

TEACHERS' PERCEPTIONS OF NEED FOR AND FEELING OF COMPETENCY IN
TRANSCRIBING BRAILLE MATERIALS IN THE NEMETH CODE WITH STUDENTS
WITH VISUAL IMPAIRMENTS

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TEACHERS' PERCEPTIONS OF NEED FOR AND FEELING OF COMPETENCY IN
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WITH VISUAL IMPAIRMENTS

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Abstract

TEACHERS' PERCEPTIONS OF NEED FOR AND FEELING OF COMPETENCY IN
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WITH VISUAL IMPAIRMENTS

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This is a repeated study which reports how Teachers of the Visually Impaired (TVIs) view their competency transcribing materials in Nemeth braille code and their perception of their ability to teach math using Nemeth braille. Results indicate mean ratings of TVIs perception of fifty-five mathematical skills and competency in teaching them in the Nemeth code.

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CHAPTER I: INTRODUCTION

DeMario and Lian (2000) conducted a survey from Illinois and Massachusetts Teachers of the Visually Impaired to see their perceptions and competence in teaching math in Nemeth and transcribing math into Nemeth. While the Nemeth Code is very effective at mathematics, research shows teachers may not feel as confident in their ability to transcribe the Nemeth Code especially in higher mathematical classes.

Since mathematics needs to be represented linearly, literacy braille did not fill the need; Nemeth was developed in 1956 by Abraham Nemeth in 1952 to elegantly solve this problem. Nemeth does not follow the rules of literary braille and is used in mathematics, science and other technical writings. Nemeth has only been revised a few times the last being 1972. While this is not the only mathematical braille code it is the one adopted by the United States. However, there are many concerns in using Nemeth for braille students such as finding math books written in Nemeth code (Rapp & Rapp, 1992), if it is found it is often different than the print version (Corn & Wall, 2002) and if it is prepared in Nemeth there is also a long-time delay in the preparation of materials (De-Mario & Lian, 2000).

Statement of the Problem

My research is built upon the research of DeMario and Lian (2000) by examining the ratings of current Teachers of Visually Impaired on teachers perceptions and competence in teaching mathematics with the Nemeth Code. In this research, teachers of visually impaired in Wisconsin were asked to provide demographic information and then to respond to several Likert

scale questions regarding their perception of their confidence and competency in teaching mathematics with the Nemeth Code. Teachers were also asked to provide written comments on the supplemental strategies they used to assist in teaching the notations that were needed particularly in teaching high level mathematics where notations could be more difficult.

Definition of Terms

Nemeth Code: Braille code developed to teach mathematical skills

Teacher of Visually Impaired (TVI): Teachers trained to teach students who are blind or visually impaired

Academic Achievement: The outcome of a student's education that is measured by GPA.

Delimitations and Limitations of the Research

There are two limitations to the survey in the Wisconsin teachers of visually impaired.

1. The scope of my study is limited to the teachers of visually impaired in Wisconsin which is a small group.
2. The research is limited to period of the Fall of 2016. This is necessary to allow for the research to be completed by the end of the semester.

There are two limitations to the research of Teachers of Visually Impaired students

1. The lack of a control group created a limitation in understanding if the independent variable truly impacts the dependent variables.
2. When surveying the teachers, the education and experience in the classroom and with students with visual impairments may impact the results of the study. No effort was made

to distinguish the teacher's experience with Nemeth code to teach mathematics before the survey was conducted.

Method of Approach

The original study survey Illinois and Massachusetts TVIs in the fall of 1996 and the spring of 1997. Four hundred and ninety-eight TVIs were given the survey and two hundred fourteen responded. They were asked to rate their perspective and comfort level while teaching and transcribing Nemeth. The survey was comprised of three sections: demographic, math instruction and Nemeth transcribing through a self-assessment of transcribing skills and the need for the math to be in the Nemeth format.

