Teacher Survey Report

Graspable Math UX Project

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Summer 2019

Survey Purpose and Methodology

The purpose of this survey was to gather information from classroom math teachers, to help make Graspable Math better suited for their use. The survey is part of a larger UX project for summer 2019.

The survey was implemented as a Google Form at the following URL: https://forms.gle/aTNWZbsJsKKPkdNu9

It consisted of approximately 24 questions in the following groups:

- Qualification questions
- Teaching context
- Technology
- Graspable Math usage
- Recruiting for UX testing

When questions asked respondents to select from multiple non-scalar options, the survey randomized the order of the options.

The survey was pilot tested with one teacher and updated based on their responses.

Links to the survey were then distributed as follows:

- Posted on Graspable's Twitter feed
- Posted on Graspable's Facebook feed
- Sent to an educational honor society (Kappa Delta Pi) to distribute to its members
- Sent to Indianapolis education leaders recommended by Crossroads Education
- Sent to educators known personally by the UX intern

Survey invitees were also encouraged to pass the survey link to contacts of their own (aka snowball recruiting).

Respondents needed to pass the following screening questions:

1. Do you teach a subject in which students work with mathematical notation or expressions?
2. Do you teach students as a class? That is, with one instructor simultaneously teaching multiple students?
3. Do you have reliable access to the Internet while teaching?

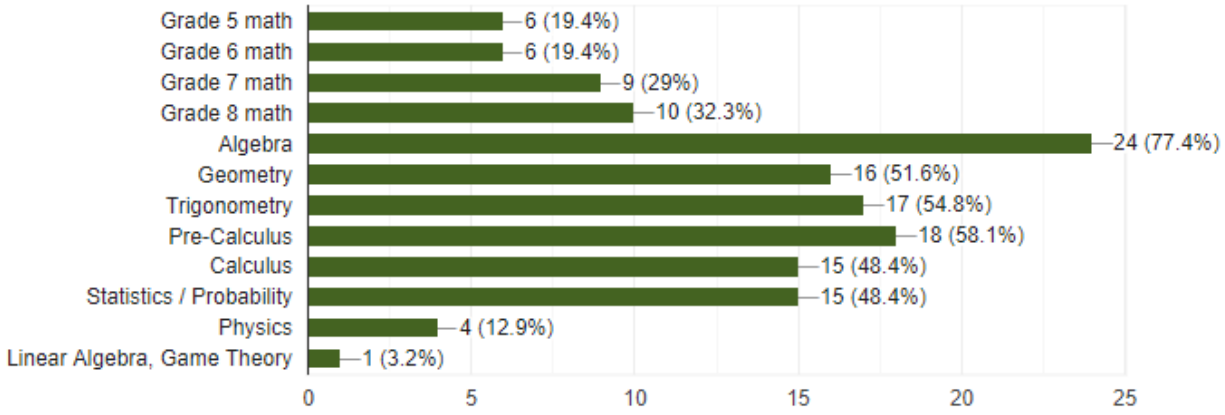
31 responses were received from July 3 to July 18. 1 respondent answered No to screening question #3 and was rejected from the survey. 7 other respondents (22%) answered Usually to screening question #3 and were allowed to continue. The pilot teacher's adjusted responses are included in the survey results where possible, for a total of 31 respondents.

Teaching Context

What math-related subjects do you teach?

28 of the 31 respondents teach multiple subjects.

Linear Algebra and Game Theory responses were added by respondents as part of the Other category.

