Appalachian Mathematics and Science Partnership (AMSP) Needs Analysis Surveys: Methodology and Results

Harold Peach, Data Analyst AMSP
Josh Poulette, Technical Research Associate AMSP
Barbara Q. Shoemaker, PEP Coordinator AMSP
Donald Long, Associate Director AMSP
Dr. Stephen Henderson, Co-PI AMSP

This brief research note details a survey that was conducted by the Appalachian Mathematics and Science Partnership in the fall of 2006 and the spring of 2007. This survey consisted of a 'paper' survey administered to a focus group, which facilitated the development of an online survey that was administered to 2,175 educators from AMSP partner school districts. The justification for and methodology and results of this survey are detailed below. This survey indicated that most respondents were, in general, quite willing to identify need areas as salient for their school or district, and that administrators were more likely to identify salient need areas than were teachers. The following sections provide an introduction and justification (Section 1), description of methodology (Section 2), results and analysis (Section 3), summary of limitations (Section 4) and conclusion (Section 5).

Section 1: Introduction and Justification

The general motivation for the survey described in detail below stems from the goals of the Appalachian Mathematics and Science Partnership (AMSP)[1]. A close examination of each of these goals makes it clear that an awareness of the perspectives of PreK-12 mathematics and science educators is critically important to the work of the AMSP. Along with higher education faculty, this is the primary group of personnel involved in facilitating mathematics and science education. Therefore, the specific goals that this survey research were designed to address the views and opinions of PreK-12 school personnel. These goals are:

1. Assess the mathematics and science education professional development needs in preK-12 schools and districts.

2. Develop an understanding of the barriers that inhibit PreK-12 educators from delivering highly effective instruction and leading to increased student learning.

3. Compare the results of a national survey of STEM instructional standards with results from a similar survey of Appalachian schools and districts.

4. Determine the sources of the data underpinning PreK-12 educators' views on these matters.

The purpose of the focus groups and the online survey was to generate a profile of the viewpoints of AMSP-involved PreK-12 school personnel relative to the goals of the AMSP. The data collected is

[1] AMSP serves students and educators by emphasizing strong partnerships that tackle local needs and build grassroots support to:

- Enhance schools' capacity to provide challenging curricula for all students and encourage more students to succeed in advanced courses in mathematics and the sciences;
- Increase the number, quality and diversity of mathematics and science teachers, especially in underserved areas;
- Engage and support scientists, mathematicians, and education faculty at local colleges and universities to work and build partnerships with K-12 educators and students;
- Contribute to a greater understanding of how students effectively learn mathematics and science and how teacher preparation and professional development can be improved, especially in rural areas; and,
- Promote institutional and organizational change in education systems — from kindergarten through graduate school — to sustain partnerships' promising practices and policies.

currently being utilized to facilitate the design of effective activities and programs. Note that data was collected from two sources with the potential for overlap: district-level focus groups and surveys of individual school district personnel.

Section 2: Survey Methodology

In the fall of 2006, focus-group-meetings were carried out by AMSP with the participation of stakeholders from 31 (60.8%) of the 51 AMSP school districts. Each district self-selected the members of its team, but AMSP suggested that teams include a district level and school level administrator, as well as mathematics and science educators. One meeting was held in each of the 4 AMSP regions, in locations geographically convenient for the districts in that region.

Each group was given an instrument (see Appendix A) to guide their discussion. This instrument was developed using the needs districts had previously identified in proposals submitted to AMSP or in school improvement plans. Needs identified by AMSP in the course of classroom observations and evaluation instruments used at AMSP workshops were also used.

Participants were instructed to use the instrument to record their consensus from their discussions with groups of their peers, not as an individual survey instrument. They were first asked to discuss the degree to which their district needed assistance with each area listed in Step 1. Then, in Step 2, they were asked to rank the needs listed in Step 1 and record the top 3 needs in the blanks provided on the form. For these needs, the districts were asked to provide more detail and record the sources of information they used to identify each need and how they believed each need could best be addressed. At the end of the session, completed instruments and notes were collected by the AMSP staff and examined.

