Discovering the Art of Mathematics – Class Survey

As part of this course you have been asked to complete online surveys before the course has started and again after it is completed. The current survey is the first of these two surveys.

This survey will not affect your grade: Your teacher will not see your answers before grades are submitted and your personal information will be removed before the data is analyzed. It will take you about 10 to 15 minutes to complete the survey.

This survey is part of a broader research program, which aims at improving mathematics learning and teaching. This particular survey is focused on understanding students' attitudes and beliefs about learning mathematics. We appreciate your contributions towards this important research program.

By participating in this survey, you agree with the following:

I agree to participate in the survey, which is being conducted by Drs. Julian Fleron, Philip Hotchkiss, Christine von Renesse, Volker Ecke, and Kenneth Rath. I understand that this participation is entirely voluntary; I can withdraw my consent at any time while taking the survey.

The following points have been explained to me (during the classroom discussion before signing the paper informed consent form):

1. The reason for the research is to improve teaching and learning.
2. The procedure is as follows: respond to both surveys, both at the beginning and the end of the semester.
3. The results of this participation will be confidential and will not be released in any individually identifiable form.

Thank you for your candid responses!

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1a. To what extent do you agree with the following statements about your relationship with mathematics?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
1) I think doing mathematics is interesting.	○	○	○	○	○	○
2) I like to ask "why" and understand how things work.	○	○	○	○	○	○
3) I am able to understand and critique written or spoken mathematical arguments.	○	○	○	○	○	○
4) Mathematics makes sense to me.	○	○	○	○	○	○
5) Thinking in a mathematical way will be helpful to me in my life.	○	○	○	○	○	○
6) I often think I understand something and later realize that I don't.	○	○	○	○	○	○
7) I'm often aware of situations where my initial understanding is incomplete.	○	○	○	○	○	○
8) Thoughts and ideas that come to me while working on mathematical problems will often get me closer to a solution.	○	○	○	○	○	○
9) I believe that I can learn to make sense of mathematics.	○	○	○	○	○	○
10) My thoughts and ideas matter when solving a mathematical problem.	○	○	○	○	○	○
11) I have a positive attitude about mathematics.	○	○	○	○	○	○

1b) To what extent do you agree with the following statements about your relationship with mathematics (continued)?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
12) In order to make sense of mathematics, I need to understand the precise meaning of terms.	○	○	○	○	○	○
13) When I get stuck on a problem, I believe that I will eventually be able to figure it out by myself.	○	○	○	○	○	○
14) When I get stuck on a problem, I believe that I will eventually be able to figure it out with the help of my peers.	○	○	○	○	○	○
15) I think mathematics can be beautiful.	○	○	○	○	○	○
16) Making mathematical mistakes is okay because it is a natural part of making sense of mathematics.	○	○	○	○	○	○
17) I can clearly explain my mathematical thinking.	○	○	○	○	○	○
18) Outside of its everyday uses, nothing I learn about mathematics will impact my daily life.	○	○	○	○	○	○
19) If I hear a valid argument that is not in line with my reasoning, I am willing to change my thinking.	○	○	○	○	○	○
20) I feel anxious about mathematics.	○	○	○	○	○	○
21) I learn mathematics best when I explain ideas to other students.	○	○	○	○	○	○
22) I learn mathematics best when I work on problems in small groups.	○	○	○	○	○	○

1c) How much do you enjoy

	No enjoy-ment		Neutral		Strong enjoy-ment	Don't know
1) Working on a challenging mathematical problem.	○	○	○	○	○	○
2) Discovering a new mathematical idea.	○	○	○	○	○	○
3) Using rigorous reasoning in a math problem.	○	○	○	○	○	○

2. For this survey, we call a "mathematician" somebody who spends much of his or her professional day engaged in doing mathematics. This may be in industry, in government, or in universities and colleges.

2a. Can you name one mathematician, who is still alive and describe what you think he/she does? Y/N.

2b. If Y, then "Name the person and give a name for what he/she does."

3. Can you name or describe a famous unsolved or recently resolved problem in mathematics. Y/N.

3a. If Y, then "Give it a name or describe it."

4. How many active mathematicians do you think there are in the world?

- ○ Almost none
- ○ Just a few (less than 1,000)
- ○ A moderate number (between 1,000 and 10,000)
- ○ A significant number (between 10,000 and 1,000,000)
- ○ Many (between 1,000,000 and 10,000,000)
- ○ A whole lot (more than 10,000,000)

5. Can you name or describe a historically important, generally accepted belief or theory that was changed through mathematical thinking?
Y/N

5a. If Y, "Give it a name or briefly describe it."