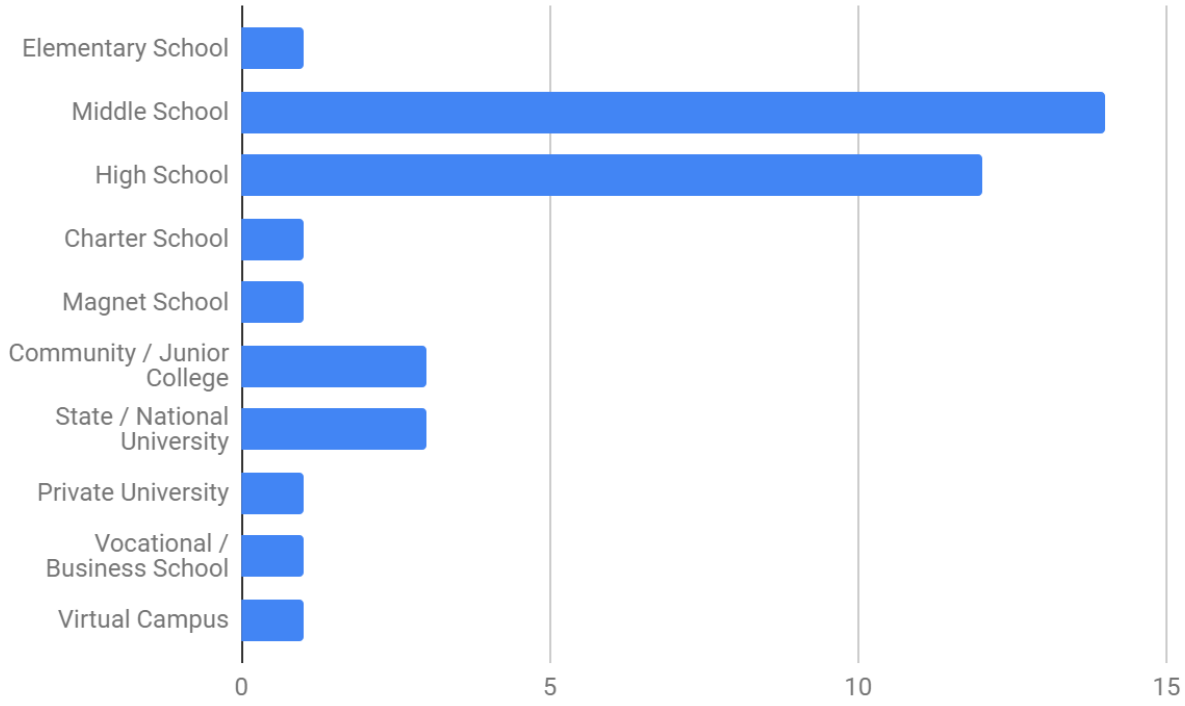


Do you teach in-person or remotely?

29 of the 31 respondents teach in a physical classroom. 2 respondents exclusively teach remotely. 5 respondents do some of both.

At what type of school do you teach?

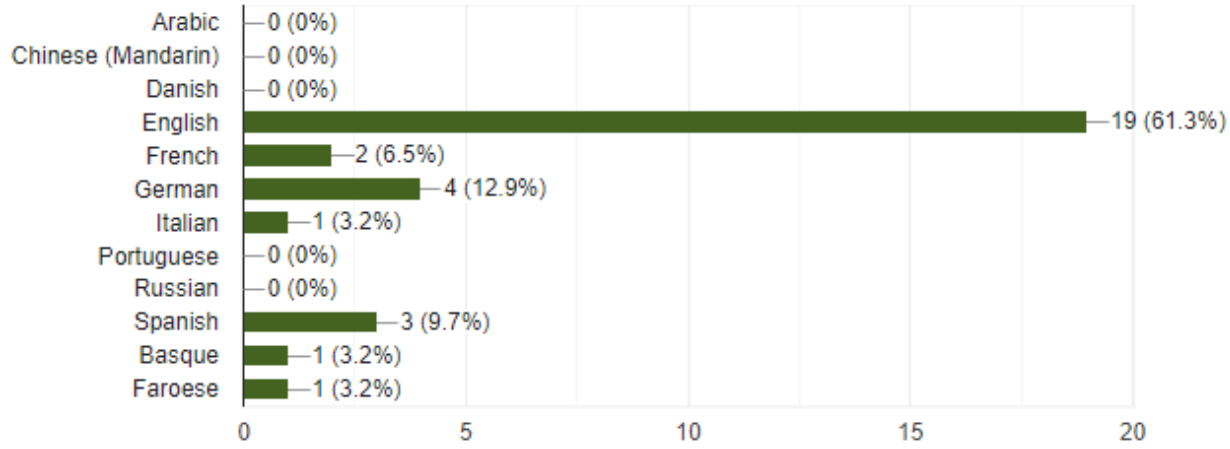
Most of the 31 respondents teach at middle or high school, or the foreign equivalent. 7 respondents teach at multiple types of schools.



In what language do you teach?

Most of the 31 respondents teach in English, but 12 (39%) teach in other languages. Respondents were allowed to select multiple options, but none did so.

Language options provided with this question were based upon GM analytics data and their popularity worldwide. Basque and Faroese were added by respondents.



