school districts in providing successful professional development?

2. What factors influence teachers' and students' conceptual understanding of mathematical and scientific knowledge?

- What are the major conceptual difficulties exhibited by Appalachian children and youth in science and mathematics?
- What are the major conceptual needs Appalachian teachers have in science and mathematics?
- What instructional interventions are effective in promoting conceptual change in K-12 students or preservice or in-service teachers?
- What is the relationship between conceptual learning and curricular and instructional characteristics of AMSP courses/institutes?
- What is the efficacy of the transfer of professional learning and use of new instructional materials and methods into the local curricula?

3. *What factors influence rural students to enter and remain in mathematics and science teaching or to select and remain in mathematics and science majors in higher education?*

- What strategies are both effective and cost efficient for recruiting Appalachian students into middle and high school science and/or mathematics teaching?
- What factors are most important in high school students' decisions to enter a STEM field in college, including science and/or mathematics teaching?
- What factors are most important in retaining Appalachian students who enroll in STEM fields in college?
- After graduation from higher education in a STEM field, what careers do Appalachian students pursue and to what extent do they contribute to the economy in the Appalachian region?
- What are unique Appalachian cultural factors that create barriers or provide motivation for Appalachian students to enter and remain in mathematics and science fields?

4. *What is the relationship between teacher performance and student achievement or among teachers' conceptual understanding, mentorship, and degree of program implementation?*

- How much of the variance in student performance in science or mathematics can be attributed to teachers' understanding of the content, observable classroom practices, contextual factors and other variables?
- What student achievement effects in AMSP schools are attributable to AMSP and which are attributable to other externally funded mathematics and science projects?
- To what extent do teachers apply what they learn in institute training in their daily teaching?
- What is the relationship between achievement test results of K-12 students and involvement levels of schools and districts?
- What policies and policy environments promote or inhibit students' enrollment in higher-level math and science courses?

- What is the relationship between particular practices of school counselors and advanced course taking by students in the Appalachian region?
- To what do principals and teachers attribute persistent learning difficulties encountered by students in science and mathematics instruction?

5. Do Appalachian science and mathematics teachers use instructional technology when appropriate and do they use it effectively?

- What instructional technology do rural mathematics and science teachers use for specific purposes and why?
- What major barriers do Appalachian teachers encounter in using technology to enhance instruction in mathematics or science?
- How successful are AMSP institute participants in subsequently utilizing technology that was a major component of instruction in the institute?

6. How do educational policies at the IHE, school district, state and national levels impact science and mathematics education in the Central Appalachian region?

- How do policies serve to promote or inhibit desirable changes in science and mathematics education in local school districts in Appalachia?
- How does the impact of local, state and national educational policies differ between high and low performing schools in Appalachia?
- How do AMSP partnerships influence educational policies and how do educational policies influence AMSP partnerships?
- What educational policies can AMSP partners positively impact; how can the changes be achieved?
- What indices of sustainability from AMSP initiatives are meaningful?
- What policy factors promote or inhibit the institutionalization of the changes and practices advocated by AMSP?

- What IHE policies can be used effectively to recruit and retain mathematics and science teachers?

Faculty members and doctoral students in the AMSP partnership and ACCLAIM are especially encouraged to apply for research funding under this program. For the 2004-2005 academic year, the total budget for each research proposal should normally not exceed \$25,000.

Proposal Preparation

A proposal in response to this RFP should contain three components.

1. **Contribution of Research Project to the AMSP Research Agenda.** A clear description of each of the following issues should be provided:
 - Identification of a research question closely related to the AMSP Research Agenda
 - Indication of relevance to math and science education in the region and beyond.
2. **Research Plan.** A clear and concise description of each of the following should be provided:
 - A rationale addressing theoretical and empirical foundations supporting the project (relevant grounding in the research literature must be included)
 - Research questions and/or research hypotheses
 - Description of sample needed
 - Data collection procedures
 - Measures and variables
 - Data analysis procedures
 - Indication of how measures and analyses relate to research questions or research hypotheses
3. **Personnel.** A brief description of each of the following.
 - Experience and qualifications of principal investigator and other investigators with a major role.
 - Role of each researcher in the project
4. **Time line**
 - Timeline for completion of the project from beginning through dissemination of results.
5. **Dissemination**
 - Plans for dissemination [Dissertation, technical report, paper presentation (specify likely organization/conference), and/or referred publication]

The research proposal is limited to 6 single-spaced pages (8.5 inch x 11 inch). Text should be included only on one side of each page with 1 inch margins at all sides. References, tables, figures, and appendices may be in addition to the 6 page limit.

Budget Justification

Proposals must include a budget narrative containing sufficient details to justify costs. AMSP can support the following costs:

- Summer salary (usually one month, maximum of two)
- Consultant fees, subject to limits
- Research assistant
- Travel to data collection sites
- Conference travel (to present findings of the project)
- School related compensation (if schools are involved, teachers' work outside of the usual M-F schedule, etc.)
- Cost of photo copying and report production

A justification for each estimated project-related cost should be provided in the budget narrative. AMSP cannot support the following costs:

- Indirect costs
- Equipment
- Academic year teaching release time (exceptions may be possible for faculty with a heavy teaching load)

Submission Information

Each application package should include:

- Research Proposal
- Budget Justification
- Curriculum Vita (3 page limit for each researcher)

Proposals must be prepared following the instructions outlined above and sent electronically to the AMSP Research and Evaluation Coordinator, Dr. Xin Ma (xin.ma@uky.edu). Deadline for the first round of funding is November 15, 2004. If funds permit, closing date for a second round will be February 1, 2005. For responses to questions contact Dr. Xin Ma at (859) 257-2432 (phone), (859) 257-1602 (fax), or xin.ma@uky.edu (email).

Proposal Review

Members of the AMSP Executive Committee and National Research Advisory Council, as well as invited external experts, will serve as reviewers. The review process is expected to take 1 to 2 months. A proposed starting date of January 15, 2005 or later should be reasonable for the first round of proposals. In some cases, revisions of proposals may be requested before a final decision is made on funding. Each proposal will be assessed for quality on the basis of the following criteria:

- Originality of the research relative to the fields of mathematics and science education.
- Potential contribution to the AMSP Research Agenda
- Potential contribution to the advancement of knowledge in mathematics and science education
- Quality of the theoretical/empirical basis
- Appropriateness of the proposed research plan and methodologies
- Potential of personnel to successfully complete the project in a timely fashion
- Cost effectiveness of the proposed project