Talking with Students about their Strengths and Weaknesses

Moments of frustration as well as pride are common for students with math problems and for the adults who work with them. Some students give up and see themselves as failures; others exhibit behavior complications that relate to their difficulties with math.

Dr. Mel Levine suggests using a process called demystification, which, through open discussion with supportive adults, helps students learn to clarify and specify their differences and understand that, like everyone else, they have strengths and weaknesses. This process creates a shared sense of optimism that the person and adult are working toward a common goal, and that learning problems can be successfully managed. The following suggestions can help parents, teachers, and learning specialists work together to demystify students’ difficulties with math.

Eliminate any stigma. Empathy can reduce students’ discouragement and anxiety about their difficulties with math. Emphasize that no one is to blame, and that you know they often need to work harder than others to think with numbers successfully. Explain that everyone has differences in the way they learn. Reassure students that you will help them find ways that work for them. Share an anecdote about how you handled a learning problem or an embarrassing mistake.

Discuss strengths and interests. Help students find their strengths. Use concrete examples, but avoid false praise. You might tell a person who seems to make friends quickly, "You’re a real people person." Value students' interests. To a person who enjoys drawing, you might say, "Try drawing pictures of math problems as you solve them." Identify books, videos, Web sites, or places in the community that can help students build on their strengths and interests.

Discuss areas of weakness. Use plain language to explain what aspect of math learning is difficult for the person. For example, you might say, "You may have difficulty completing a multi-step math problem not because you don't know your math facts, but because it is hard for you to remember the procedures for completing the problem."

Emphasize optimism. Help students realize that they can improve -- they can work on their weaknesses and make their strengths stronger. Point out future possibilities for success given their current strengths. Help students build a sense of control over their learning by encouraging them to be accountable for their own progress. A person who has difficulty remembering multiple steps in solving a math problem, for example, can learn to use sub-vocalization strategies to organize and guide his or her effort.

Teach explicit meta-cognitive strategies when needed. For some students, a teacher will need to provide direct instruction to help students think about their approach (including previewing), pursue facts, and self-monitor. Other students may need strategies to help check the precision or the reasonableness of their answers. Remember that explaining meta-cognitive approaches only once won't be sufficient for some students. They may need repeated instruction and practice in how to apply these strategies.

Identify an ally. Help students locate a mentor -- a favorite teacher, a teacher’s aide, or a neighbor -- who will work with and support them. Explain to students that they can help themselves by sharing with others how they learn best. Older students can explain the strategies that work for them, while younger ones may need adult support. Encourage students to be active partners with their allies.

Protect from humiliation. Help students strengthen self-esteem and maintain pride by protecting them from public humiliation related to their learning differences. Always avoid criticizing students in public, and protect them from embarrassment in front of siblings and classmates. For example, do not ask students to solve math problems in front of their classmates at the chalkboard. Downplay confrontational or competitive aspects of mathematics, particularly those that create anxiety such as speed drills. Explore alternate ways of covering and assessing these skills.

Suggestions and Strategies

You may use the following suggestions and strategies to help students who are experiencing problems with mathematics. Many of those listed are accommodations -- they work around a person's differences by offering alternative approaches to learning material. Checking work is one example of a suggestion that might help. Strategies -- more research-based methods -- are designed to specifically strengthen a weakness. From the suggestions and strategies described below, select those that you and the person think
Maintain consistency and communication across school and home settings is vital. For example, if a tutor explains math concepts in one way, the classroom teacher takes another approach, and parents yet a third, this may compound problems rather than solve them.

General Suggestions

Teach basic concepts using concrete objects. Let students explore number concepts by adding and subtracting objects in the room (for example, add the legs of a chair to find the number four or subtract crayons from a box). Move from concrete materials to pictorial representations to numbers (abstract representations).

Provide specialized materials. To help students organize their calculations, have them use graph paper (or lined paper turned sideways) to keep numbers in columns. Encourage the use of scrap paper to keep work neat, highlighters for underlining key words and numbers, and manipulatives such as Cuisenaire rods, base-ten blocks, or fraction bars.

Make your expectations explicit. Tell students the procedures you would like them to use when solving a problem, and model each procedure for them. Have a person then tell you what he is expected to do. Some students benefit by having a math notebook filled with examples of completed problems to which they can refer if they become overwhelmed or confused.

Use cooperative math-problem-solving activities. Provide opportunities for students to work in groups when solving math problems. Encourage them to share their thinking aloud as they solve problems. Reinforce efficient strategies using multiple pathways.

Provide time for checking work. Emphasize that completing math assignments is a process. Encourage students to become comfortable reviewing their work, making changes, or asking questions when they are unsure of their answers.