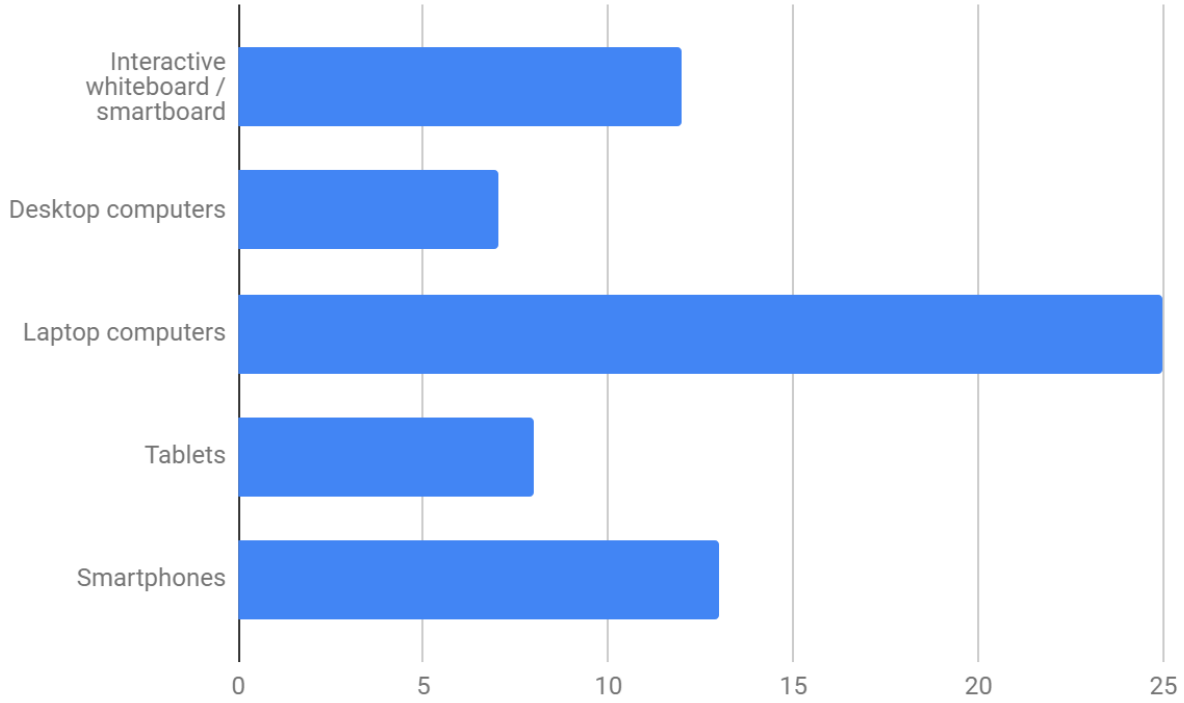
Technology

What Internet-enabled devices are available for your class?

Of the 31 respondents:

- 25 (81%) had access to laptop computers in their class. For 5 respondents, this was the only available device.
- 13 (42%) had access to smartphones. For 1 US respondent, this was the only available device.
- 12 (39%) had access to interactive whiteboards / smartboards. For 1 Italian respondent, this was the only available device.

Some respondents wrote “Chromebooks” in as a response: for analysis, these were grouped in with laptop computers.



What system do you use to help create, distribute, and/or grade class assignments?

Of the following options provided for selection, the 31 respondents indicated they used the following:

System	Responses	Percent
Google Classroom	16	52%
Canvas	4	13%
Schoology	3	10%
Blackboard	2	6%
Moodle	2	6%
Edmodo	0	0%

Other systems written in by respondents included Google Sites, Neo School, Office 365 for Education, OneNote Notizbuch, Sakai, and Skyward.

Two respondents indicated that they used custom / locally developed systems.

Two respondents indicated they used no such system.

What software and websites do you use to help your students learn math?

Of the following options provided for selection, the 31 respondents indicated they used the following:

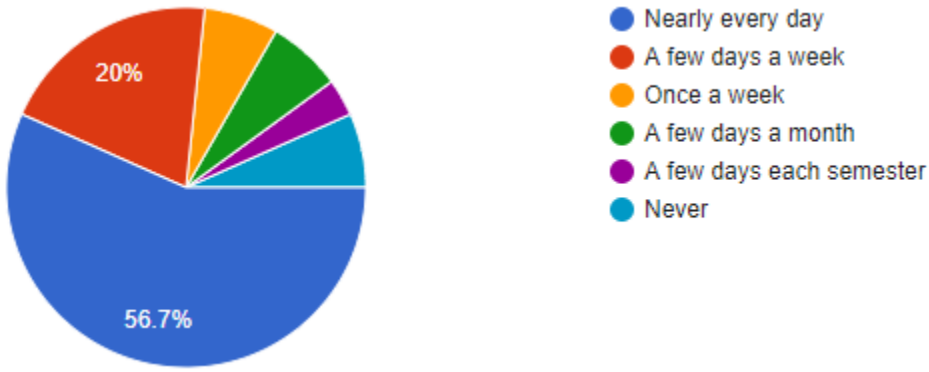
System	Responses	Percent
GeoGebra	23	74%
Desmos	15	48%
Khan Academy	9	29%
Wolfram MathWorld / Mathematica	6	19%
Dudamath	4	13%
Photomath	3	10%
Mathalicious	2	7%
CueThink	1	3%
Virtual Nerd	1	3%
Woot Math	0	0%

Other systems written in by respondents included Graspable Math (2 users), Nearpod (2 users), Quizizz (2 users), Bettermarks, edPuzzle, Edulastic, ExploreLearning, Delta Math, Kahoot, Kami, Maple, Pear Deck, Plickers, Quizlet, and Voicethread.