The findings from this examination were used to create an online survey (see Appendix B), administered in the spring of 2007. District and school level administrators and mathematics and science teachers who had participated in at least 1 AMSP activity over the 4 year life of the project were sent emails (when available) and paper correspondence explaining the purpose of the survey, soliciting their participation, and providing a link to the Web-based survey instrument. Some of these individuals had

been among the focus group participants at the fall meetings. Other individuals had not participated in those meetings. The final response rate was nearly 30%[2].

Section 3: Analysis

The "cornerstone" section (Section I) of the internet-facilitated District Needs Survey asks respondents to rank the salience of particular need areas for their schools or districts, as applicable. This ranking is-based on a five-point scale, with "5" indicating a "major need - highest priority" to "1" indicating no need – not a priority. Respondents were asked to rank ten need areas (given in Table 1). The average ranking for a given item (across all items and respondents) was 3.71. That is, the "average" respondent rated the "average" item close to "4" indicating that it was a "high need – high priority." Table 1 below gives average responses for each survey item. It is apparent from this table that many of the responses vary only slightly from the overall average response

Table 1: Average Response by Survey Item (Section I)

Survey Item	Average Response
Eliminating academic gaps based on subgroup achievement	3.79
Using differentiation strategies in the classroom	3.78
Using instructional strategies that are consistent with standards based practices	3.75
Designing and implementing standards based assessment strategies	3.69
Using technology in instruction	3.67
Increasing higher level course enrollment	2.86
Improving math and or science school leadership	3.62
Increasing parent involvement	3.95
Aligning curriculum to standards	3.37
Improving content knowledge	3.53

[2]

Breakdown of District Needs Survey Respondents

	Completed	Surveyed
District Administrators	63 (50.0%)	126
Non BIS School Administrators	48 (28.9%)	166
BIS School Administrators	46 (28.8%)	160
Non BIS Teachers	222 (24.2%)	917
BIS Teachers	257 (31.9%)	806
TOTAL	636 (29.2%)	2,175

- As of February 28, 2007 (Final)

of 3.71. However, some marked departures exist: the "Increasing higher level course enrollment" item exhibits a significantly lower average response than any other item at 2.86 (though this relatively extreme value is likely due to the inapplicability of this item to elementary and middle school environments, as explained below). The responses for the "aligning curriculum to standards" and "improving content knowledge" items are also noticeably lower than the average response value, while the "Increasing parent involvement" exhibits a slightly higher-than-average response value. Overall, the ten survey items from Section I display responses that are rather closely gathered around the average with only a few exceptions.

A more detailed analysis is given below in Table 2. In this table, respondents are disaggregated and grouped according to their (self-identified) position type[3]. The averages for these position types differ. respondent is, the more likely The administrators were more likely to perceive higher need for the given set of items in Section I. The overall averages differ across position type, as respondents from the different positions display different rating behavior for the ten survey items from Section I. It is clear from Table 3 that the different respondent classes (by position) display some interesting variation in the values they assign to the survey items from Section I. For example, the three position groups give quite similar assessments of the salience of "Improving math and or science school leadership," while they seem to have markedly different opinions on the priority of "Improving content knowledge" or "Designing and implementing standards based assessment strategies." In summary, the three position groups display somewhat different assessments of the ten possible need areas included in Section I. For all items as a whole (and for most items individually), district administrators are more likely than the other groups (and school administrators more likely than teachers) to assign a higher need priority to a given survey item.

Table 2: Average Response by Position (Section I)

	District Administrators	School Administrators	Teachers
Average Response	3.86	3.73	3.54

[3] Options: Teacher, School Administrator, District Administrator, Other.

