


Math Machines & Algebraic Thinking Follow-up Survey

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Faculty Headlines

Key Claims	Actions to Consider
>50% indicate persistence of strong positive attitudes, knowledge and skill	Communicate success. Workshop impact endures two years post participation. High level of interest, use and engagement persists.
>60% report increased opportunities for small group work, math relevance/career and technical applications	
50% note the development of new MM uses	
>50% have used single/multiple MM stations for demo and/or small groups at least 1-2X	Differentiate services--Novice and expert tracks, provide additional opportunities for peer exchange.
More expansion, exchange/collaboration (>50%, 1-2X) than community college (<35%, 1-2X)	Determine if expansion and collaboration are still high priority workshop goals. Provide additional support for prior and current participants, particularly CC
<30% currently use assessment to inform instruction	Determine if assessment is a high priority workshop goal. Provide additional support for prior and current participants.

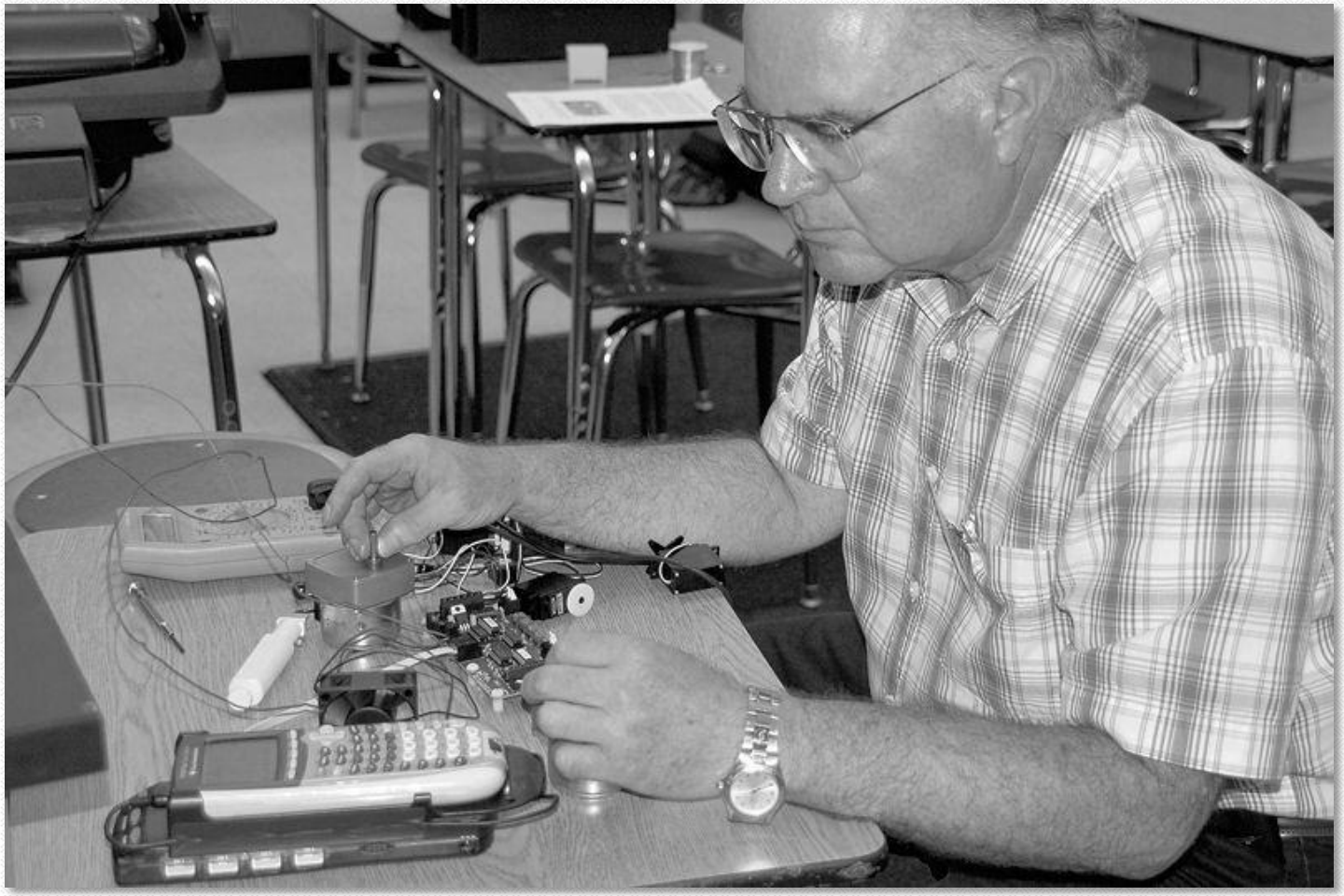
Results are for 18-24 months post-workshop