A list of math skills were used from the Curriculum and Evaluation Standards for School Mathematics (National Council of Teachers for Mathematics, 1989). A scale ranging from 1 to 4 was used with 1 being not anxious to 4 being very anxious concerning their assessment of their own teaching and transcribing skills for each math element.

As students in the United States have low assessment scores in mathematics, it is relevant to assess teachers perceptions of their ability to teach and provide properly transcribed materials to students with visual impairments. In order to understand where Wisconsin TVIs are in relation to this question can provide important information for preservice TVI programs and for professional developments needed for TVIs.

In my study, Wisconsin teachers who serve students with visual impairments were surveyed by sending a survey to each of the teachers. I asked the teachers to rate their perceived confidence and competence in teaching mathematics with the Nemeth Code. Teachers were also

asked to provide written comments of how they supplemented the codes and notations that students needed to do algebra and other higher level mathematics problems. In the summer of 2016, surveys were sent via a listserv to teachers of visually impaired students in Wisconsin based on the data base provided by the Wisconsin Department of Public Instruction. A total of 73 teachers were asked to complete the survey and 20 or (27%) responded.

The survey was derived of three sections, demographic information, five Likert-scale questions about the teachers perceived competence in teaching mathematics using the Nemeth Code and five questions about their confidence. Respondents were also asked to provide a written response of how they provided supplemental material for teaching higher level mathematics such as algebra.

The IRB approval letter is attached as Appendix A. Project data collection materials are attached as Appendix B. The data collection includes the survey that was sent to the teachers of the visually impaired students and the summary of the results.

CHAPTER II: REVIEW OF THE LITERATURE

Research Question

My research focused on the teachers perceived competence and confidence in using the Nemeth Code in teaching mathematics to student with visual impairments.

Discussion of Prior Research

DeMario (2000) explored the perceptions of teachers of visually impaired students in Illinois and Massachusetts. The study surveyed teachers to rate their perceived competency in transcribing math materials into the Nemeth Code, their need to do so, and their perceived competency to teach mathematics using the Nemeth Code. Results indicated “a significant difference between mean ratings on competency and needs by respondents for 23 of the 55 math skills on the survey.”

There has been a great deal of research on the need for increasing the basic mathematical skills of students with visual impairments. Wittenstein conducted a survey in 1993 and found 50.2% of those surveyed demonstrated Nemeth skills to graduate from a TVI training and 35.8% felt they were proficient in their knowledge of the code. Similar findings were found in studies by DeMario, Lang, and Lian (1998) and DeMario and Lian (2000) (Kapperman, 2003). A survey of universities with TVI training programs revealed 20% of programs didn't teach Nemeth as part of their programs (Amato, 2002). However, a Delphi study showed that TVIs rate knowing the Nemeth code as important (Koenig & Holbrook, 2000). "Without the ability to read and write the symbols that represent mathematical concepts, the field of mathematics is closed to persons who are visually impaired" (Kapperman & Sticken, 2003, p. 110).

Mathematics is traditionally “presented in a visual two dimensional and linear form.” (Cahill, 1994). This has led to difficulties for the population of blind and visually impaired students to access mathematics and science. Thus, this population has been alienated from careers in science, technology, engineering or mathematics (Karshmer). While many attempts have been made to rectify this situation, there hasn’t been a concrete solution. Through teachers of the visually impaired, students in this population and organizations like the American Foundation for the Blind information has been collected about what is working and what isn’t in relation to brailled text, tactile representations and mathematics through audio.

Mathematics is brailled in a linear formation. The problem is mathematical equations are often two dimensional nonlinear (Karshmer). Only the simplest of equations can adequately be expressed linearly. For those who access Nemeth with a refreshable braille note there is usually only one line of braille which the reader has access to. This takes a very powerful tool out of the hands of this population. There is also the factor that students must be taught two codes literary braille and Nemeth. This adds additional learning and in general cannot represent complex equations simply for these students. One student stated, “Even simple expressions can be difficult to solve due to the length of the braille questions and working problems out.” (Cahill). Currently, hard copy braille books are the best braille option for multiple lines can be used to represent problems as accurately as possible.

