

**UTMOST Project External Evaluation
Final Test Site Interviews 2014
Overview**

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Overview

Five of the seven volunteers asked to participate in a brief interview about using Sage in the classroom provided feedback in July 2014. One of the volunteers refereed a colleague for the interview in his place. Five telephone interviews were conducted, taking 10 to 20 minutes.

Courses in which Sage was used included the following:

- Linear Algebra
- Business Calculus
- Dynamical Systems
- Calculus 1, 2, and 3
- Numerical Analysis
- Cryptography
- Mathematical Modeling

Participants were asked about the students typically enrolled in these courses.

The age of students ranged from traditional college freshman to nontraditional seniors. The consensus seemed to be that Sage was primarily being used in undergraduate classes. Most participants did not seem to differentiate between using Sage with math majors and non-majors.

Participants were asked how they have used Sage in the classroom.

All of the participants spoke about the importance of using Sage for demonstrations. Participants dwelled on using Sage for demonstration purposes as it was helpful for students in both majors and non-majors courses. Several mentioned using Sage for large projects throughout the semester or regular homework. A few participants mentioned the benefits of having students experiment with Sage and share their findings with the rest of the class.

One participant mentioned an experience he had in his Hyperplane Arrangement course. The participant explained that Sage was used for experimentation and two papers were published based on the experience. He noted that this was particularly unusual for an undergraduate course, but that the experience was very useful for him as an instructor and researcher.

Participants were asked about the impact Sage has had upon their student's learning.

Particular impacts included:

- Understanding abstract mathematical concepts
- Exploring difficult computations
- Exposure to mathematical computation software
- Emotional investment
- Heighten mathematical curiosity
- Beautiful graphs allowing for better understanding of mathematic concepts
- Sage's accessibility
- Concrete/real-world examples
- Helps visual learners

Participants were asked about the beneficial aspects of the Sage-based tools and materials.

Responses included:

- Producing effective graphs.
- The quickstarts and tutorials
- The interacts
- The move to web based delivery of Sage stuff
- Moving to the cloud system
- Not having to install any programs
- Graphics and interacts as classroom demos
- Submitting Sage worksheets online allows for sharing in class and effective collection of materials
- The timestamps on the materials
- Lessened amount of prep-time necessary for class
- Has all of the mathematical commands necessary for effective teaching

One participant spoke extensively about their issues with the move to the cloud system. They spoke about the notebook no longer working because of the move to the cloud and how issues with Java have prevented effective use of Sage. In light of the issues faced with the cloud system the instructor made all work with Sage optional instead. The participant said that Sage

seems to be in flux right now and the problems should resolve over the course of a few years.

Participants were asked about the specific instructional challenges that Sage is helpful for.

Responses included:

- Teaching students how to functionally use a computer to do math
- Emphasizing the importance of using technology to do math
- Allows students to do more examples
- Using bigger and more complex examples
- Makes problems far more realistic
- Eliminates minor arithmetic mistakes
- Sketching in 3D
- Provides realism to the problems presented
- Legitimizes courses
- Helps with motivation
- Encourages students to investigate mathematical concepts on their own
- Simplifying complex concepts

Participants were asked if they thought using Sage in the classroom has effected how they teach.

All participants responded in the affirmative and elaborated on the largest impacts that Sage has made on their teaching.

Responses included:

- Allows for more examples
- More integration of technology into lectures and homework
- Frequent use means constant exposure for students
- Realistic examples
- More emphasis on 3D examples and topics
- More interesting examples leads to happier students
- Allowed for inquiry based style instruction
- Insuring that students are comfortable with the software
- Good examples can be used throughout multiple semesters
- Allowed students to present their work quickly and easily

Participants were asked what type of support they needed when using Sage.

Responses included:

- The google groups
- The wikis
- The website
- Colleagues
- Students
- UTMOST test site email list
- UTMOST group
- Sage Edu group
- Quickstart tutorials

Several participants remarked on how easy it was to search through the google groups.

Participants were asked if they had used any of the Sage-Integrated curriculum materials.

Several participants had not used the Sage-Integrated curriculum materials, but remarked that they were very aware of the materials that are available to them. Many mentioned that the materials available relied too heavily on Sage and that did not suit the needs of the courses they taught. One did mention using interacts and the different costs of using books that incorporate Sage.

Participants were asked what they believed to be the best aspects of participating in the UTMOST project?

The most common response was the UTMOST community itself.

Responses included:

- The community
- Modernizing the curriculum
- Learning what the capabilities of computer algebra systems are
- Collaborating with others to improve mathematics
- Improving the way mathematics is taught

One respondent mentioned the new opportunities presented to him at Sage Edu Days and how it resulted in his participation in a teaching program in South Africa.

Participants were asked if there was anything else they would like to say about Sage.

Responses included:

- The need for a simple textbook for beginners
- Sage is in flux, but the next few years should make it more accessible
- It's been helpful for research too
- It's hard getting the students to participate, but it's been good
- I'm glad to be a part of it