“Mental Math”: Building coping and problem-solving skills in math class

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Abstract: *Many youth face mental health obstacles to their learning and well-being. School—particularly math class—is an overlooked and underutilized arena for students to learn coping and problem-solving skills and apply them to both academic and broader life challenges. A brief online intervention, Mental Math, developed with cognitive-behavioral principles, had high engagement and significant positive effects on academic performance among high school math students. Implications for future implementation are discussed.*

Keywords: *coping, problem solving, math anxiety, mental health, social emotional learning*

Introduction

Up to 20% of children aged 3 to 17 in the United States have a reported mental, emotional, or behavioral disorder, and about half of those do not receive adequate treatment each year (OSG, 2021). Schools can serve as accessible and practicable settings to teach and foster students’ skills related to mental health and well-being. American schools have always been meant to provide more than academic learning: from their religious origins to Deweyan civic ethos to student athletics and clubs today (Urban & Wagoner, 2014). Students develop their sense of self and build their individual and social competencies among their peers at school.

In May and June of 2020, although half of students identified depression, stress, and anxiety as obstacles to online learning, only 54% of school districts surveyed were providing mental health support, and less than 10% were measuring student wellbeing (DeArmond et al., 2021). In addition, according to a 2020 meta-analysis, schools provide mental health services for about 7.3% of the general youth population and 22% of youth with elevated mental health symptoms or diagnoses, which are only slightly higher rates than outpatient settings (Duong et al., 2020). These rates are despite school professionals having access to nearly all children on a day-to-day basis.

Schools are good candidates for social and emotional learning (SEL); however, valuable skills like empathy, social problem-solving, and coping with challenges are not universally taught. While these rates are increasing, only 53% of teachers and 76% of principals reported that their schools used SEL programs or materials at least “sometimes” in the 2021-2022 school year (Schwartz et al., 2022). Furthermore, the most common schoolwide SEL activity is supportive discipline, and not explicit skill training or integration into classroom learning (Schwartz et al., 2022). Altogether, these data indicate that SEL skills are far from being taught in most classrooms or to most students

Math class is an overlooked arena for a student to learn certain coping and problem-solving skills, apply them to academic challenges, and extend them to their own life. Proficiency in math requires

students to "make sense of problems and persevere in solving them" (Ohio DOE, 2017). The structure and rules inherent to mathematics provide scaffolding and support: a contained place for students to learn to solve problems and cope with setbacks. These lifelong lessons are applicable to a myriad of challenges.

Furthermore, math class is particularly appealing because it allows for acquisition and practice of skills in a setting where anxiety is likely to be present. Approximately 30% of adolescents are affected by math anxiety, which inhibits both math content intake and performance (Moustafa et al., 2021). Math anxiety stems from negative experiences in math and is tied to emotional dysregulation, paving the way for other anxieties, distress, and dysfunction (Moustafa et al., 2021). Furthermore, math anxiety is associated with decreased academic achievement, academic self-concept, motivation to learn, and pursuit of STEM careers (Moustafa et al., 2021; Asanjarani & Zarebahramabadi, 2021).

Some research indicates that math anxiety can be addressed with directed intervention. In one study, a cognitive-behavioral intervention involving psychoeducation, cognitive restructuring, relaxation, and graded exposure reduced anxiety symptoms in students with elevated levels of math anxiety (Asanjarani & Zarebahramabadi, 2021). In another study, a 16-session counseling program which focused on SEL competencies reduced math anxiety in a non-clinical group of middle school students (Kamour & Altakhayneh, 2021). In general, SEL programs have well-established beneficial effects on both academic performance and mental health (Durlak et al., 2022).

It may not be practical to implement a full-scale SEL or mental health program; even school-based interventions can require screening, mental health professionals, clinical spaces, and months of sessions (e.g. Kamour & Altakhayneh, 2021; Marlotte et al., 2023). Classroom-level changes and brief interventions are other possibilities with greater potential reach and accessibility. Elements of mindfulness, relaxation, self-reflection, and building a growth mindset can be incorporated into math classrooms to decrease anxiety (RELNW, 2017). Resources exist for implementing SEL practices in math class (e.g. Inside Mathematics, 2023; Vorensky, 2023), but their efficacy is untested. Outside of the classroom, enrichment experiences like math clubs can build problem-solving skills and stave off math anxiety (Flick & Kuchey, 2022). Learning the coping strategies to address math anxiety in particular can address other anxiety issues and mental health in general while the academic context can reduce the associated stigma and improve grades.