Summary

The results of the survey indicated that 60% of teachers of visually impaired students in Wisconsin feel competent and confident to teach Nemeth Code mathematics to elementary

students. However, for high school students only 35% of teachers felt competent transcribing mathematical materials into Nemeth.

Hypotheses

I hypothesized that the teachers' of visually impaired students in Wisconsin would report they felt competent and confident in teaching the Nemeth Code to students in preschool through middle school or approximately 8th grade. I predicted that 50% of the teachers would not feel competent or confident in teaching the Nemeth Code to high school students because although they would have had the training, they may not have had the current experiences.

Chapter III: Method

Participants

Research was conducted at the state of Wisconsin with twenty teachers of visually impaired students. There was a total of 1 male teachers, and 19 female teachers. The largest ethnic group was Caucasian with 98%. The average age of the participants was 50 years old.

Materials

The information collected included teacher perception of their competence and confidence in teaching mathematics using the Nemeth Code. Data was collected in the beginning of the 2016 school year. The survey was divided into 4 sections: perceived competence (questions 1-5), perceived competence (questions 6-10), demographic information (questions 11-15), written comments that could be included of how the teacher provided supplemental materials they used to teach more advanced mathematical concepts. Teachers answered each question on a Likert scale of 1 to 4 with 1 meaning not necessary and 4 meaning very necessary.

Procedures

Before the research began I first received permission from the Department of Public Instruction to collect and research. Once permission was received I proceeded to receive permission from those needed for consent form for participation of human participants.

During the Fall, I prepared, administered, and collected data from the teachers. To protect the participant's identity a data key code was prepared for each participant on the separate data sheet. Each participant was assigned a number on the data collection sheet instead of their name.

The data key code was stored separate from the data collection sheet. The data was collected and placed in a data collection form and analyzed for growth or regression.

CHAPTER IV: RESULTS

Of the teachers surveyed 70% have been teaching 8 or more years with the remaining separated into 6 to 8 years (10%), 3-5 years (10%), and 1-2 years (10%). The number of students who learn literary braille was higher than the number of students learning Nemeth (Chart 1 and 2).

None	0
1-2 students	5
3-4 students	9
5 or more students	6

Table 1 how many students do you have who read braille or are potential braille readers?

None	0
1-2 students	12
3-4 students	3
5 or more students	5

Table 2 how many students use or potentially will use the Nemeth Code?

When asked how necessary it is to transcribe mathematical materials into Nemeth TVIs felt it was very necessary (70%) in elementary school, 75% in middle school and 85% thought it was very necessary in high school. However, when asked how anxious teachers were about transcribing Nemeth there was an decrease in teachers not feeling anxious from 65% to 35%.

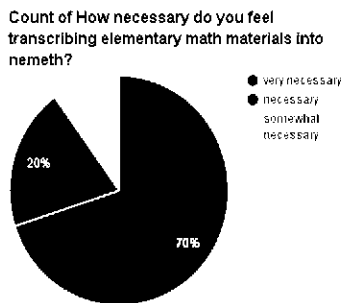


Figure 1 Necessary to transcribe Elementary math?

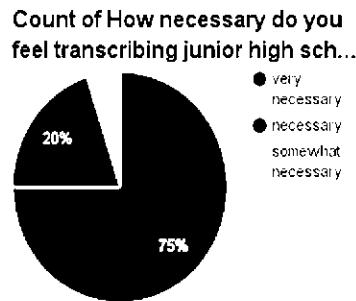


Figure 2 Transcribe JR High math?