Student Headlines

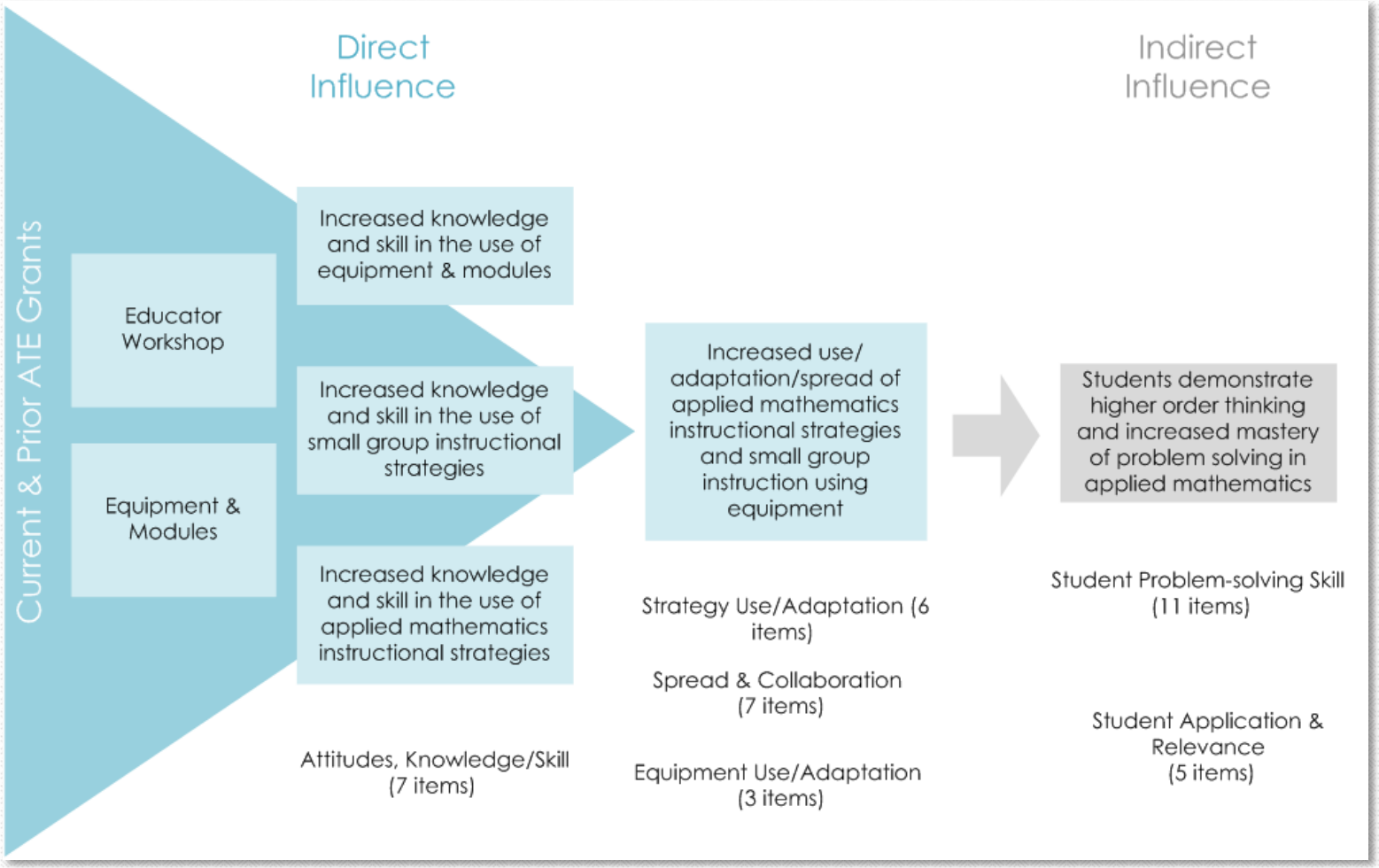
Key Claims	Actions to Consider
Approximately 50% + indicate students have stronger higher order thinking and basic problem solving skills than before the training.	Communicate success. Workshop impact endures two years post participation. High level of student problem solving interest and skill persists.
50% report students have stronger advanced problem solving skills than before the training.	
50% note higher levels of STEM engagment, enjoyment and time on task for student than before the training.	
<50% report stronger student appreciation of math relevance/career option, ability to apply math functions, proficiency experimenting with electronics	Differentiate services--Novice and expert tracks, provide additional opportunities for peer exchange and support relative to relevance/career exploration and student application/experimentation.

Results are for 18-24 months post-workshop

Introduction



Survey Domains



Survey Development & Administration

- Purpose is to gather evidence of the value and impact of services with intent to improve
- Drafted based on logic model of Math Machines services and expected outcomes/impact
- 2 rounds of edits with project team designees
- Zoomerang electronic survey was sent to all faculty that participated under prior NSF grant (*n*=37)
- Starbuck's e-coupon incentive offered
- 23 faculty from prior NSF grant responded, response rate 62%

Interpretation Assumptions

- <50% strong positive response set as "flag" for further inquiry and/or improvement opportunity
- Guiding questions behind the analysis:
  - *How are MM stations used? By whom?*
  - *What claims can be made about impact?*
  - *What could be done to improve resources, reach and effectiveness?*
- Next administration, this quarter with recent participants under current ATE grant

Who responded to the survey?

Types of respondents?

