ESUCC
Professional Development Committee Meeting
Wednesday, October 14, 2015, 8:30 AM
Country Inn & Suites 5353 N 27th Street Lincoln, NE 68521, 6949 South 110th Street, LaVista, NE 68128

Attendance Taken at 8:28 AM.

Allen ESU 19:	Present
Gegg ESU 05:	Present
Jeff West (NE):	Present
Dr Kraig Lofquist:	Present
Tedesco ESU 11:	Present
Ted DeTurk (ESU 02):	Present
Dr Larianne Polk (ESU 07):	Absent

1. Call to Order
2. Roll Call
3. Agenda Item

3.1. September PDO

3.2. NWEA Stats

3.3. i3 Development Grant: Fostering Connections in Education

3.4. Approve NCSA/ESUCC BlendEd Learning Pilot Project

3.5. EAP Advisory

3.6. Instructional Delivery Action Plan

3.7. MSP Math Grant

3.7.1. NMPDS

4. Next Meeting Agenda Items
5. Executive Session

6. Adjournment

{{Name: Agenda Item Name}}
{{Discussion: Agenda Item Discussion}}
{{Comments: Agenda Item Comments}}
{{Actions: Agenda Item Actions}}

- PROJECT SUMMARY -

Nebraska's "Fostering Connections in Education" i3 Grant Proposal

Type of Grant: U.S. Department of Education's *"Investing in Innovation"* (i3) Fund
"Development" Grant Competition Category (CFDA: 84.411C)

Absolute Priorities: - Leveraging Technology to Support Instructional Practice and Professional Development
- Serving Rural Communities

Applicant: Educational Service Unit Coordinating Council (ESUCC)
(*Supporting Novice i3 Applicant*, requesting *Competitive Preference Priority*)

Grant Amount: $6 Million ($3 Million Federal Funds and $3 Million Private-Sector Matching Funds)

Time Table:

- 5 Year Proposed Project, beginning January 1, 2016
- Grant Awards announced by December 31, 2015
- Full Application due August 11, 2015
- ✓ Highly Rated Pre-Application approved June 24, 2015; followed by Full Application Invitation
- ✓ Pre-Application submitted May 5, 2015
- ✓ Abstract submitted April 17, 2015

Overall Goal: To promote continuity of instruction and academic achievement for systems-involved children and youth through the cross-systems sharing of "real time" student-level information, prudent data use, and collaborations between educators, child welfare and juvenile/criminal justice professionals, and behavioral health care providers.

Population Served: Systems-involved students include any school-age child or youth involved or at risk of becoming involved in the child welfare, juvenile/criminal justice, or behavioral health system. This encompasses approximately one-third (100,000) of all Nebraska students, including those who are State or court wards. These students represent the "neediest of the needy" and most at risk academically.

Systems-involved students generally fare worse than all other sub-populations across a variety of academic indicators. A recent statistical study found there is twice the incidence of disabilities eligible for special education among Nebraska State wards compared to their non-ward peers. There is also a strong prevalence of mental health and substance abuse diagnoses, with six times the percent of State wards having an emotional disturbance disability. State wards are absent nearly twice the number of school days as non-wards. The percent of State wards scoring "below the standards" on Nebraska State Accountability (NeSA) tests in Math, Reading, Writing, and Science is twice that of non-wards. The percent of State wards graduating from high school is half that of non-wards, with over four times the percent of wards dropping out of school.

Systems-involved children and youth frequently undergo multiple transitions in the midst of significant personal trauma and upheaval, including changes in residential placement, school of attendance, and legal status. The percent of State wards who are highly mobile (changing schools two or more times a year) is six times higher than non-wards. When out-of-home placement results in a change in schools, these students often fall farther and farther behind academically, and may become lost and slip between the cracks of the various systems meant to serve them. The challenges they face are further exacerbated in rural areas which often lack a comprehensive array of residential and community-based programs. Appropriate placements and specialized services may be significant distances from home, sometimes even several states away.

Project Overview: While the child welfare, juvenile/criminal justice, behavioral health and education systems are all deeply committed to ensuring the safety, health and well-being of the children and youth they serve, each operates independently of the others. This often results in delayed communication and notifications, omissions of critical information being shared, inefficient and ineffective service delivery, and loss of continuity in the student's education.

Nebraska's *"Fostering Connections in Education"* Initiative was established in 2011, to improve continuity of instruction and academic outcomes for systems-involved students through school stability and cross-systems information sharing. Schools are in the unique position of being the one constant system intended and specifically designed to continually serve all school-age children and youth until they near or reach adulthood. To effectively serve all students, including those most at risk, the education system must be cohesive across multiple systems. Toward that end, the Nebraska Department of Education (NDE) and ESUCC have collaborated with the Nebraska Supreme Court, Nebraska Department of Health and Human Services, Nebraska Commission on Law Enforcement and Criminal Justice, State Office of Probation Administration, Nebraska Foster Care Review Office, and Nebraska Department of Correctional Services to establish the proposed i3 grant project's overall goal, project design, and objectives. Only through the continued commitment and diligence of all the systems involved, can a comprehensive, cohesive framework for deliberate, defined, and timely information sharing and prudent data use be established.

Student-level information is the most private and sensitive data open for misuse. Several national research models, as well as State and local level programs, have contributed to Nebraska's knowledge of "promising practices" in the cross-systems information sharing arena which, in and of itself, represents highly complex legal, political, policy, security, privacy and technical challenges. Nebraska's *"Fostering Connections in Education"* State Team is tasked with addressing these inherent intricacies through the development of an information sharing blueprint at each primary decision point between the respective systems. The existing collaboration between the "systems partners" noted earlier provides a solid foundation for development and perpetuation of a trusted data infrastructure to effectively meet those challenges.

In 2013, Nebraska entered a no-cost license agreement with the Michael and Susan Dell Foundation to adopt the Ed-Fi® data standard as the basis for a statewide student data dashboard. The Nebraska ADVISER *(Advanced Data Views Improving Student Educational Response)* dashboard provides a web-based view of student and staff information, allowing educators a quick and easy way to personalize instruction and make data-driven decisions. The *"Fostering Connections in Education"* project builds upon the Ed-Fi® data infrastructure currently being implemented in Nebraska schools with the addition of necessary connections to existing external data platforms which provide portals to relevant child welfare and juvenile/criminal justice databases.

This innovative federation of multiple data systems will make possible secure and protected access to appropriate "real-time" student-level data, with a set of visualization applications which can be tailored to the unique needs of the child, the educator, and the respective system. Its security and privacy controls allow each external system to share information while maintaining direct control over access and use. Trusted data security and privacy control systems will manage the identity and locations of students across schools and placements, with timely notification of critical events and transitions. Parental permissions and court orders authorizing more extensive information to be shared, when necessary and appropriate, can also be systematized. Proper access and prudent use of information will be reinforced through professional development and micro-certification of educators, child welfare and juvenile/criminal justice professionals, and behavioral health care providers.

Primary Objectives and Activities:

- *Policies, Process and Protections:* Collaboratively establish necessary legal, policy, process, and protection mechanisms needed for information sharing across the respective systems.
- *Information Sharing and Visualizations:* Collaboratively determine the information sharing "map", system of record, and intended data use. Design and develop visualizations customized to each system's respective role and responsibilities at primary decision points.
- *Trusted Infrastructure:* Collaboratively define requirements for data security, privacy, control, and audit. Design and develop a trusted data infrastructure, with the necessary connections to external data platforms.
- *Professional Development:* Collaboratively develop and provide sustained professional development, with micro-certifications established within each respective system to ensure student-level data is properly accessed, prudently used, securely maintained, and vigilantly protected.
- *Pilot Projects:* Collaboratively identify and implement multi-systems pilot projects at three rural sites.
- *Evaluation and Validation:* Collaborate with an independent evaluator to define the research process, outcome measurements, analysis, and validation. Conduct an independent evaluation and monitor the pilot projects.

Special Project Features: Nebraska is part of the Multi-State Technology Collaborative (MSTC), consisting of Arizona, Colorado, Delaware, Georgia, Illinois, Kansas, Nebraska, New Jersey, Oklahoma, and Wisconsin. The purpose of the MSTC is to develop and deploy multiple large-scale technology solutions to improve data use among educators and policymakers with minimized cost to the U.S. Department of Education and individual states, while maximizing standardization, common functional requirements, usability, sustainability, and viability of deliverables across states. The Ed-Fi® data standard, on which the proposed i3 grant project is based, is licensed by 26 states to date. Nebraska's *"Fostering Connections in Education"* grant proposal has potential application for multi-systems connections across state lines as well as national adoption.

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2015-16
(10-7-15)

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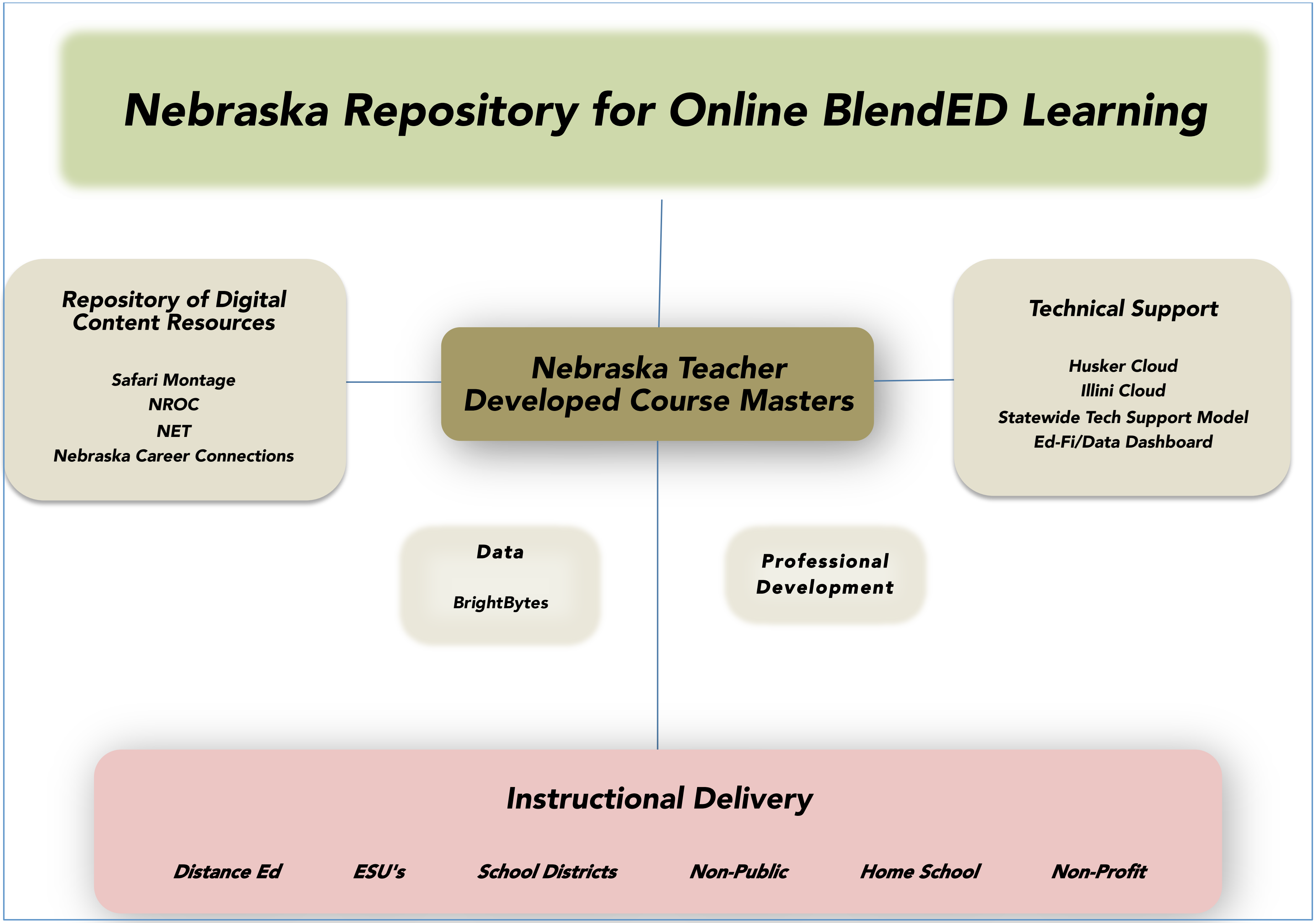
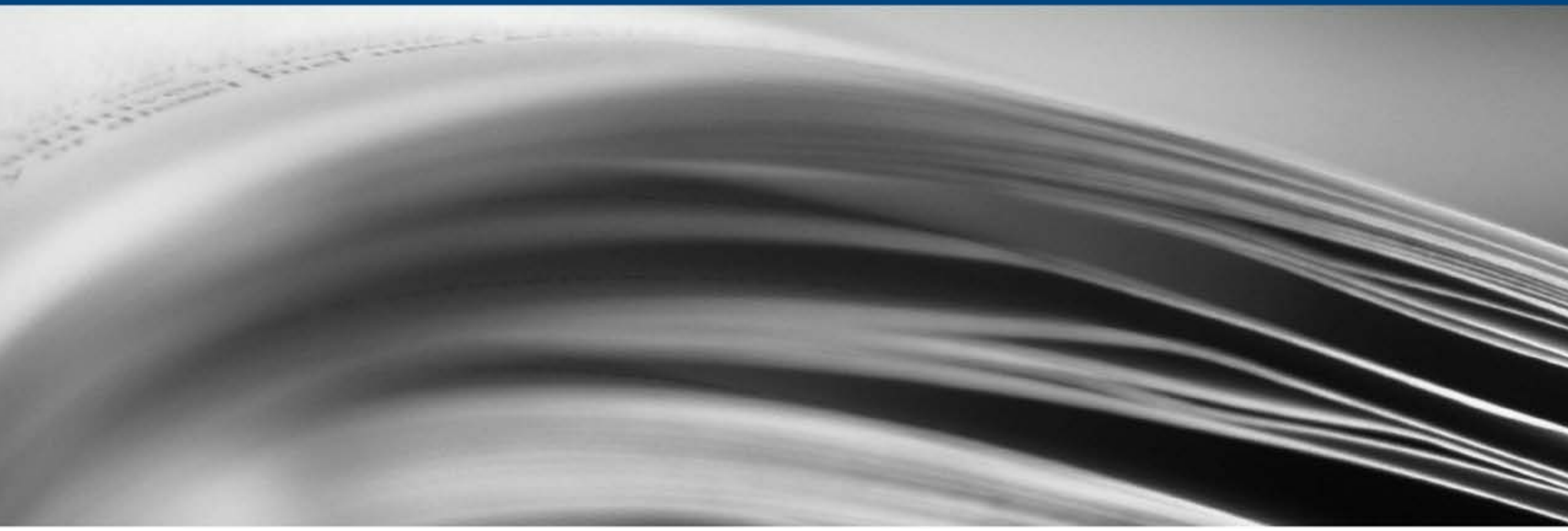

Nebraska Repository for Online BlendED Learning
Repository of Digital Content Resources
Safari Montage
NROC
NET
Nebraska Career Connections
Nebraska Teacher Developed Course Masters
Technical Support
Husker Cloud
Illini Cloud
Statewide Tech Support Model
Ed-Fi/Data Dashboard
Data
BrightBytes
Professional Development
Instructional Delivery
Distance Ed
ESU's
School Districts
Non-Public
Home School
Non-Profit



NEBRASKA STATEWIDE MATHEMATICS AND SCIENCE PARTNERSHIP PROGRAM –
NEBRASKA MATHEMATICS PROFESSIONAL DEVELOPMENT SERIES 2014-2015

EVALUATION REPORT

PREPARED FOR:
EDUCATIONAL SERVICE UNIT COORDINATING COUNCIL
6949 SOUTH 110TH STREET
OMAHA, NE 68128

SEPTEMBER 2015

RMC RESEARCH

NEBRASKA STATEWIDE MATHEMATICS AND SCIENCE PARTNERSHIP PROGRAM –
NEBRASKA MATHEMATICS PROFESSIONAL DEVELOPMENT SERIES
2014-2015

EVALUATION REPORT

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SEPTEMBER 2015

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and is funded through the Nebraska Department of Education funds from
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Executive Summary

Beginning in June 2013, the Nebraska Mathematics Professional Development Series (NMPDS) operated by Educational Service Unit Coordinating Council (ESUCC) began a 3-year project period to provide professional development services to teachers in grades 3-12 throughout the state of Nebraska in mathematics content and pedagogical content knowledge to elementary teachers in grades 3-6 through the Elementary Mathematics Academy (EMA) and secondary teachers in grades 7-12 through the Middle School/High School (MS/HS) Institute. This year enrollment was limited to no more than 100 participants in each of the two sections of NMPDS and was offered at three locations for EMA and three locations for MS/HS Institute, often at the same time. A long-distance satellite station was provided for both EMA and MS/HS Institute participants in Scottsbluff, NE during the academic year and in conjunction with the Kearney sessions.