2 respondents indicated that they used no such software or websites.

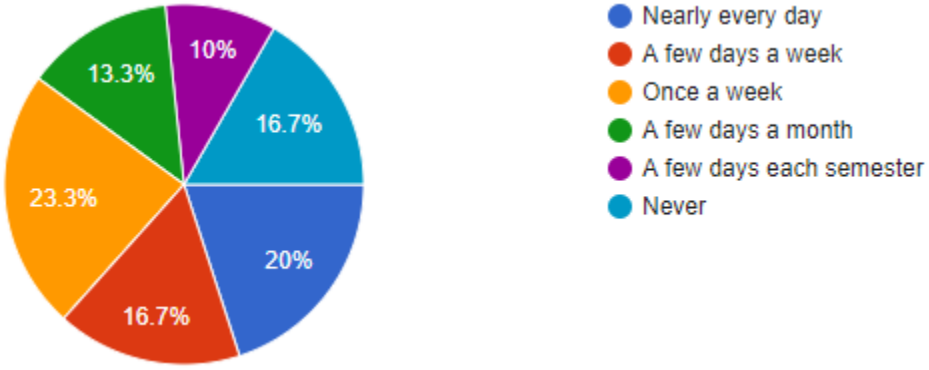
About how often do you use math software or websites while teaching your class?

30 respondents answered as follows:



About how often do you assign homework that uses math software or websites?

30 respondents answered as follows:



What are the biggest challenges with using software and websites to help your students learn math?

19 respondents replied with descriptions of one or more challenges, which largely fell into the following categories:

- Poor student behavior or compliance. (7 responses)
- Learning how to use the tools. (6 responses)
- Not finding the right tools for the teaching topic. (4 responses)
- Student inability to demonstrate knowledge after using the tool. (3 responses)
- Expense. (2 responses)

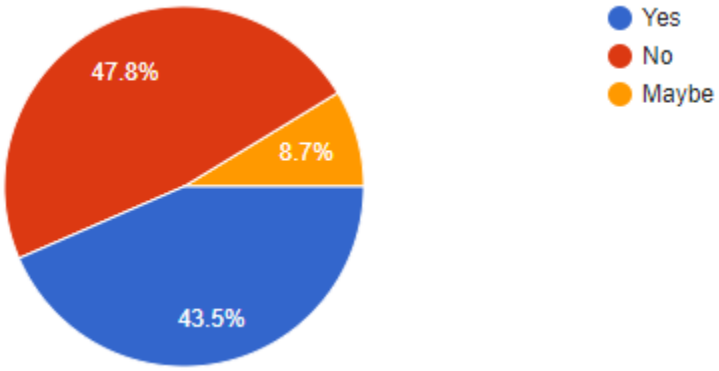
One of the respondents gave these unique responses:

- Keeping track of student work on multiple sites.
- Not being able to see student work in progress.
- Student access to tools at home.
- Tool only allows students to solve existing problems, instead of finding original solutions.
- Typing math notation.
- A desire to receive digital submissions of work students did in their own handwriting.

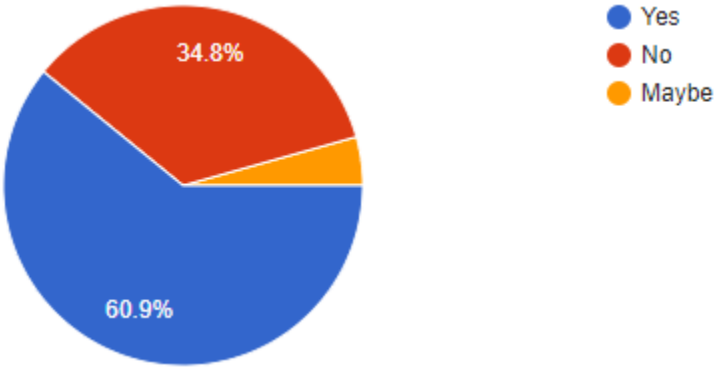
Graspable Math

23 of 31 respondents had some experience using Graspable Math. These respondents were asked the following additional questions.