Workshops

- 57%, 2010 Lima OH
- 26%, 2009 Clayton OH
- 26%, 2009 Ghanna OH
- 4%, Can't Recall

Demographics

- 77% Male, 23% Female
- 87% Caucasian
- 59% >15 total years teaching (any level), 64% <1 yr teaching com coll
- 25% Algebra, 25% Trig, 6% Calc, 31% Other Math
- 44% Physics, 62% Other Science

MM Station Deployment

Availability

- 41%, 1 MM station
- 18%, 2 MM stations
- 36% 3+ MM stations

Associated Financial Costs

- 68%, $<10 plus cost of workshop
- 18% Don't Know

Square Feet Devoted to Storage/Use

- An average of 6 sq feet

Preparation Time to Support Use

- An average of 1.6 hours/use

Factors Influencing Use

- 39% Student ability and learning objectives
- 28% Examples from the workshops
- 28% Not using, too much prep time required

I am still using the projects we put together in class.

I consider the effectiveness to the objective of the lesson.

We have so little time in class. The time it takes to put the materials together and reacquaint myself limit use.

Current unit/lesson plans, timing and student ability levels .

I use to allow student to see the electronics and see the relationship between programming and electronics.

Examples of Classroom Use

- Teach x, y, z coordinates using a white board, sizing letters
- Science Olympiad robot competition
- Open programming goals using MM, not "cook book"
- Less content to show students so they could learn by trying different ways
- Light and frequency.
- pH probe and Lab Quest
- Hands-on exploring ideal and real world situations
- Reinforce vector addition in CP Physics
- Trig. Students program routes through obstacle courses.
- Less book problems and work on problems "hands-on" in small groups
- Students programmed instead of using remote control robot for projects
- RGB light, demonstrated how various colors change

Examples of Student Learning

- Bug zapper. Students learned how one variable can be used to feed data into another
- Students caught on to the programming and off they went making things happen!
- Students collaborated as a group and helped teach each other, rather than me lecturing up front
- What graphing calculators can do and a lot about real world variables
- Accessing and moving the SAM through trial and error
- Take what they learned in class lecture and apply it
- Let the kids use the equipment and develop their own comfort level

Improvement Suggestions

- 31% Great, none at this time
- 19% More follow-up workshops
- 13% Opportunities to purchase additional equipment
- 13% More advanced options
- 25% Make it simpler to use

It really works well ,but the programming on the calculator is a bit tedious.

If you could decrease the level of programming knowledge necessary for use, it would enable more students to participate.

I would prefer plans that teachers turn in be like templates , so I could modify.

Come with [more] ways we can teach science curriculum with MM

More workshops that include teachers and students.

Additional Needs

- 38% More ideas, more than programming
- 25% More follow-up workshops, peer exchange
- 25% Nothing, not sure
- 13% More equipment, replacement options

Open lines of communication to ask questions and troubleshoot.

More instruction time. Follow-up with instructors and past participants.

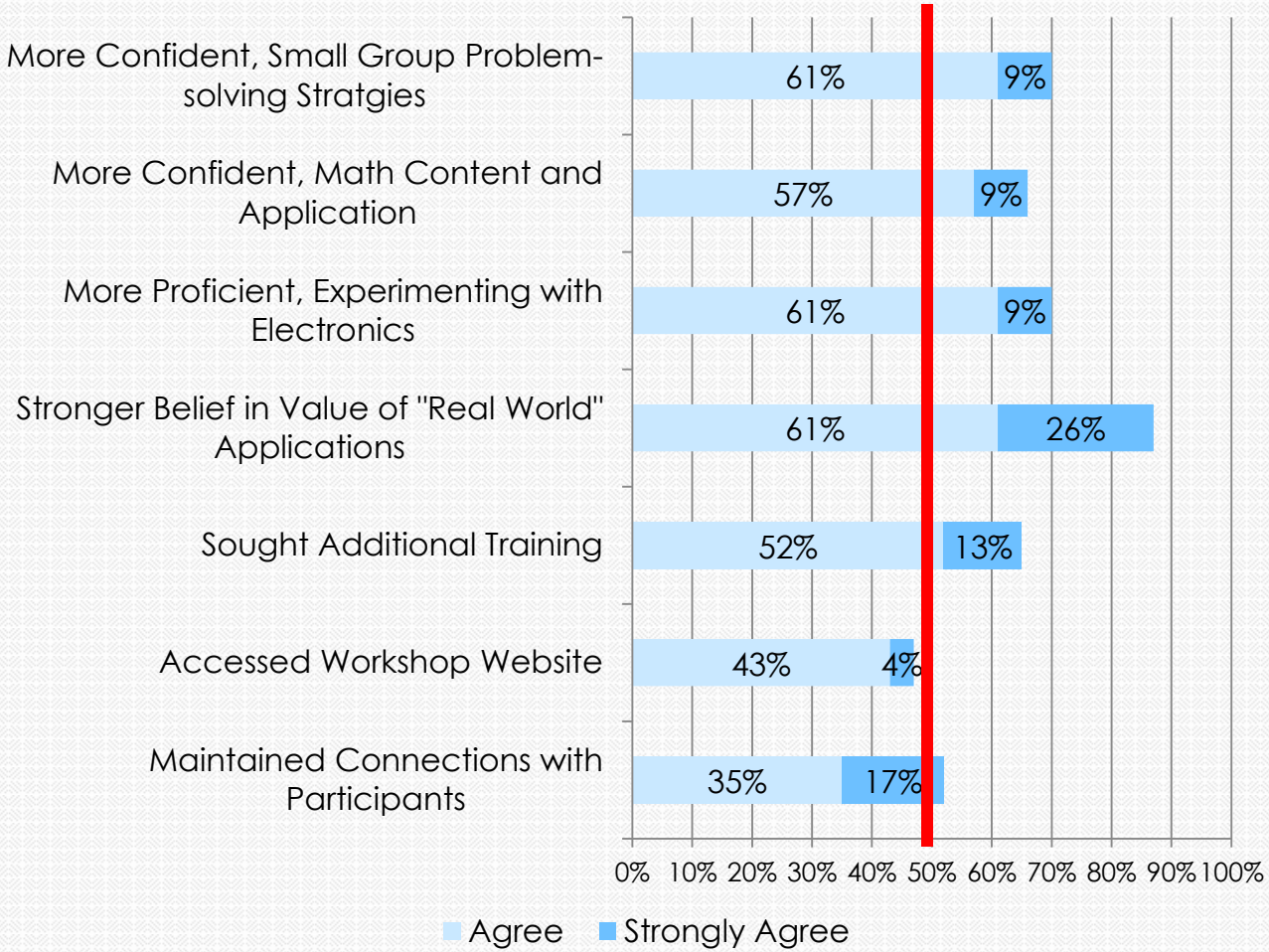
Meet with other teachers who already have the MM and share lesson plans already [tested].