This evaluation report covers the activities during the period of October 2014 through June 2015.

Findings

- **NMPDS participants rated the topical emphasis of professional development activities between moderate and great emphasis in three connected areas.** *Mathematics content, mathematics pedagogy/instruction, and integrating informational technology in mathematics* were rated the highest topical emphasis with results 3.39 and 4.15 on a 5-point scale. Some participants felt this year concentrated on increasing their own content knowledge.

- **Over 45% of the EMA participants demonstrated a statistically significant gain in the overall content knowledge.** Of the 44 EMA participants who completed both the pretest and posttest, 39% had a significant gain on the Number Concept and Operations subscale and 39% had a significant gain on the Geometry subscale.

- **Over 56% of the MS/HS Institute participants demonstrated a statistically significant gain on the overall content knowledge assessment.** Of the 59 participants who completed both the pretest and posttest, 59% showed a significant increase on the Patterns, Functions, and Algebra subscale and 47% had a statistically significant increase on the Geometry subscale.

- **Native American Workshop (WS) Participants showed statistically significant growth on all four of the subscales on Mathematical Practices with very large effect size.** The Wilcoxon Signed Ranks Test were conducted to examine differences over time on the four subscales of teacher knowledge on mathematical practices, preparedness to implement mathematical practices, comfort level in helping students develop mathematical practices, and preparedness to assess students' ability to apply mathematical practices.

- **After NMPDS activities, participants indicated they were very confident in their overall confidence in their mathematical knowledge at a statistically significant increase prior to attending NMPDS professional development activities.** Prior to participation, confidence in teaching was rated moderately confident and very confident**.** At the conclusion of activities, participants rated their change to very confident.

- **Teacher ratings of preparedness to teach mathematics increased after participation in NMPDS activities.** Participants indicated they were moderately prepared prior to NMPDS activities in the two subscales (Preparedness to Teach Mathematics and Preparedness to Meet the Needs of All Students) and were closer to well prepared at the conclusion of the activities.

- **NMPDS participants indicated their participation in professional development activities moderately influenced their teaching ability.** Native American WS participants more often said the program moderately impacted their teaching ability. As a whole group, teachers reported that NMPDS had the greatest impact on their ability to apply mathematical practices to classroom instruction.

- **NMPDS participants showed changes in philosophy regarding traditional and progressive teaching and learning statements.** NMPDS participants decreased their level of agreement with all six traditional statements at statistically significant levels. Ratings of agreement by NMPDS participants on each of the four progressive teaching statements increased at statistically significant levels with effect sizes of small to very large.

Recommendations for Year 3 of Grant

1. **Communication is key to the success of the grant.**

2. **Establish procedures to allow instructors and participants to know their responsibilities for the sessions.**

3. **Consider incorporating networking activities that are grade span specific.**

INTRODUCTION

This section provides background information about the Nebraska Mathematics Professional Development Series project along with a logic model that provides a visual representation of key project components and outcomes.

BACKGROUND

In January 2002, the No Child Left Behind Act (NCLB) became law. Title II, Part B authorized state Mathematics and Science Partnership (MSP) competitive grant programs to encourage institutions of higher education (IHEs), local school districts, elementary schools, and secondary schools to participate in professional development activities that increase the subject matter knowledge and teaching skills of mathematics and science teachers. The grant program called for professional development activities that were:

- Sustained;
- Intensive;
- Classroom focused; and
- Aligned with state and local standards and with mathematics and science curricula.

The activities undertaken by grantees were expected to show demonstrable and measurable improvement in student academic achievement in mathematics and science. Core partners in these grants were to include mathematics, science, and/or engineering departments from IHEs, including community colleges. Partnerships of IHEs, K-12 districts, and other stakeholders would draw upon the strong disciplinary expertise of the mathematicians, scientists, and engineering faculty from IHEs to design professional development activities that affect improvements in student outcomes by providing K-12 teachers with strong mathematics and/or science content knowledge.

The Nebraska Department of Education (NDE) selected two projects to operate statewide under Title II B, MSP program: the NMPDS and Science: Keep Improving Content Knowledge and Skills (KICKS).

THE NEBRASKA MATHEMATICS PROFESSIONAL DEVELOPMENT SERIES

Beginning in June 2013, NMPDS, operated by the ESUCC, began a 3-year project to provide professional development services to K-12 teachers throughout the state of Nebraska in mathematics content and pedagogical content knowledge. NMPDS offered two distinct branches of professional development to meet the needs of different grade level teachers: EMA for Grades 3-6 and MS/HS Institute for Grades 7-12.

NMPDS OBJECTIVES

The project objectives reflect the needs identified by teachers surveyed through the statewide needs assessment administered in October 2009. The NMPDS objectives are as follows:

1. Provide content-focused professional development training in number sense, algebra, geometry/measurement, and data analysis/probability for elementary, middle and high school teachers that integrates technology as a tool into the content area of mathematics and aligns with Nebraska State Mathematics Standards/Common Core through collaborative partnerships.

2. Model and implement research-based instructional strategies using math content examples with the teachers, so they are confident with the implementation of strategies into their classroom.

3. Establish effective professional learning communities (PLCs) with Teacher Leaders of Math (TLM).

4. Utilize myeLearning as an internet-based Learning Management System (LMS) for communication and repository of resources.

5. Build a collaborative statewide network of educators to provide outreach and on-going professional development regarding mathematics knowledge and skills.

6. Recruit teachers who do not meet the NCLB requirements as highly-qualified teachers to participate in professional development. Involve schools not meeting federal and/or state accountability student achievement status for mathematics.

Logic Model

Exhibit 1 presents a logic model that reflects hypotheses about the relationship between NMPDS activities and outcomes. The model illustrates that NMPDS components are expected to have impacts on participating teachers and lead teachers, which in turn leads to impacts on participating schools. The model also indicates that within participating schools, improvements in teacher knowledge are expected to affect practice, which, in turn, affects student achievement outcomes.

Report Organization

This evaluation report covers the program period of October 2014 through June 2015. The methodology section describes specific questions and methods for this evaluation. Following the methodology are findings which present information about:

- NMPDS professional development activities;
- Development of teacher content knowledge;
- Impact on classroom practice;
- Establishing effective PLCs and building a collaborative statewide network of educators; and
- Facilitators and barriers.

The final section provides conclusions and recommendations.

Exhibit 1. NMPDS: Mathematics and Science Partnership Project Logic Model (2013-2016)

NMPDS Components

Middle/High School Institute (7 sessions at 3 sites across state October through June; utilize Teacher Leaders in Mathematics (TLM) as facilitators during and between sessions)

Elementary Math Academy (7 sessions at 3 sites across the state; TLM during and between sessions)

Professional Learning Communities (community of learners who meet during institute and use myeLearning as a reflection/discussion mechanism between training sessions)

Enhancements (In-depth study of select content areas, L to J Content Growth Analysis)

ESU Mathematics Professional Development Team (ESU Cadre members and TLM from 17 ESUs)

Math Champions (Database with contact person in each NE school building to receive math info/resources)

Statewide MSP Committee (Conduct statewide needs assessment, evaluation, and grant oversight)

NMPDS Participation

Chadron State College (Mathematics Education) and Wayne State College (Mathematics) and University of Nebraska-Omaha – Assist in planning and design of institutes, coordinate college credit.

K-12 Partner Districts – Provide use of facilities, release time for participants, access to computer network, and access to student achievement data.

ESUCC Administrative support, fiscal agent.

ESU Cadre Team – Site facilitators, recruit teacher leaders and workshop participants, market opportunities, designate monetary support.

Nebraska Association of Teachers of Mathematics (NATM) – Mathematics content and pedagogical expertise, joint sponsor of state math conference, sustain efforts.

Nebraska Department of Education – Assist in statewide planning and coordination, alignment with NE Standards, alignment with HOUSSE criteria, provide technical assistance to project, and monitor program.

K-12 Partner School Outcomes

Institutional Outcomes
Alignment of mathematics experiences with NE Standards and college requirements and demands, attainment of NCLB Teacher Quality requirements, creation of Professional Learning Communities and teacher leaders, enhanced professional development offerings, changes in policies and practices.

Teacher Knowledge

Content
- Number sense
- Algebra
- Geometry/Measurement
- Data Analysis/Probability
- NE State mathematics standards

Pedagogy
- Common Core Standards for Mathematical Practices
- Emphasize application of mathematics content with students.
- Focus on problem solving
- Target special student populations, such as limited English proficiency

Teacher Practice
- Participate in network of mathematics educators for leadership development.
- Address the appropriate use and integration of technology and STEM connections.
- Increase use of effective research-based instructional strategies.

Student Change Achievement
- NeSA mathematics scores
- National norm- and criterion-referenced tests
- ACT scores
- District assessments

Participation
- Increase in mathematics course enrollment.
- Increase of participating students from under-represented groups.

Institutional Context (e.g., institutional structures and incentives, coordinating activities, support for teacher selection and participation, examination of policy and practice.)

METHODOLOGY

This section of the report identifies questions used to guide the evaluation, along with data used for analysis and the analysis techniques.

EVALUATION QUESTIONS

Exhibit 2 contains a listing of questions that guided the evaluation process.

EXHIBIT 2. NMPDS EVALUATION QUESTIONS

NMPDS Evaluation Questions
1. To what extent has NMPDS met its articulated goals? *To what extent does NMPDS . . .*
a. provide content-focused professional development that integrates technology as a tool?
b. model and implement research-based instructional strategies?
c. align activities with Nebraska State Mathematics Standards (and Common Core State Standards, as appropriate)?
d. establish effective PLCs?
e. build a collaborative statewide network of educators to provide ongoing professional growth and support?
f. recruit teachers who do not meet the NCLB requirements as highly qualified and further their designation as highly qualified?
g. involve schools not meeting federal and/or state accountability student achievement status for mathematics?
2. To what extent does participation in NMPDS activities enhance teachers' mathematics content and pedagogical content knowledge?
3. To what extent does participation in NMPDS activities enhance teachers' levels of confidence, comfort, and preparedness to teach mathematics?
4. What factors impede or facilitate progress toward NMPDS goals?
5. What progress has been made toward sustaining and "scaling up" NMPDS activities and strategies?

For this report, all questions are answered through data analysis. Findings in the report are based on pre- and post-Academy and/or Institute data collected from pretest and posttest content knowledge inventories during the 2014-2015 school year; retrospective pretest and posttest Teacher Survey[1], as well as participant focus groups, project staff interviews, and a limited number of NMPDS professional development observations.

[1] A retrospective pretest/posttest survey is designed to collect pretest data at the same time as the posttest data. For each item in the survey, respondents rate themselves twice: first, as they would prior to their participation in the professional development, and second, as they would at the current point in time.

QUALITATIVE DATA

Professional Development Activity Observations, Focus Groups, and Interviews. Data for this report were collected from participants during onsite professional development observations to:

- EMA Distance Learning Session 3 in Scottsbluff, Nebraska on January 23, 2015;
- MS/HS Institute Distance Learning Session 3 in Scottsbluff, Nebraska on January 23, 2015;
- EMA Session 5 in Kearney, Nebraska on March 16, 2015;
- MS/HS Institute Session 5 in Kearney, Nebraska on March 16, 2015;
- EMA Session 5 in Norfolk, Nebraska on March 17, 2105;
- MS/HS Institute Session 5 in Norfolk, Nebraska on March 17, 2015;
- MS/HS Institute Session 5 in Omaha, Nebraska on March 18, 2015;
- Native American Workshop (WS) Participants Session 2 in Wakefield, Nebraska on March 19, 2015; and
- Combined EMA and MS/HS Institute Session 6 - 7 in Kearney, Nebraska on June 2-3, 2015.

During the onsite visits, RMC Research staff conducted focus groups with randomly selected participants. They also observed and scripted the professional development sessions provided by instructors and key personnel for the project. RMC analyzed the data for trends that could provide insights into progress toward the MSP project goals. Interviews were conducted with the project director, course instructors, and other key personnel at the end of sessions. Qualitative data included in this report are summarized in Exhibit 3.

EXHIBIT 3. SUMMARY OF FOCUS GROUP AND OBSERVATION DATA

Focus Groups	Observations
EMA	**EMA**
Scottsbluff • January 23, 2015 (3 participants) • 2 Participants new to NMPDS grant program.	Scottsbluff • January 23, 2015 • 4 participants
Kearney • March 16, 2015 (9 participants) • All participated in previous NMPDS grants	Kearney • March 16, 2015 • 9 participants
Norfolk • March 17, 2015 (9 participants) • 2 Participants new to NMPDS grant program	Norfolk • March 17, 2015 • 9 participants

Focus Groups	Observations
MS/HS Institute Scottsbluff • January 23, 2015 (3 participants) • 1 participant new to NMPDS grant program	**MS/HS Institute** Scottsbluff • January 23, 2105 • 12 participants
Kearney • March 16, 2015 (8 Participants) • 2 participants new to NMPDS grant program	Kearney • March 16, 2015 • 20 participants
Norfolk • March 17, 2015 (12 participants) • 2 participants new to NMPDS grant program	Norfolk • March 17, 2015 • 18 participants
Omaha • March 18, 2015 (7 participants) • 3 participants new to NMPDS grant program	Omaha • March 18, 2015 • 18 participants
Native American WS Wakefield • March 19, 2015 (10 participants) • 2 participants new to NMPDS grant program	**Native American WS** Wakefield • March 19, 2015 • 10 participants
	Combined EMA and MS/HS Institute • June 2-3, 2015 • Approximately 95 participants

QUANTITATIVE DATA

Teacher Content Knowledge Assessments. All NMPDS participating teachers were asked to complete a relevant content knowledge assessment. The Mathematics Knowledge for Teaching (MKT)[2] assessments are well-established instruments with several content strands to choose from in order to closely match program requirements. The various instruments have undergone rigorous testing and have produced data that is valid and reliable. The MKT instruments were designed to measure content knowledge and pedagogical content knowledge, necessary components for effective mathematics teaching. The EMA content knowledge assessment was composed of items from two MKT forms, Spring 2006 EQ-NCOP and Winter 2008 Geometry. The items asked questions about number concepts and operations and geometry. The MS/HS Institute content knowledge assessment included items from three MKT forms: Winter MS-2006, Winter GEO-2008, and Winter PDS-2008. These items focused on patterns, functions, and algebra; geometry; and data, probability, and statistics. Since the assessments were hybrids combining items from several forms, the scores could not be transformed into IRT scores like in previous

[2] Hill, H.C., Schilling, S.G., & Ball, D.L. (2004). Developing measures of teachers' mathematics knowledge for teaching. *Elementary School Journal, 105*, pp. 11-30.

years because whole scales were not used. Therefore, the number of items correct and the percentage correct were used for this year's analysis.