Give students opportunities to connect mathematical concepts to familiar situations. For example, when introducing measurement concepts, have students measure the height of classmates and family members, or the weight of their book bags when empty and when full. Ask students to estimate the measurements (guessing how much taller the refrigerator is than the stove) before solving the problem. Point out how math is used in everyday life, such as when examining bus schedules or filling out catalogue order forms.

Help students apply math concepts to new situations. Show students how to use percentages to understand the price of a jacket on sale at the mall or the amount of their allowance spent on snacks.

Provide tutors. Tutors can assist students with weak math sub-skills (such as multiplication and division). Arrange for tutors during summer months or after school to boost performance and ensure that the person retains his skills.

Specific Strategies

Strategy Tips: Decide which strategies to try by observing the person and identifying the ways in which he or she learns best.

- It may take several attempts to see positive results from one strategy. Don't give up too soon.
- If the first few strategies you try do not improve the person's skills, try others.
- Most of these strategies can be adapted for use with different age groups.

Memory

Provide the technology tools needed for problem solving. Encourage students to think mathematically, even if they have not mastered basic skills. For example, let them use computer spreadsheet programs and calculators when the goal of the math activity is to develop problem-solving skills.
as opposed to calculation skills.

**Teach basic math facts.** Use explicit instruction to promote student mastery. Put a few selected unknown facts on index cards. Put strategies for remembering on the back of the cards. Cards can be put on notebook rings. Add new facts as previous ones are learned. Build practice into lessons. Also, routinely conduct cumulative reviews of skills and knowledge to help students develop automaticity with math facts.

**Use rule books.** Ask students to keep a notebook in which they write math rules in their own words. Encourage students to use rule books with classroom or home assignments by looking up the rule in the book and talking about it. Rule books could have a math vocabulary section and a strategy section for recording "tricks" that help with the operations.

**Teach sub-vocalization as a strategy.** Show students how to quietly repeat sequences (such as numbers and procedures) under their breath while working. Practice the strategy by giving them a sequence of numbers or directions and having them quietly repeat them back to you.

**Practice sub-skills.** Help students recall math sub-skills (like multiplication) more automatically with the use of flashcards and drills. Play a game in which you quiz a person about math facts and record how many he answers correctly. To build motivation, have the person record her own progress each day. Together, review progress periodically.

**Teach math in more than one mode.** Students respond well when math is taught in a variety of ways -- visually (such as demonstration), verbally (such as using oral explanations), and experientially (such as setting up a mock store) -- so that students have an opportunity to process and use math information in multiple ways.

**Use games.** To enhance active working memory, play mental math games. For example, "What two numbers can be multiplied to get 24? How many different combinations can you find?" Gradually build up a person’s ability to hold a long problem (How much is 4 + 2 - 1 x 3?) in memory. Make sure the person understands the reason for playing the game.

**Review patterns.** Use flash cards to review patterns, such as key words that provide clues to the operation of a word problem, or geometric patterns or shapes within complex visual designs.

**Language**

**Focus on the information provided in word problems.** Have students separate the necessary information for solving the problem from unnecessary details.

**Teach mnemonic strategies for solving word problems.** Choose strategies that suit the person’s learning style. One strategy is TIPS: Think (read and paraphrase), Information (what numbers and information do you need in order to solve the problem), Problem (write equation), Solve.

**Encourage students to put problems into their own words.** Teach students to read for meaning when trying to identify the operation to use for solving a math problem. Have them verbalize the problem before trying to solve it.

**Teach math vocabulary.** Review the meaning of key words and phrases commonly used in mathematics problems, such as "all" or "total" in addition problems ("How much money did they spend in all?" "What was the total amount of the grocery bill?"). To help students identify key terms in problems, ask them whether a problem requires a particular procedure, and have them underline the word or term that gave the answer away. Include new vocabulary in their rule books (see above).

**Attention**

**Teach students how to preview an assignment.** Help them to see the importance of thinking ahead before beginning the task. For example, cue them to ask, "Which math operations will I need next?"

**Teach students how to self-monitor.** During a task, show students how to stop and assess how well they are progressing. For example, tell them, "Every 10 minutes you will need to stop and check your answers."
Teach students to ask themselves questions such as "How is it going?" and, "Do I need to make changes?" "Does my answer make sense?" and "Does my answer match my estimate?"

**Help students maintain mental energy.** Allow them to take frequent breaks while completing math assignments. Suggest that they get up and walk around during these breaks.

**Teach self-checking strategies.** Have students change to a different color pen when they have finished their work, becoming a "test checker" instead of a "test taker." This will help them notice their errors. For students who continue to make attentional errors in calculation, despite instruction and practice with self-checking, permit the use of a calculator for checking.

**Help students stay focused.** Let them choose the best place to do assignments, or allow them to listen to music if that helps their concentration.

