Experiential Sampling Methodology
Spark Math R&D Team
Last updated 11.4.25

Experiential Sampling Methodology (ESM)

The ESM is a set of multiple-choice and Likert-scale items that cover a variety of topics related to students' experiences and perceptions during math learning in classroom contexts.

Purpose

- The ESM captures student perceptions regarding:
    - their classroom learning environment,
    - their cognitive, behavioral, emotional and social engagement therein,
    - their motivation, anxiety, and predictions about math performance
    - their metacognitive awareness
    - their teachers' social and instructional approaches, and
    - their own sense of belonging in math class

Measure Details

- These questions collect data on various aspects of student experience on the Skye platform, which is hosted on Saga Connect. For all implementations that used the Skye platform, ESM data was collected in the form of a variety of Likert-type questions addressing math orientation and motivation, executive function (EF) in practice, and classroom belonging.
- The ESM has eight subscales, totaling
    - Math Discussions: 10 items
    - Math Engagement: 33 items across 4 dimensions
    - Math Expectancy-Value-Cost: 10 items across 3 dimensions
    - EF Motivation: 31 items across 3 dimensions
    - EF Metacognitive Awareness: 16 items across 2 dimensions
    - EF Strategies: 12 items across 2 dimensions
    - Culturally Relevant Pedagogy in Classrooms: 18 items across 2 dimensions
    - Culturally Relevant Pedagogy Belonging: 10 items

Contribution to the Field

- The Experiential Sampling Methodology (ESM) was developed to capture students' thoughts, feelings, and behaviors in real-time and in their natural environment. Unlike traditional methods like surveys or interviews that rely on retrospective recall, ESM provides a more immediate and ecologically valid way to measure students' experiences.

Accessing the Measure

- All subscales and items are included within this file.
- For additional information and to obtain permissions for future use, please contact:
    - Adriana Colom Cruz at acolomcruz@saga.org, Saga Education

Experiential Sampling Methodology: Math Discussion Protocol
Spark Math R&D Team
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Measure Items & Scoring Protocol: Math Discussion

Instructions: The following questions ask for your thoughts about your most recent math class session. For each question, select one response that best describes your experience in the whole class discussion in your most recent math class meeting.

1. What did you need to do in order to be successful in your most recent math class session?
    a. Solve problems using the steps the teacher showed me
    b. Listen to and make sense of other students' reasoning

2. Was there only one right way to solve the problem(s) in your most recent math class session?
    a. Yes
    b. No

3. What was the purpose of your most recent math class session's whole class discussion?
    a. Share how we solved problems using the steps our teacher showed us
    b. Learn the way the teacher showed us to solve the problem
    c. Learn different ways that work to solve a problem from other students
    d. Share a mathematical idea we came up with on our own
    e. Check to see if our answers are correct

4. Who talked the most in your most recent math class session's whole class discussion?
    a. Students
    b. The teacher

5. Did you have trouble understanding other students' thinking in your most recent math class session's whole class discussion?
    a. Yes
    b. No

6. Did listening to other students in your most recent math class session's whole class discussion help make your thinking better?
    a. Yes
    b. No

7. Were you comfortable sharing your thinking in your most recent math class session's whole class session?
    a. Yes
    b. No

8. Would it have been okay to share thinking you were unsure about in your most recent math class session?
    a. Yes
    b. No

9. Did you feel like other students really thought about your mathematical ideas in your most recent math class session?
    a. Yes
    b. No
    c. I did not share today.

10. Did you feel like your teacher really thought about your mathematical ideas in your most recent math class session?
    a. Yes
    b. No
    c. I did not share today.

Experiential Sampling Methodology: Math Engagement Protocol
Spark Math R&D Team
Last updated 11.4.25

Measure Items & Scoring Protocol: Math Engagement

Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how much you agree with it. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree

Cognitive Engagement Dimension:

1. I go through the work for math class and make sure that it's right.
2. I think about different ways to solve a problem in math class.
3. I try to connect what I am learning in math class to things I have learned before.
4. I try to understand my mistakes when I get something wrong in math class.
5. I would rather be told the answer than have to do the work in math class.
6. I don't think that hard when I am doing work for math class.
7. When work is hard in math class, I only study the easy parts.
8. I do just enough to get by in math class.

Behavioral Engagement Dimension:

1. I stay focused in math class.
2. I put effort into learning math.
3. I keep trying in math class even if something is hard.
4. I complete my math homework on time.
5. I talk about math outside of class.
6. I don't participate in math class.
7. I do other things when I am supposed to be paying attention in math class.
8. If I don't understand, I give up right away in math class.