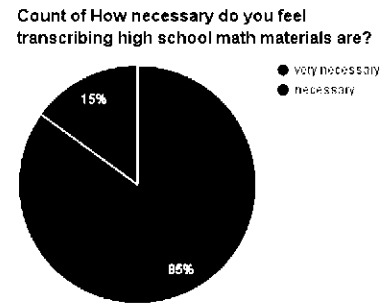


Figure3 Transcribe High School Math

When asked in general what was their anxiety about math 65% said they were not anxious. This was surprising since 60% of teachers said they received no elementary math methods class in pre-service training and 75% felt there should be such a class. Most teachers did share in their

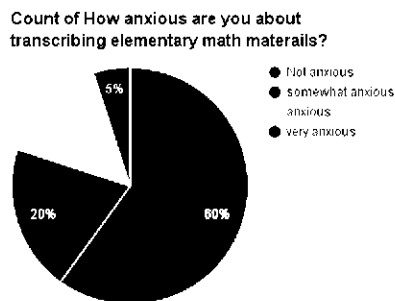


Figure 4 Anxious to Transcribe Elementary

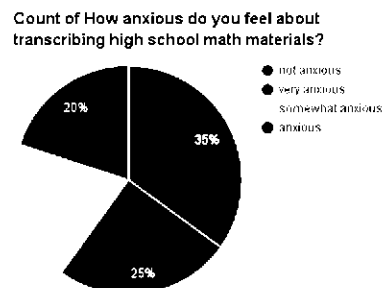


Figure 5 Anxious to Transcribe High School

writings they pursued professional development opportunities not only in math but also in Nemeth and because of these trainings they now felt qualified and less anxious to teach math and Nemeth.

The tables at the end of this report show different mathematical skills, how necessary teachers feel it should be taught in Nemeth and how anxious teachers are to transcribe these skills into Nemeth. Teachers felt most skills were necessary or strongly necessary to be transcribed into Nemeth, however, the higher the mathematical skill the less competent teachers felt in their ability to transcribe and teach the skills. Teachers who have more experience teaching felt more comfortable teaching and transcribing in Nemeth. Many teachers reported they did not feel they had enough training out of preservice TVI programs and sought after additional professional development in order to become comfortable. Overall, higher level math skills teachers felt less comfortable teaching and transcribing in Nemeth.

CHAPTER V: DISCUSSION

Comparing these results with the original study there continues to be a high need for mathematics to be transcribed and taught in Nemeth, but teachers continue to feel less competent as mathematical skills are more difficult. It also shows preservice programs are not teaching elementary mathematics methods, which 75% of teachers felt was necessary. Considering 95% of teachers did not feel anxious overall about math it should be considered preparation programs should increase the level of math method courses to include middle school and high school math if TVIs are expected to work with students at these levels. In some cases, TVIs may be working with a math teacher who teaches the subject, but the TVI needs to understand the content in order to transcribe accurately for students.

Both studies have shown TVIs are not comfortable teaching higher level mathematics to students with visual impairments. As the US pushes science, technology and mathematic success for graduating high school students, there must also be competent teachers to teach our visually impaired students in these areas. Nemeth is supposed to allow our students access to these areas of study. There needs to be research as to what type of training TVIs need to feel confident in teaching mathematics to all of their students and to feel confident in their transcribing skills. TVIs are not feeling prepared right out of preservice programs and these type of programs need to consider additional classes for transcribing and teaching mathematics. For current TVI teachers, professional developments should to pursued to meet this need. Additional studies need to be repeated to monitor progress of the additional trainings to ensure this need is being met.

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APPENDIX A: IRB APPROVAL LETTER

Included PDF Attachment

University of Wisconsin-Platteville
IRB HUMAN PARTICIPANTS RESEARCH REVIEW PROTOCOL: STANDARD FORM

This protocol is to be submitted to and approved in writing by the IRB prior to the initiation of any investigation involving human participants, data, or material. **Approval is valid for one year unless otherwise noted .**

Indicate Requested Review Level: Expedited Full Board

See Section III, pages 9-11, of the IRB Manual for instructions to determine the appropriate review level. Be aware that the IRB may require a level of review different from your request.