Table 3: Average Response by Position and Survey Item (Section I)			
Survey Item	**District Administrators**	**School Administrators**	**Teachers**
Eliminating academic gaps based on subgroup achievement	4.11	3.94	3.72
Using differentiation strategies in the classroom	4.11	3.97	3.70
Using instructional strategies that are consistent with standards based practices	4.16	3.94	3.66
Designing and implementing standards based assessment strategies	4.17	3.86	3.60
Using technology in instruction	3.63	3.82	3.65
Increasing higher level course enrollment	3.26	2.81	2.81
Improving math and or science school leadership	3.76	3.72	3.59
Increasing parent involvement	3.79	4.03	3.95
Aligning curriculum to standards	3.66	3.50	3.30
Improving content knowledge	3.90	3.72	3.45

A similar analysis is performed with data disaggregated by educational level. Table 4 breaks down the average response for respondents from each (self-reported) level (Elementary, Middle, High, K-12), while Table 5 lists average survey response by the respondent's level for each survey item. Table 4 offers only one difference: teachers at K12 schools are more likely (on average) to perceive salient need areas than are other teachers (more so than even school administrators). Table 5 further breaks down this data by listing the average response value by survey item and education level (Elementary, Middle, High, or K12). Table 5 has two implications: first, it is apparent that the generally depressed value of the "Increasing higher level course enrollment" item is due to the inapplicability of this item to elementary and middle school-based respondents. Second, while all respondents rate "Increasing parent involvement" as a similarly salient

Table 4: Average Response by Level (Section I)				
	Elementary	**Middle**	**High**	**K12**
Average Response	3.57	3.58	3.57	3.87

need, K12 personnel are, in general, more likely than other respondents to identify priority areas of need (i.e., of the other nine items).

Table 5: Average Response by Level and Survey Item (Section I)				
Survey Item	**Elementary School**	**Middle School**	**High School**	**K12**
Eliminating academic gaps based on subgroup achievement	3.74	3.76	3.82	3.96
Using differentiation strategies in the classroom	3.81	3.74	3.65	4.17
Using instructional strategies that are consistent with standards based practices	3.82	3.70	3.59	4.10
Designing and implementing standards based assessment strategies	3.80	3.62	3.48	4.03
Using technology in instruction	3.60	3.84	3.58	3.75
Increasing higher level course enrollment	2.28	2.67	3.66	3.58
Improving math and or science school leadership	3.61	3.53	3.62	3.94
Increasing parent involvement	3.89	3.97	4.01	3.92
Aligning curriculum to standards	3.48	3.43	3.10	3.50
Improving content knowledge	3.65	3.56	3.23	3.79

Section 4: Limitations

While the two survey instruments described above offer some unique and interesting findings, several considerable limitations exist. First, all survey participants were self-selected. Other concerns pertain to the participants at the focus meetings: during the focus meetings each school chose representatives from their districts to present ideas concerning their math and science programs. The representatives included superintendents, supervisors, principals, and mathematics/science resource persons, elementary, middle and high school teachers. Thus, teams had a wide variety of administrators, teachers, and resource personnel, and the ratio of each group varied from school to school making it difficult to aggregate data effectively into subgroups. It was assumed that the school representatives

were involved with mathematics, science and AMSP activities but we have insufficient information as to the process used to assign personnel to the project: thus, we cannot say with confidence that the group was proficient in assessing district and school needs.

The highly structured nature of the online survey is also a potential limitation: open response was not an option on the online survey. The online survey allowed individuals to choose answers which were directed to pre-selected responses that did not allow the participant to explain their reason for making the choice. Expressions of individual views on the mathematics and science program in the relevant school or district were severely limited without an open response mechanism. With the online survey, selections were ranked, but there was not a mechanism to link the ranking with a specific determination or data source for the need.

Section 5: Conclusion

During this study a total of 2,175 AMSP participants (including administrators and math and science teachers) were surveyed with a total of 636 completing the survey (plus an additional 85 who participated in the focus group survey). The unique two-step survey process allowed AMSP personnel to generate a profile of the viewpoints of AMSP-involved PreK-12 school personnel on the most salient educational needs at their school or district. This series of surveys and data collection led to three distinct outcomes: (1) Focus groups were able to discuss individual needs with their own district personnel and share the information with regional peers. It is rare that school districts make opportunities to openly discuss needs or concerns with each other. (2) The follow-up online survey allowed for an expanded view of school and district needs as identified by both teachers and administrative personnel. The closed-response nature of this survey device produced data that was more easily to analyzed (as in Section 3) and holds the potential for more analysis than was conducted to date. (3) Finally, this process provided AMSP with vital information on the needs of the-PreK-12 partners. This information will be crucial in helping AMSP (and other projects) better address the need areas of its population of partners which sorely need assistance.