Emotional Engagement Dimension:

1. I look forward to math class.
2. I enjoy learning new things about math.
3. I want to understand what is learned in math class.
4. I feel good when I am in math class.
5. I often feel frustrated in math class.
6. I think that math class is boring.
7. I don't want to be in math class.
8. I don't care about learning math.
9. I often feel down when I am in math class.
10. I get worried when I learn new things about math.

Social Engagement Dimension:

1. I build on others' ideas in math class.
2. I try to understand other people's ideas in math class.
3. I try to work with others who can help me in math.
4. I try to help others who are struggling in math.

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Social Engagement Dimension (continued):

5. I don't care about other people's ideas in math class.
6. When working with others in math class, I don't share ideas.
7. I don't like working with classmates in math class.

Experiential Sampling Methodology: Math Expectancy-Value-Cost Protocol
Spark Math R&D Team
Last updated 11.4.25

Measure Items & Scoring Protocol: Math Expectancy-Value-Cost

Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how much you agree with it. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree

Expectancy:

1. I know I can learn the material in my math class.
2. I believe that I can be successful in my math class.
3. I am confident that I can understand the material in my math class.

Value:

1. I think my math class is important.
2. I value my math class.
3. I think my math class is useful.

Cost:

1. My math classwork requires too much time.
2. Because of other things that I do, I don't have time to put into my math class.
3. I'm unable to put in the time needed to do well in my math class.
4. I have to give up too much to do well in my math class.

Experiential Sampling Methodology: EF Motivation Protocol
Spark Math R&D Team
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Measure Items & Scoring Protocol: EF Motivation

Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how true they are to you. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree. Items marked with an asterisk (*) should be reverse coded during analysis.

Value Dimension: Intrinsic goal orientation:

1. In my math class, I prefer course content that really challenges me so I can learn new things.*
2. In a class like math, I prefer content that prompts my curiosity, even if it is difficult to learn.*
3. The most satisfying thing for me in my math class is trying to understand the content as well as possible.*
4. When I have the opportunity in my math class, I choose assignments that I can learn from even if they don't guarantee a good grade.

Value Dimension: Extrinsic goal orientation:

1. Getting a good grade in my math class is the most satisfying thing for me right now.
2. The most important thing for me right now is improving my overall grade point average, so my main concern in my math class is getting a good grade.
3. If I can, I want to get better grades in my math class than most of the other students.
4. I want to do well in my math class because it is important to show my ability to my family, friends, teacher, or others.

Value Dimension: Task value:

1. I think I will be able to use what I learn in my math class in other courses.
2. It is important for me to learn the course content in my math class.
3. I am very interested in math.*
4. I think the information in my math class is useful for me to learn.*
5. I like the subject matter of my math class.*
6. Understanding the subject matter of my math class is very important to me.

Expectancy Dimension: Control of learning beliefs:

1. If I study in appropriate ways, then I will be able to learn the content in my math class.*
2. It is my own fault if I don't learn the information in my math class.*
3. If I try hard enough, then I will understand the content in my math class.*
4. If I don't understand the information in my math class, it is because I didn't try hard enough.*

Expectancy Dimension: Self-efficacy for learning and performance:

1. I believe I will receive an excellent grade in my math class.
2. I'm certain I can understand the most difficult content presented in my math class.*

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Expectancy Dimension: self-efficacy for learning and performance (continued):

3. I'm confident I can learn the basic concepts taught in my math class.
4. I'm confident I can understand the most complex content presented by my teacher in math class.*
5. I'm confident I can do an excellent job on the assignments and tests in my math class.
6. I expect to do well in my math class.
7. I'm certain I can master the skills being taught in my math class.
8. Considering how hard my math class is, the teacher, and my skills, I think I will do well in this class.

Affective dimension: Test anxiety

1. When I take a test in math, I think about how poorly I am doing compared with other students.
2. When I take a test in math, I think about items on other parts of the test I can't answer.
3. When I take tests in math class, I think of the consequences of failing.
4. I have an uneasy, upset feeling when I take a test in my math class.
5. I feel my heart beating fast when I take a math test.

Experiential Sampling Methodology: EF Metacognitive Awareness Protocol
Spark Math R&D Team
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Measure Items & Scoring Protocol: EF Metacognitive Awareness

Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how typical these statements are of you. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree. Items marked with an asterisk (*) should be reverse coded during analysis.

Knowledge of Cognition Dimension:

1. I know what kind of information is most important to learn in my math class.
2. I know what my math teacher expects me to learn.
3. I have control over how well I learn in my math class.
4. I am a good judge of how well I understand something in my math class.
5. I am aware of what strategies I use when I study for my math class.
6. I find myself using helpful learning strategies automatically during my math class.
7. I can motivate myself to learn when I need to during my math class.
8. I know when each learning strategy I use during my math class will be most effective.