Paper copies of these assessments were administered as a pretest at the first sessions for EMA and MS/HS Institute, and as a posttest at the conclusion of the school year activities. The number of correct responses was compared over time from pretest to posttest. Of the 46 enrolled EMA participants, 46 completed both a pretest and posttest for a response rate of 100%. Of the 70 enrolled MS/HS Institute participants, 68 completed both a pretest and posttest for a response rate of 97%.

The Native American Workshop participants completed a pretest on Standards for Mathematical practices during their first session in February rather than the content assessments given to EMA and MS/HS Institute participants. The post assessment was completed at the end of the professional development sessions. The assessment covered teachers' knowledge about mathematical practices, preparedness to implement mathematical practices, the teachers' level of comfort in helping students develop mathematical practices, and teachers/ preparedness to assess students' ability to apply mathematical practices. Both the knowledge and preparedness items were rated using a 4-point scale, where 1 = not very, 2 = somewhat, 3 = quite, and 4 = very. Teachers' ratings of assessment items were compared over time from pretest to posttest. Fourteen of the 15 participants in the Native American Workshop completed both the pretest and posttests for a response rate of 93%.

The internal reliability of the scaled items from the Teachers of Native American Students Assessment was assessed using Cronbach's Alpha.[3] As seen in Exhibit 4, the findings from the reliability analysis showed that subscales had acceptable Cronbach's Alphas of .78 or greater.

EXHIBIT 4. TEACHERS OF NATIVE AMERICAN STUDENTS ASSESSMENT SUBSCALE RELIABILITY ANALYSIS

Construct Being Measured	Number of Items	Cronbach's Alpha
Knowledge about Mathematical Practices	8	.824
Preparedness to Implement Mathematical Practices	8	.848
Comfort Level in Helping Students Develop Mathematical Practices	8	.937
Preparedness to Assess Students' Ability to Apply Mathematical Practices	8	.951

Teacher Surveys. NMPDS participating teachers were asked to complete a retrospective pretest/posttest-Teacher Survey at the conclusion of the EMA, MS/HS Institute, and Native American Workshop sessions. The same instrument was used for all three groups. For EMA, 33 out of 46 participants (72%) across all locations completed the Teacher Survey at the end of their last session in June 2015. Of the 69 participants in the MS/HS Institute, 53 participants (77%) completed the Teacher Survey at the end of the last combined session in June 2015. Thirteen of the 15 (87%) participants in the Native American Workshop participants completed the Teacher Survey during the last session in June 2015. All teacher surveys were analyzed together to examine the impact of the NMPDS program as a whole, and they also were analyzed separately to see if the participants in the three different groups reported different changes.

[3] Cronbach's alpha (α) is a measure of the reliability or internal consistency of a composite measure or scale that is based on multiple survey items. Values range from 0 to 1.

The Teacher Survey included questions about participant's educational background, teaching certification, and teaching experience. Teachers were asked to rate on a 5-point scale, where 1 = no emphasis, 3 = moderate emphasis, and 5 = complete emphasis, the degree specific topics were emphasized during the professional development activities in which they participated. The survey contained questions assessing teacher opinions regarding effective mathematics instruction and learning that were rated on a 5-point scale where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. Questions regarding teacher preparedness to utilize several instructional strategies and to instruct students with diverse needs were rated on a 5-point scale where 1 = not well prepared, 2 = somewhat prepared, 3 = moderately prepared, 4 = well prepared, and 5 = very well prepared. Teachers also were asked to rate their confidence in their mathematical knowledge using a 5-point response scale, where 1 = not confident, 2 = somewhat confident, 3 = moderately confident, 4 = very confident, and 5 = extremely confident.

The Teacher Survey items have been analyzed in previous years for construct validity; thus, the internal reliability of the scaled items was confirmed using Cronbach's alpha. Scales and subscales with acceptable reliability were retained for the analysis. Exhibit 5 presents the reliability results for scaled items with internal reliability greater than .70. The survey section about opinions regarding effective mathematics instruction and learning was analyzed at the item level.

EXHIBIT 5. TEACHER SURVEY SUBSCALE RELIABILITY ANALYSIS

Construct Being Measured	Number of Items	Cronbach's Alpha
Overall Preparedness	**15**	**.923**
Preparedness to Teach Mathematics	10	.918
Preparedness to Meet Needs of All Students	5	.784
Confidence in Teaching	**4**	**.815**
Impact of NMPDS on Teaching Ability	**7**	**.940**

Exhibit 6 summarizes the number of completed assessments and completion rates for each assessment administered to EMA and MS/HS Institute participants.

EXHIBIT 6. NUMBER OF COMPLETED ASSESSMENTS

Assessment	Number of Completed Assessments	Completion Rate
EMA (*n* = 46)[4]		
Teacher Survey	34	72%
Pretest Content Knowledge Assessment	46	100%
Posttest Content Knowledge Assessment	46	100%
Pretest/Posttest Matched Pairs	*46*	*100%*
MS/HS Institute (*n* = 69)		
Teacher Survey	53	77%
Pretest Content Knowledge Assessment	69	99%
Posttest Content Knowledge Assessment	68	97%
Pretest/Posttest Matched Pairs	*68*	*97%*
Native American WS Participants (*n* = 15)		
Teacher Survey	14	93%
Pretest Content Knowledge Assessment	14	93%
Posttest Content Knowledge Assessment	15	100%
Pretest/Posttest Matched Pairs	*14*	*93%*

ANALYSIS

Retrospective pretest/posttest teacher survey data were analyzed using paired-samples *t* tests[5] to determine if any statistically significant changes occurred in teacher opinions or attitudes over time. Content knowledge data were analyzed using the U.S. Department of Education MSP supplied *t* test program to examine changes over time in teacher knowledge. Using Cohen's *d,*[6] effect sizes[7] were reported for any statistically significant differences revealed for the subscales and individual items analyzed using parametric statistics.

Survey forms were analyzed using descriptive statistics when appropriate. Statistical results presented in this report should be interpreted with some caution. While steps were made to reduce the probability of committing a Type 1 error (finding significant differences when there are no differences) by combining scale items when appropriate, this type of error increases with each analysis. Since there were numerous statistical analyses conducted for this report using *t* tests, programmatic decisions should be made only after triangulating findings.

Qualitative results were analyzed using data summaries and matrices, and analysis was undertaken using techniques and principles recommended by Miles, Huberman, and Saldaña (2013)[8] with data from focus group interviews, project staff interviews, and observations provided to complement the analysis where appropriate.

[4] *N* is the total number in a sample. *n* is the number in a subsample.
[5] A *t* test is a statistical procedure that commonly used to examine differences in mean values over time or across two groups.
[6] Cohen's *d* is a measure of effect size, designed to measure the magnitude of treatment effect. Traditionally these effect sizes are measured as "small, *d* = .2," "medium, *d* = .5," and "large, *d* = .8."
[7] Effect size (ES) is a name given to a family of indices that measure the magnitude of a treatment effect, represented by differences in outcomes across groups. Unlike significance tests, these indices are independent of sample size.
[8] Miles, Huberman, and Saldaña (2013). *Qualitative data analysis: An expanded sourcebook (3rd ed).* Thousand Oaks, CA: Sage.

FINDINGS

This section presents a summary of findings based on evaluation data collected from October 2014 through June 2015. NMPDS professional development activities are presented first including findings from Teacher Surveys indicating topical emphasis of NMPDS professional development activities. Next, findings related to the analysis of change in NMPDS teachers' mathematics content knowledge over time in addition to an analysis of Teacher Survey data to identify teacher perceptions regarding confidence in mathematics knowledge are presented. An analysis of how mathematics learned through NMPDS activities was transferred into participants' classrooms is included using findings from Teacher Survey and participant focus groups. Next, the extent to which NMPDS activities fostered interaction among mathematics teachers, which contributed to effective PLCs and a collaborative statewide network of educators is presented along with participant ratings of professional interactions. The findings section concludes with a discussion of factors that facilitated and impeded progress.

NMPDS PROFESSIONAL DEVELOPMENT ACTIVITIES

NMPDS PROFESSIONAL DEVELOPMENT ACTIVITIES

Between October 2014 and June 2015, Nebraska teachers participated in a variety of professional development experiences in mathematics as part of the NMPDS activities. Both EMA and MS/HS Institute offered five sessions spaced throughout the academic school year at three sites for both the EMA and the MS/HS Institute around the state. Participants were assigned to attend the site closest to their school district to assist in keeping the number of participants relatively equal at each of the sites and the cost of travel at a minimum. A distance learning option was held in Scottsbluff for the five content sessions in cooperation with the Kearney dates. The final sessions in June 2015 required physical attendance in Kearney with all of the other participants.

NMPDS also had the opportunity to apply for extra funds from NDE for additional workshops. Eight sessions were held, three sessions in Wakefield and five sessions in Norfolk, for Native American WS participants between February and June 2015. These sessions concentrated on applying Standards of Mathematical Practices using K-12 content to illustrate the various practices.

No more than 100 participants for either EMA or MS/HS Institute were to be accepted to participate during the year from the applicants. Each participant needed to adhere to established criteria of schools not meeting federal and/or state accountability student achievement status for mathematics, which included adequate yearly progress (AYP), free and reduced lunch (FRL), and low performing results on the Nebraska State Assessment (NeSA) mathematics test. Principals also needed to give written permission for those participants selected to attend the sessions, to which substitute teacher expenses would be reimbursed by the grant.

Each participant had seven hours of professional development for each of the five scheduled sessions for a total of 35 hours. BlendED Training sessions extended the professional development during June 2-4 in Kearney at Educational Service Unit (ESU) 10 for all participants for an additional 21 hours. Participants read various chapters from NCTM's book *Principles to Actions* and reflected online how the implemented principles affected their classroom and their instruction for an additional 5 hours (1 hour per session). Attendance at the NATM conference, September 14, 2015, added 8 more hours for a total of 69 hours offered during the 2014-2015 NMPDS professional development. Participants either implemented one or more of the activities into their classroom with their students or completed homework assignments during the academic school year sessions for the remaining 15 hours of the required 84 hours.

The Native American Workshop held three sessions during the school year for seven hours per session. Each of these sessions required an additional hour of reading and reflection around sections from *Principles to Actions* as well as two hours to implement one of the activities into their classroom. The summer sessions in June were for five days at eight hours per day. Four of those evenings required approximately two hours of reading, web site research and problem solving. Each participant is also expected to attend the NATM conference for an additional 8 hours of professional development.

The sites, dates, and number of participants for all NMPDS activities are identified in Exhibit 7.

EXHIBIT 7. MATHEMATICS NMPDS PROFESSIONAL DEVELOPMENT ACTIVITIES

NMPDS Activity	Location	Institute Dates	Number of Participants
EMA	Kearney at ESU 10	October 9, 2014 November 17, 2014 January 23, 2015	14
	Distance learning at Scottsbluff	February 16, 2015 March 16, 2015 June 2-4, 2015 September 14, 2015	
EMA	Norfolk at Lifelong Learning Center	October 13, 2014 November 18, 2014 January 21, 2015 February 17, 2015 March 17, 2015 June 2-4, 2015 September 14, 2015	10
EMA	Omaha at ESU 3	October 15, 2014 November 6, 2014 January 16, 2015 February 19, 2015 March 19, 2015 June 2-4, 2015 September 14, 2015	22

NMPDS Activity	Location	Institute Dates	Number of Participants
MS/HS Institute	Kearney at ESU 10 Distance learning at Scottsbluff	October 10, 2014 November 13, 2014 January 23, 2014 February 16, 2014 March 16, 2014 June 2-4, 2015 September 14, 2015	40
MS/HS Institute	Norfolk at Lifelong Learning Center	October 9, 2014 November 11, 2014 January 21, 2014 February 17, 2014 March 17, 2014 June 2-4, 2015 September 14, 2015	12
MS/HS Institute	Omaha at ESU 3	October 15, 2014 November 6, 2014 January 16, 2015 February 19, 2015 March 18, 2015 June 2-4, 2015 September 14, 2015	17
Native American WS	Wakefield at ESU 1 Norfolk at Lifelong Learning Center	February 24, 2015 March 19, 2015 April 7, 2015 June 15 – 19, 2015	15

The theme for the 2014-2015 sessions was *Modeling the Eight Mathematical Practices Through Algebraic Thinking* with concentration in the focus areas of: Nebraska State Mathematics Standards and Standards for Mathematical Practices; content areas of algebra, geometry, data analysis, and probability; strategies to integrate science, technology, engineering, and mathematics (STEM) into the classroom; and development of mathematical concepts through problem solving, representation, reasoning, communication, and connections.

Attendance at the various locations varied throughout the year. Only 50% and 59% of EMA and MS/HS Institute participants, respectively, attended all of the scheduled sessions during the academic year for NMPDS. 87% of the Native American Workshop attended all of the sessions during the academic year. The BlendED sessions scheduled for June 2-4 yielded 91% of the combined EMA and MS/HS Institute participants in attendance, with more representation from the MS/HS Institute participants.

There were between 4 and 100 participants at the observed professional development sessions, with predominately more females in attendance. Each site set up the classroom with tables and chairs to accommodate four to five participants per table. Everyone could view the large group presentations and work with either a shoulder partner or across the table as a small, interactive group. Two instructors consistently facilitated all of the EMA sessions and two different instructors facilitated the MS/HS Institute sessions. One ESUCC person attended all of the NMPDS sessions and one ESU site person attended the sessions to address logistical concerns. The long-distance learning held in Scottsbluff was welcomed by the participants who would not have to travel a major distance to attend NMPDS sessions.

However, instructors did not ask them to participate in the discussion with the onsite group or the materials were not received in time, meaning the participants had to spend time copying the problems and devoting time to the solving and forthcoming discussions.

