

**SCIMath MN  
Teacher Research Network  
Elementary Math Profile Analysis  
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Summary of Elementary Mathematics Profiles

Note: There are seven preservice and inservice teachers who participated in the mathematics portion of TRN for the year 2000-2001. I will organize this report so that the teachers area separated into two groups: preservice and inservice teachers.

**Context**

<b>Inservice Teachers</b>				
<b>Name</b>	<b>Grade level/ how many years</b>	<b>Location of school</b>	<b>Subjects taught</b>	<b>Specialty in teaching</b>
Kelly	3/2 years	Suburban Public	All	Language arts
Joe Cooke	6 <sup>th</sup> grad/; 2 <sup>nd</sup> year	Rural Public	All	No subject specialty
Karen Shoe	3 <sup>rd</sup> / 2 <sup>nd</sup> year	Small metro area school; magnet Public	All	Math specialty
Mr. O. J.	6 <sup>th</sup> / second year	Small metro area school; magnet Public	All	None specified

<b>Preservice Teachers</b>				
<b>Name</b>	<b>Grade level taught; # of years taught</b>	<b>Location of school</b>	<b>Subjects taught</b>	<b>Specialty in Teaching</b>
Kim	5th	Suburban Public	All	social studies
Andrea	5th	Suburban Public	All	Math
Mary Jones	6/8 <sup>th</sup> grade math	Small metro area Public	Math	Math

**Summary of data:**

**Inservice teachers:** All inservice teachers are in their 2<sup>nd</sup> year of teaching. They all teach multiple subjects in their perspective classrooms. No one is identified as having a specialty in math. Locations are varied: small (northeastern Minnesota) metro area, suburban area, and rural area.

**Preservice teachers:** All taught in the middle grades. Two teach all subjects, one is identified as teaching only math. Two have a specialty in math for licensure. Locations: two are in suburban schools districts (Minneapolis), one in small northeastern Minnesota metro.

Demographic Data						
Name	Size of class; gender division	Diversity of class	School size	Resources for math	Classroom arrangement	Distribution of teaching math
Kelly	23 students, 10(m), 12 (f).	All English proficient. 1 Hearing impaired. 8 gifted.	750	Houghton- Mifflin text. Evidence of multiple manipulatives in the classroom.	Pods: 3-5 student desks per pod.	Daily: 50 minutes
Joe Cooke	26 students, 10(m), 16(f).	All English proficient. Two gifted, no disabilities. 23 white, 3 Native American.	525	Exploring Mathematics, Scott Foresman, manipulative aids (demographic form)	5 rows, front to back	Daily: 55 minutes
Karen Shoe	19 students; 10(m), 9(f).	18 proficient in English, 1 ELL. 2 students EBD or LD. 4 students in gifted program.	560; 85% white, 6% African American, 6% American Indian, 3 % Hispanic.	Investigations Math Program, multiple manipulative kits, math and literature resources	Pods- 4 desks	Daily: 40 minutes
Mr. O. J.	29 students, 13(m), 16(f)	1 EBD, 1 learning disabled	200 35 % free and reduced lunch. Minority population of 10%.	Mathematics Plus (1989) by Harcourt Brace. No manipulative seen.	Rows	Daily: 45 minutes
Kim	35 students, 19(m), 15(f)	34 English proficient, 1 ESL, 3African Americans, 1 Asian, 30 Caucasians.	500	Addison Wesley (c= 1987), manipulatives	Rows-5-6 desks in each row	Daily: 50 minutes
Andrea	29 students; 18(m), 11(f)	3 ELL, 1 African American, 2 Asian, 26 Caucasian.	550	Addison Wesley (c=1987), manipulatives.	Pods; 4-5 student desks per pod	
Mary Jones	26 students; 15(m), 11(f); all white	White	550 students; 94 white; 2 African.1 Asian, 1hispanic	CMP, overhead, manipulatives in the classroom	Pods of 4 students	50 minutes of math, every day

**Key:** M= male, f= female, CMP= Chicago Mathematics Program (this is assumed by M. Koomen), EBD= Emotional/Behaviorally Disability, ELL= English Language Learners, LD=Learning Disabled.