Regulation of Cognition Dimension:

1. I think about what I really need to learn before I begin a task in my math class.
2. I set specific goals before I begin a task in my math class.
3. I try to translate new information into my own words during my math class.
4. I use the headings of my student pages to help me learn during my math class.*
5. I ask myself if what I'm learning during my math class is related to what I already know.*
6. I review my math content every so often to help me understand important concepts.*
7. I summarize what I've learned after I finish an activity or assignment in my math class.*
8. I ask myself if I learned as much as I could have once I finish a task in my math class.
9. I change strategies when I fail to understand something during my math class.
10. I reconsider what I assume to be true when I get confused in my math class.*
11. I stop and go back over new information that is not clear during my math class.

Experiential Sampling Methodology: EF Strategies Protocol
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Measure Items & Scoring Protocol: EF Strategies

Frequency Subscale:

> *Instructions: The following questions ask about what you do during your math class. For each question, think about how often you do that action. Remember there are no right or wrong answers, just answer in the way that best describes your experiences.*
>
> *Note: All items in this subscale use a 6-point Likert scale: Always, Very frequently, Occasionally, Rarely, Very rarely, Never*

1. *How often do you recheck your work when doing a math problem?*
2. *How often do you write down important information when solving a math problem?*
3. *How often do you talk through problems with yourself when you are stuck on a math problem?*
4. *How often do you move to a space where you can focus when doing difficult math problems?*
5. *How often do you slow down and not rush through math problems?*
6. *How often do you plan ahead when reading a math problem before you start?*

Utility Subscale:

> *Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how much you agree. Remember there are no right or wrong answers, just answer in the way that best represents your beliefs.*
>
> *Note: All items in this subscale use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree*

1. I find it helpful to recheck my work when doing a math problem.
2. I find it helpful to write down important information when solving a math problem.
3. I find it helpful to talk through problems to myself when I am stuck on a math problem.
4. I find it helpful to be in a space where I can focus when doing difficult math problems.
5. I find it helpful to slow down and not rush through math problems.
6. I find it helpful to plan ahead when I read a math problem before I start.

Experiential Sampling Methodology: CRP in Classrooms Protocol
Spark Math R&D Team
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Measure Items & Scoring Protocol: CRP in Classrooms

Instructions: The following questions ask for your thoughts about your math teacher(s). For each statement, think about how much you agree with it. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree

Diverse Teaching Practices Dimension:

1. My math teacher(s) explain what we are learning in different ways to help students learn.
2. My math teacher(s) want parents to be involved in student learning.
3. My math teacher(s) provide visual examples when explaining things.
4. My math teacher(s) use things such as videos, pictures, and guests to help students learn.
5. My math teacher(s) want students from different cultures to respect one another.
6. My math teacher(s) use what I already know to help me understand new ideas.
7. My math teacher(s) try to communicate with my parents about my grades and what I am learning.
8. My math teacher(s) treat all students like they are important members of the classroom.
9. My math teacher(s) try to find out what interests me.
10. My math teacher(s) use real-life examples to help explain things.
11. My math teacher(s) use examples that are interesting to help students learn.

Cultural Engagement Dimension:

1. My math teacher(s) use examples from my culture when teaching.
2. My math teacher(s) ask about students' home life.
3. My math teacher(s) are interested in my culture.
4. My math teacher(s) ask about ways that students' culture may be different from others.
5. My math teacher(s) speak about contributions that my culture has made to math.
6. My math teacher(s) help students learn about other students and their cultures.
7. My math teacher(s) have talked about the ways that people from different cultures are not understood.

Experiential Sampling Methodology: CRP Belonging Protocol
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Measure Items & Scoring Protocol: CRP Belonging

Instructions: The following questions ask for your thoughts about your time in math class. For each statement, think about how much you agree with it. Remember there are no right or wrong answers, just answer in the way that best describes your thoughts and experiences.

Note: All items use a 6-point Likert scale: Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree

1. I feel like I belong in my math class at my school.
2. I feel comfortable in my math class at my school.
3. Other people understand more than I do about what is going on in math at my school.
4. I think in the same way as students who do well in my math class at my school.
5. It is a mystery to me how math class at my school works.
6. I feel like I am alone in my math class at my school.
7. I fit in well in my math class at my school.
8. Compared with most other students at my school, I am similar to the kind of people who succeed in math.
9. Compared with most other students at my school, I know how to do well in math class.
10. Compared with most other students at my school, I get along well with people in my math class.