Principal Investigator(s)

Name(s): Letha Oppman

Rank/Title(s): Graduate Student

Department/Program(s): Education

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Sponsor(s) (if PI is a student)

Name(s): Jennifer Collins

Rank/Title(s): Assistant Professor of Education

Department/Program: Education

Email: collinsjen@uwplatt.edu

Phone: 608.342.1248

Project Title: TEACHERS' PRECEPTIONS OF NEED FOR AND FEELING OF COMPETENCY IN TRANSCRIBING

Start Date for Data Collection: 7/1/16

End Date for Data Collection: 8/1/16

Is federal or other extramural funding being sought? Yes No

Name of potential supporting agency:

Assurance of Departmental/Program Review:

If a departmental/program HSR exists, the signature of the HSR Chair assures the IRB that the protocol has been approved and a copy is on file in the department. If no HSR exists, the signature of the Department Chair assures the IRB that s/he has been informed of the project and a copy is on file in the department.

Signature/Date: _____

Indicate Title: HSR Chair Department Chair

Assurance to IRB: I/we have read the UW-Platteville IRB Manual of Policies and Procedures for Research Involving Human Participants and will comply with the informed consent requirement and conditions. Further, I/we will inform the IRB if significant changes are made in the proposed study.

Signature of PI(s)/Date: Letha Oppman Digitally signed by Letha Oppman
Date: 2016.06.22 17:46:43 -05'00'

Signature of Sponsor(s)/Date: _____

PART I: DESCRIPTION OF STUDY

Note:

For detailed instructions on completing Parts I and II, refer to pages 20-23 of the IRB Manual.

A. RESEARCH QUESTION:

(Include appropriate citations)

What are TEACHERS' PERCEPTIONS OF NEED FOR AND FEELING OF COMPETENCY IN TRANSCRIBING BRAILLE MATERIALS IN THE NEMETH CODE WITH STUDENTS WITH VISUAL IMPAIRMENTS?

B. HYPOTHESIS(ES):

Most teachers will feel their nemeth skills are not up to par and teachers will feel more comfortable in elementary math than middle school and high school math.

C. PARTICIPANT SELECTION:

1. Number of participants:

20

2. Human participant pool:

a. Relevant features of the participants you will be using:

Wisconsin Teachers of the Visually Impaired

b. Relevant affiliations of your participants:

Teachers of the Visually Impaired teach and produce math in the Nemeth format.

3. If participants are from a legally restricted group:

a. Explain the necessity of using these particular groups:

b. Describe any special arrangements to protect their safety, rights and well-being:
Teachers' names will not be used, they will be assigned a number.

D. PROCEDURES:

1. Recruitment procedures and material inducements for participation:

A request will be made through the WI TVI list serve for teachers to fill out the survey

2. Location of study (data collection):

The state of Wisconsin

3. Personnel and relevant affiliations:

I am a Teacher for the Visually Impaired

4. Information to be gathered and means for collecting and recording data (include citations, if applicable; attach all materials):

Data will be attained by google form survey

5. Step-by-step description of procedure(s), including any materials not described in D.4:

Survey will be sent out via list serve

As teachers reply data will be recorded via google forms

6. Proposed design and statistical analysis:

“A two-tailed t test will be conducted to determine the differences between mean ratings for need and competency for each math skill. A conservative level of significance ($p < .001$) will be used to correct for the comparatively narrow range of possible responses and the tendency to obtain significant results with a large sample size.”

E. REFERENCES:

(for above citations)

DeMario, N., & Lian, G. (2000). Teachers' perceptions of need for and competency in transcribing braille materials in the Nemeth Code. *Journal of Visual Impairment & Blindness*, 94, 7-14.

PART II: HUMAN PARTICIPANT PROTECTION

A. POTENTIAL RISKS YOU CAN ANTICIPATE FOR PARTICIPANTS:

1. Describe immediate risks, long-term risks, and rationale for the necessity of such risks, alternatives that were or will be considered, and why alternatives may not be feasible. Since this study is done as a confidential survey risks are minimum.

2. Describe any potential legal, financial, social, or personal effects on participants of unintentional data disclosure.