**Provide a model.** Work through the mathematical problem with the person, verbalizing or demonstrating each step. Especially with homework, assist the person by doing the first problem together.

**Identify topics of interest to students.** Explore mathematical concepts in relation to motivating topics, such as building a skateboard ramp, tracking a satellite's orbit around the earth, discovering how the pyramids were built, or saving money in an interest-bearing account. Ask students to help you identify topics for mathematical problems.

**Build a foundation for multi-step problems.** Be sure the person understands basic one-step problems (problems requiring only one math operation) before advancing to those that require multiple operations.

**Isolate steps.** Have students focus on one step at a time. For example, provide mathematical activities in which students identify only (1) what the question is asking them to find, (2) which information is necessary to answer the question, and (3) which operations should be used in solving the problem.

**Complete each step.** Explain to students that even good problem solvers rarely skip steps when solving problems, though they may appear to.

**Reduce the amount of data on a page.** Students with spatial problems often become overwhelmed by large amounts of visual data on a page. Reduce the number of math problems or the number of diagrams to interpret per page. Remove unessential visual features.

**Have students draw pictures to represent what is going on in a math problem.** Suggest they draw representations of objects from the problem (for example, three shirts, a 6-by-12 foot garden plot).

**Make auxiliary tools available.** Provide calculators, graph paper for aligning numbers, or templates for tracing geometric shapes.

**Production**

Because math difficulties can affect a person's performance and ability to get work done, the following strategies are designed to help students improve their organization skills, work habits, and overall production.

**Use assignment books.** Teach students to use assignment books and "To Do" lists to keep track of their short- and long-term assignments, tests, and quizzes. Use peers to help monitor other students' assignment books. Most schools have a "homework hotline" on voicemail or homework posted on the school Web site. These resources provided by the school can help you support a student who does not yet record assignments consistently without reminders.

**Provide models of assignments and criteria for success.** Give students a clear sense of how a final product might look by showing examples and sharing exemplary products (such as providing a workbook of sample problems completed correctly). You might make work from last year available and draw the students' attention to specific qualities of the work (for example, "Notice how lining up the columns makes the problem easier to understand."). Do not, however, compare students' work with that of peers or
siblings.

**Build in planning time.** Give students five minutes of planning time before beginning an assignment. Provide guidance in effective planning when necessary.

**Use stepwise approaches.** Require students to break down tasks into parts and write down the steps or stages. Compile steps of frequent tasks into a notebook for easy reference during work assignments. For long-term assignments, provide a due date for each step of the assignment.

**Teach proven strategies.** Provide students with specific age-appropriate strategies to use in checking work. For example, use TIPS: **Think** (read and paraphrase), **Information** (what numbers and information do you need in order to solve the problem?), **Problem** (write equation), **Solve**. Students can create a reminder card to keep on their desk or in their assignment book for quick reference to the strategy.

**Stress the importance of organization.** Have students preview an assignment and collect the materials they will need before starting it. Guide students in keeping their materials and notebooks organized and easily accessible. At the beginning of the school year give a list of requirements. Emphasize the positive impact that organization and preplanning will have on the completed project or assignment. By grading organization, you will emphasize its value in the learning process.

**Let students wait to turn in work.** The day before an assignment is due, have students review their work and check it with a parent. This will give the students enough perspective to catch errors or add more details and produce better results in the end.

**Encourage self-evaluation.** Set a standard of work quality or criteria for success for students to follow, and allow them to self-assess the quality of their work before turning it in. If the grade matches the person's appraisal, give extra points for good self-assessment. **Rubrics** are one way for students to assess their own work.

**Set goals and record progress.** Have students set a short-term goal, such as completing all homework for the week. Record their daily progress toward the goal for students to observe. Graphic recording, such as plotting their own line graphs, may be particularly reinforcing for some students. Reward improvement at home.

**Practice estimating.** Students may benefit from estimating answers to math problems and science experiments. Stress the real-life benefits of estimating and understanding what the correct answer might look like.

**Eliminate incentives for frenetic pacing.** Remove any positive reinforcement for finishing first. State the amount of time a task should take. This will slow down students who work too quickly and will speed up students who work too slowly.

**Provide consistent feedback.** Create a feedback system so students understand which behaviors, actions, or work products are acceptable and which are not. Use specifics to praise good work and recognize when students use strategies effectively. Say, for example, "I like the way you drew a table to help explain the problem," or "Asking to take a break really seemed to help you come back and focus."

**Try a mentor.** Some students may benefit from a mentor who will work with them to analyze their academic progress, brainstorm alternative strategies, and provide recognition of progress. The mentor must be seen as credible, and may be an individual from either inside or outside the school.