## Knowing Mathematics

### Commonalties:

- 1) Math is a subject that four participants are confident in and or is one of their favorites: Kelly, Kim, Mary Jones, and Andrea. (MnMTII, CLES)
- 2) District or school text is a main resource for development of important content. (Joe Cooke, Karen Shoe, Mr. O.J., Mary Jones, Andrea). Kim used district wide curriculum (assuming it was also the text \*MJK). (MnMTII, MnMTOI).
- 3) Math was observed by the researcher as being accurate: (Joe Cooke, Karen Shoe, Mr. OJ, Kelly, Mary Jones). (MnMTOI)
- 4) Math was determined to be appropriate by a combination of use of the text and students work (assessment), (Karen Shoe, Andrea, Kim, Mary Jones,). (MnTII, MnMTOI)
- 5) Follows the curriculum set forth by district and or schools: (Joe Cooke, Andrea, Kim, Mary Jones). (MnTII, MnMTOI).

### Differences:

- 1) Joe Cooke, Karen Shoe, and Mr. O. J. did not indicate a comfort level in teaching math. (not indicated on any forms or reports).
- 2) Kim, Kelly, and Andrea all cited use of MN Graduation Standards in determining content with district wide curriculum. (MnMTII)
- 3) Major emphasis on **Joe Cooke** was on computational aspects. (MnMTII, MnMTOI)
- 4) **Kim** indicated that she used high interest materials to keep kids engaged. (High interest was not defined). (MnMTII, MnMTOI).
- 5) **Kelly** described the math as appropriate based on student responses. (MnTII). Kelly does not feel any constraints except for "Time" (MnTII)
- 6) Researcher for **Mr. O. J.** described the material in math as being appropriate for the students. (MnMTII, MnMTOI). Mr. O.J. Expected all students to solve all the problems. Also appreciated the way that some students solved problems. (MnTII, MnTOI). Mr. OJ is only 6<sup>th</sup> grade teacher in school. (MnTII)
- 7) **Karen Shoe** also described that the "team" helps determine whether math content is appropriate. (MnMTII, MCLES). Karen Shoe indicated that student work was also important in determining content.
- 8) **Joe Cooke** stated that computational skills must be mastered - this was important content. Also viewed, math as a collection of algorithms. No integration of math with other subjects. (MnTII, MnTOI)
- 9) **Mary Jones** described math as being an investigation. (MnTII)

### **Omissions:**

- 1) Joe Cooke did not use MN Grad Standards in defining important content. (no citations found in reports).
- 2) Kim and Andrea's reports did not indicate whether they were accurate in math delivery.
- 3) Joe Cooke's knowing mathematics as appropriate section was not described.
- 4) No one indicated use of NCTM Standards as a component in determination of knowing content

### **Sources of data**

As indicated above: (MnMTII, MnMTOI) and researchers profiles

### **Knowing Pedagogy**

#### **Kinds of Activities**

#### **Commonalties**

- 1) Various kinds of activities were described and observed: use of manipulatives, hands on activities, cooperative learning techniques, real world applications (Kelly, Karen Shoe, Andrea, and Kim). (MnMTII, MnMTOI)
- 2) Thinking about mathematics (Andrea, Kim, Kelly). (MnMTII).
- 3) A constructivistic classroom was described as sharing of ideas, and knowing that there is more than one way to solve a problem. (Kelly, and Kim). (MnMTII)

#### **Kinds of activities**

#### **Differences**

- 1) Joe Cooke used only the text for resource on activities. (MnMTII, MnMTOI).
- 2) Joe Cooke also talked about manipulatives and not wanting to use them. (MnMTOI)
- 3) Kim described the importance of students creating their own meaning and understanding. (She was the only one that described this). (MnMTII).
- 4) Problem solving was defined as the most important aspect of math (Kim) - (MnMTII)
- 5) How is math defined: Karen Shoe as solving a math problem using manipulatives. (MnTII)