"Mental Math" Intervention

Development

Alex Lower (the first author) developed a brief intervention to build emotional and cognitive skills in a high school math class. As a math educator, Alex had observed how young people could be overwhelmed by anxiety, frustration, confusion, disappointment, or stress when facing math problems and tasks that were, in fact, within their ability. Alex developed the intervention, "Mental Math," at Xavier University as part of his secondary education coursework (Lower, 2018) and piloted the intervention in various formats.

Following the conceptualization of the "Mental Math" intervention, its content was carefully crafted to bridge cognitive-behavioral therapy (CBT) principles, acceptance and commitment therapy (ACT), and practical classroom-based applications. CBT and ACT are both empirically-supported treatments for anxiety; their concepts are also common in school-based mental health interventions directed towards adolescents (e.g. Marlotte et al., 2023; Bodicherla et al., 2021; Petersen, 2021). Some exercises and techniques were adapted from self-help material (e.g. Burns, 2009; Harris, 2009; Satterfield, 2015) to increase accessibility and reduce stigma.

The "Mental Math" intervention is segmented into four thematic clusters, each designed to highlight and develop specific coping mechanisms and problem-solving skills:

1. **Emotional Labeling (Questions 1 & 2)**: This initial cluster focuses on enhancing students' ability to identify and articulate their emotions, a foundational skill in emotional regulation and a critical first step in addressing anxiety. By encouraging students to generate and reflect upon a comprehensive list of feeling words, these tasks aim to broaden their emotional vocabulary, fostering greater self-awareness and emotional intelligence.

2. **Cognitive Defusion (Questions 3 & 4)**: Building on the foundation laid by emotional labeling, the next set of tasks introduces students to the concept of cognitive defusion. Through creative and reflective exercises, students learn to distance themselves from unhelpful thoughts and perceptions, thereby reducing their impact and influence. This cluster encourages a reevaluation of challenges, promoting a more flexible and adaptive mindset.

3. **Reframing Negative Thoughts (Questions 5, 6, & 7)**: As students become more adept at recognizing and managing their emotions, they are guided through the process of reframing negative thoughts. This cluster directly tackles the cognitive distortions that often underlie math anxiety, using structured exercises to replace harmful thought patterns with more constructive, empowering beliefs.

4. **Reflection & Application (Question 8)**: The intervention culminates in a reflective exercise that encourages students to consolidate their learning and consider the application of these newly developed skills beyond the classroom. This final task underscores the holistic approach of the "Mental Math" intervention, emphasizing the importance of self-reflection in personal growth and learning.

Delivery

The present iteration of "Mental Math" was conceived when Alex served as a geometry teacher at an online school, aiming to bolster students' mental preparedness for exams and enhance their coping skills as they approached the semester's end. The intervention, endorsed by the school's math department, was implemented in Spring 2022 as a self-guided online module, delivered through a Canvas quiz. This format was strategically chosen to engage students in a structured exploration of their emotional responses to mathematical challenges, guiding them from the initial recognition and labeling of "negative" feelings (e.g., frustration), through the reevaluation of these emotions, to the transformation of harmful thoughts into more constructive ones (e.g., shifting from "I'll never get this" to "I haven't gotten this yet, and I can").

This Mental Math assignment was administered in a single session and designed to be completed in 45 to 60 minutes. Students had one week to submit their responses, allowing adequate time for thoughtful engagement with the material.

Participants

Mental Math was made available to 126 students in Alex's geometry class. These students represented one-third of the geometry students at the school. The majority of participants were high school sophomores and were 15 to 17 years old. Both male and female students were represented. The school offered only online classes and served students across Ohio from rural, suburban, and urban areas. According to school demographic reports from 2020, about 57% of students were white, 25% were Black, 8% were multi-racial, and 9% were Hispanic. About 36% of students were considered economically disadvantaged. According to school AIR testing reports, 13% of freshman students tested proficient in algebra and 12% of sophomore students tested proficient in geometry.