Continued access to sample programs and them continuing to provide more examples.

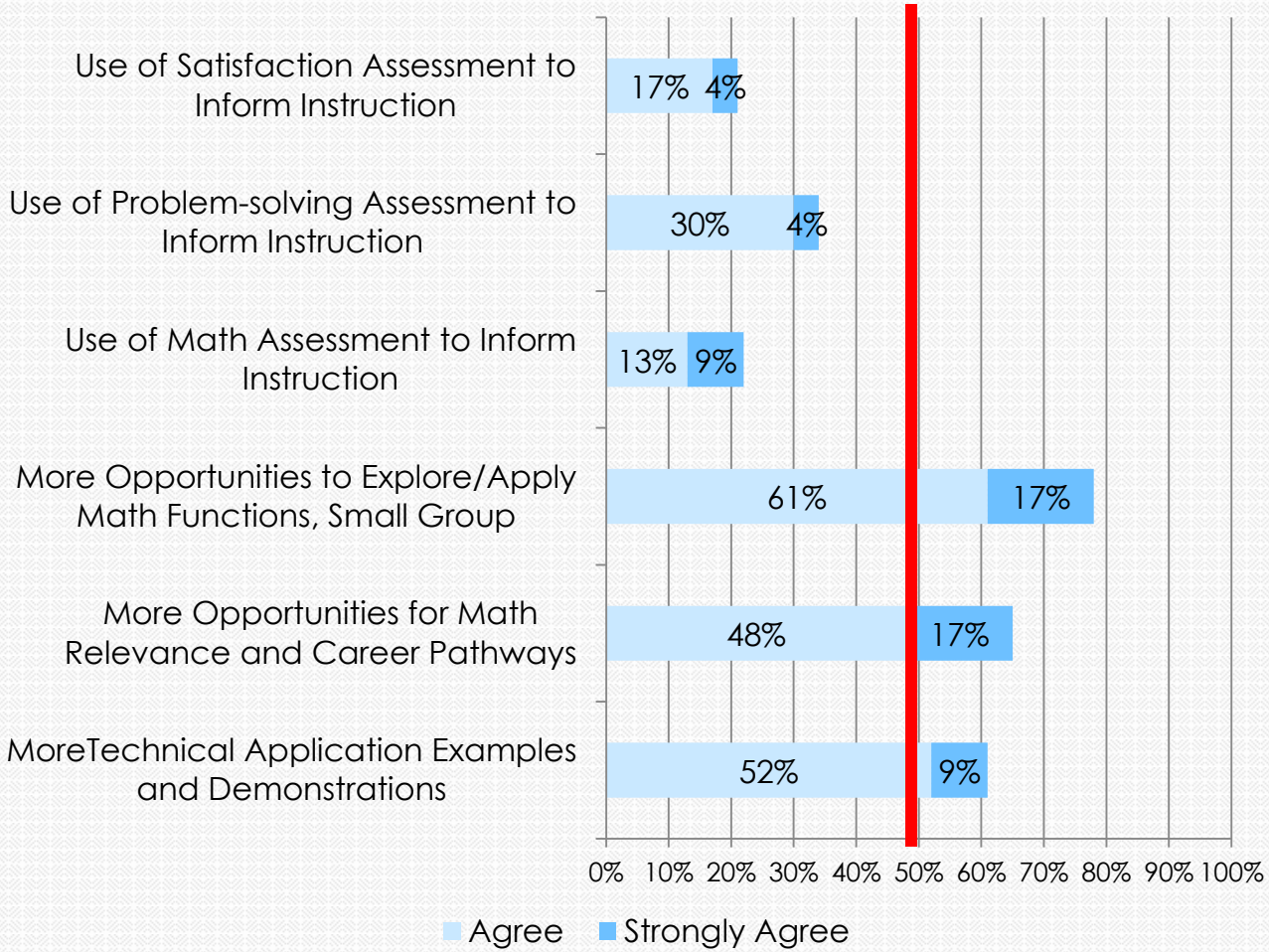
Some other varieties of electronics.