#### **Appropriate activities:**

#### **Commonalties**

- 1) Activities taken from the text: Joe Cooke and Mr. O.J., Kim. (MnTII,)
- 2) Used manipulatives with activities: Andrea, Kim, Kelly (MnMTII, MnMTOI)
- 3) Not aligned with standards: Joe Cooke (profile)

#### **Differences:**

- 1) Kim stated that math asks different things from students, but because an answer can be found, anyone can do it. (MnMTII)

- 2) Mr. Cooke said that a math activity was appropriate if kids could do them. (MnMTII)
- 3) Only one teacher (Karen Shoe) described activities as attempts to make meaning in math (MnTII)

**Kinds of thinking/discourse:**

- 1) Students sharing of math ideas and asking questions, solving problems with more than one correct answer: Mr. O.J., Kelly, Karen Shoe, and Kim. (MnMTII, CLES, MnTOI)
- 2) Thinking as related to computational problems or one correct answer, teacher explaining the computation: Mr. Cooke, Andrea, and JC. (MnMTII, CLES, MnTOI)

**Teacher's role:**

**Commonalties:**

- 1) As a facilitator: Kelly, Mary Jones, and Karen Shoe. (MnMTII)
- 2) Student driven environment: Mary Jones, Karen Shoe (MnMTII)
- 3) Be there to help answer questions: Mary Jones, Andrea, Mr. Cooke, Kelly, and Kim. (MnMTII, CLES, MnTOI)

**Differences:**

- 1) Rationale for why we need to know math: Kelly ((MnMTII)
- 2) Role as a giver of instruction - adjusting pace as necessary to complete # of exercises. Joe Cooke (MnMTII)

**Assessments:**

**Commonalties:**

- 1) Developed to help teacher understand students learning and background and to develop math curriculum: Kim, Kelly, Karen Shoe, Andrea, and Mr. Cooke. (MnMTII and MnMTOI)
- 2) Mary Jones - talked about importance of students doing work together - but her teaching was giving and doing examples in front of the class. (MNMTOI, MNTII)

**Differences:**

- 3) Assessments based on what the kids are expected to do: Mary Jones (MnMTII)
- 4) Assessment was assignments, and quizzes -Joe Cooke-(MnMTII)
- 5) Explanations by children important (Mary Jones). (MnMTII)

**How has student learning been achieved?**

**Commonalties:**

- 1) Completion of daily work, listening to their questions: Kelly, Mary Jones. Karen Shoe (MnMTII and MnMTOI)
- 2) Learning achieved and determined by scores on daily work or tests: Mr. Cooke (MnMTII, MnMTOI)

**Differences:**

Teacher reflection on their comfort zone (Kelly) (MnMTII)

**Omission:**

No indication how Mr. O.J. determines assessment poor student learning.

**Resources:**

Besides text that was already indicated: other resources are Internet (1 teacher), cooperating teacher (1 teacher). (MnMTII)

**Omissions**

No one described what a manipulative was supposed to do in math

**Knowing Students**

**Commonalties**

- 1) Appropriate to students was largely determined by the district: Mary Jones, Kim, Andrea (MnMTII, CLES)
- 2) Described that materials or content was appropriate to the students by their reactions, or attitudes: Kim, Karen Shoe, Mary Jones, and Mr. Cooke. (MnMTII, CLES)

**What is student's role?**

- 1) Listening to the teacher and following directions: Mr. Cooke, Mary Jones (MnMTII & CLES)
- 2) Discussion, asking questions: Kim, Andrea, Kelly, Mr. Cooke, Mr. OJ, and Karen Shoe. (MnMTII & CLES)

**Differences:**

Mr. Cooke seems to view the asking of questions as a means of finding the one correct answer. The other teachers view asking of questions as a means to understanding what their students know and do not know about math. Also he asks students questions as a means of being sure that they are paying attention to the math class?? (page 8 report). Mary Jones's discussion really involves her questions put to students and not the students questioning on their own.