Alternative Delivery Options

While the intervention's initial implementation offered a concentrated experience of emotional and cognitive engagement, the authors of this paper recognize the diversity of classroom settings and instructional needs. Accordingly, we note that the Mental Math items may be adapted to various educational contexts beyond their original online, self-guided format. For instance, educators may consider distributing the tasks over several days or weeks, enabling deeper reflection and integration of the intervention's objectives.

Tasks that emphasize emotional labeling (Questions 1 & 2) might serve as the groundwork in an introductory phase, gradually acquainting students with the introspective process of identifying and articulating emotions. Following this foundation, educators could sequentially introduce tasks centered around cognitive defusion (Questions 3 & 4) and the reframing of negative thoughts (Questions 5-7), each session building upon the last. The intervention could then culminate with the reflective task (Question 8), which not only serves to consolidate the skills acquired but also encourages students to apply these strategies in broader contexts beyond the classroom. This modular, flexible approach to delivery is designed not merely to accommodate logistical and instructional variances but to enhance the pedagogical impact of the Mental Math intervention.

Description of Student Tasks

This section elucidates the structured set of questions designed to enhance students' coping and problem-solving skills through a blend of cognitive-behavioral therapy (CBT) principles and practical application. Each question addresses specific aspects of math anxiety and emotional regulation, supporting students in navigating the emotional and cognitive challenges often encountered in math learning environments. We present these questions across four thematic clusters: Emotional Labeling, Cognitive Defusion, Reframing Negative Thoughts, and Reflection & Application, detailing their objectives, implementation strategies, and the pedagogical rationale underpinning each.

Emotional Labeling Cluster

Question 1

The intervention began with an introduction intended to set expectations and warn students about potential discomfort. In this question, students engage in an exercise designed to enhance their emotional vocabulary and awareness. The goal is to activate students' thinking, creativity, and engagement through a simple yet profound task: generating a list of feeling words within a two-minute time frame. This exercise lays the foundational groundwork for emotional labeling, encouraging students to explore and articulate a broad spectrum of emotions more specifically than general terms like "happy" or "sad."

> For the next two minutes, create a set of **feeling words**—words to describe feelings and emotions—the more specific, the better. "Happy" and "sad" are a solid start, but vague. List words that your English teacher would be proud of. Write as many strong, specific feeling words as you can in two minutes

Student examples of feeling words—ranging from "exhausted," "doubtful," and "drained" to "cheerful," "delighted," and "exhilarated"—illustrate the diversity and depth of emotional experiences that can be evoked in the context of learning and personal reflection. These examples demonstrate the task's effectiveness in expanding students' emotional lexicon and also underscore the importance of recognizing and naming emotions as a first step towards managing feelings associated with mathematical challenges.

Question 2

Question 2 builds upon the emotional awareness cultivated in Question 1, guiding students to a deeper introspection about their emotional responses. This question specifically encourages students to reflect on the list of feeling words they generated, identifying which emotions they associate with challenging situations, such as difficult math problems. The aim is to foster a nuanced understanding of how specific emotions influence their approach to learning and problem-solving in math.

> Look at your list of words above.
>
> - Which are your favorites?
> - Which do you feel when confronted by a challenge, like a hard math problem?
> - Do those words describe "bad" feelings?

This task provides a pathway for students to begin evaluating their emotional reactions, a key step in developing effective coping strategies for anxiety and frustration related to math challenges.

Such exercises enhance students' emotional literacy and promote a growth mindset by helping them recognize that all emotions can provide valuable insights into their learning behaviors and preferences. Acknowledging and reflecting on these emotions is a crucial step toward fostering resilience and developing adaptive learning strategies in mathematics education.

Student Examples

- "My favorite words would be motivated, joyful, and confident. The word I feel when dealing with a challenge would be anxious. This word I would say describes a bad feeling because being anxious isn't a good thing."
- "Confronted by a math challenge I feel anxious, challenged, and weak."
- "My favorites are numb, anxious, and surprised as that is basically the only things I feel on a day to day basis. When confronted with a hard math problem I feel rather "frazzled" (I love this word) and confused. These don't necessarily describe bad feeling, they're more like a 'stumped' feeling."