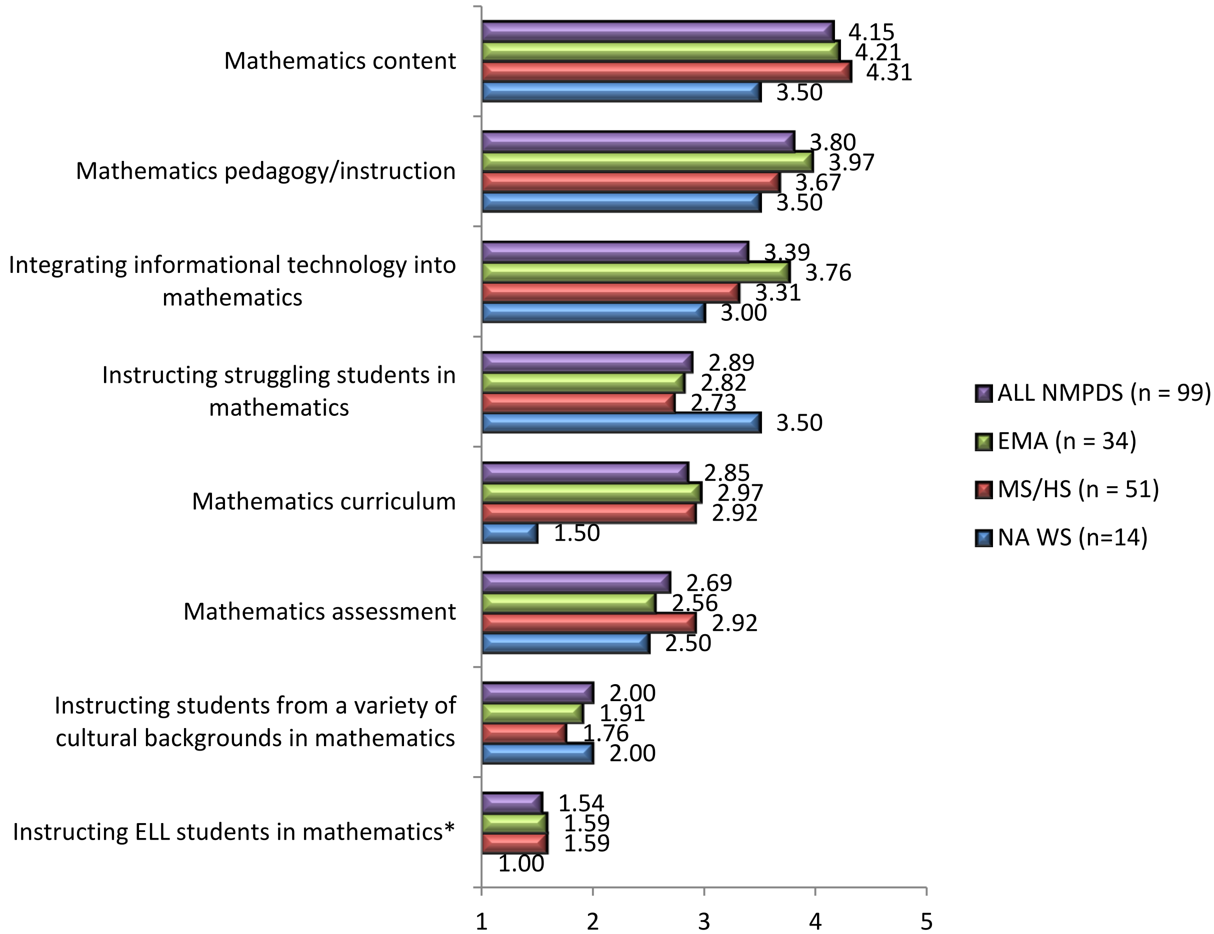
Each set of instructors at the EMA, MS/HS Institute, and Native American WS worked well together as a coherent and cohesive team who brought complimentary skills into the learning environment in order to provide learning opportunities for all participants. Instructors utilized a structured teaching approach that included presenting mathematics content, assigning tasks, and providing feedback. They also employed guided discovery and questioning strategies to facilitate and model implementation of activities into classrooms with students. Participants engaged regularly in a combination of whole class and small group collaborative learning opportunities that emphasized content-specific and developmentally appropriate classroom activities designed to enhance various curriculums and to illustrate a variety of different strategies and approaches to solve problems. The Standards for Mathematical Practices were illustrated and reinforced throughout the sessions as well as the interdisciplinary aspect of mathematics.

Participants who completed the Teacher Survey during the June BlendED Training or Native American WS were asked what other mathematics professional development they participated in during the 2014-2015 school year. More than half participated in the NATM conference during September 2014. Many of the participants attended mathematics professional development provided by ESUs in their area. Other professional development activities listed were math circle, studio lesson/lesson study, and book study at their school on *Accessible Mathematics* by Steve Leinwand.

TOPICAL EMPHASIS OF PROFESSIONAL DEVELOPMENT ACTIVITIES

The Teacher Survey collected participant ratings for the degree to which NMPDS professional development activities emphasized mathematical topics. Exhibit 8 displays the ratings and shows that NMPDS activities overall placed between moderate and great emphasis on *mathematics content*, *mathematics pedagogy/instruction*, and *integrating informational technology into mathematics*. Both EMA and MS/HS Institute participants rated the emphasis on *instructing struggling students in mathematics* between some emphasis and moderate emphasis while the NA WS participants rated this topic between moderate emphasis and well emphasis. The area with no emphasis to some emphasis for all participants involved *instructing ELL students in mathematics*.

EXHIBIT 8. PARTICIPANT RATINGS OF TOPICAL EMPHASIS OF PROFESSIONAL DEVELOPMENT ACTIVITIES



*The value for NA WS is 1, and therefore the bar is not visible on the graph.
Note. Responses were rated on a 5-point scale where 1 = Not Emphasis, 2 = Some Emphasis, 3 = Moderate Emphasis, 4 = Well Emphasis, and 5 = Complete Emphasis.

NMPDS PARTICIPANT COMMENTS

Focus group participants across the various sessions commented on the comparison of the NMPDS project to other professional development activities they attended as well as the impact the project was having on their schools/districts. All of the sections commented on the engaging, hands-on approach of the professional development as well as the multiple sessions which allowed the teachers to implement the activities into their classrooms. Many commented on NMPDS professional development is specific to mathematics, but some participants felt that this year concentrated on increasing their own content knowledge because the activities were above the level of their students. Some schools are being impacted directly with NMPDS because, in some instances, all of the grade level teachers from the building attend the NMPDS professional development activities. A few of the teachers share what they have learned with other teachers in professional development settings at their school. Some schools rotate teachers to the sessions with the expectation they will share what they learned with the other teachers.

This is my first PD focusing on math and math isn't my favorite subject. However, I am finding it extremely interesting and useful. I've already tried activities and brought more manipulatives into my classroom.

This PD is more intense than other PD offered by ESUs. There are more details, practical application, and better instructors.

It pertains to what we're teaching in the class, so it's easy to implement in the classroom.

I like the fact that we are involved and acting as students. This shift in perspective has been really helpful.

It has definitely helped out school. We come back and speak with the other math teachers in our department. It enhances the whole department.

Development of Teacher Content Knowledge

Elementary Mathematics Academy

Exhibit 9 displays the performance of EMA participants on the content knowledge assessment as a whole as well as the two subscales. Of the 44 EMA participants who completed both the pretest and posttest content knowledge assessment, 20 participants demonstrated a statistically significant gain in overall content knowledge; 17 teachers (39%) had a significant gain on the Number Concept and Operations subscale; and 17 teachers (39%) had a significant gain on the Geometry subscale. As a whole group, EMA participants demonstrated statistically significant increases in scores from pretest to posttest on the overall assessment and the geometry subscales, with small effect sizes.

Exhibit 9. EMA Participant Content Knowledge (*N* = 44)

Scale/Subscale	Number of Teachers With Significant Gains	Possible Range	Pretest Mean	Pretest *SD*	Posttest Mean	Posttest *SD*	Mean Difference	*r*[9]	*t*	Cohen's *d*
EMA Content Knowledge Assessment	**20**	**0 - 27**	**14.91**	**5.18**	**16.05**	**4.80**	1.14	.849	**2.72****	**.23**
Number Concepts and Operations	17	0 - 20	11.70	4.09	12.36	3.61	0.66	.822	1.87	.17
Geometry	17	0 - 7	3.20	1.50	3.68	1.62	0.48	.637	2.37**	.30

Note. Bold text indicates overall scale. **$p < .01$.[10]

MS/HS Institute

Exhibit 10 presents the performance of MS/HS Institute participants on their content knowledge assessment. Of the 59 participants who completed both the pretest and posttest content knowledge assessment, 33 participants (56%) demonstrated a statistically significant gain on the overall content knowledge assessment; 35 participants (59%) showed a significant increase on the Patterns, Functions and Algebra subscale, and 28 participants (47%) had a statistically significant increase on the Geometry subscale. Thirty-one participants (53%) had a statistically significant increase on the Data, Probability, and Statistics subscale. As a group, participants showed a statistically significant increase in scores from pretest to posttest on the whole assessment, and also all three of the subscales. The effect sizes were small to medium.

Exhibit 10. Participant Content Knowledge for MS/HS Institute (*N* = 59)

Scale/Subscale	Number of Teachers With Significant Gains	Possible Range	Pretest Mean	Pretest *SD*	Posttest Mean	Posttest *SD*	Mean Difference	*r*	*t*	Cohen's *d*
Middle/High School Content Knowledge Assessment	**33**	**0 - 28**	**17.08**	**3.39**	**18.97**	**3.72**	**1.89**	**.599**	**4.52****	**.53**
Patterns, Functions, and Algebra	35	0 - 15	11.29	1.99	12.10	2.23	0.81	.412	2.72**	.38
Geometry	28	0 - 5	2.37	1.23	2.83	1.33	0.46	.461	2.64*	.36
Data, Probability & Statistics	31	0 - 8	3.42	1.32	4.03	1.29	0.61	.450	3.43**	.47

Note. Bold text indicates overall scale. *$p < .05$. ** $p < .01$.

[9] The Pearson product-moment correlation coefficient (*r*) is a measure of the relationship between two variables; in other words, a measure of the tendency of the variables to increase or decrease together. Values range from -1 to +1. A correlation of +1 indicates perfect positive correlation (i.e., that the two variables increase or decrease together). A correlation of -1 indicates perfect negative correlation (i.e., that one variable decreases as the other increases, or vice versa).

[10] The *p*-value is an indicator that represents the likelihood that observed results occurred by chance. In education research, values of $p < .05$ (i.e., values indicating that observed results had a less than 5% chance of occurring by chance) are typically used to identify results that are statistically significant. Lower *p*-values indicate a smaller likelihood that observed results occurred by chance and are therefore associated with statistically significant findings.

NATIVE AMERICAN WS PARTICIPANTS' ASSESSMENT OF TEACHER KNOWLEDGE AND PREPAREDNESS

Wilcoxon Signed Ranks Tests [11] were conducted on the Native American WS Participants Assessment to examine differences over time on the four subscales that assessed teacher knowledge and preparedness to implement and assess mathematical practices. This statistical analysis test was used due to the small number of teachers who were in this group. As seen in Exhibit 11, the findings reveal that teachers showed statistically significant growth on all four subscales. The effect sizes for all four subscales are very large.

EXHIBIT 11. CHANGE OVER TIME IN TEACHERS OF NATIVE AMERICAN WS PARTICIPANTS KNOWLEDGE AND PREPAREDNESS TO IMPLEMENT AND ASSESS MATHEMATICAL PRACTICES (*N* = 14)

Measure	Prior to Participation		At the Conclusion				
	Mean	*SD*	Mean	*SD*	Mean Difference	Wilcoxon Signed Rank Test Statistic	Cohen's *d*
Knowledge about Mathematical Practices	2.57	.53	3.06	.22	1.49	2.703**	1.13
Preparedness to Implement Mathematical Practices	2.30	.53	2.81	.29	.51	2.519*	1.19
Comfort Level in Helping Students Develop Mathematical Practices	2.15	.79	2.73	.44	.58	2.394*	1.03
Preparedness to Assess Students' Ability to Apply Mathematical Practices	2.05	.81	2.69	.44	.64	2.751**	1.11

Note. Responses were rated on a 4-point scale where 1 = Not Very, 2 = Somewhat, 3 = Quite, 4 = Very.
**$p < .01$, *$p < .05$.

NMPDS PARTICIPANT COMMENTS

Focus group participants commented on how the NMPDS project deepened their understanding of mathematics content knowledge and the Nebraska mathematics standards. They appreciated that the instructors connected different concepts that were not apparent to the teachers, making the mathematics appear more fluid. For some participants they were reviewing content they had not done since high school. Content standards were passed out but the connection of activities to a standard was not a focus during the sessions. Many stated this was not necessary because they are well aware of what standards needed to be accomplished at their grade level. Some appreciated connecting activities to the Standards for Mathematical Practices or NCTM's process standards.

> *They are breaking the barrier for me between algebra and geometry.*
>
> *The instructors illuminate math in everyday life in ways that I did not know.*

[11] W_+ is the test statistic for the Wilcoxon signed-rank test, which is a distribution-free test of the difference between two repeated measurements taken on the same person or sample. It is preferred to the repeated measures *t* test in cases when it cannot be assumed that the data are normally distributed.

I think we are hitting standards, but it is not discussed in the sessions. We never hear or say "this is standard ____."

We are looking at the process standards because that has been harder when alone. We can find what to teach, like the math standards, but knowing how to teach is the challenge.

Impact on Classroom Practice

Teacher Confidence

A portion of the Teacher Survey asked participating teachers to rate how confident they perceived themselves to be with regards to teaching mathematics. Four items formed the Confidence in Teaching scale. Exhibit 12 displays participants' mean ratings. After NMPDS activities, participants indicated they were very confident in their overall confidence in their mathematical knowledge, a statistically significant increase from their ratings prior to participation. In looking at the two groups separately, EMA and MS/HS Institute participants exhibited similar statistically significant increases, with EMA participants indicating a larger increase in their confidence in comparison to MS/HS Institute participants. Native American WS participants had the largest increases from prior to participation to at the conclusion of the workshops. Effect sizes ranged between large and very large.

Exhibit 12. Change Over Time in Participant Confidence - Scales

		Prior to Participation		At the Conclusion					
Confidence in Teaching	*N*	Mean	*SD*	Mean	*SD*	Mean Difference	*r*	t	Cohen's *d*
All NMPDS Participants	96	3.56	.68	4.09	.48	.53***	.629	9.866	.87
EMA Participants (*n* = 33)		3.68	.61	4.18	.50	.50***	.669	6.197	.88
MS/HS Institute Participants (*n* = 49)		3.64	.62	4.08	.49	.44***	.612	6.047	.76
Native American WS Participants (*n* = 14)		2.96	.765	3.93	.359	.97***	.655	6.06	1.35

Note. Responses were rated on a 5-point scale where 1 = Not at All Confident, 2 = Somewhat Confident, 3 = Moderately Confident, 4 = Very Confident, and 5 = Extremely Confident. ***$p < .001$.

The Appendix contains a table (Exhibit A9) showing all NMPDS participants', EMA participants', MS/HS Institute participants', and Native American WS participants' ratings for each item utilized to assess teacher confidence. The findings reveal that participant ratings increased over time at statistically significant levels for most items.

Teacher Preparedness

A section of the Teacher Survey asked participants to rate their level of preparedness to teach and meet the needs of all students as shown in Exhibit 13. Fifteen items formed the Overall Preparedness scale and condensed into two subscales: Preparedness to Teach Mathematics (10 items) and Preparedness to Meet the Needs of All Students (5 items). Participants indicated they were moderately prepared prior to NMPDS activities and were closer to well prepared at the conclusion of activities for each scale or subscale. These increases in preparedness were statistically significant with moderate to large effect sizes. Native American WS participants had larger increases in preparedness compared to EMA or MS/HS Institute participants.