**Management of social aspects and behavior:**

**Commonalties:**

Classroom management was not an issue: Kelly, Karen Shoe, Mr. Cooke (MnMTOI)

### **Differences**

Classroom management was an issue: Mr. O.J., Mary Jones, Kim, and Andrea. (MnMTOI)

### **Summary:**

It was either an issue in the majority of the classrooms.

### **Learning Environment**

#### **Commonalties**

- 1) No safety issues indicated in any of the participating teachers, Kim and Andrea went over their expectations for the lesson. and handling of the equipment. (MnMTOI).
- 2) 2. Classroom arranged in a manner that students can turn to each other: Kelly, Andrea, Mary Jones, Karen Shoe (not described) (MnMTOI, Pre & Post Observation Forms).

#### **Differences:**

Students in rows and very crowded: Kim (MnMTOI & MnMTII).

### **Professional Development**

#### **Commonalties**

- 1) Many working on Master's: Mr. Joe Cooke, Kelly, Mr. O.J. - (however, subject of master's not described in MnMTII).
- 2) Attended Math conference: Mary Jones, Karen Shoe (MnMTII)
- 3) Indicates teaching experience as contributing the most to being a math teacher: Kelly, Karen Shoe, Mr. O.J. (MnMTII)
- 4) Undergraduate programs contributing less than 40% percent to ability to teach math: Mr. Joe Cooke, Kelly, Karen Shoe, and Kim. (MnMTII)

#### **Differences**

- 1) Teaching examined in terms of pacing or # of exercises - not as a different approach. (MnMTII & MnMTOI)
- 2) Teaching reflected on as indication of a different approach: Kelly (MnMTII)
- 3) Difficulty being reflect: Andrea -(MnMTII)
- 4) Thinks about the lessons as being an indication that she can think on her feet and engage students in learning Kim - (MnMTII)
- 5) Andrea thought that she had achieved her objectives. (MnMTII)
- 6) No professional development as a math teacher: Andrea (MnMTII)

### **Omissions**

Self-reflection on teaching not indicated in the reports: Mary Jones, Karen Shoe

**Sources of data:** As indicated above and profiles.

### **Summary and Conclusions:**

#### **Knowing Mathematics:**

More of the participants - 57% - feel confident in math. Most of the participants - 85%- use district or school curriculum. Math that was observed is accurate - 71%. Math was considered to be appropriate based on the classroom text or the district curriculum. This does not take in to account the possibility that the texts or the district curriculum may not address mathematics in a manner set forth by the goals of the NCTM or the MN Graduation Standards. Only 42% of the participating teachers indicated that the MN Graduation Standards were a part in their development of math content. It also assumes that the teacher is not actively analyzing the standard materials provided by the district and or schools.

It is heartening to note, that only 1 teacher had a major focus on computational aspects as being the primary aspect in the mathematics classroom.

#### **Knowing Pedagogy and Students:**

It is encouraging also to note that many classrooms engaged in mathematics discourse and discussion during mathematics class. One can conclude that these teachers are helping students to develop the understanding of the various concepts in their mathematics class, as well as the understanding that there are multiple ways and methods for solving mathematical problems. Several of the teachers used manipulatives in various capacities - it is not truly clear or evident in the narrative how the manipulatives were used in most cases to develop the content of the class. Just using manipulatives is not enough - they need to help student “think” about the math problem at hand and make sense of the math. In short - the use of manipulatives was not described as purposeful.

Many of the participants described themselves as being a facilitator of math. However, again this was not always defined. In at least one case, the facilitator only facilitated her own questions to the students and not questions from the students as they processed and tried to make sense of the meaning of mathematics. In describing the student’s role in math class - two teachers described the role of the students as listening and following directions and six with a role of asking questions and discussing mathematics (Mr. Cooke was in both groups).