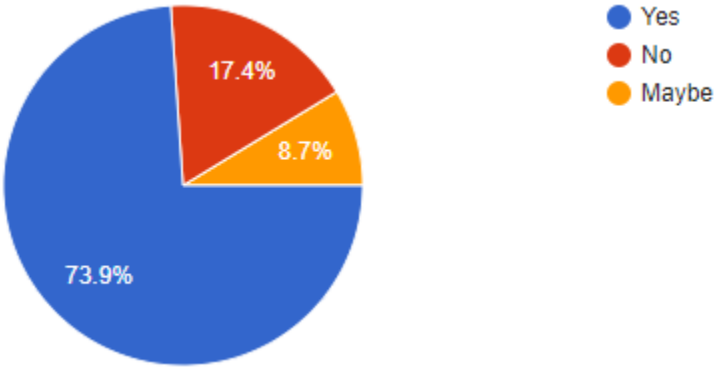
Have you saved a Graspable Math canvas?



Have you used Graspable Math with a student?



Have you showed Graspable Math to students during a class?



What are the greatest benefits of using Graspable Math?

15 respondents replied with descriptions of one or more benefits, which largely fell into the following categories:

- Provides a safe space for students to play with math expressions. (5 responses)
- Provides visual representation of the problem solving process. (5 responses)
- Creates understanding of math notation and order of operations. (4 responses)
- Provides interactive manipulation of expressions. (3 responses)
- Easy to use. (2 responses)

Some unique responses were as follows:

- Students have to do the work, instead of the system doing it for them.
- Allows focus on concepts instead of details.
- Students can submit work electronically.
- Integration with GeoGebra.
- Substitution.

What are the greatest challenges with using Graspable Math?

15 respondents replied with descriptions of one or more challenges, which largely fell into the following categories:

- Learning how to use it. (7 responses)
- Not enough screen space for canvas, especially on iPad. (3 responses)
- Organizing / finding saved canvases. (2 responses)

Some unique responses were as follows:

- Lack of live online collaboration.
- Required to sign in to work with canvases.
- It stops working.
- Not sure how to design useful canvases.
- Students rush through steps without understanding.
- Students don’t see the mistakes they make.
- Some key interactions are unintuitive, such as distribution over brackets.

What do you most like about Graspable Math?

17 respondents replied with descriptions of one or more things they liked, which largely fell into the following categories:

- Provides a better way to work with equations and formulas. (5 responses)
- Aesthetically pleasing and engaging. (4 responses)
- Simple and intuitive. (3 responses)
- Everything. (2 responses)
- Facilitates understanding of deep concepts. (2 responses)

- Integration with GeoGebra. (2 responses)

Some unique responses were as follows:

- Free, with no ads.
- Inbuilt restraints.
- Integration with Google Classroom.

What do you most dislike about Graspable Math?

13 respondents replied with descriptions of one or more things they disliked. These are summarized here:

- Difficulty of use / confusion
    - Selecting multiple terms
    - There's always a visible handle for copying, but not for arranging, even though users probably need to arrange more frequently than they need to copy
    - How to change tools
    - iPad interface issues
    - Use of "scrub" as a mathematical term
    - Canvas scrolling on spacebar hit
    - How to use the formulas list
- Missing features
    - Organization of canvases
    - Integration with Desmos
    - Control of settings on canvases assigned to students
    - Customizing colors and fonts
    - Copying and pasting canvas text elements
    - Random number generation
    - Polynomial division
- Mathematical issues
    - Negative exponent on power of 10
    - Decimal approximations
- Crashes
- Lack of support when reporting a defect
- Requirement to use a Google account

Respondent Information

21 respondents indicated that they would be willing to participate in helping improve the usability of Graspable Math, and provided contact email addresses accordingly. Even though the survey asked specifically for users in Indiana, these teachers teach at the following locations:

- USA
    - Spanish Fort, AL
    - Los Angeles, CA
    - Boulder, CO
    - Flagler County, FL
    - Carmel, IN
    - Lafayette, IN
    - Wayland, MA
    - Henderson, NV
    - New Jersey
    - Rochester, NY
    - Duvall, WA
- Colombia
- Faroe Islands (Denmark)
- France
- Germany (4)
- Spain (3)

Respondent contact information is available in the survey response spreadsheet: https://docs.google.com/spreadsheets/d/1pXNf1bot4THr60WRBeFpNuelwVriBBGMwxHcywEnc7I/edit#gid=210478440

Please note that respondents were promised “We will keep your data anonymous, and won't follow up unless you say it's okay.”