Exhibit 13. Change Over Time in Participants' Preparedness to Teach Scales

Measure	*N*	Prior to Participation Mean	Prior to Participation *SD*	At the Conclusion Mean	At the Conclusion *SD*	Mean Difference	*r*	t	Cohen's *d*
Overall Preparedness									
All NMPDS Participants	99	3.33	.62	3.80	.52	.47***	.756	11.451	0.80
EMA Participants (*n* = 34)		3.60	.52	4.03	.43	.43***	.744	7.067	0.87
MS/HS Institute Participants (*n* = 51)		3.30	.57	3.70	.52	.40***	.773	7.818	0.74
Native American WS Participants (*n* = 14)		2.74	.62	3.56	.56	.82***	.617	5.923	1.39
Preparedness to Teach Mathematics									
All NMPDS Participants	99	3.42	.68	3.96	.53	.54***	.732	11.675	0.86
EMA Participants (*n* = 34)		3.71	.56	4.24	.41	.55***	.676	7.453	1.03
MS/HS Institute Participants (*n* = 51)		3.40	.63	3.86	.50	.46***	.728	7.717	0.80
Native American WS Participants (*n* = 14)		2.79	.73	3.65	.52	.86***	.628	5.589	1.29
Preparedness to Meet Needs of All Students									
All NMPDS Participants	99	3.14	.67	3.46	.64	.32***	.830	8.463	0.50
EMA Participants (*n* = 34)		3.39	.67	3.62	.64	.23***	.885	4.146	0.34
MS/HS Institute Participants (*n* = 51)		3.10	.61	3.39	.63	.29***	.864	6.294	0.46
Native American WS Participants (*n* = 14)		2.67	.64	3.39	.67	.72***	.708	5.431	1.14

Note. Responses were rated on a 5-point scale where 1 = Not at All Prepared, 2 = Somewhat Prepared, 3 = Moderately Prepared, 4 = Well Prepared, and 5 = Very Well Prepared. Bolded text indicates scale. ***$p < .001$.

The Appendix contains a table (Exhibit A10) presenting changes in ratings over time for each of the 15 preparedness items. In general, participants showed statistically significant increases in ratings over time for most items with effect sizes ranging from small to large.

Impact of NMPDS on Teaching Ability

The Teacher Survey asked teachers to rate the extent to which their participation in NMPDS influenced their teaching ability. The questions focused on the teacher's ability to craft and respond to questions; to adjust their mathematical classes to all students; to gauge the varying levels of comprehension; and to apply mathematical practices to classroom instruction. A total of 7 items formed the Impact of NMPDS on Teaching Ability scale. As Exhibit 14 shows, participants indicated their participation in NMPDS moderately influenced their teaching ability. Native American WS participants more often said the program moderately impacted their teaching ability. As a whole group, teachers reported that NMPDS had the greatest impact on their ability to apply mathematical practices to classroom instruction. Item results are included in the Appendix in Exhibit A11.

EXHIBIT 14. IMPACT OF NMPDS ON TEACHING ABILITY

Impact of NMPDS on Teaching Ability	*N*	*Mean*	*SD*
All NMPDS Participants	99	3.64	.84
EMA Participants	34	3.74	.92
MS/HS Institute Participants	51	3.54	.86
Native American WS Participants	14	3.80	.42

Note. Responses were rated on a 5-point scale where 1 = Not Well, 2 = Somewhat, 3 = Moderately, 4 = Well, and 5 = Very Well.

TEACHER OPINIONS REGARDING MATHEMATICS INSTRUCTION

Exhibit 15 presents participant ratings of agreement with several statements related to mathematics teaching and learning. Six of the statements reflect traditional ideas of teaching and learning while four of the statements reflect progressive ideas of teaching and learning. NMPDS participants decreased in their level of agreement with each of the six traditional teaching statements, all at statistically significant levels. The largest decreases in agreement were found for the following statements: *it is important for students to learn basic mathematics skills before solving problems and learning mathematics mainly involves memorizing.* Ratings of agreement by NMPDS participants on each of the four progressive teaching statements increased at statistically significant levels. Effect sizes were small to very large with the very large effect sizes related to the responses of Native American WS participants. At the conclusion of NMPDS activities, participants had strongest agreement with the statements: *there are different ways to solve most mathematical problems* and *it is important for student learning to make connections between mathematics and other subject areas*.

Exhibit 15. Change Over Time in Participants' Philosophy on Teaching and Learning Mathematics

Item	*N*	Prior to Participation Mean	Prior to Participation *SD*	At the Conclusion Mean	At the Conclusion *SD*	Mean Difference	*r*	t	Cohen's *d*
Traditional Statements									
Students generally learn mathematics best in classes with students of similar abilities.									
All NMPDS Participants	96	2.93	.91	2.65	.87	-.28***	.712	4.077	-.32
EMA Participants (*n* = 34)		2.82	.87	2.59	.89	-.23	.685	1.963	-.27
MS/HS Institute Participants (*n* = 48)		2.83	.88	2.73	.84	-.10	.909	1.944	-.12
Native American WS Participants (*n*=14)		3.50	.94	2.50	.94	-1.00**	.478	3.894	-1.06
Students master and retain mathematical algorithms more efficiently through repeated practice than through the use of applications and simulations.									
All NMPDS Participants	99	2.80	1.02	2.44	1.01	-.36**	.750	4.894	-.35
EMA Participants (*n* = 34)		2.82	1.00	2.41	1.10	-.41**	.727	3.066	-.39
MS/HS Institute Participants (*n* = 51)		2.63	.98	2.47	1.01	-.16**	.932	3.050	-1.16
Native American WS Participants (*n* = 14)		3.36	1.08	2.43	.85	-.93**	.322	3.045	-.95
Learning mathematics mainly involves memorizing.									
All NMPDS Participants	99	2.51	1.08	2.10	.84	-.41***	.595	4.511	-.41
EMA Participants (*n* = 34)		2.29	.97	1.85	.66	-.44**	.592	3.273	-.51
MS/HS Institute Participants (*n* = 51)		2.27	.96	2.16	.86	-.11	.772	1.353	-.13
Native American WS Participants (*n* = 14)		3.86	.77	2.50	1.02	-1.36**	.000	3.975	-1.36
It is important for students to learn basic mathematics skills before solving problems.									
All NMPDS Participants	99	3.62	.92	3.20	1.11	-.42***	.707	5.180	-.40
EMA Participants (*n* = 34)		3.24	1.02	2.79	1.12	-.45**	.761	3.447	-.41
MS/HS Institute Participants (*n* = 51)		3.80	.83	3.57	.99	-.23**	.829	3.050	-.25
Native American WS Participants (*n* = 14)		3.86	.77	2.86	1.10	-1.00*	.826	2.876	-.45
Few new discoveries in mathematics are being made.									
All NMPDS Participants	99	2.43	.85	2.33	.92	-.10***	.811	1.848	-.11
EMA Participants (*n* = 34)		2.15	.86	2.03	.97	-.12	.688	0.941	-.13
MS/HS Institute Participants (*n* = 51)		2.40	.73	2.32	.77	-.08	.898	1.661	-.11
Native American WS Participants (*n* = 14)		3.21	.80	3.07	.92	-.14	.710	0.806	-.16
Mathematics should be learned as sets of algorithms or rules that cover all possibilities.									
All NMPDS Participants	99	3.92	.71	4.26	.69	.34***	.562	5.200	.49
EMA Participants (*n* = 34)		3.88	.81	4.24	.89	.36**	.799	3.783	.41
MS/HS Institute Participants (*n* = 51)		4.10	.54	4.35	.52	.25**	.443	3.250	.48
Native American WS Participants (*n* = 14)		3.36	.75	4.00	.68	.64*	.152	2.223	.77

Item	N	Prior to Participation Mean	Prior to Participation SD	At the Conclusion Mean	At the Conclusion SD	Mean Difference	r	t	Cohen's d
Progressive Statements									
Solving mathematics problems often involves making conjectures, testing, and modifying findings.									
All NMPDS Participants	99	3.92	.71	4.26	.69	.34***	.562	5.200	.49
EMA Participants (*n* = 34)		3.88	.81	4.24	.89	.36**	.799	3.783	.41
MS/HS Institute Participants (*n* = 51)		4.10	.54	4.35	.52	.25**	.443	3.250	.48
Native American WS Participants (*n* = 14)		3.36	.75	4.00	.68	.64*	.152	2.225	.77
There are different ways to solve most mathematics problems.									
All NMPDS Participants	99	4.39	.64	4.65	.50	.26***	.633	5.006	.43
EMA Participants (*n* = 34)		4.50	.56	4.68	.48	.18	.509	1.977	.34
MS/HS Institute Participants (*n* = 51)		4.47	.58	4.65	.52	.18**	.760	3.273	.32
Native American WS Participants (*n* = 14)		3.86	.77	4.57	.51	.71**	.611	4.372	1.03
It is important for student learning to make connections between mathematics and other subject areas.									
All NMPDS Participants	99	4.24	.62	4.49	.58	.25***	.682	5.222	.42
EMA Participants (*n* = 34)		4.44	.61	4.71	.46	.27**	.686	3.447	.47
MS/HS Institute Participants (*n* = 51)		4.24	.59	4.35	.63	.11*	.857	2.582	.19
Native American WS Participants (*n* = 14)		3.79	.58	4.50	.52	.71**	.128	3.680	1.30
All students can learn challenging content in mathematics.									
All NMPDS Participants	99	3.59	.98	3.96	.88	.37***	.762	5.737	.40
EMA Participants (*n* = 34)		3.76	1.05	4.09	1.03	.33**	.839	3.204	.32
MS/HS Institute Participants (*n* = 51)		3.65	.87	3.90	.76	.25**	.770	3.250	.31
Native American WS Participants (*n* = 14)		2.93	1.00	3.86	.95	.93**	.638	4.192	.95

Note. Responses were rated on a 5-point scale where 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree. *$p < .05$, **$p < .01$, ***$p < .001$.

The Teacher Survey in 2015 included a set of items assessing agreement or disagreement with statements about the teaching and learning of mathematics reflected in NCTM's publication *Principles to Actions*. Six of the 12 statements were categorized as unproductive statements and the other six were categorized as productive statements. Exhibit 16 shows the mean, standard deviation, and the percentage of respondents who selected each response option for the unproductive statements for all of NMPDS and each subsection of NMPD. The lower the mean for these statements, the further away from agreement from unproductive statements is occurring. All NMPDS participants strongly disagreed to disagreed with the statement *students need only to learn and use the same standard computational algorithms and the same prescribed methods to solve algebraic problems*.

EXHIBIT 16. RATINGS OF AGREEMENT WITH UNPRODUCTIVE STATEMENTS

Item	*N*	Mean	*SD*	Strongly Disagree 1	Disagree 2	Neither Agree or Disagree 3	Agree 4	Strongly Agree 5
				Percentage of Responses				
Mathematics learning should focus on practicing procedures and memorizing basic number combinations.								
All NMPDS Participants	97	2.47	0.77	4.1	7.76	17.5	20.6	0.0
EMA Participants (*n* = 32)		2.38	0.91	12.5	53.1	18.8	15.6	0.0
MS/HS Institute Participants (*n* = 51)		2.55	0.73	0.0	58.8	13.7	27.5	0.0
Native American WS Participants (*n* = 14)		2.43	0.65	0.0	64.3	28.6	7.1	0.0
The role of the teacher is to tell students exactly what definitions, formulas, and rules they should know and demonstrate how to this information to solve mathematics problems.								
All NMPDS Participants	99	2.14	0.71	14.1	52.5	18.2	5.1	0.0
EMA Participants (*n* = 34)		2.09	0.67	14.7	64.7	17.6	2.9	0.0
MS/HS Institute Participants (*n* = 51)		2.24	0.79	13.7	56.9	21.6	7.8	0.0
Native American WS Participants (*n* = 14)		1.93	0.47	14.3	78.6	7.1	0.0	0.0
An effective teacher makes the mathematics easy for students by guiding them step-by-step through problem solving to ensure they are not frustrated or confused.								
All NMPDS Participants	99	2.23	0.85	14.1	58.6	20.2	4.0	3.0
EMA Participants (*n* = 34)		2.15	0.89	20.6	52.9	20.6	2.9	2.9
MS/HS Institute Participants (*n* = 51)		2.25	0.74	7.8	66.7	19.6	3.9	2.o
Native American WS Participants (*n* = 14)		2.36	1.15	21.4	42.9	21.4	7.1	7.1
Students can learn to apply mathematics only after they have mastered the basic skills.								
All NMPDS Participants	99	2.63	0.93	6.1	49.5	21.2	22.2	1.0
EMA Participants (*n* = 34)		2.18	0.67	8.8	70.6	14.7	5.9	0.0
MS/HS Institute Participants (*n* = 51)		3.00	1.00	3.92	35.3	29.4	58.8	2.9
Native American WS Participants (*n* = 14)		2.63	0.63	7.1	50.0	42.9	0.0	0.0
The role of the student is to memorize information that is presented and then use it to solve routine problems on homework quizzes, and tests.								
All NMPDS Participants	99	1.98	0.68	21.2	62.6	13.1	3.0	0.0
EMA Participants (*n* = 34)		1.97	0.83	26.5	58.8	5.9	8.8	0.0
MS/HS Institute Participants (*n* = 51)		2.00	0.60	17.6	64.7	17.6	0.0	0.0
Native American WS Participants (*n* = 14)		1.93	0.63	21.4	64.3	14.3	0.0	0.0
Students need only to learn and use the same standard computational algorithms and the same prescribed methods to solve algebraic problems.								
All NMPDS Participants	99	1.26	0.49	20.2	73.7	6.1	0.0	0.0
EMA Participants (*n* = 34)		1.74	0.57	32.4	61.8	5.9	0.0	0.0
MS/HS Institute Participants (*n* = 51)		1.98	0.42	9.8	82.4	7.8	0.0	0.0
Native American WS Participants (*n* = 14)		1.71	0.47	28.6	71.4	0.0	0.0	0.0

Exhibit 17 shows findings for each participant's agreement with productive statements about the teaching and learning of mathematics reflected in NCTM's publication *Principles to Actions*. The higher the mean for these statements, the closer to agreement for productive statements is occurring. The statement *an effective teacher provides students with appropriate challenge, encourages perseverance in solving problems, and supports productive struggle in learning mathematics* rated between agree and strongly agree for all NMPDS Participants. EMA and MS/HS Institute Participants rated the statement *students can learn mathematics through exploring and solving contextual and mathematical problems* than the Participants from the Native American WS.

