

# OPINIONS OF COLLEGE STUDENTS (FUTURE TEACHERS)

ABOUT THE MATHEMATICS TAUGHT IN ELEMENTARY, MIDDLE, AND HIGH SCHOOL

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## 1. INTRODUCTION

The implementation of the Common Core State Standards (CCSS) brings a significant change in the organization, methods, and content of teaching mathematics in grades K to 12. Some of the changes are controversial, and in some places, strongly contested by teachers' unions and parents of students. In this study we surveyed the opinions of people most influenced by the reform, namely, future math teachers who are now taking university mathematics courses to get their credentials, and other students who already are or plan to be involved in mathematics education in schools.

## 2. QUESTIONS In an anonymous questionnaire we asked:

- Who should be making decisions about math education?
- Who should learn mathematics?
- And also some specific questions about content and pedagogy, which have been hotly discussed during previous attempts to reform mathematics education.

In all cases we encouraged students to justify their answers.

## 3. THE QUESTIONNAIRE

### 1. Who should take part in the decision about what mathematics students learn in elementary, middle, and high school?

You can mark as many of the choices listed below as you want, and please add any additional group(s) that you think should be involved. (The federal government; the state; parents; teachers; mathematicians; mathematics educators)

### 2. Who needs to learn mathematics in K-12 schools?

(Everyone; only students who are interested in math; only students going into some professions; only students who pass some tests; others)

### 3. What mathematics should be taught (in grades K-12)?

(Traditional algorithms for the four arithmetic operations; algebra; geometry; statistics; calculus)

### 4. How should mathematics be taught in K-12 schools?

(As a sequence, so that one course or topic is a prerequisite for another; as a menu, so that different people can choose what they want to learn; abstractly; in real (applied) contexts.

### 5. Should students use technology (computers and calculators)?

(In elementary school; in middle school; in high school)

### 6. Which students should memorize addition and multiplication facts?

(All students; some students: elementary students; middle school students; high school students: none)

## 4. SUBJECTS

13 graduate and 47 undergraduate students taking two different graduate mathematics courses and two sections of an undergraduate mathematics course answered the survey questions. The undergraduate course was obligatory for students trying to get a teaching credential, and both graduate courses were offered to students interested in mathematics education at any level. The questionnaires were anonymous, but students were obliged to turn them in. The questions were given in two versions: An open version (shown above in 3. THE QUESTIONNAIRE), and an extended version that also included multiple choice lists to be marked, such as,

### QUESTION 1.

Who should take part in the decision about what mathematics students learn in elementary, middle, and high school?

- a. everyone
- b. only students who are interested in math
- c. only students going into some professions (give your list of professions)
- d. only students who pass some tests
- e. others (please list)

The only (rather obvious) difference we notice between these two versions was that students provided with the multiple choice version had a tendency to mark more options than students who had to list the options themselves.

### NUMERICAL DATA

Below is the distribution of answers to the first question, "Who should take part in the decision ...?"

Answers were provided by 60 respondents:

	Yes:	
the federal government	14	23%
the state	29	48%
parents	34	57%
teachers	50	83%
mathematicians	23	38%
mathematics educators	40	67%
"write in" options:		
students	4	7%
all other	7	12%

## A SUMMARY OF OUR FINDINGS

### QUESTION 1.

The main differences in the answers were in the number of groups that need to be involved in making decisions. But the top three were clear: teachers, math educators, and parents, with the federal government being last. None of the respondents mentioned any constitutional or legal issues. The main criterion was "those who know what is best for students".

### QUESTION 2.

The almost unanimous answer was everyone. "Math is essential for everyone in everyday life."

### QUESTION 3.

There was a significant variety of opinions in how much mathematics everyone should learn. But many respondents thought that topics beyond arithmetic and algebra should be optional.

### QUESTION 4.

A large majority of respondents favored a sequence of topics, with some talking about a menu as an option in higher grades. All respondents who mentioned an abstract versus an applied context preferred applied.

### QUESTION 5.

The majority of respondents favored using calculators in all grades. A minority thought that calculator use should start in middle school. This shows a change in attitude toward technology; a survey we made three years ago (Baggett & Ehrenfeucht, 2012) showed that a majority of respondents were against the use of calculators in early grades.

### QUESTION 6.

Almost all respondents said that students should memorize arithmetic "facts". This is similar to the opinions we observed several years ago. "Fact memorization" is an important topic because the importance and need for "rote learning" divides mathematics education into two camps.

## EXAMPLES OF ANSWERS TO THE FIRST FOUR QUESTIONS

### 1. Who should take part in the decision about what mathematics students learn in elementary, middle, and high school?

Teachers and mathematics educators should have the final decision of what math students should learn in K-12. My justification is that they are the ones that are actually in the classroom teaching these subjects. Parents should somewhat have a say according to the needs of their child.

It should be a collaboration of teachers and parents. This is because it would balance genuine knowledge of what kids should learn, and people who are looking out for the best interests of their kids. Government officials who have no previous background in education shouldn't have a part in deciding, but they can be part of implementing what others have decided.

The state should decide what mathematics students learn in elementary, middle, and high school. I feel that everyone in a state should get together to make the decision.

