

Authors: This instrument was created by Scott Adamson, Mark Burtch, Trey Cox, Debra Banks, Eugene Judson, and Tony Lawson as part of the ACEPT grant sponsored by the National Science Foundation. Any use of this instrument without the knowledge of this group is prohibited.

Background:

The literature indicates that there exists two views about the nature of mathematics and that most mathematicians and mathematics educators fall on a continuum somewhere between the two. Teachers of mathematics may not be as extremely entrenched with one view or the other. The intent of **Part One** (statements 1 – 9) of this survey **is not** to determine if one individual's view of math is more "correct" than another individual's but rather to classify the individual as to whether their views come more from the "absolutist" or the "fallibilist" mathematics camp (Ernest).

Part Two (statements 10 – 14) of the survey is meant to look at the teacher's philosophy of mathematics education. How is it that they teach mathematics? What is the best way for students to learn mathematics?

Further research will determine to what extent the teacher's views about the nature of mathematics and their personal philosophy of mathematics education relates to their actual instructional practice. We may also look at how the teacher's views about the nature of math and their teaching practices affect their students' views about the nature of mathematics.

Hypothesis:

Based on the researchers' experiences, we believe that it is likely that most teachers will have a more "applied" or "mixed" view about the nature of mathematics. However, their classroom practices will reveal more of a "pure" view. That is, while they may believe that mathematics can be useful to describe nature, solve problems, and be created, their classroom practice reveals a culture where absolute truth is presented, facts are memorized, and isolated abstract symbols are manipulated. We believe that there will be various and powerful *societal constraints* (Ernest, 1998) imposed by the particular setting the instructor finds himself that will largely affect how the methods of instruction are chosen. It is also hypothesized that many teachers' personal views of the nature of mathematics and mathematics education are not consciously held but rather they are not even aware that they hold one view or the other. (See the appendix for a model of NOM, teaching, and learning mathematics.)

Nature of Mathematics Survey for Teachers

Teachers have differing beliefs about the nature of mathematics. For each of the following pairs of statements (#1 - #9), darken the circle that best shows how closely your own beliefs fall on the continuum. *Please darken only one circle for each set.*

1. "Mathematics is an objective, absolute, certain, and consistent body of knowledge."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematics is a process of inquiry, and a coming to know."
2. "Mathematics rests on human intuition and shared meaning."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematics rests on deductive logic/reasoning."
3. "Current mathematical knowledge is not open to future revision and change."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Current mathematical knowledge is open to future revision and change."
4. "Mathematics consists of objects and patterns that have no existence outside of the mind."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematics consists of objects and patterns that can be seen in real objects and natural phenomena."
5. "As new mathematics arises, its primary value is in furthering yet more mathematics."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"As new mathematics arises, its primary value is in describing real objects and modeling natural phenomena."
6. "Mathematics is a dynamic and continually expanding field."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematics is an accumulated set of facts, rules, skills, and procedures."
7. "Mathematics is created/produced."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematics is discovered."
8. "The elegance and beauty of mathematics is found mostly when complex problems are solved using symbolic notation, language, and representation."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"The elegance and beauty of mathematics is found mostly in how it is displayed and found in the patterns of nature."
9. "Mathematical claims are considered to be true when a formal proof is given and accepted by the community of mathematical experts."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Mathematical claims are considered to be true when sufficient supporting evidence has been found."

Mathematics Education Survey for Teachers

Teachers have differing beliefs about the nature of mathematics. For each of the following pairs of statements (#10 - #14), darken the circle that best shows how closely your own beliefs fall on the continuum. *Please darken only one circle for each set.*

10 "I mainly see my role mainly as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"I mainly see my role as a transmitter of knowledge. I try to assist students in arriving at a point of independence and mastery from which they can proceed on their own."
11 "The most important part of instruction is the content of the curriculum. That content is the field's judgment about what students need to be able to know and do."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"The most important part of instruction is that it encourages 'sense-making' or thinking among students. Content is secondary."
12 "My job as a mathematics instructor is to teach students how to calculate and find answers to problems without using technology."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"Technology, including graphing calculators and computers, is an integral part and an invaluable tool in mathematics instruction in today's math classroom."
13 "It is imperative that students have opportunities to work together with others when solving mathematics problems so that they can learn from one another and learn the mathematics more deeply."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"To me, when students work with other students in groups it is too difficult to determine what each individual student knows and often one student does most of the work while others benefit from his/her effort."
14 "When preparing mathematics lessons, I generally follow the textbook and/or the proscribed curriculum."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	"When preparing mathematics lessons, I generally modify the textbook approach and supplement it with additional problems and/or activities."

Key

Nature of Mathematics Survey for Teachers

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|------------------|------------------|------------------|------------------|
| 1. 1, 2, 3, 4, 5 | 2. 5, 4, 3, 2, 1 | 3. 1, 2, 3, 4, 5 | 4. 1, 2, 3, 4, 5 |
| 5. 1, 2, 3, 4, 5 | 6. 5, 4, 3, 2, 1 | 7. 5, 4, 3, 2, 1 | 8. 1, 2, 3, 4, 5 |
| 9. 1, 2, 3, 4, 5 | | | |

If the average score is 4 – 5, then the person has a more applied (fallibilist) view of the nature of mathematics.

If the average score is 3, then the person has a mixed view of the nature of mathematics.

If the average score is 1 – 2, then the person has a more pure (absolutist) view of the nature of mathematics.

Key

Mathematics Education Survey for Teachers

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|-------------------|-------------------|-------------------|-------------------|
| 10. 5, 4, 3, 2, 1 | 11. 1, 2, 3, 4, 5 | 12. 1, 2, 3, 4, 5 | 13. 5, 4, 3, 2, 1 |
| 14. 1, 2, 3, 4, 5 | | | |

If the average score is 4 – 5, then the person has a more social constructivist view of the nature of mathematics education.

If the average score is 3, then the person has a mixed view of the nature of mathematics education.

If the average score is 1 – 2, then the person has a more authoritarian view of the nature of mathematics education.

The NOM (Part One) of the survey addresses the following aspects of mathematics:

- Product or Process (Statement #1) – Is mathematics product (a noun) or process (a verb)?
- Foundations (Statement #2) – What is mathematics based on?
- Modifiability (Statement #3) – Does mathematics change?
- Material (Statement #4) – What are the materials of mathematics?
- Value (Statement #5) – What is the purpose of mathematics?
- Fluidity (Statement #6) – Is mathematics growing or a fixed set?
- Origin (Statement #7) – How does mathematics originate?
- Beauty (Statement #8) – What constitutes mathematical beauty?
- Proof (Statement #9) – How do we know if mathematics is true?

The NOME (Part Two) of the survey addresses the following aspects of mathematics education:

- Center of Mathematical Authority (#9) – Where does the mathematical authority in the classroom reside?
- Goals (#10) – What is the goal of teaching mathematics?
- Usage of Technology (#11) – What is the proper use of technology?
- Socialization and Learning (#12) – What place does working with others have in teaching mathematics?
- Curricular Views (#13) – How are curricular materials used in the classroom?