Exhibit 17. Ratings of Agreement with Productive Statements

				Percentage of Responses				
Item	*N*	Mean	*SD*	Strongly Disagree 1	Disagree 2	Neither Agree or Disagree 3	Agree 4	Strongly Agree 5
All students need to have a range of strategies and approaches from which to choose in solving problems, including, but not limited to, general methods, standard algorithms, and procedures.								
All NMPDS Participants	98	4.32	0.62	0.0	1.0	5.1	55.1	38.8
EMA Participants (*n* = 33)		4.39	0.75	0.0	3.0	6.1	39.4	51.5
MS/HS Institute Participants (*n* = 51)		4.24	0.55	0.0	0.0	5.9	64.7	29.4
Native American WS Participants (*n* = 14)		4.43	0.51	0.0	0.0	0.0	57.1	42.9
The role of the teacher is to engage students in tasks that promote reasoning and problem solving and facilitate discourse that moves students toward shared understanding of mathematics.								
All NMPDS Participants	99	4.49	0.54	0.0	0.0	1.0	46.5	51.5
EMA Participants (*n* = 34)		4.56	0.56	0.0	0.0	2.9	38.2	58.8
MS/HS Institute Participants (*n* = 51)		4.39	0.55	0.0	0.0	2.0	56.9	41.2
Native American WS Participants (*n* = 14)		4.71	0.71	0.0	0.0	0.0	28.6	71.4
Mathematics learning should focus on developing understanding of concepts and procedures through problem solving, reasoning, and discourse.								
All NMPDS Participants	99	4.41	0.59	0.0	0.0	5.1	54.5	40.4
EMA Participants (*n* = 34)		4.44	0.66	0.0	0.0	8.8	38.2	52.9
MS/HS Institute Participants (*n* = 51)		4.31	0.55	0.0	0.0	3.9	60.8	35.3
Native American WS Participants (*n* = 14)		4.71	0.71	0.0	0.0	0.0	71.4	28.6
Students can learn mathematics through exploring and solving contextual and mathematical problems.								
All NMPDS Participants	99	4.16	0.49	0.0	0.0	4.0	75.8	20.2
EMA Participants (*n* = 34)		4.12	0.48	0.0	0.0	5.9	76.5	17.6
MS/HS Institute Participants (*n* = 51)		4.10	0.41	0.0	0.0	3.9	82.4	13.7
Native American WS Participants (*n* = 14)		4.52	0.52	0.0	0.0	0.0	50.0	50.0
An effective teacher provides students with appropriate challenge, encourages perseverance in solving problems, and supports productive struggle in learning mathematics.								
All NMPDS Participants	99	4.52	0.52	0.0	0.0	1.0	46.5	32.3
EMA Participants (*n* = 34)		4.65	0.54	0.0	0.0	2.9	29.4	67.6
MS/HS Institute Participants (*n* = 51)		4.43	0.50	0.0	0.0	0.0	56.9	43.1
Native American WS Participants (*n* = 14)		4.50	0.52	0.0	0.0	0.0	50.0	50.0
The role of the student is to be actively involved in making sense of mathematics tasks by using varied strategies and representations, justifying solutions, making connections to prior knowledge or familiar contexts and experiences, and considering the reasoning of others.								
All NMPDS Participants	99	4.49	0.52	0.0	0.0	1.0	48.5	50.5
EMA Participants (*n* = 34)		4.56	0.56	0.0	0.0	2.9	38.2	58.8
MS/HS Institute Participants (*n* = 51)		4.45	0.50	0.0	0.0	0.0	54.9	45.1
Native American WS Participants (*n* = 14)		4.50	0.52	0.0	0.0	0.0	50.0	50.0

NMPDS PARTICIPANT COMMENTS

Teacher focus groups were asked to describe the impact of the NMPDS project on their classroom teaching and meeting the needs of all their students. For teachers who have changed grade levels, they have resources to impact ideas and concepts in the mathematics content. Awareness of using correct mathematics vocabulary, providing helpful feedback to students, and asking purposeful questions during small and large gr

oup discussions were ideas presented by the Participants that was impacting their instruction. They stated they appreciated the different strategies to approach a problem that helped them meet the needs of their students. Some stated that they had a broader perspective of their classroom.

> *You get so much from these sessions. It can be adapted across the curriculum. There are things I can add to beef up the content for my students a little more. I also have another method to teach the students beyond what I've used in the past.*
>
> *I don't need to save the kids so soon when solving problems. They can try and struggle with the problems more. I have learned to be more patient and use wait time as students struggle with the material.*
>
> *The work we do here is challenging me which makes me do a better job challenging my students.*
>
> *These sessions have increased my awareness of how students learn. We are working on modeling to make the mathematics more meaningful for my students and not just memorizing facts.*

ESTABLISHING EFFECTIVE PROFESSIONAL LEARNING COMMUNITIES AND BUILDING A COLLABORATIVE STATEWIDE NETWORK OF EDUCATORS

Many of the teachers participating in NMPDS were already considered teacher leaders for their school or districts. Many teacher shared information they learned at the sessions with their schools and ESUs in a community of learning from each other. Casual professional learning communities were established through the reading and reflection of the book "*Principles to Actions*." Each participant also responded to at least two other reflections posted by their colleagues. Focus group Participants always prefer to have more networking time during the sessions to learn what others are doing and how they may adapt their learnings into their own situation.

Instructors used *myeLearning* for reflections and repository of resources. Some school districts have eliminated the use of *myeLearning;* thus, many teachers were not as familiar with the site and the ability to move from one are of the site to another. Participants received communications from ESU-CC to remind them of assignments and upcoming NMPDS professional development session. Some focus group Participants commented their questions were promptly answered by instructors or project personnel.

"Math Champions" became a reality this year for NMPDS. The project has received 500 names to date representing different schools around the state. The goal is to have one representative for each of the school buildings to receive information about mathematics within the state directly from the

Mathematics Coordinator for the state and then share the information directly with their colleagues. This communication is especially important with the new Nebraska mathematics standards. A breakout session at NATM will talk about the Math Champions and their responsibilities to their school.

There is also a Math Cadre that represents each of the ESUs throughout the state. Some of the representatives do have mathematics backgrounds while the others are increasing their knowledge through attending the NMPDS sessions. This learning community shares emails and information to others in their ESU areas.

Facilitators and Barriers

Perceptions of Facilitators and Barriers to NMPDS Implementation

Facilitators

NMPDS is a well-developed project that provides teachers with professional development during the academic school year to impact their content and pedagogical content knowledge in order to improve mathematics learning for all students. The project capitalizes on collaboration and shared expertise with a cadre of ESU staff to assist with recruitment and site facilitation.

NMPDS hired a project director whose leadership and attention to grant operations increased the success of the project. Having a positive relationship with state mathematics director, ESU personnel, NATM, and the instructors contributed to the sustainability for the project. Consistency and rigor among the instructors was a focus that was well implemented during the year. The instructors did more than give Participants quick activities to do in the classrooms the next day, they stretched the Participants with problem solving activities that may have threatened Participants whose mathematics content knowledge is not that strong. Participants understood the time commitment required throughout the school year as well as a couple of days in the summer.

Many Participants return year-after-year because of their perceived belief that the mathematics professional development does impact the achievement of their students. The teachers are trying more inquiry-based learning approaches and incorporating more problem solving activities into their classroom lessons. The strategies being modeled allow teachers to diversify for their classroom needs and increase connections for different learning styles.

Barriers

Many of the teachers use Saxon math and are afraid to move outside of the scripted lesson. They fear their administrators will not respond well to them merging activities from EMA into their classrooms. The new EMA instructors for 2015-16 will address this issue because they are aware of this issue through their work at Wayne State with their pre-service teachers.

Communication with Participants is critical, specifically at the application stage. Stating course requirements ahead of time was mentioned by Participants in focus groups across the state as a benefit to deciding if they had the time to commit to the professional development. The definition of professional development for some Participants reflected a “get and take activity” mentality that did not include any additional work outside of the day’s session. Some were not aware that homework would be required. Accountability of obtaining the required hours for each participant is necessary. Others did not understand the stipend for travel. They stated the stipend covered a portion of their expenses.

The Participants prefer to network with others in the sessions in a structured way. Many are rural teachers who want to hear how others are inserting problem solving outside of the current curriculum, assessing students' acquisition of mathematical concepts, and adapting activities for various student levels.

At the participant level, a challenge was remembering the directions for the activities done in the sessions. Sharing the directions along with the activity on the *myeLearning* site would help teachers who want to implement the activities into appropriate areas after the sessions are completed. The distance-learning Participants need to have access to the handouts prior to the sessions in order to fully participate in discussions.

Conclusions and Recommendations

This section summarizes key finding from data collected during the period from October 2014 through June 2015, and then presents recommendations for the NMPDS project.

Findings

- **NMPDS participants rated the topical emphasis of professional development activities between moderate and great emphasis in three connected areas.** *Mathematics content, mathematics pedagogy/instruction, and integrating informational technology in mathematics* were rated the highest topical emphasis with results 3.39 and 4.15 on a 5-point scale. Native American WS participants ranked instructing struggling students in mathematics between moderate emphasis and well emphasis which is higher than EMA and MS/HS Institute participants. Some participants felt this year concentrated on increasing their own content knowledge.

- **Over 45% of the EMA participants demonstrated a statistically significant gain in the overall content knowledge.** Of the 44 EMA participants who completed both the pretest and posttest, 39% had a significant gain on the Number Concept and Operations subscale and 39% had a significant gain on the Geometry subscale. On the overall assessment and geometry subscale, EMA participants demonstrated statistically significant increases with small effect sizes.

- **Over 56% of the MS/HS Institute participants demonstrated a statistically significant gain on the overall content knowledge assessment.** Of the 59 participants who completed both the pretest and posttest, 59% showed a significant increase on the Patterns, Functions, and Algebra subscale and 47% had a statistically significant increase on the Geometry subscale. On the Data, Probability, and Statistics subscale, 31% had statistically significant increase. The effect sizes were small to medium.

- **Native American WS participants showed statistically significant growth on all four of the subscales on Mathematical Practices with very large effect size.** The Wilcoxon Signed Ranks Test were conducted to examine differences over time on the four subscales of teacher knowledge on mathematical practices, preparedness to implement mathematical practices, comfort level in helping students develop mathematical practices, and preparedness to assess students' ability to apply mathematical practices.

- **After NMPDS activities, participants indicated they were very confident in their overall confidence in their mathematical knowledge at a statistically significant increase prior to attending NMPDS professional development activities.** Prior to participation, confidence in teaching was rated moderately confident and very confident**.** At the conclusion of activities, participants rated their change to very confident.

- **Teacher ratings of preparedness to teach mathematics increased after participation in NMPDS activities.** Participants indicated they were moderately prepared prior to NMPDS activities in the two subscales (Preparedness to Teach Mathematics and Preparedness to Meet the Needs of All Students) and were closer to well prepared at the conclusion of the activities. These increases were statistically significant with moderate to large effect size. Native American WS participants had larger increases in preparedness compared to EMA or MS/HS Institute participants.

- **NMPDS participants indicated their participation in professional development activities moderately influenced their teaching ability.** Native American WS participants more often said the program moderately impacted their teaching ability. As a whole group, teachers reported that NMPDS had the greatest impact on their ability to apply mathematical practices to classroom instruction.

- **NMPDS participants showed changes in philosophy regarding traditional and progressive teaching and learning statements.** NMPDS participants decreased their level of agreement with all six traditional statements at statistically significant levels. The largest decreases were found in the two statements: *it is important for students to learn basic mathematics skills before solving problems* and *learning mathematics mainly involves memorizing.* Ratings of agreement by NMPDS participants on each of the four progressive teaching statements increased at statistically significant levels with effect sizes of small to very large. At the conclusion of NMPDS activities, participants had strongest agreement with the statements: *there are different ways to solve most mathematical problems* and *it is important for student learning to make connections between mathematics and other subject areas*.

RECOMMENDATIONS FOR YEAR 3 OF GRANT

1. **Communication is key to the success of the grant.** Acquiring a full-time project director coordinated communications between instructors, ESUs, and participants during this year. ESUCC personnel helped to remind participants of upcoming sessions as well as completing and posting prior assignments. In the acceptance of newly written mathematics standards and being fully aware of how participants perceive what the next round of the MSP grant could look like, the Math Champions can help with the sustainability in the coming years.

2. **Establish procedures to allow instructors and participants to know their responsibilities for the sessions.** Attendance needs to be prioritized to eliminate the mindset that NMPDS participants and their principals can pick-and-choose activities to attend. When a majority of participants are new to the grant each year, repeating obligations and accountability is important. Instructors need to be reminded that distance-learning participants need to be included in the activities by sending the handouts in advance for printing and asking participants to be involved in the discussion.

3. **Consider incorporating networking activities that are grade span specific.** Many participants return year-after-year because of their perceived belief that the mathematics professional development does impact the achievement of their students. Providing structured network time allows rural teacher to hear how others are incorporating problem solving into their current curriculum, adapting activities for various student levels, and assessing students' acquisition of mathematical concepts.

Appendix

Appendix

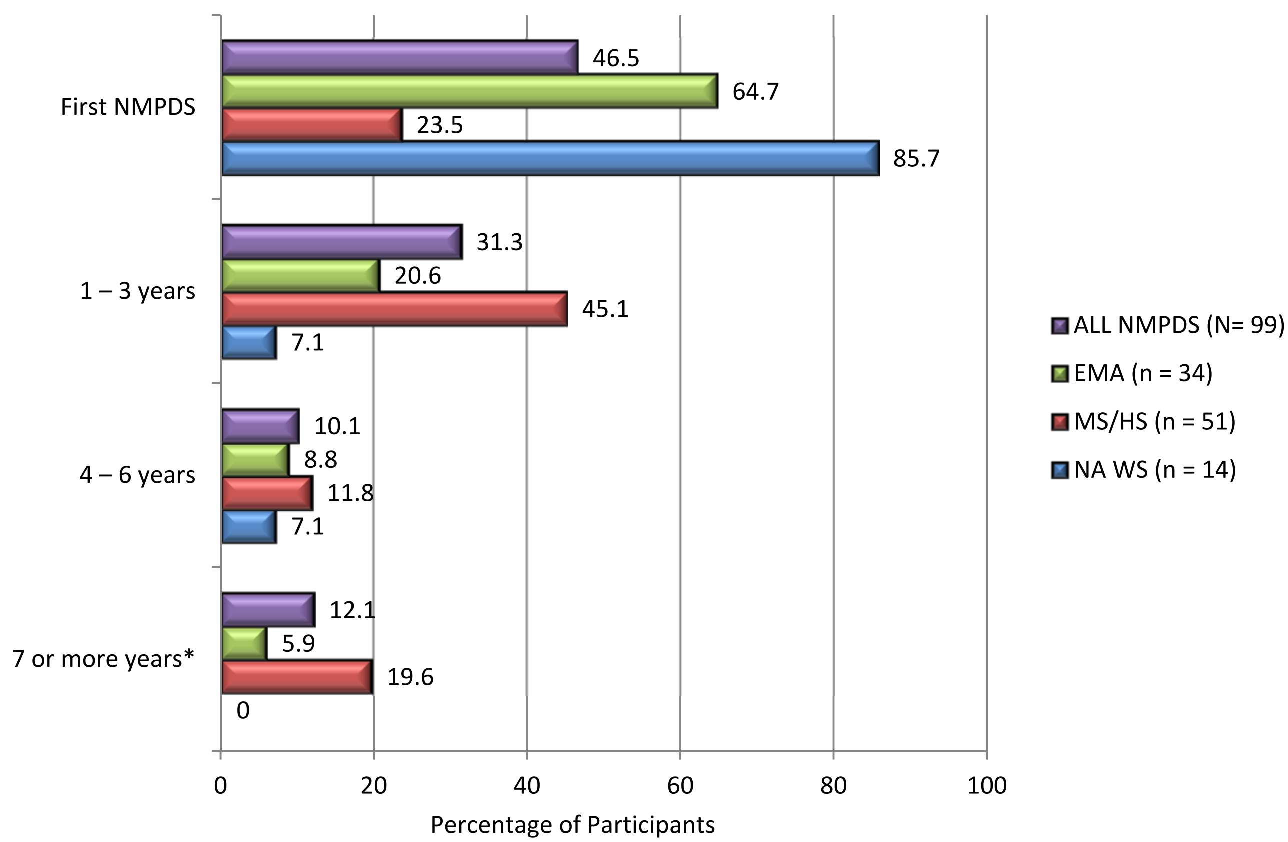
This section presents teacher characteristics including an examination of participant education, teaching certification, and teaching experience. Item level findings of the Teacher Survey items are then presented.