I think there should be standards from the federal government, but I think they should be loose standards so that the teachers have a lot of freedom when they teach. I say this but I also know that this issue is a lot more complicated and there is a lot more politics involved that I don't understand.

I believe teachers and parents should decide what math students should learn. They know best and are around the children the most and know what the children need to know to excel.

Teachers and the state, because each state's demands are different. Teachers should be able to teach material they best see fit for their students and shouldn't feel pressure from all the tests.

I believe that teachers and mathematics educators should decide what mathematics students learn in elementary, middle, and high school, because they are the ones that know the students and how they learn, and how for they can learn. And they know what the students should learn.

Teachers and parents. I think when the government is involved, they only care about politics and money, not about teaching and children learning.

I think the teachers and the state should decide what math is taught because teachers are the ones who teach it...

I think math educators have mastered the subject and know what concepts are important to know and which aren't. I think that educators are teaching concepts based on the standardized tests (but) that they don't have time to make sure students are grasping the concepts.

Teachers and mathematics educators should decide what mathematics students learn in every grade because they are the ones working/teaching students.

I think teachers because teachers are the ones that spend more time with students and they know what students need to learn and what they don't.

### Q2.

### 2. Who needs to learn mathematics in K-12 schools?

I think everyone should learn math, because it benefits everybody's daily life. They shouldn't be required to learn detailed math like calculus though, because it may be too hard and cause them to lose all interest in math.

I think people should be able to choose what math they want to be in, or to do the math they will need or use in the future.

Everyone should learn math, but I also think it is important to classify some math to certain professions (engineer, teachers, physical therapists).

Everyone should learn math in K-12... Students need to be proficient in math because we use math in everyday life...

I think everyone who works whether it be McDonald's or doctors. Everyone in K-12 should learn at least the basics because math is essential.

...I feel people only need a basic understanding of simple math concepts. For professionals in science and engineering, I think they need to take more advanced classes because they are working with equations and numbers so that they need the knowledge.

### 3. What mathematics should be taught (in grades K-12)?

Any math that people use in everyday life, because then it won't be useless knowledge. However, harder math classes (calc and trig, etc.) should be offered for those who are interested or bored in normal classes.

I took up to algebra 2 and I have not found anything where I needed a higher math. So I think that is sufficient for K-12.

I think traditional algorithms, how to count money, and how to manage your money.

K-2 – number sense, basic addition and subtraction  
3-5 – traditional algorithms, and the four operations, measuring, fractions  
6-8 – statistics, measuring, algebra, and geometry  
9-12 – trigonometry and calculus

Math needs to be taught in a way that makes sense. If a child doesn't know or have a good understanding of the four operations, how can teachers teach much algebra and geometry?

The more math that is taught in schools, the better. The more exposure students have to math the more it allows for students to build on that solid foundation which will set them up for success in college or in the work world.

I think traditional algorithms, and make it optional for other higher math.

All math is important. Calculus should be optional depending on what the student wants to study in college.

### Q3.

### 4. How should mathematics be taught in K-12 schools?

During the lower grades with basic math, it should be taught in a sequence which builds on one another. During middle-high school students should have a menu to choose from, so that they will stay interested. Math should also be taught in more real, physical circumstances.

One thing I agree with is the sequence in which math is taught. It is important to learn the basics in order to continue learning the more complicated math. In high school since students are more advanced, then they should be allowed to decide what they want to learn.

Personally I feel math should be taken in a sequence format. If you struggle with algebra, you're definitely gonna struggle with calculus. I feel children should master the math they are placed in before they can move forward.

I think we need prerequisites. Students need to develop a good number sense before they take things like calculus.

I believe there should be some kind of order or sequence involved. This is where some guidelines may be used from the federal or state governments to help teachers find individual goals for each student to achieve...

I think as a menu is the best way. This is because students should never be pressured to take a class. ...If it is in a menu style it is in the student's hands, which is where their education should be. We should not be in charge of what they do or study because it is not our education; it is theirs.

I think mathematics should be taught as a sequence because it is easier for the student to understand what is being taught in a class if the information builds off the knowledge learned in the previous course.

Mathematics should be taught that is applied in a real life context. It will help students prepare for everyday life.

It should be in sequence because you have to know some concepts before you move on to the next course.

A sequence of mathematics should be taught in schools using manipulatives. Depending on the students' career interests, they should take whatever applies to them.

In real (applied) contexts. It makes more sense to students when they can actually see applications.

I think it would be good as a menu, so everyone has different options. Some people learn slower than others. And some are more advanced. It would give everyone the opportunity to move up or down on their level.

### Q4.

## FINAL COMMENTS

In the survey questions, we avoided topics that are currently the most controversial: the use of standardized tests, and using test scores as a criterion in evaluating teachers. Instead, we asked for opinions about more general questions regarding the content of education and educational policies.

There is a consensus among the respondents that the government can be a partner in making educational decisions, but that it doesn't have the right to make such decisions. And this could mean that any government-initiated reform, even when it is well designed and well funded, will be rejected as an illegitimate intrusion if it has not been approved by teachers and parents of the community involved.

## REFERENCES

- Baggett, P. & Ehrenfeucht, A. (2012). University students' opinions about the mathematics that is taught in grades K-12. 53rd Annual Meeting, Psychonomic Society, Minneapolis, MN  
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