NA

B. SAFEGUARDING PARTICIPANTS' IDENTITY:

1. Where might you present or publish your findings? Will any formal papers or reports result from your project and with whom will they be shared?

I will not publish my findings. Results will be shared with my advisor and professor of my class.

2. What precautions will be taken to safeguard identifiable records of individuals and/or groups?

How will confidentiality of data be protected?

The google form will be setup so I do not see who answered the survey.

C. EXPECTED BENEFITS FOR PARTICIPANTS (IF ANY) AND/OR SOCIETY:

1. Clarify the potential for new knowledge resulting from this study as well as any benefits directly to the participants.

Since my advisor and the Director of my TVI program (my professor) will be the only ones to read my results they may use this information in the training of future TVIs.

2. Summarize the content of your debriefing.

The survey questionnaire consisted of three sections: demographic information, math instruction and braille transcription, and a self-assessment of the need for and competency in the Nemeth code.

D. DECEPTION USED IN GATHERING DATA:

Justify the use of any deception in the project. If participants are provided with any untruthful or misleading information, provide a detailed written description of the debriefing.

NA

E. INFORMED CONSENT:

Submit a copy of all materials used in the recruitment and selection of participants.

Either submit a copy of the (signed or unsigned) consent form or, if you believe informed consent should be waived for your project, write a justification for your recommendation based on the criteria detailed in Section VII, page 15, of the IRB Manual.

APPENDIX B: PROJECT MATERIALS

How many years of teaching experience do you have?

How many students do you have who read braille or are potential braille readers?

How many students use or potentially will use the Nemeth code?

How necessary do you feel transcribing elementary math materials into nemeth?

How anxious are you about transcribing elementary math materials?

How necessary do you feel transcribing junior high school math materials are?

How anxious are you about transcribing junior high school math materials?

How necessary do you feel transcribing high school math materials are?

How anxious do you feel about transcribing high school math materials?

How anxious do you feel about math in general?

Do you teach how to use the abacus?

Do you teach the use of a calculator?

Did you have an elementary math methods course as part of your pre-service training?

Did you believe such a course was necessary as part of your training?

Number concepts: How necessary is it to teach number recognition into nemeth code?

Number concepts: What is your competency level in transcribing/teaching number recognition into nemeth code?

Number concepts: How necessary is it to teach number writing in nemeth code?

Number concepts: What is your competency level in transcribing/teaching number writing in nemeth code?

Number concepts: How necessary is it to teach rounding to nearest 10 or 100 in nemeth code?

Number concepts: What is your competency level in transcribing/teaching rounding to nearest 10 or 100 in nemeth code?

Number concepts: How necessary is it to teach counting by 2s, 5s, 10s, 100s into nemeth code?

Number concepts: What is your competency level in transcribing/teaching counting by 2s, 5s, 10s, 100s in nemeth code?

Word Problems: How necessary is it to teach word problems with graphics in nemeth?

Word Problems: What is your competency level in transcribing/teaching word problems with graphics into nemeth code?

Fractions: How necessary is it to teach fractions into nemeth code?

Fractions: What is your competency level in transcribing/teaching fractions in nemeth code?

Fractions: How necessary is it to teach complex fractions in nemeth code?

Fractions: What is your competency level in transcribing/teaching complex fractions in nemeth code?

Fractions: How necessary is it to teach multiplication and division of fractions in nemeth code?

Fractions: What is your competency level in transcribing/teaching multiplication and division of fractions in nemeth code?

Fractions: How necessary is it to teach addition and subtraction of fractions in nemeth code?

Fractions: What is your competency level in transcribing/teaching addition and subtraction of fractions into nemeth code?

Fractions: How necessary is it to teach cancellation of fractions in nemeth code?

Fractions: What is your competency level in transcribing/teaching cancellation of fractions in nemeth code?

Measurement: How necessary is it to teach circumference, diameter, radius problems in nemeth code?

Measurement: What is your competency level in transcribing/teaching circumference, diameter, radius problems in nemeth code?