Classroom management was an issue in four out of the seven classrooms (always difficult for new teachers). It is also important to note that only two profiles described the teacher as developing expectations, especially with the

use of materials and manipulative. Without the teacher developing care and handling of “hands-on” materials, it is doubtful that students will be able to use the manipulatives as a valuable learning tool.

Most of the classrooms were physically arranged for safety and conducive for group work with other students.

Several of the inservice teachers were enrolled in Graduate programs - it was not described as to the type of graduate programs - curriculum and instruction, educational leadership or? Few teachers had had opportunities for other professional development or attended conferences. This remains and is a critical need for all inservice teachers.

It was also difficult to ascertain how the teachers really understood how learning in the various mathematics lessons had occurred. Only one teacher (Mr. Joe Cooke) based learning solely on assignments, reviews, and testing. The majority of the other teachers did assess the students informally by various means (listening to their questions, daily work, participation and group work, projects) - but was this an indication of student learning? How do we gauge student learning in mathematics?

### **What else stands out?**

**Mr. O. J:** Researcher noted that he does seem to have a grasp on student centered learning; main weakness was in classroom management. Excited about the new math book. **Kelly:** pressed for time. Little time to reflect on with students on the outcome or conclusions of the lessons. Very reflective in interview – answers detailed and appropriate. **Kim:** Classroom management was definitely an issue. Researcher felt that this was more important than the actual teaching of the math material. Math class went over allotted time on both days. Many of the students that composed her math class were not from her homeroom. **Andrea:** Her reluctance to be reflective about her teaching. The fact that she has a specialty in teaching math. Inexperience with teaching is perhaps reason for management issues.

### **Presservice teachers**

Andrea: 5<sup>th</sup> grade

Kim: 5<sup>th</sup> grade

Mary Jones: 6<sup>th</sup> grade

### **Inservice teachers**

Kelly: 3<sup>rd</sup> grade (2<sup>nd</sup> year)

Joe Cooke: 6<sup>th</sup> grade (2<sup>nd</sup> year)

Karen: 3<sup>rd</sup> grade (2<sup>nd</sup> year)

O.J.: 6<sup>th</sup> grade (2<sup>nd</sup> year)

## **Elementary Math Profile Writer Analysis Comments and Suggestions (from Michele Koomen):**

The research from the Teacher Research Project Network for SCI/Math MN is noble and important. I believe that the researchers whose reports are the foundation for this analysis (including my own) have compiled their reports with integrity, professionalism, and reflection. If this study is to be of real merit in the description of the research in math and science (this is, I believe a Descriptive Study), and contribute to our knowledge as professionals, I believe that it is paramount that the research and description of the research (Profiles, Analysis, and other reports) are done with greater consistency. I believe that there continues to be a critical need for a more standardized format in the development of the profiles in particular. The Profile Reports are done using the categories that we have described: Context, Knowing Science/Math, Knowing Pedagogy, Knowing Students, Learning Environment, Professional Development), however, the description in each of these sections remains inconsistent. Some writers have included the categories and all the sub categories, while others have not. Some research writers have only written a narrative and with little documentation as to which instrument supports their evidence.

I also advocate that the TRN Program Managers develop definitions for some very key terms: pedagogy, constructivism, activity, hands on - to delineate a few. I think in math it may also be important to differentiate between the two types of mathematical knowledge: procedural and conceptual knowledge.

I also believe that the interview itself, while not needing to be scripted, should have again standardized questions that are asked of all participants.

Being picky - writers should be sure to include a key for any abbreviations or acronyms that they use. It may be assumed they the use written is understood and common knowledge - but - this is not always the case.

Finally, the research program managers need to verify that all profiles and other necessary reports are similar and consistent, before they are sent out to the analysis/reviewer teams.