Cognitive Defusion Cluster

Question 3

This question introduces the first part of the broken chair exercise (Harris, 2009), aiming to elicit students' automatic responses to perceived negative situations. This question serves as a starting point for practicing cognitive defusion, encouraging students to observe their immediate judgments or reactions to the broken chair and question their validity.

> **Broken chair exercise, part 1.** Consider the chair to the right.
>
> This chair has a loose leg. It looks okay, but as soon as someone sits in the chair, the leg will give out and the chair will collapse.
>
> Answer the following questions:
>
> - Is this a broken chair?
> - Does this chair fill its purpose as a chair?
> - Is this a good chair?
>
> 

By challenging the notion that a broken chair is inherently "bad" or useless, this exercise begins the process of cognitive defusion, where students learn to distance themselves from their initial automatic thoughts and view situations with a more flexible and creative mindset.

Student examples

- "The chair is not good right now because it does not serve its purpose."
- "It's a broken chair but that doesn't make it a bad chair. Chairs are meant to be sat on but just like everything else they are meant to be fixed when they are broken."
- "As soon as somebody sits on it it will break, but for looks it does, it looks ok but really it's breaking down, sometimes people are like this and need help."

This question's goal is to begin shifting students' perceptions from seeing problems as insurmountable to viewing them as opportunities for creativity and growth.

Question 4

The next prompt continues the exploration started in Question 3, pushing students further into the realm of cognitive defusion by changing their interpretation of the "bad" chair. This part of the exercise engages students in creative problem-solving, asking them to think beyond the chair's initial "badness" and come up with useful alternatives for it.

Broken chair exercise, part 2. Consider the same chair with the loose leg. Think—and then write—about how this particular chair might be useful. What can you do with this chair that you can't do with a "good" chair?

- Maybe this chair would be useful in a prank.
- Maybe it would be helpful to someone who's learning carpentry.
- Maybe it makes good firewood!

Work to come up with several examples—the more creative, the better!

By encouraging students to consider various innovative uses for the chair, this question promotes a more adaptable and open-minded approach to challenges, which is a core aspect of cognitive defusion.

Student examples

- "For someone who's learning carpentry, they can make the chair into spindles, picture frames, coat rack, a shelf, a hanger, a bench swing, and a bed frame."
- "You could even cut a hole in the middle of the chair and put a flower pot inside to grow flowers or whatever you would like to."
- "One way this chair could be useful is to take all of the legs off of it and you could turn it into a swing. You could use rope or chain and hang it from a tree branch."

These examples demonstrate how cognitive defusion helps students view problems not as obstacles but as opportunities for creative thinking and learning.

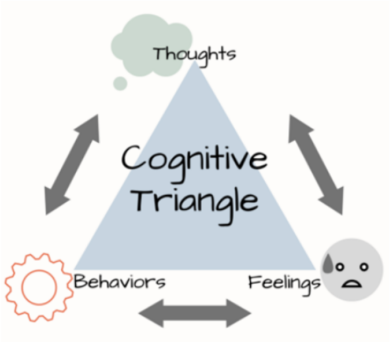
Reframing Negative Thoughts Cluster

Question 5

This task introduces the concept of the cognitive triangle, which connects thoughts, feelings, and behaviors. This question challenges students to categorize their thoughts and feelings as "helpful" or "harmful" rather than "good" or "bad" (Satterfield, 2015), encouraging them to reframe their mindset towards challenges they encounter in math class.

"Thoughts and feelings are neither good or bad, true or false. They are either harmful or helpful." –Dr. Jason Satterfield.

Look back at your list of feeling words from Question 1. **Labeling feelings** is a powerful strategy to recognize cycles where hurtful feelings lead to hurtful thoughts and actions, as in the Cognitive Triangle shown below.



Our next strategy is **thought replacement**:

- Pick one of the feeling words that you associate with a challenge—one that labels a "bad" feeling.
- Consider the thought this feeling brings on. What do you think about yourself and your ability when you feel this way?
- Reflect on how this "bad" feeling could be helpful to you.
- For example, if you feel frustrated by a problem, maybe that frustration is an indicator that you need to try a new strategy.