6. Can you name or describe a surprising mathematical aspect of, or idea in, your personal environment that you have noticed outside of your mathematics class?
Y/N

6a. If Y, "Give it a name or briefly describe it."

7. In which of the following areas do you see mathematics playing a significant role? (Choose all that apply)

☐ Visual arts	☐ Language	☐ Formal Decision Making
☐ Theater	☐ Technology	☐ Understanding of Nature
☐ Music	☐ Science	☐ Economics
☐ Philosophy	☐ Engineering	☐ Dance
☐ Reasoning/Logic	☐ Arithmetic	☐ Criminal Justice
☐ History	☐ Architecture	
☐ Games/Puzzles	☐ Literature	

8. To what extent do you agree with the following statements about the field of mathematics?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
1) Mathematics is something that only really smart people can do.	○	○	○	○	○	○
2) Mathematics requires creativity.	○	○	○	○	○	○
3) Doing mathematics for its own sake is as valuable as composing music, creating art, or other intellectual endeavors.	○	○	○	○	○	○
4) Computers can do all the mathematics that is really needed, so mathematics is not that important anymore.	○	○	○	○	○	○
5) A major reason why mathematicians engage in mathematics is because they find it beautiful.	○	○	○	○	○	○
6) Mathematics requires curiosity.	○	○	○	○	○	○
7) There are debates within mathematics.	○	○	○	○	○	○
8) Mathematics is more than the arithmetical skills needed in everyday life (e.g., balancing a checkbook, baking, etc.).	○	○	○	○	○	○
9) Mathematics is mostly a tool for the sciences.						
10) Mathematicians are excited and passionate about their work.	○	○	○	○	○	○
11) There is still a lot of mathematics for me to discover.	○	○	○	○	○	○
12) Someday, all of mathematics will be figured out.	○	○	○	○	○	○
13) Mathematics has had and still has an impact on shaping history, culture, logic, philosophy, and knowledge.	○	○	○	○	○	○
14) There are still unsolved problems in mathematics.	○	○	○	○	○	○

9. **(POST ONLY)** How have you changed in the following areas due to your participation in this course?

	Increased a lot	Increased a little	No change (stayed high)	No change (stayed low)	Decreased a little	Decreased a lot
My ability ...						
... to think and reason more effectively has	○	○	○	○	○	○
... to express myself clearly when talking has	○	○	○	○	○	○
... to express myself clearly in writing has	○	○	○	○	○	○
... to read and understand mathematical problems (i.e., what the problem is asking, not just how to solve it) has	○	○	○	○	○	○
Likelihood that I will read mathematics papers or books has	○	○	○	○	○	○
Likelihood that I will talk about mathematics with others outside of a math class has	○	○	○	○	○	○
Likelihood that I will go to a talk or watch a video about mathematics not associated with a math class has	○	○	○	○	○	○
My curiosity about the world around me has	○	○	○	○	○	○
My awareness of how I approach and solve problems has	○	○	○	○	○	○
My sense of empowerment as a learner has	○	○	○	○	○	○
My confidence in my ability to take responsibility for my own learning has	○	○	○	○	○	○

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
10. I think I will remember this class 10 years from now?	○	○	○	○	○	○

11. **POST:** Having taken this class, how hesitant would you be to sign up for another math class?

○ Very hesitant
○ Somewhat hesitant
○ Not at all hesitant

12. **PRE** Do you think you will enjoy this class? **POST:** Did you enjoy taking this class?

○ Yes, very much
○ Yes, somewhat
○ Neutral

○ No, not much
○ No, not at all

13. What is your gender?
○ Female
○ Male
○ Other

14. What is your racial/ethnic background (choose all that apply)
☐ African American or Black
☐ Asian
☐ Hispanic, Latino, or Chicano
☐ Native American or Alaska Native
☐ White
☐ Other (please specify): _____

15. What is your class?
○ Freshman/First Year
○ Sophomore/Second Year
○ Junior/Third Year
○ Senior

The following prompts will not be part of the pre/post survey. They will form a journaling assignment half way into the course. Examining one or two semesters of data in detail, with student interviews will be more valuable than hundreds of pre/post survey responses we need to code and analyze.

A. Some people say that it's okay to be bad at math. Why do you think this is the case?

B. There are more men than women who are among the top group of mathematicians. Why do you think this is the case?

C. Minority groups (African Americans, Hispanics, etc.) represent a certain percentage of the total US population. It turns out that among the top group of mathematicians the percentage of minority members is lower than their percentage of the total population. Why do you think this is the case?