Student achievement for the almost 170,000 students in the Appalachian Mathematics and Science Partnership's partner districts is significantly lower than state averages.. [4] The Appalachian Mathematics and Science Partnership seeks to eliminate the "achievement gap" in science, mathematics, and technology in the Central Appalachian region. The information gleaned by the survey tools described will aid AMSP, and other agencies/projects, design programs which can help eliminate this "achievement gap."

[4] MSPnet, http://hub.mspnet.org/index.cfm/showcase_project/project_id-5

Appendix A: Focus Group Survey Instrument

Step I Rate the degree of need that exists in your district for each of the following:

Need/Problem/Weakness/Deficiency	Very Great Need	Great Need	Moderate Need	Little Need	Not Needed	No Opinion
A. Curriculum alignment to standards	O	O	O	O	O	O
B. Instructional strategies/Standards-based Practices	O	O	O	O	O	O
C. Teacher content knowledge	O	O	O	O	O	O
D. Questioning skills	O	O	O	O	O	O
E. Assessment	O	O	O	O	O	O
F. Technology use in instruction	O	O	O	O	O	O
G. Differentiation	O	O	O	O	O	O
H. Leadership	O	O	O	O	O	O
I. Parent Involvement	O	O	O	O	O	O
J. Rigorous course enrollment	O	O	O	O	O	O
K. Academic gaps and subgroups	O	O	O	O	O	O

Needs Analysis Survey

District: _____

Subject: O Mathematics O Science

Appalachian Math Science Partnership
187 Ralph G. Anderson Building
University of Kentucky
Lexington, KY 40506-0503
(859) 257-9219

Step II Choose the top three needs from Step I. Rank the three needs from highest to lowest priority. Choose from the categories below each column and place the corresponding letter in the box. Explain your choice in the box to the right of each letter. *Do not* limit your responses to needs you think AMSP is able to address.

Priority	Need/Problem/Weakness/Deficiency		What led you to this conclusion? / What led you to determine/identify this problem/need/deficiency?		What intervention/service/assistance could address this need? / How do you propose to fix/resolve?	
Example	B	How to use manipulatives effectively in the classroom.	J, C	The teachers indicate they do not know how to use manipulatives effectively in class. Also lack of manipulative use mentioned in PIR.	C	Work with expert on use of manipulatives.
Highest Priority Need		(Use back if more space is needed)		(Use back if more space is needed)		(Use back if more space is needed)
Second Highest Priority Need		(Use back if more space is needed)		(Use back if more space is needed)		(Use back if more space is needed)
Third Highest Priority Need		(Use back if more space is needed)		(Use back if more space is needed)		(Use back if more space is needed)
Other Need (Not listed in categories below.)		(Use back if more space is needed)		(Use back if more space is needed)		(Use back if more space is needed)
	↑ (choose one per priority need)		↑ (choose all that apply)		↑ (choose all that apply)	
Categories	A. Curriculum alignment to standards B. Instructional strategies/Standards-based Practices C. Teacher content knowledge D. Questioning skills E. Assessment F. Technology use in instruction G. Differentiation H. Leadership I. Parent Involvement J. Rigorous course enrollment K. Academic gaps and subgroups		Post-graduation tracking and surveying A. Student retention / remediation B. Students going on to college Internal and External Assessments C. Program improvement reviews D. State Assessment Report E. Student Surveys F. Annual Yearly Progress (AYP) Report G. Feedback from college or university H. School improvement planning process I. Number of students in higher level courses J. Teacher surveys / feedback K. Student feedback L. Site based counsel M. Other (describe in box above)		Professional development A. Content knowledge B. Specific programs or areas of study C. Instructional strategies/Standards-based Practices D. Technology use in the classroom E. Assessment Release time for… F. Planning G. Observations / Mentoring Curriculum alignment / mapping to standards H. State I. National J. Parent / community engagement K. Partnering (K12 with IHE) L. Other (describe in box above)

Appendix B: Online Survey Instrument[4]

AMSP 2006-07 District Needs Survey (v. E)

2. Your school district (you may have to scroll down to find yours):

Please select one ...