This process requires patience. If the first thought you come up with doesn't help, try another. You can do it!

Through this exercise, students practice the skill of cognitive flexibility, learning to transform self-criticism into self-encouragement, which is crucial for overcoming barriers to learning.

Student examples

- "Thoughts and feelings can neither be good or bad. [T]hat is true our feelings are our thoughts and our thoughts can come from our feelings. [O]ur thoughts and feelings can be harmful if negative thoughts or feelings get to us but they can be turned into positive thoughts, feelings, and reactions. The word I chose is panic and when I think of that word many others come to mind at once like stress or confused or anxious when there is panic in the mind and body. [T]hat's where the cognitive triangle comes in. [O]ur thoughts become feelings and our feelings become behavior. [I]t is all the way you think, the word panic can also be good. [I]t can get you to do something on time or be early."
- "I don't know."
- "When I feel disquiet, I would feel like I won't be able to ever understand the math problem I'm struggling with and think [I'm] dumb. At the same time it can help me to learn to not to push myself too much and keep practicing at my own pace."
- "One of the words I wrote was worthless which I have felt before. Like I thought to myself 'Am I worthy of doing this?' or 'what if I can't do this?' But then those negative thoughts give me the motivation to do good and to prove myself wrong. I try to replace the negative thoughts with positive thoughts and it usually works for me."

Although some students evidently struggled with this task, these examples illustrate the transformative power of reframing: students move from a fixed to a growth mindset, opening the door to greater resilience and academic achievement.

Question 6

The next task engages students in a matching exercise designed to normalize harmful thoughts associated with math and practice thought replacement. This task allows students to consider common negative thoughts and to match them with a corresponding helpful thought, promoting a shift toward a more constructive mindset in math class.

Thought Replacement Exercise. Match each harmful thought on the left with the most relevant helpful thought on the right. Each will only be used once.

For example: "I'm bad at math." → "I haven't mastered this part of math yet."

Harmful Thought		**Helpful Thought**
I'm bad at math.		I haven't mastered this part of math yet.
This is boring.		I haven't found a way to make this interesting yet.
This is useless.		I haven't found a way to make this useful yet.
I'm stuck.		I may need help finding the next step.
I'll never understand this.		I don't understand this yet, so I may need another explanation.
The teachers don't help me.		Teachers are my coaches, but I need to practice on my own.
Making mistakes makes me a failure.		Mistakes happen to everyone and making mistakes grows my brain.

This exercise normalizes the experience of having harmful thoughts and provides a framework for students to actively reframe these thoughts into something more helpful and positive.

Question 7

This task expands the thought replacement exercise, making it open-ended and allowing students to apply the concept to their own experiences in math or life in general. Students create a personalized version of the thought replacement exercise by identifying a harmful thought and then reforming it into a more helpful one.

Thought Replacement Application. Using your responses above, write your own version of the thought replacement exercise. What is a harmful thought for you regarding math or life in general and what is a more helpful thought you can replace with it? _____ → _____

Student examples

- "Bored with the problem" → "Find new/fun ways to solve."
- "No one will help me" → "I need to make it clear that I need help."
- "You're failing" → "But I'm gonna graduate. Using competitive drive as motivation."
- "I will never be good enough" → "No one is perfect."
- "I'm wasting my time" → "I need to manage my time more effectively."

This task emphasizes the importance of self-reflection and the active application of cognitive reframing techniques to foster resilience and a proactive approach to overcoming challenges. Through personalization of the reframing process, students demonstrate their understanding of how cognitive restructuring can be directly applied to enhance their mathematical learning experience and their broader life perspective. This exercise encourages students to take ownership of the reframing process, fostering greater self-awareness and adaptability.

Reflection & Application Cluster

This cluster marks the culmination of the "Mental Math" intervention, where students consolidate their learning and apply the cognitive restructuring skills they have developed. Reflection and application are key components that allow students to internalize the strategies they have practiced and consider how they can be utilized in both academic settings and in their personal lives. By reflecting on their thought processes and projecting their learning into real-world scenarios, students gain a deeper understanding of the practical significance of the coping strategies they have learned.

