

Survey Results from Nebraska Science Teaches Inquiry Knowledge, Practice, and Professional Development

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Purpose of Study

- To provide a baseline of Nebraska teachers'
 - Science inquiry professional development experiences
 - Frequency and duration of training, delivery format, training strategies, distance travelled, etc.
 - Knowledge of inquiry
 - Perceptions of inquiry
 - Inquiry instructional practice

Purpose of Study

- To compare Nebraska elementary teachers results with those from a national sample
- To explore relationships between Nebraska middle/high school teachers inquiry perceptions, practice, and knowledge

Participants

Nebraska Sample

- 145 teachers completing survey at 2010 NATS
- 41% elementary; 59% secondary

National Sample

- Random sample of teachers with stratification of rural/urban
- Total of 595 K-5 teacher participants

Science Survey Measures

Measure	Description
Demographics	Teaching assignment, certification, experience, class organization and size, gender, age, and ethnicity
Professional development characteristics	Characterization of best professional development experience within past year in terms of format, PD leader, total hours, time span, distance travelled, use of demonstration/modeling, opportunities for collaboration, practice, & feedback
Perceptions	Importance of science inquiry topics, degree of knowledge improvement related to topics
Knowledge	Scientific inquiry, classroom inquiry, and inquiry pedagogical content knowledge
Reported practice	Extent to which specific inquiry topics and skills are focus of teacher practice

Elementary Teacher Descriptives

- Predominantly female (92%), with 16 years of teaching experience and 15 years teaching science, and teaching an average of 20 students
- 46% have Masters
- 27% were from rural schools
- Taken average of 7-8 science courses and 3 science ed courses
- 60% had participated in KICKS

Results: Elementary Teacher PD

Professional Development Characteristic	Nebraska	National
Format		
Single workshop	43.5%	37.8%
Series of workshops	34.8%	24.3%
Workshop with follow-up coaching	8.7%	24.3%
PD Leader		
Teacher or staff from your school	4.5%	10.5%
District staff	9.1%	21.1%
Regional educational unit	31.8%	18.4%
External expert	27.3%	31.6%
Miles traveled to PD	174	104

Results: Elementary Teacher PD

Professional Development Characteristic	Nebraska	National
Time Spent in PD		
Hours spent in PD	70.45	18.92
Span over PD (in days)	22.9	50.8
Format		
Live, in person	100%	92.1%
Lecture (% of time)	30-40%	40-50%
Equal amount of time		
–Modeling of skills within workshop		
–Learning community		
–Practice/feedback opportunities in classroom		
– Practice/feedback opportunities in workshop		

Results: Elementary Teacher PD

Professional Development Characteristic	Nebraska	National
Interaction/collaboration		
Interaction was part of PD	39.1%	57.9%
Interaction was independent of PD	43.5%	18.4%

Inquiry Areas Researched

- Discipline-specific knowledge
- Classroom inquiry
 - Engaging students in questioning
 - Guiding student in proposing explanations
 - Guiding students in conducting investigations
 - Helping students to use data to construct explanations
 - Helping students to communicate findings
- Inquiry strategies

Results: Elementary Teacher PD

- Degree of Focus in Best PD (1=not included, 2=minor focus, 3=significant focus)

Topic	Nebraska	National
Discipline Specific Knowledge	2.81	2.25**
Classroom Inquiry	2.68	2.42*
Inquiry Strategies	2.74	2.56

*p < .05, ** p < .01

Results: Elementary Teacher PD

- Knowledge Improved in Best PD (1=not at all to 5=greatly improved)

Topic	Nebraska	National
Discipline Specific Knowledge	3.61	3.18
Classroom Inquiry	3.61	3.27
Inquiry Strategies	3.58	3.27

Results: Elementary Teacher PD

- Degree of Classroom Focus(0=not a focus, 1=minor focus, 1.5=moderate focus, 2=significant focus)

Topic	Nebraska	National
Discipline Specific Knowledge	1.66	1.20***
Classroom Inquiry	1.46	1.21*
Inquiry Strategies	1.52	1.16**

Results: Elementary Teacher PD

- Importance to Student Learning(1=less important, 2=somewhat important, 3=important, 4=critical)

Topic	Nebraska	National
Discipline Specific Knowledge	3.07	2.85
Classroom Inquiry	3.22	3.06
Inquiry Strategies	3.53	3.11***