NMPDS Teacher Survey Demographic Data

Teacher Characteristics

The Teacher Survey asked participants about their participation in past NMPDS offerings. As Exhibit A1 shows, almost two-thirds of the 34 EMA participants who completed a Teacher Survey indicated that this was their first time in NMPDS. Less than a quarter of the 51 MS/HS teachers who completed a Teacher Survey were new to NMPDS, with nearly one fifth indicating that they have participated in NMPDS for 7 or more years, not including this year's offerings. From the 14 participants from the Native American Workshop, most of them were attending a NMPDS professional development session for the first time.

Exhibit A1. NMPDS Past Participation



*The value for NA WS is 0, and therefore the bar is not visible on the graph.

Exhibit A2 presents demographic data for the 99 NMPDS participants who completed Teacher Surveys. The majority of all NMPDS participants who completed the 2014-2015 Teacher Survey were female and white.

Exhibit A2. NMPDS Participant Demographics

	All NMPDS (*N* = 99)		EMA (*n* = 34)		MS/HS Institute (*n* = 51)		Native American WS (*n* = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Gender								
Male	21	21.2	4	11.8	13	25.5	4	28.6
Female	78	78.8	30	88.2	38	74.5	10	71.4
Ethnicity								
White	95	96.0	33	97.1	50	98.0	12	85.8
Hispanic	2	2.0	1	2.9	0	0.0	1	7.1
American Indian or Alaskan Native	1	1.0	0	0.0	0	0.0	1	7.1
Asian or Pacific Islander	1	1.0	0	0.0	1	2.0	0	0.0

Information about participants' level of education and certification is displayed in Exhibit A3. Over half of NMPDS participants (51%) reported earning advanced degrees. Less than 20% of EMA participants minored in mathematics and almost 75% of MS/HS Institute participants majored in mathematics. Almost all EMA participants held an elementary teaching certification and a little more than half held a middle level teaching certificate. Almost two-thirds of the MS/HS participants were certified at the middle level and 93% held secondary level certificates. From the Native American WS, one-third of the participants held an advanced degree, more than half (57%) majored in a mathematics intensive field, and more than three-fourths held an elementary teaching certificate.

Exhibit A3. NMPDS Participant Education

	All NMPDS (*N* = 99)		EMA (*n* = 34)		MS/HS Institute (*n* = 51)		Native American WS (*n* = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Highest Degree Completed								
BA or BS	46	46.5	10	29.4	28	54.9	8	57.1
MA, MS, or MEd	51	51.5	23	67.6	23	45.1	5	35.7
PhD or EdD	0	0.0	0	0.0	0	0.0	0	0.0
Other (e.g., special education, para professional)	2	2.0	1	2.9	0	0.0	1	7.1
Undergraduate Mathematics Emphasis[a]								
Major in Mathematics	39	39.4	2	5.9	37	72.5	0	0.0
Major in Another Field	30	30.3	26	76.5	3	5.9	1	7.1
Major in Mathematics - Intensive Field (e.g., statistics, physics, etc.)	22	22.2	0	0.0	14	27.5	8	57.1
Minor in Mathematics	15	15.2	6	17.6	8	15.7	1	7.1
Minor in Another Field	7	7.1	0	0.0	7	13.7	0	0.0
Minor in Mathematics - Intensive Field (e.g., statistics, physics, etc.)	4	4.0	3	8.8	0	0.0	1	7.1

	All NMPDS (N = 99)		EMA (n = 34)		MS/HS Institute (n = 51)		Native American WS (n = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Level of Teaching Certification[a]								
Elementary	48	48.5	30	88.2	7	13.7	11	78.6
Middle	57	57.6	18	52.9	32	62.7	7	50.0
Secondary	57	57.6	5	14.7	47	92.2	5	35.7

[a] Percentages do not sum to 100 because respondents could select more than one response.

Participant Teaching Experience

Exhibit A4 summarizes the teaching experiences of NMPDS participants. Nearly two-thirds of the EMA have been teaching for 15 or more years, with 50% of reporting having taught mathematics for the same amount of time. Nearly three fourths of EMA participants reported teaching only 1 class of mathematics. Nearly half of the MS/HS participants taught for 15 or more years, 45% have taught mathematics for 10 to 14 years, and they taught three to five classes of mathematics. Almost half of the participants of the Native American WS have taught for 15 or more years with the same amount dedicated to teaching mathematics to two to three classes during the school year.

Exhibit A4. NMPDS Participant Experience

	All NMPDS (N = 99)		EMA (n = 34)		MS/HS Institute (n = 51)		Native American WS (n = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Years Full-Time, Teaching in a K-12 School								
3 or less	14	14.1	1	2.9	11	21.6	2	14.3
4 to 6 Years	11	11.1	4	11.8	5	9.8	2	14.3
7 to 9 Years	12	12.1	5	14.7	5	9.8	2	14.3
10 to 14 Years	9	9.1	2	5.9	6	11.8	1	7.1
15 or More Years	52	52.5	22	64.8	24	47.1	6	42.9
N/A or Missing Response	1	1.0	0	0.0	0	0.0	1	7.1
Years Full-Time, K-12 Teaching Mathematics								
3 or less	16	16.2	1	2.9	11	21.6	4	28.6
4 to 6 Years	13	13.1	6	17.6	5	9.8	2	14.3
7 to 9 Years	12	12.1	6	17.6	5	9.8	1	7.1
10 to 14 Years	26	26.3	3	8.8	23	45.1	0	0.0
15 or More Years	30	30.3	17	50.0	7	13.7	6	42.9
N/A or Missing Response	2	2.0	1	2.9	0	0.0	1	7.1

	All NMPDS (*N* = 99)		EMA (*n* = 34)		MS/HS Institute (*n* = 51)		Native American WS (*n* = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Number of Different Mathematics Classes Currently Teaching								
1 class	5	5.1	4	11.8	1	2.0	0	0.0
2 classes	28	28.2	16	47.1	8	15.7	4	28.6
3 classes	20	20.2	5	14.7	11	21.6	4	28.6
4 classes	23	23.2	9	26.5	13	25.5	1	7.1
5 classes	13	13.1	0	0.0	11	21.6	2	14.3
6 classes	6	6.1	0	0.0	4	7.8	2	14.3
7 or more classes	4	4.0	0	0.0	3	5.9	1	7.1

Exhibit A5 shows that the most commonly reported teacher description for EMA participants was a regular content classroom educator at the elementary level. About one fourth of the MS/HS participants were regular content classrooms educators at the middle-level and three-fourths were a regular content classroom educator in the secondary grades. Over a third of the Native American WS participants described their teaching position as regular content classroom educator at the elementary level.

Exhibit A5. NMPDS Participant Teacher Description

	Elementary Education		Middle-level Education		Secondary Education	
	n	Percentage	*n*	Percentage	*n*	Percentage
All NMPDS (*N* = 99)						
Regular content classroom educator	27	27.2	24	24.2	40	40.4
Special education educator	3	3.0	1	1.0	0	0.0
Gifted and talented educator	1	1.0	0	0.0	0	0.0
Administrator	1	1.0	0	0.0	0	0.0
Paraprofessional	1	1.0	0	0.0	0	0.0
Other	1	1.0	0	0.0	0	0.0
EMA (*n* = 34)						
Regular content classroom educator	21	61.8	9	26.5	--	
Special education educator	--		1		--	
Gifted and talented educator	1	2.9	--		--	
Administrator	1	2.9	--		--	
Paraprofessional			--		--	
Other	1	2.9	--		--	
MS/HS (*n* = 51)			--			
Regular content classroom educator	1	2.0	12	23.5	38	74.5
Special education educator	--		--		--	
Gifted and talented educator	--		--		--	
Administrator	--		--		--	
Paraprofessional	--		--		--	
Other	--		--		--	
Native American WS (*n* = 14)						
Regular content classroom educator	5	35.7	3	21.4	2	14.2
Special education educator	3	21.4	--		--	
Gifted and talented educator	--		--		--	
Administrator	--		--		--	
Paraprofessional	1	7.1	--		--	
Other	--		--		--	

The Teacher Survey asked participants to identify which courses they taught during the 2014-2015 school year. Participants were able to attend either EMA or MS/HS Institute regardless of their current teaching assignment. Findings displayed in Exhibit A6 show that slightly over half of the EMA participants taught 4th or 5th grade and one fourth taught a science class. Of the MS/HS participants, 57% taught Algebra I, followed by 51% teaching Geometry and Algebra II. Native American WS participants were split between K or 1 grade (29%), 7th grade (29%), or 8th grade (29%).

EXHIBIT A6. NMPDS PARTICIPANT EXPERIENCE - COURSES TAUGHT DURING THE PAST SCHOOL YEAR

	All NMPDS (*N* = 99)		EMA (*n* = 34)		MS/HS Institute (*n* = 51)		Native American WS (*n* = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
K or 1 grade	7	7.1	2	5.9	1	2.0	4	28.6
2 or 3 grade	10	10.1	7	20.6	1	2.0	2	14.3
4 or 5 grade	23	23.2	18	52.9	2	3.9	3	21.4
6th grade	19	19.2	13	38.2	3	5.9	3	21.4
7th grade	27	27.3	4	11.8	19	37.3	4	28.6
8th grade	20	20.2	1	2.9	15	29.4	4	28.6
Pre-Algebra	17	17.2	0	0.0	17	33.3	0	0.0
Algebra I	31	31.3	1	2.9	29	56.9	1	7.1
Algebra II	28	28.3	0	0.0	26	51.0	2	14.3
Geometry	28	28.3	0	0.0	26	51.0	2	14.3
Statistics	6	6.1	0	0.0	6	11.8	0	0.0
Calculus	11	11.1	0	0.0	10	19.6	1	7.1
Integrated Math 1	9	9.1	0	0.0	8	15.7	1	7.1
Integrated Math 2	5	5.1	0	0.0	5	9.8	0	0.0
Integrated Math 3	3	3.0	0	0.0	3	5.9	0	0.0
Science Class	9	9.1	9	26.5	0	0.0	0	0.0
Technology Class	5	5.1	1	2.9	3	5.9	1	7.1
Other	26	26.3	1	2.9	25	49.0	0	0.0

Note. Percentages do not sum to 100 because respondents could select more than one response.

Participants were also asked to report the number of students they taught mathematics to during the 2013-2014 school year. As shown in Exhibit A7, EMA participants reported teaching an average of 28 elementary students and an average of 77middle school students. MS/HS Project participants reported teaching an average of 50 elementary students, 39 middle school students and 59 high school students. Participants from the Native American WS reported teaching an average of 27 elementary students, 23 middle school students, and 23 high school students.

EXHIBIT A7. NUMBER OF STUDENTS TAUGHT BY NMPDS PARTICIPANTS

Number of Students Taught by Participants	All NMPDS (*N* = 99)			EMA (*n* = 34)			MS/HS Institute (*n* = 51)			Native American WS (*n* = 14)		
	Range	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*
Elementary Students	0 - 70	25.5	17.2	14 - 70	27.6	14.8	0 - 50	50	0	10 - 68	26.8	20.7
Middle School Students	1 – 140	44.6	35.7	21 – 127	77.4	36.9	2 - 140	38.9	32.4	1 - 60	23.3	22.6
High School Students	3 - 125	56.3	35.4	---	---	---	10 - 125	59.3	35.2	3 – 50	23.5	25.7

As conveyed in Exhibit A8, almost 30% of the EMA participants taught in an elementary only school or in a K-12 multilevel school. Nearly 50% of MS/HS participants most commonly taught in K-12 multilevel school and over 25% taught in a 7-12 multilevel school. Over 75% of the participants in the Native American WS taught in a K-12 multilevel school. Three fifths of EMA participants, two-thirds of the MS/HS participants, and over 93% of the Native American participants taught at schools where 40% or more students in the district or school qualify for free or reduced cost meals. Nearly half of the NMPDS participants also taught in a district or school that did not meet AYP or School Accountability requirements in a content area.

Exhibit A8. NMPDS Participant School Configuration

	All NMPDS (*N* = 99)		EMA (*n* = 34)		MS/HS Institute (*n* = 51)		Native American WS (*n* = 14)	
	n	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
School Configuration								
Elementary Only	12	12.1	10	29.4	1	2.0	1	7.1
Middle School	11	11.1	8	23.5	3	5.9	0	0.0
High School	8	8.1	0	0.0	8	15.7	0	0.0
K-12 Multilevel School	45	45.5	10	29.4	24	47.1	11	78.6
7-12 Multilevel School	16	16.2	0	0.0	14	27.5	2	14.3
Other	8	8.1	6	17.6	1	2.0	0	0.0
High Need Designation[a]								
District/school did not meet AYP or School Accountability requirements in a content area.	48	48.5	14	41.2	21	41.2	13	92.9
40% or more students in district or school qualify for free or reduced cost meals.	68	68.7	21	61.8	34	66.7	13	92.0
Teachers in the district or school were assigned to a mathematics or science course but were not appropriately endorsed for the assignment and/or were not NCLB qualified.	9	9.1	1	2.9	2	3.9	6	42.9
Special Education teachers who are responsible for teaching mathematics or science content to special education students.	35	35.4	9	26.5	18	35.3	8	57.1

Note. [a] Percentages do not sum to 100 because respondents could select more than on response.

Lastly, the Teacher Survey asked participants if they had participated in science portion of the MSP grant, Keep Improving Content Knowledge and Skills (Science KICKS). Of the 99 respondents, seven previously participated in KICKS, with five teachers from EMA, one teacher from MS/HS, and one teacher from the Native American WS.

Teacher Survey Item Analysis

The following section contains the item level analysis of Teacher Survey items that were presented as scales in the Findings section of the evaluation report. Findings for each item are displayed for all NMPDS participants and disaggregated by EMA, MS/HS Institute, and Native American WS participants.

Teacher Confidence

Exhibit A9 presents the change over time in ratings for items assessing Confidence in Mathematical Knowledge. NMPDS participants demonstrated statistically significant increased ratings over time for all items with effect sizes ranging between medium and very large. Overall, NMPDS participants had the largest increase in ratings of confidence for their *ability to help colleagues improve their knowledge and skills related to mathematics and mathematics education* and *their knowledge about current educational issues related to mathematics*. NA Workshop participants showed the highest gains as a subgroup.