Question 8

As students complete "Mental Math," Question 8 serves as a guided reflection to encourage them to contemplate their journey through the assignment. It is a chance to elicit feedback, understand the utility of the techniques practiced, and motivate students to apply these strategies to future challenges. It is also an opportunity to end on a positive note, emphasizing the importance of self-care.

> **Last Question! Reflection.** Reflect on your experience with this assignment:
>
> - What did you like or not like about this assignment?
> - What seemed the most helpful or least helpful?
> - What is a situation where you will use one of the techniques we practiced (labeling, thought replacement) or another technique to cope?
>
> You did it! Now take a well-deserved break. See you in class!

Student examples: See Engagement section below.

This question allows for an assessment of the assignment's impact and reinforces the concept of continuous learning and self-improvement. By asking students to think about future applications of the techniques, it fosters a proactive mindset towards personal growth and resilience.

Study Findings

Measures

Completion, engagement, and academic performance measures were taken. The intervention had seven free-response questions (scored for completion) and one matching question (scored for accuracy). Written feedback was solicited in the last question (Question 8). Student exam grades and final grades for geometry were collected and paired with Mental Math responses after the conclusion of the school semester. In this study, there were no explicit measures of math anxiety or mental health.

Analysis

Question completion and feedback valence were assessed by rubric. Descriptive statistics were executed to describe the sample. Independent samples t-tests were run to examine differences in students' exam grades and final course grades, comparing students who completed the intervention to students who did not. Pearson's correlations were used to understand relationships between variables

of interest. Results were further examined by specifically analyzing students with certain minimum scores or grades as a means of controlling for floor effects. The analysis was conducted by Alex after the conclusion of the school semester.

Results

Of the 126 students with recorded grades, 83 students (66%) completed Mental Math by submitting the finished assignment. Students who submitted Mental Math showed significantly more improvement from the exam prior to Mental Math to the exam after Mental Math than those who did not submit the assignment, $t(80)=3.173$, $p<0.01$. This association was maintained when including only students with nonzero exam scores, $t(78)=2.520$, $p<0.05$. Furthermore, among the 77 students (61%) with a final course grade over 50%, score on Mental Math was positively correlated with exam score improvement, $r(77)=0.458$, $p<0.001$, and final course grade, $r(77)=0.297$, $p<0.01$.

Engagement

Students who completed Mental Math were highly engaged with the assignment, with 75 students (91%) answering every question. Specifically, students came up with an average of 14.4 feeling words for emotional labeling (Question 1; range 4-80) and 3.4 broken chair uses for cognitive defusion and problem-solving (Question 4; range 0-7). Also, students performed very well on the thought replacement matching exercise, scoring an average of 6.48 out of 7 (Question 6; SD 1.12). Generally, students were on topic and fully answered each free-response question, though length and rigor of responses varied widely. Certain students vented, shared their struggles, made insights, expressed their confusion, and even composed poetry. Examples of student responses to the free-response questions are shown above.

Feedback

Student feedback in Question 8 was mostly positive (78%) with some mixed/neutral (12%) or negative (9%). Four students (5%) wrote about not feeling comfortable with discussing their feelings or with being asked to do so in a math class:

- "Throughout doing this assignment I felt like I was writing about things I didn't feel comfortable talking about."
- "I did not like this assignment because it made me feel like I was in English or psychology class."

Other students enjoyed the expressive and reflective aspects of the assignment and found its techniques helpful:

- "What seemed the most helpful was turning these negative thoughts and feelings into inspiration."
- "I honestly loved this assignment. It gave me a chance to express how I feel."
- "It's good to challenge your brain by formulating opinions."
- "Doing this assignment I've learned more about myself."
- "I got frustrated and wanted to give up but I like how it helped my solving skills and helped me get over my fear of asking for help."
- "I enjoyed the aspect of using ways to help make our brains less negative into helping our frustrations with math."

Discussion

The purpose of this study was to test the viability of a brief mental health skills promotion intervention delivered to a high school math class with the aim of building coping and problem-solving skills related to challenges in math. The brief online Mental Math intervention had high engagement and significant positive effects on academic performance among high school math students. These math performance effects were found for subsequent exam improvement and for final course grade. As far as we know, this is the first empirical study of a single-session or online mental health intervention set in a math class.