Results: Inquiry Knowledge

Construct Measured		Nebraska	National
Classroom Inquiry		Average = 72.7%	65.8%*
Science Inquiry		Average = 61.5%	50.3%**
Pedagogical Content Knowledge		Average = 56.1%	54.8%
1	Direct Didactic	4%	6%
2	Direct Active	8%	15%
3	Guided Inquiry	56%	55%
4	Open Discovery	32%	26%

Results: Comparison of PD for Reading, Science, and Math

- Less time devoted to science instruction
 - Science: Nebraska: 41 minutes per day
National 26 minutes
 - National Reading: 81 minutes
 - National Math: 64 minutes
- Less professional development for science
 - Science: Nebraska 75% participated, national 26%
 - Reading: 79% of teachers
 - Math: 52% of teachers

MS/HS

Descriptive Statistics

- About 1/3 of the teachers were from rural schools
- Education
 - Average of 14 science courses
 - Average of 4 science education courses
 - 51% have Master's degree
- Professional Development
 - 73% have received science inquiry PD in the last 2 years
 - 79% of teachers were involved in collaborative and interactive PD
 - Time spent in PD was about equally split between lecture, discussion, and demonstrations, with less opportunity for practice and feedback.
- Teachers average 20 minutes per day in informal science education

MS/HS Inquiry Knowledge

Topic		
Classroom Inquiry		Average = 70%
Science Inquiry		Average = 65%
Instructional Strategies		Average = 3.09
1	Direct Didactic	5%
2	Direct Active	11%
3	Guided Inquiry	56%
4	Open Discovery	28%

MS/HS

Classroom focus and beliefs about student learning

- There was a high correlation between focus on topics in the classroom and belief of importance to promoting student learning.
- Importance of topics in classroom and importance to student learning
 - Most important topics were discipline specific knowledge and laboratory activities.
 - Classroom inquiry and inquiry teaching strategies were moderately important.
 - Least important topics were nature of science, demonstrations, reading textbooks/science materials, and outside classroom experiences.

MS/HS

Learning from Science Inquiry PD

- Focus on topics in PD that lead to similar perceived knowledge improvement
 - Classroom inquiry
 - Inquiry teaching strategies
- Focus on topics in PD that lead to lower perceived knowledge improvement
 - Discipline specific knowledge
 - Nature of science

MS/HS

Focus in PD versus Classroom

- PD focus is higher than classroom focus and importance to student learning
 - Classroom inquiry
 - Inquiry teaching strategies
 - Discipline specific knowledge
 - Nature of science
- Item Exceptions – these are equivalent
 - Classroom Inquiry – “Helping students to use data to construct a reasonable explanation of their observations”
 - Nature of Science – “Science is a blend of logic and imagination”

Summary: Elementary

- Characteristics of PD
 - Nebraska PD is more likely to be led by external than internal staff/consultants
 - Nebraska teachers spend more concentrated time on PD than national sample (more total hours over fewer days)
 - Most PD (NE and national) is face-to-face
 - NE PD uses a variety of strategies, including lecture, modeling of skills, and practice/feedback opportunities

Summary: Elementary

- PD Focus, Classroom Focus, and Inquiry Knowledge
 - PD in NE has more focus on content knowledge and classroom inquiry than national
 - NE teachers focus more on content knowledge and classroom inquiry than national
 - NE teachers score higher on inquiry knowledge assessment in areas of classroom inquiry and scientific inquiry, but not PCK

Summary: MS/HS

- Most NE teachers chose inquiry instructional strategies in the inquiry knowledge assessment
- NE teachers focus in the classroom on what they believe is important to student learning.
- Order of focus on PD topics in NE professional development
 - Inquiry strategies
 - Classroom inquiry/Discipline specific knowledge
 - Nature of science

Professional Development Opportunities

- **Summer 2012 Professional Development Opportunities:** *KICKS2* and *CSI (Coaching Science Inquiry): Rural Schools (UNL)*
- **CSI: Rural Schools seeks**
 - Middle and high school teachers in rural schools for summer PD with focus on science inquiry as content and instructional strategy
 - Instructional coaches to provide on-going, one-on-one support during the year for CSI teacher participants
- **CSI Curriculum Working Group** – gkunz2@unl.edu
- **UNL Survey:** complete and return for Friday night raffle (\$25 Target gift cards, 4 recipients)

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