3. Your position:

- ○ Teacher
- ○ School Administrator
- ○ District Administrator
- ○ Other

4. Subject(s) that you work in:

- ○ Mathematics
- ○ Science
- ○ Mathematics and Science
- ○ N/A
- ○ Other

5. Level that you work in:

- ○ Elementary (grades p-5)
- ○ Middle (grades 6-8)
- ○ High (grades 9-12)
- ○ K-12

◂ Back Next ▸

[4] Please note that only part of the online survey is included in order to keep paper length to a minimum.

AMSP 2006-07 District Needs Survey (v. E)

Section I - Professional Development Needs for Your School and District

6. To help us better understand the needs of your school and district please rate the below needs. These were indicated as needs of AMSP partners within Program Improvement Reviews (PIRs), Partnership Enhancement Project (PEP) Proposals, School Improvement Plans, etc. Please give your opinion concerning the priority level of each.

	Major Need - Highest Priority	High Need - High Priority	Somewhat of a Need - Medium Priority	Minor Need - Low Priority	No Need - Not a Priority	Not Applicable - No Opinic
Eliminating academic gaps based on subgroup achievement	○	○	○	○	○	○
Using differentiation strategies in the classroom	○	○	○	○	○	○
Using instructional strategies that are consistent with standards-based practices	○	○	○	○	○	○
Designing and implementing standards-based assessment strategies	○	○	○	○	○	○
Using technology in instruction	○	○	○	○	○	○
Increasing higher level course enrollment	○	○	○	○	○	○
Improving math and/or science school leadership	○	○	○	○	○	○
Increasing parent involvement	○	○	○	○	○	○
Aligning curriculum to standards	○	○	○	○	○	○
Improving content knowledge	○	○	○	○	○	○

◂ Back Next ▸

AMSP 2006-07 District Needs Survey (v. E)

7. If you rated "improving content knowledge" in question 8 as a priority, then what is your opinion regarding the level of need for professional development in the following specific areas?

	Major Need - Highest Priority	High Need - High Priority	Somewhat of a Need - Medium Priority	Minor Need - Low Priority	No Need - Not a Priority	Not Applicable - No Opinion
Math - Elementary Mathematics	○	○	○	○	○	○
Math - Pre-Algebra Concepts	○	○	○	○	○	○
Math - Algebra Concepts	○	○	○	○	○	○
Math - College Algebra Concepts	○	○	○	○	○	○
Math - Geometry Concepts	○	○	○	○	○	○
Math - Probability & Statistics	○	○	○	○	○	○
Science - Elementary Life Science Concepts	○	○	○	○	○	○
Science - Elementary Earth Science Concepts	○	○	○	○	○	○
Science - Elementary Physical Science Concepts	○	○	○	○	○	○
Science - Biological Science Concepts	○	○	○	○	○	○
Science - Chemistry Concepts	○	○	○	○	○	○
Science - Earth Science Concepts	○	○	○	○	○	○
Science - Physical Science Concepts	○	○	○	○	○	○

◂ Back Next ▸

AMSP 2006-07 District Needs Survey (v. E)

Section II - Identification of Problems and Issues for Science and Mathematics in Your District

8. The following are other problems or issues that may influence professional development or growth as an educator. Please rate the level of severity of each problem or issue in your district. (You may need to scroll down to see those at the bottom.)

	Serious Problem	Major Problem	Somewhat of a Problem	Minor Problem	Not a Significant Problem	No Opinion
Materials for individualizing instruction	○	○	○	○	○	○
Access to computers	○	○	○	○	○	○
Appropriate computer software	○	○	○	○	○	○
Student interest in science or mathematics	○	○	○	○	○	○
Teacher preparation to teach science or mathematics	○	○	○	○	○	○
Time to teach science or mathematics	○	○	○	○	○	○
Opportunities for teachers to share ideas	○	○	○	○	○	○
Mathematics in-service education opportunities	○	○	○	○	○	○
Science in-service education opportunities	○	○	○	○	○	○