Faculty Knowledge & Skill

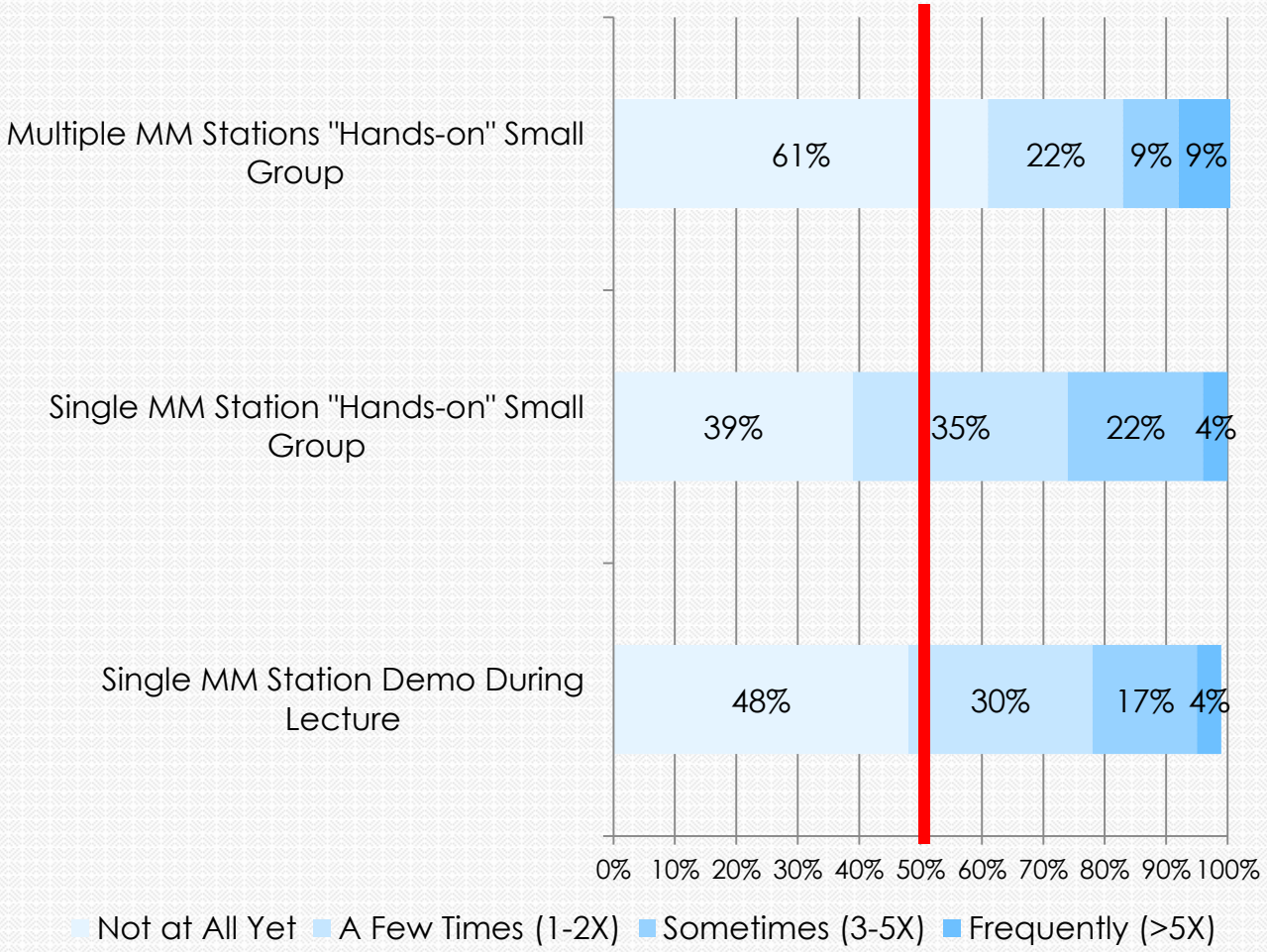
Attitude, Knowledge & Skill Retention Claims, Q1