Exhibit A9. Change Over Time in Participant Confidence - Items

		Prior to Participation		At the Conclusion					
Confidence in Mathematical Knowledge	*N*	Mean	*SD*	Mean	*SD*	Mean Difference	r	t	Cohen's *d*
1. In your mathematics knowledge with respect to the mathematics that you teach.									
All NMPDS Participants	96	3.99	.84	4.46	.54	.47***	.636	7.086	0.62
EMA Participants (*n* = 33)		4.03	.73	4.45	.56	.42***	.650	4.346	0.63
MS/HS Project Participants (*n* = 49)		4.18	.73	4.53	.50	.35***	.581	4.069	0.53
Native American WS Participants (*n* = 14)		3.21	1.05	4.21	.58	.10***	.677	4.770	1.02
2. In your mathematics knowledge beyond and below what you teach.									
All NMPDS Participants	96	3.57	.84	4.09	.65	.52***	.689	8.295	0.67
EMA Participants (*n* = 33)		3.67	.78	4.12	.70	.45***	.712	4.626	0.61
MS/HS Project Participants(*n* = 49)		3.65	.83	4.12	.63	.47***	.676	5.335	0.61
Native American WS Participants (*n* = 14)		3.07	.92	3.93	.62	.86***	.691	4.837	1.02
3. In your ability to help colleagues improve their knowledge and skills related to mathematics and mathematics education.									
All NMPDS Participants	96	3.53	.81	4.11	.75	.58***	.644	8.665	0.75
EMA Participants (*n* = 33)		3.67	.74	4.21	.78	.54***	.671	5.078	0.72
MS/HS Project Participants (*n* = 49)		3.59	.73	4.06	.76	.47***	.668	5.335	0.62
Native American WS Participants (*n* = 14)		3.00	1.04	4.07	.62	1.07***	.722	5.491	1.09
4. In your knowledge about current educational issues related to mathematics.									
All NMPDS Participants	96	3.14	.89	3.70	.77	.57***	.706	8.534	0.67
EMA Participants(*n* = 33)		3.36	.90	3.94	.70	.58***	.730	5.387	0.69
MS/HS Project Participants) (*n* = 49)		3.14	.84	3.59	.84	.45***	.733	5.115	0.53
Native American WS participants (*n* = 14)		2.57	.85	3.50	.52	.93***	.522	4.759	1.24

Note. Responses were rated on a 5-point scale where 1 = Not at All Confident, 2 = Somewhat Confident, 3 = Moderately Confident, 4 = Very Confident, and 5 = Extremely Confident. ***$p < .001$.

Teacher Preparedness

Exhibit A10 displays findings for items assessing change in participant ratings of Preparedness to Teach Mathematics and Preparedness to Meet Needs of All Students. Participants showed statistically significant increases in ratings over time for most items. Effect sizes ranged between very small to very large, with larger effects generally found for increases in the Preparedness to Teach Mathematics items with the exception of NA Workshop participants who also showed large increases in several items related to meeting the needs of all students. *Teaching mathematics to students who are English Language Learners* were rated as an item participants only felt slightly prepared for before and after their participation in the Academy/Institute. The numbers at the beginning of the statement reflect the order they were presented in the Teacher Survey.

Exhibit A10. Change Over Time in Participants' Preparedness to Teach - Items

Item	*N*	Prior to Participation		At the Conclusion		Mean Difference	r	t	Cohen's *d*
		Mean	*SD*	Mean	*SD*				
Preparedness to Teach Mathematics									
1. Provide sequenced instruction in mathematics that aligns to NE mathematics content standards									
All NMPDS Participants	99	3.78	.85	4.18	.68	.40***	.727	6.841	0.51
EMA Participants(*n* = 34)		3.97	.758	4.41	.50	.44***	.593	4.200	0.65
MS/HS Project Participants (*n* = 51)		3.80	.78	4.12	.71	.32***	.768	4.397	0.42
Native American WS Participants (*n* = 14)		3.21	1.12	3.86	.77	.65**	.750	3.229	0.61
2. Teach problem solving strategies.									
All NMPDS Participants	99	3.43	.89	4.03	.75	.60***	.590	7.856	0.71
EMA Participants(*n* = 34)		3.82	.80	4.29	.76	.47***	.689	4.464	0.60
MS/HS Project Participants (*n* = 51)		3.45	.78	3.92	.69	.47***	.587	4.987	0.63
Native American WS Participants (*n* = 14)		2.43	.76	3.79	.80	1.36***	.290	5.467	1.74
3. Teach mathematics with the use of manipulative materials.									
All NMPDS Participants	99	3.40	.91	4.12	.79	.72***	.670	10.188	0.83
EMA Participants(*n* = 34)		3.79	.85	4.59	.66	.80***	.662	7.224	1.02
MS/HS Project Participants (*n* = 51)		3.27	.85	3.78	.73	.51***	.710	5.946	0.63
Native American WS Participants (*n* = 14)		2.93	1.00	4.21	.70	1.28***	.575	5.828	1.44
4. Teach mathematics with the use of technology tools, such as calculators, graphing calculators, simulation software, and spreadsheets.									
All NMPDS Participants	99	3.25	.94	3.80	.86	.55***	.659	7.275	0.60
EMA Participants(*n* = 34)		3.29	.84	3.82	.76	.53***	.706	5.022	0.66
MS/HS Project Participants (*n* = 51)		3.37	.94	3.94	.86	.57***	.575	4.888	0.63
Native American WS Participants (*n* = 14)		2.71	1.07	3.21	.89	.50*	.714	2.463	0.50
5. Select and/or adapt instructional materials to implement your written curriculum to provide challenging curriculum for all students									
All NMPDS Participants	98	3.22	.87	3.93	.72	.71***	.701	11.075	0.87
EMA Participants		3.62	.89	4.29	.68	.67***	.749	6.699	0.81
MS/HS Project Participants		3.16	.74	3.82	.63	.66***	.547	7.092	0.95
Native American WS		2.50	.76	3.43	.76	.93***	.670	5.643	1.23
6. Make connections between mathematics and other subject areas.									
All NMPDS Participants	99	3.29	.93	3.75	.91	.46***	.779	7.406	0.49
EMA Participants(*n* = 34)		3.74	.75	4.15	.66	.41***	.633	3.943	0.58
MS/HS Project Participants (*n* = 51)		3.16	.97	3.53	.97	.37***	.851	5.042	0.39
Native American WS Participants (*n* = 14)		2.71	.73	3.57	.94	.86**	.597	4.163	1.00
13. Apply mathematical practices to classroom instruction.									
All NMPDS Participants	99	3.59	.83	4.18	.69	.59***	.682	9.543	0.76
EMA Participants(*n* = 34)		3.85	.78	4.47	.62	.62***	.651	5.965	0.85
MS/HS Project Participants (*n* = 51)		3.55	.78	4.02	.71	.47***	.703	5.814	0.63
Native American WS Participants (*n* = 14)		3.07	.92	4.07	.62	1.00***	.672	5.508	1.19

Item	N	Prior to Participation Mean	Prior to Participation SD	At the Conclusion Mean	At the Conclusion SD	Mean Difference	r	t	Cohen's d
14. Use a variety of assessment strategies									
All NMPDS Participants	99	3.29	.86	3.88	.72	.59***	.653	8.698	0.73
EMA Participants(*n* = 34)		3.59	.78	4.06	.69	.47***	.604	4.144	0.63
MS/HS Project Participants (*n* = 51)		3.29	.81	3.90	.67	.61***	.608	6.521	0.81
Native American WS Participants (*n* = 14)		2.57	.85	3.36	.75	.79**	.624	4.204	0.97
15. Use results from student assessments to inform practice.									
All NMPDS Participants	99	3.51	.98	3.87	.85	.36***	.761	5.600	0.39
EMA Participants(*n* = 34)		3.85	.96	4.24	.78	.39***	.737	3.419	0.43
MS/HS Project Participants (*n* = 51)		3.49	.88	3.82	.71	.33**	.651	3.485	0.41
Native American WS Participants (*n* = 14)		2.71	.99	3.14	1.03	.43**	.871	3.122	0.42
Preparedness to Meet Needs of All Students									
7. Teach mathematics to students with diverse abilities.									
All NMPDS Participants	99	3.32	.84	3.77	.82	.45***	.775	7.934	0.53
EMA Participants(*n* = 34)		3.62	.89	3.88	.91	.26**	.877	3.447	0.29
MS/HS Project Participants (*n* = 51)		3.27	.78	3.71	.76	.44***	.753	5.719	0.56
Native American WS Participants (*n* = 14)		2.79	.70	3.71	.83	.92***	.685	5.643	1.20
8. Teach mathematics to students from a variety of cultural backgrounds.									
All NMPDS Participants	97	2.88	.90	3.08	.93	.20***	.853	4.072	0.22
EMA Participants(*n* = 34)		2.97	.94	3.09	.97	.12*	.941	2.098	0.12
MS/HS Project Participants (*n* = 49)		2.88	.86	2.98	.85	.10	.879	1.698	0.12
Native American WS Participants (*n* = 14)		2.64	1.01	3.43	1.09	.79**	.780	4.204	0.75
9. Teach mathematics to students who are English Language Learners.									
All NMPDS Participants	96	2.35	1.07	2.50	1.11	.15**	.913	3.117	0.13
EMA Participants(*n* = 34)		2.62	1.05	2.79	1.07	.17	.879	1.977	0.17
MS/HS Project Participants (*n* = 49)		2.41	1.04	2.51	1.08	.10	.922	1.698	0.10
Native American WS Participants (*n* = 13)		1.46	.78	1.69	1.03	.23	.921	1.897	0.21
10. Teach students who struggle in learning mathematics.									
All NMPDS Participants	98	3.54	.81	4.11	.66	.57***	.638	8.809	0.76
EMA Participants(*n* = 34)		3.85	.784	4.26	.618	.41***	.708	4.311	0.56
MS/HS Project Participants (*n* = 50)		3.50	.74	4.00	.64	.50***	.652	6.093	0.72
Native American WS Participants (*n* = 14)		2.93	.83	4.14	.77	1.21***	.620	6.497	1.51
11. Encourage participation females and minorities in mathematics.									
All NMPDS Participants	99	3.59	.97	3.82	.91	.23***	.842	4.351	0.25
EMA Participants(*n* = 34)		3.91	1.00	4.06	.85	.15	.900	1.968	0.15
MS/HS Project Participants (*n* = 51)		3.43	.94	3.67	.93	.24**	.873	3.554	0.25
Native American WS Participants (*n* = 14)		3.36	.84	3.79	.89	.43	.519	1.883	0.49
12. Take into account students' prior conceptions about mathematics when planning lessons.									
All NMPDS Participants	98	3.40	.89	3.87	.85	.47***	.762	7.199	0.50
EMA Participants(*n* = 33)		3.55	.711	4.03	.68	.48***	.607	4.503	0.69
MS/HS Project Participants (*n* = 51)		3.41	.92	3.76	.89	.35***	.833	4.825	0.39
Native American WS Participants (*n* = 14)		3.00	1.11	3.86	1.03	.86**	.608	3.379	0.80

Note. Responses were rated on a 5-point scale where 1 = Not at All Prepared, 2 = Somewhat Prepared, 3 = Moderately Prepared, 4 = Well Prepared, and 5 = Very Well Prepared. *$p < .05$; **$p < .01$; ***$p < .001$.

IMPACT OF NMPDS

The Teacher Survey asked NMPDS participants to rate the extent to which their participation in NMPDS influenced their ability level to provide mathematics instruction. Exhibit A11 presents the average group rating for each item, along with the distribution of responses. Participants indicated that their participation in NMPDS had the greatest impact on their *ability to apply mathematical practices to classroom instruction*, followed by their *ability to provide alternative explanation or example when your mathematics students are confused.*

EXHIBIT A11. IMPACT OF NMPDS PARTICIPATION

				Percentages of Responses				
To what extent did your participation in NMPDS influence your ability level to:	*N*	*Mean*	*SD*	Not Well	Somewhat	Moderately	Well	Very Well
1. Respond to difficult mathematics questions from your students?								
All NMPDS Participants	99	3.47	0.92	4.0	11.1	25.3	52.5	7.1
EMA Participants(*n* = 34)		3.47	1.02	5.9	5.1	11.8	61.7	5.9
MS/HS Project Participants (*n* = 51)		3.45	0.92	3.9	9.8	31.4	47.1	7.8
Native American WS Participants (*n* = 14)		3.57	0.76	0.0	7.1	35.7	50.0	7.1
2. Gauge student comprehension of a mathematics lesson you just taught?								
All NMPDS Participants	99	3.60	0.92	2.0	12.1	22.2	51.5	12.1
EMA Participants(*n* = 34)		3.68	0.94	0.0	14.7	20.6	47.1	17.6
MS/HS Project Participants (*n* = 51)		3.51	0.97	3.9	11.8	23.5	51.0	9.8
Native American WS Participants (*n* = 14)		3.71	0.73	0.0	7.1	21.4	64.3	7.1
3. Craft good mathematics questions for your students?								
All NMPDS Participants	99	3.72	1.02	4.0	7.1	24.2	42.4	22.2
EMA Participants(*n* = 34)		3.85	1.16	25.9	8.8	11.8	41.2	32.4
MS/HS Project Participants (*n* = 51)		3.57	0.98	3.9	7.8	31.4	41.2	15.7
Native American WS Participants (*n* = 14)		3.93	0.73	0.0	0.0	28.6	50.0	21.4
4. Adjust your mathematics lesson to the proper level for individual students?								
All NMPDS Participants	98	3.51	1.00	4.0	12.1	25.3	44.4	13.1
EMA Participants(*n* = 33)		3.58	1.06	2.9	14.7	20.6	41.2	17.6
MS/HS Project Participants (*n* = 51)		3.37	1.04	5.9	13.7	27.5	43.1	9.8
Native American WS Participants (*n* = 14)		3.86	0.66	0.0	0.0	28.6	57.1	14.3
5. Provide alternative explanation or example when your mathematics students are confused?								
All NMPDS Participants	99	3.78	0.96	4.0	4.0	23.2	47.5	21.2
EMA Participants(*n* = 34)		3.86	1.10	8.8	0.0	14.7	50.0	26.4
MS/HS Project Participants (*n* = 51)		3.75	0.93	2.0	7.8	23.5	47.1	19.6
Native American WS Participants (*n* = 14)		3.71	0.73	0.0	0.0	42.9	42.9	14.3
6. Contribute actively about making decisions about mathematics curriculum with others in your school and/or district?								
All NMPDS Participants	99	3.54	1.14	5.1	17.2	17.2	40.4	20.2
EMA Participants(*n* = 34)		3.76	1.13	5.9	8.8	14.7	44.1	26.5
MS/HS Project Participants (*n* = 51)		3.33	1.19	5.9	23.5	19.6	33.3	17.6
Native American WS Participants (*n* = 14)		3.71	0.91	0.0	14.3	14.3	57.1	14.3
7. Apply mathematical practices to classroom instruction?								
All NMPDS Participants	99	3.88	0.84	1.0	7.1	15.2	56.6	20.2
EMA Participants(*n* = 34)		3.97	1.07	2.9	5.9	11.8	50.0	29.4
MS/HS Project Participants (*n* = 51)		3.76	0.81	0.0	9.8	17.6	55.6	13.7
Native American WS Participants (*n* = 14)		4.07	0.62	0.0	0.0	14.3	64.3	21.4