Geometry: How necessary is it to teach line segments and rays problems in nemeth code?:

Geometry: What is your competency level in transcribing/teaching problems with line segments and rays in nemeth code?

Geometry: How necessary is it to teach complex shapes into nemeth code?

Geometry: What is your competency level in transcribing/teaching complex shapes into nemeth code?

Geometry: How necessary is it to teach the use of tools a (protractor, a compass, geoboards)?

Geometry: What is your competency level in transcribing/teaching the use of tools a (protractor, a compass, geoboards)?

Geometry: How necessary is it to teach the use of tools a (protractor, a compass, geoboards)?

APPENDIX C: PROJECT DATA

Table 3 Competency Questions

Competency Question	Not Competent	Somewhat Competent	Competent	Very Competent
Number concepts: What is your competency level in transcribing/teaching number recognition into nemeth code	0	4	4	12
Number concepts: What is your competency level in transcribing/teaching number writing in nemeth code	0	3	4	13
Number concepts: What is your competency level in transcribing/teaching rounding to nearest 10 or 100 in nemeth code	1	3	4	12
What is your competency level in transcribing/teaching counting by 2s, 5s, 10s, 100s in nemeth code?	0	2	6	12

What is your competency level in transcribing/teaching word problems with graphics into nemeth code?	1	7	2	10
Fractions: What is your competency level in transcribing/teaching fractions in nemeth code?	0	5	5	10
Fractions: What is your competency level in transcribing/teaching complex fractions in nemeth code?	4	2	4	10
Fractions: What is your competency level in transcribing/teaching multiplication and division of fractions in nemeth code?	3	3	5	9
Fractions: What is your competency level in transcribing/teaching addition and subtraction of fractions into nemeth code?	0	5	5	10
Fractions: What is your competency level in transcribing/teaching cancellation of fractions in nemeth code?	4	8	3	5

Measurement: What is your competency level in transcribing/teaching circumference, diameter, radius problems in nemeth code?	3	4	7	6
Geometry: What is your competency level in transcribing/teaching problems with line segments and rays in nemeth code?	3	5	6	6
Geometry: What is your competency level in transcribing/teaching complex shapes into nemeth code?	3	8	4	5
Geometry: What is your competency level in transcribing/teaching the use of tools a (protractor, a compass, geoboards)?	4	5	8	3

Table 4 Necessary to transcribe Questions

Necessary in Nemeth?	Not Necessary	Somewhat necessary	Necessary	Very Necessary
Number concepts: How necessary is it to teach number recognition into nemeth code?	0	0	4	16
Number concepts: How necessary is it to teach number writing in nemeth code?	0	0	6	14
Number concepts: How necessary is it to teach rounding to nearest 10 or 100 in nemeth code?	1	1	6	12
Number concepts: How necessary is it to teach counting by 2s, 5s, 10s, 100s into nemeth code?	1	1	4	14
How necessary is it to teach word problems with graphics in nemeth?	0	1	4	15
Fractions: How necessary is it to teach	0	0	5	15

fractions into nemeth code?				
Fractions: How necessary is it to teach complex fractions in nemeth code?	0	0	5	15
Fractions: How necessary is it to teach multiplication and division of fractions in nemeth code?	0	1	6	13
Fractions: How necessary is it to teach addition and subtraction of fractions in nemeth code?	0	0	6	14
Fractions: How necessary is it to teach cancellation of fractions in nemeth code?	0	1	8	11
Measurement: How necessary is it to teach circumference, diameter, radius problems in nemeth code?	0	0	7	13
Geometry: How necessary is it to teach line segments and rays problems in nemeth code?	2	1	5	12

Geometry: How necessary is it to teach complex shapes into nemeth code?	1	1	8	10
Geometry: How necessary is it to teach the use of tools a (protractor, a compass, geoboards)?	1	1	7	11
Geometry: How necessary is it to teach the use of tools a (protractor, a compass, geoboards)?	1	1	8	10