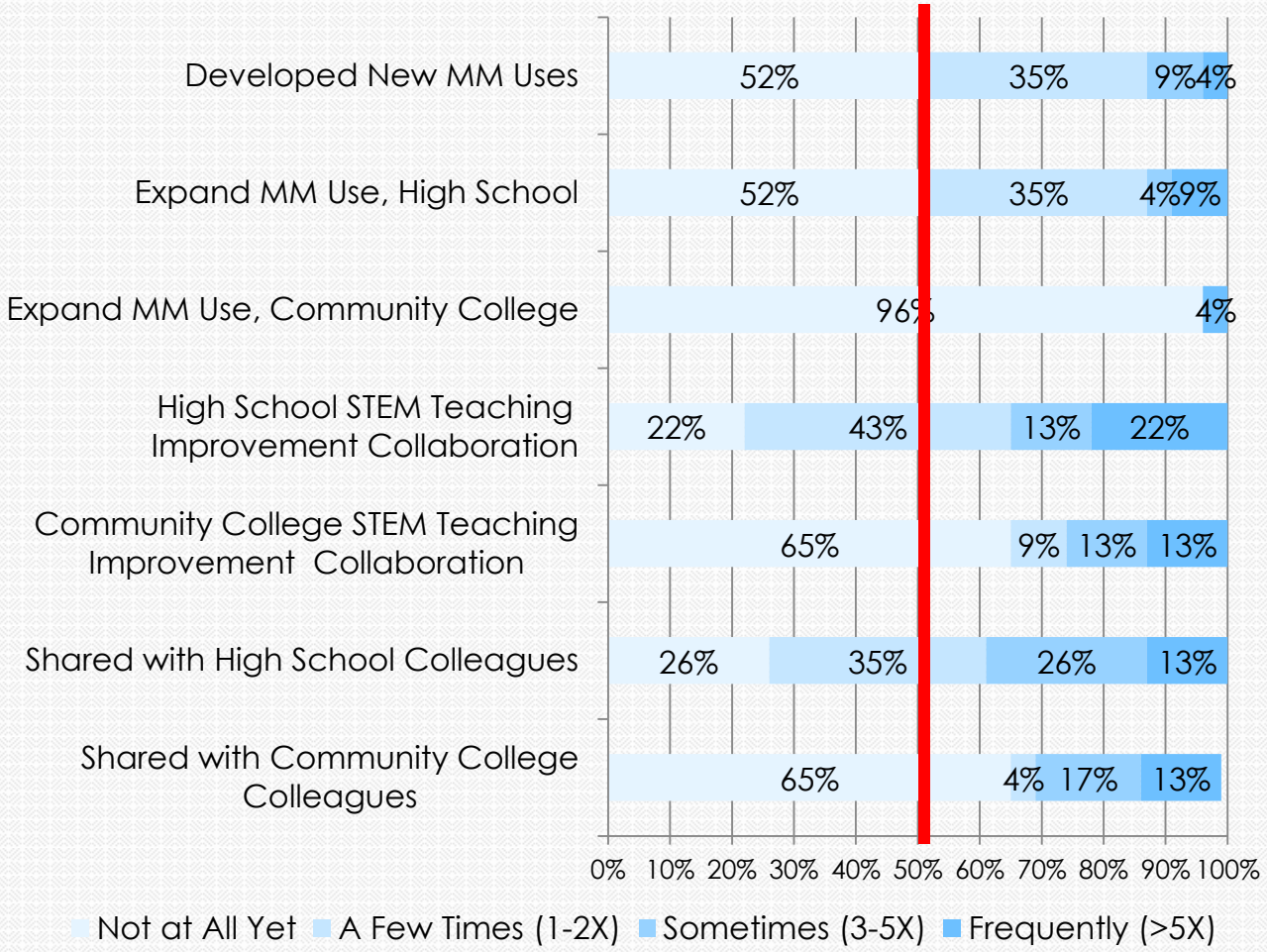
Strategy Use/Adaptation Claims, Q1 and Q3