Parental support for mathematics and/or science education	○	○	○	○	○	○
State and/or district curriculum frameworks	○	○	○	○	○	○
State and/or district testing policies and practices	○	○	○	○	○	○
Importance school places on mathematics	○	○	○	○	○	○
Importance school places on science	○	○	○	○	○	○
District's policy regarding professional development days and their use	○	○	○	○	○	○
Time available for teachers to plan and prepare	○	○	○	○	○	○
Time available to work with other teachers during the school year	○	○	○	○	○	○
Time available for professional development	○	○	○	○	○	○

AMSP 2006-07 District Needs Survey (v. E)

Section III - Opinion About Statements Regarding Mathematics and/or Science National Standards

9. The statements in question 10 can appropriately refer to the national standards in either mathematics or science. Please select the standards that you would like to refer to when making your responses to the statements in question 10.

- ○ Mathematics Standards - National Council of Teachers of Mathematics (NCTM)
- ○ Science Standards - National Research Council & American Association for the Advancement of Science (NRC/AAAS)

10. The below statements may refer to the national standards in either mathematics or science. Please select a response for each statement that reflects your opinion.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
I am knowledgeable and can explain the *standards* to my colleagues	○	○	○	○	○
The *standards* have been thoroughly discussed by the teachers	○	○	○	○	○
There is an effort to make changes inspired by the *standards* in my school or district	○	○	○	○	○
Teachers have implemented the *standards* in their teaching	○	○	○	○	○
District instructional leadership personnel are well informed about the *standards*	○	○	○	○	○
The principals in this district are well informed about the *standards*	○	○	○	○	○
The school board is well-informed about the *standards*	○	○	○	○	○
Parents in this district are well-informed about the *standards*	○	○	○	○	○

Mathematics and/or science professional development <u>offered by the district</u> is based on the *standards*	○	○	○	○	○
The *standards* inform how science/mathematics teachers are evaluated	○	○	○	○	○

◄ Back Next ►

Banilower,E., Boyd,S., Pasley, J. Weiss, I. <u>Lessons from a Decade of Mathematics and Science Reform</u>, Horizon Research, Inc. Chapel Hill, NC. 2006

AMSP 2006-07 District Needs Survey (v. E)

Section IV - Data Sources Informing Your Responses

11. We are interested in knowing the sources of data that educators use when identifying their schools' or districts' needs and the issues that impact instruction. Please tell us which potential sources of information listed below informed your responses to the questions in sections I, II and III above.

	Yes	No
Personal experience/knowledge	○	○
High school graduate data (rate of college attendance, need for remedial programs, etc)	○	○
Program Improvement Reviews (PIRs)	○	○
State testing data	○	○
Data that came from development work for a PEP proposal	○	○
Student surveys/feedback	○	○
Adequate Yearly Progress (AYP) reports	○	○
Feedback from college or university	○	○
School improvement planning process	○	○
Higher level course enrollment figures	○	○
Teacher surveys/feedback	○	○

12. Please select the data source that you used most often when responding to the questions in sections I, II and III.

Please select one ...

AMSP 2006-07 District Needs Survey (v. E)

Section I - Professional Development Needs for Your School and District

6. To help us better understand the needs of your school and district please rate the below needs. These were indicated as needs of AMSP partners within Program Improvement Reviews (PIRs), Partnership Enhancement Project (PEP) Proposals, School Improvement Plans, etc. Please give your opinion concerning the priority level of each.

	Major Need - Highest Priority	High Need - High Priority	Somewhat of a Need - Medium Priority	Minor Need - Low Priority	No Need - Not a Priority	Not Applicable - No Opinic
Eliminating academic gaps based on subgroup achievement	○	○	○	○	○	○
Using differentiation strategies in the classroom	○	○	○	○	○	○
Using instructional strategies that are consistent with standards-based practices	○	○	○	○	○	○
Designing and implementing standards-based assessment strategies	○	○	○	○	○	○
Using technology in instruction	○	○	○	○	○	○
Increasing higher level course enrollment	○	○	○	○	○	○
Improving math and/or science school leadership	○	○	○	○	○	○
Increasing parent involvement	○	○	○	○	○	○
Aligning curriculum to standards	○	○	○	○	○	○
Improving content knowledge	○	○	○	○	○	○

◂ Back Next ▸