While promising, these results are limited by lack of controls and absence of validated measures of mental health. In this study, measures of general anxiety, math anxiety, and individual demographics were not taken, and demographic differences between completers and non-completers were not examined. Future studies of skill-building interventions in classroom settings can incorporate more mental health and demographic measures. Rigorous experimental procedures, independent evaluation of subjective responses, and replication in other settings can solidify the validity and utility of this intervention.

The feedback to Mental Math indicates a need to normalize the discussion of coping with challenges in class beforehand without forcing students to overshare. Mental Math was delivered online and completed independently, without any class-wide briefing or debriefing. Different delivery formats could include more discussion, practice, normalization, and goal-setting. Potentially confusing or overlooked concepts from the intervention could be better explained to students. Follow-up with students can ensure that changes to thoughts are linked to proactive problem-solving behaviors as well. Furthermore, students need to know that they may experience uncomfortable feelings in the course of the intervention and have a way to decompress afterwards. Earlier iterations of Mental Math ended with a relaxation component, but it was removed for this online implementation; it may be worth reinstituting as other programs have included relaxation (e.g. Asanjarani & Zarebahramabadi, 2021). It seemed that the self-guided nature of the assignment was liberating to many students. It was anticipated that working on mental health skills in the setting of a math class and initially applying them to coping with difficulties in math would lessen the stigma connected to mental health, so the overall positive feedback is encouraging.

Implications

Coping and problem-solving skills are as vital in math class as they are in everyday life, and the former can provide an incubator to hone the skills for the latter. There are plenty of strong ideas on how to promote coping and problem-solving skills in math class, from cultivating a growth mindset (e.g. Boaler et al., 2021) to altering the Algebra 1-Geometry-Algebra 2 sequence in favor of a data fluency curriculum (e.g. Dubner & Levitt, 2019). While more research is needed, our findings imply that the Mental Math intervention has beneficial academic effects and is a feasible and accessible way to promote these skills for students to extend to mental health. At present, mental health support and assessment are severely lacking for youth, and avenues outside of traditional therapy need to be considered (Kazdin, 2019). School-based mental health promotion can mitigate obstacles of stigma, time constraint, and lack of access while being conducted in an environment that encourages the learning and practice of life skills (Bodicherla et al., 2021).

Social-emotional skills can be accessibly taught at the classroom level and applied to academic challenges. The Ohio Department of Education endorses K-12 SEL standards, but does not offer tools for the learning or testing of those standards (Ohio DOE, 2019). Instead, educators, school administrators, counselors, and researchers ought to collaborate to develop engaging and effective interventions and classroom practices with objective measures of student performance and health. Teachers are capable of delivering mental health and SEL practices or interventions; indeed, teachers may be more

effective at delivery than outside researchers (Durlak et al., 2022) and are likely more trusted by their students. In each classroom, be it online or in-person, a teacher can feasibly implement a skill-building intervention akin to Mental Math and integrate it into their curriculum. The description of the thematic clusters and student tasks above can provide educators with a blueprint for the construction of such an intervention. These interventions, in the form of lessons, might become regular facets of classroom practice, with a series of lessons throughout the academic term to introduce new skills or support students at stressful exam times. After introducing these skills, teachers can seamlessly incorporate them into their course: for example, when a "negative" situation arises, a teacher can remind students of the broken chair and prompt positive problem-solving. Teachers can also work with students collectively or individually—in the course of assisting with classwork—to explore any hurtful or harmful thoughts and feelings associated with academic challenges, normalize them, and help students reinterpret them to more helpful ones, leading to proactive attitudes and behavior. Building coping and problem-solving skills in the conducive and accessible environment of math class can promote mental well-being as well as academic achievement for young people.

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As the founder of *Mental Math by Alex*, **Alexander Lower** leverages his background in psychology, education, and design to offer educational services to schools and individuals. Dedicated to aiding both students and educators, Alex offers tailored tutoring, test preparation, and professional development services, striving to eliminate obstacles to academic achievement.

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