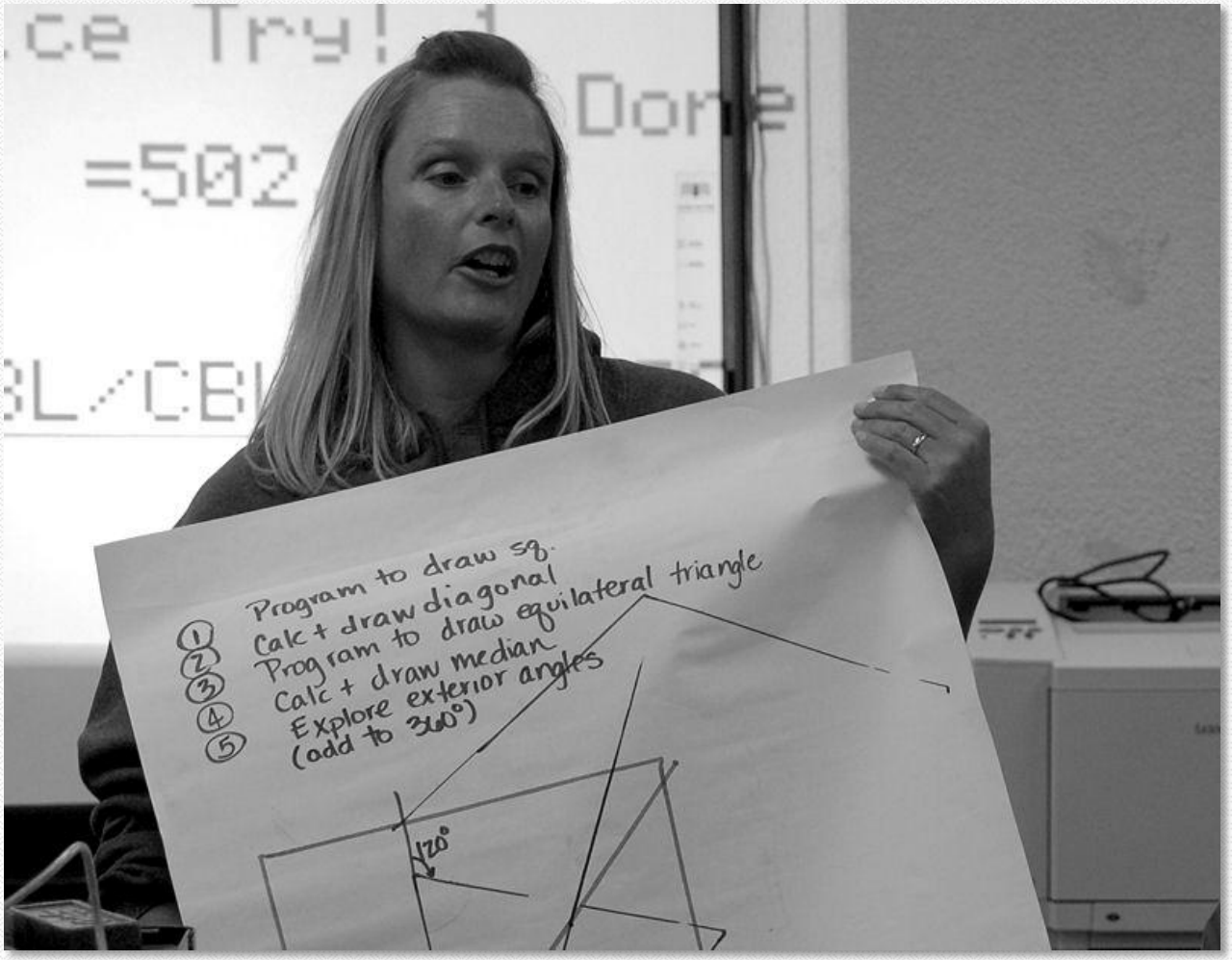
Equipment Use/Adaptation Claims, Q2



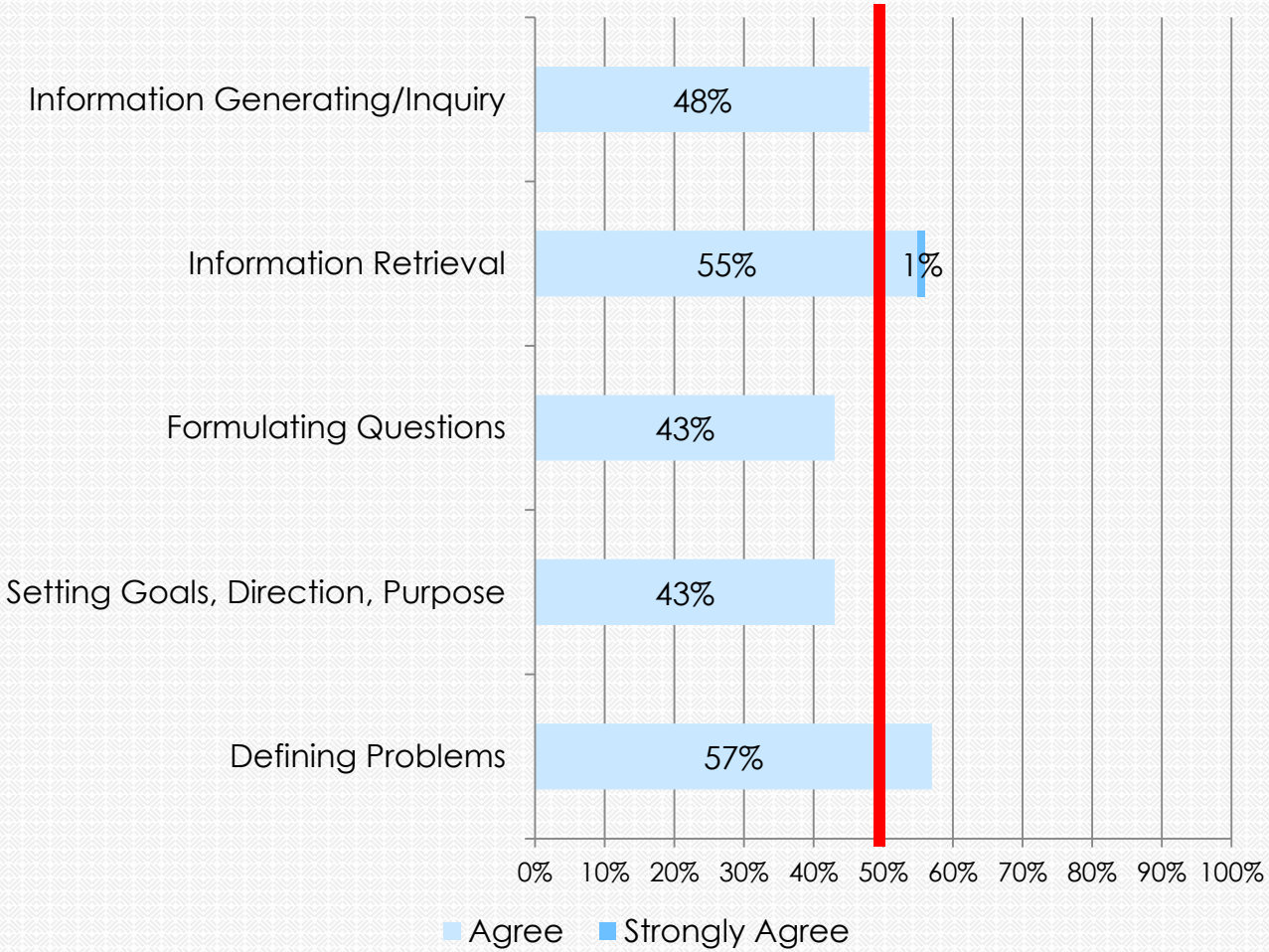
Spread & Collaboration Claims, Q3



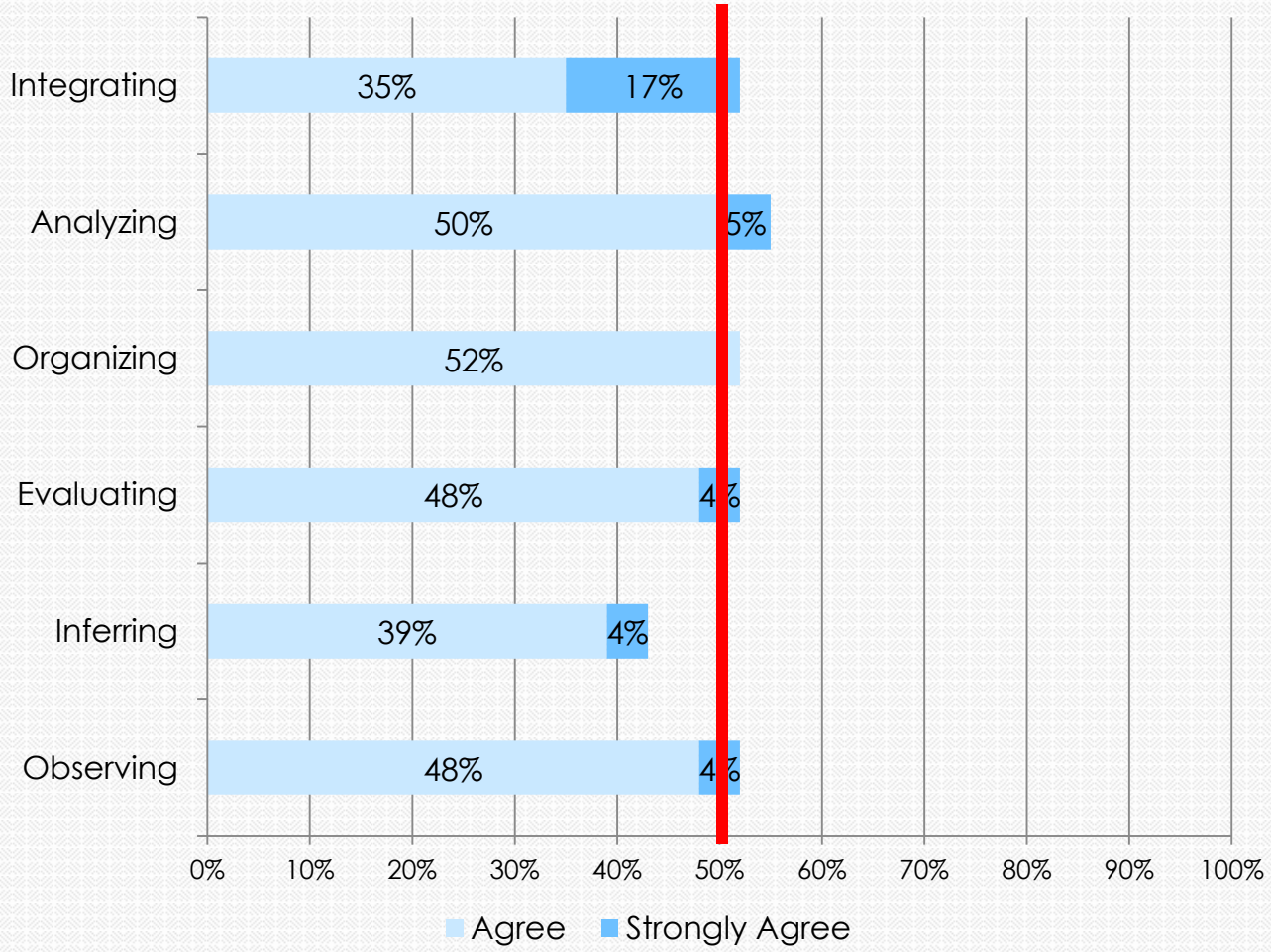
Student Knowledge & Skill



Student Basic Problem-solving Skill Claims, Q4



Student Adv. Problem-solving Skill Claims, Q4



Student Application & Relevance Claims, Q5