Self-Talk

Strategies for Success in Math

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Students with learning disabilities can experience success with math—at last! This article shows one way to turn the failure cycle into a success cycle, through learning strategies and positive attributions.

B. J. had experienced difficulty with math since the fourth grade. After being identified as having specific learning disabilities, he began working with the special education teacher to supplement math instruction. His continued difficulties led to private tutoring in math by the sixth grade; that was how Nadine met B. J. She provided after-school tutoring in math 3 days a week. A learning-strategies approach seemed to be successful because his math skills improved, and he received a final math grade of *C.*

By the end of the first term in seventh grade, however, as a fully integrated student, B. J. was losing ground quickly in his math class. Within the first few weeks, he had already accumulated a number of *D*'s and *F*'s on assignments and tests. When faced with challenging math problems, B. J. would quit after a short time; and both his math teacher and tutor noticed that he became agitated when errors were brought to his attention. He often blamed his failure in math on others: "The teacher didn't explain it well enough" was one phrase heard frequently, or "She said to do it this way, so it's her fault if it's not right!"

Despite the tutoring, B. J.'s low grades continued. He resisted offers by his math teacher to re-do the tests that he failed, and he began "losing" homework assignments. B. J. even began resisting any review of math errors with his tutor and did not want to discuss his mistakes. His tutor knew that B. J. was capable of learning and using math-related learning strategies; the problem was that he was not using them consistently or independently of the tutoring sessions. What could turn this situation around?

What Is Attribution Theory?

Attribution theory, which helps us understand human motivation, reminds us that people who experience frequent success often attribute their success to their own effort or ability, and their failure to their own lack of effort or ability. People who experience repeated failure, however, often attribute their failure to bad luck or to task difficulty, and their success to good luck or the ease of the task (Weiner, 1990).

For students with a history of failure, teaching learning strategies alone may not be sufficient to consistently increase effort and persistence because the student's attributional state often determines whether and to what extent a learning strategy will be used (Borkowski, Weyhing, & Turner, 1986).

The research of attribution theorists has spawned investigations into expectancy theory (Betancourt & Weiner, 1982; Dweck, 1986; Licht, 1983), which states that when a person feels success is possible, he or she is likely to exert greater effort, persist for a longer period of time, and attribute a greater proportion of success to the effort exerted than is someone who does not expect success (Carr, Borkowski, & Maxwell, 1991; Deshler, Schumaker, & Lenz, 1984; Garner, 1990, Yasutake, Bryan, & Dohrn, 1996).

The Failure Cycle

B. J. is like many students who have difficulties with specific academic tasks and who have long histories of school failure. Often, with repeated failure comes a sense of helplessness and a distorted perception of reasons for the failure (Dweck, 1986; Shelton, Anastopoulos, & Linden, 1985). To B. J., both success and failure were out of his control, so he felt helpless in dealing effectively with either state. Consequently, B. J. not only had difficulty with math problems but also seemed to lack motivation to try (see box, "What Is Attribution Theory?"). Like B. J., students who do not expect to be successful in academic situations often develop a sense of helplessness or passivity when encountering content areas such as math.

A Plan of Action

Because Nadine had tutored B. J. in the sixth grade, we had academic information on his math performance. She was familiar with how he approached math problems, especially those involving multiple-step processes. B. J. had experienced some successes with the use of learning strategies, but did not view success as being the result of his own effort and ability; instead, he would say that the assignment was easy or that he "had a good day." Thus, he was inconsistent in applying the strategies, and he often did not persist in the use of appropriate strategies. Consequently, his percentage of correct answers on problem sets was often below 50%.

We decided that instruction using only learning strategies would be insufficient for B. J. to achieve long-term success; we needed to combine learning strategies with an instruction that directly addressed his attributions about successes and failures in math (Montague, 1992; Turner, Dofney, & Dutka, 1994). We thus started B. J. in a tutoring program that combined teaching of learning strategies with the gradual re-shaping of his attributional state. The goals of the instructional program were as follows:

- B. J. would use learning strategies more consistently.

- He would be more accurate on math problems.
- He would persist longer in using learning strategies with challenging problems.
- He would increase the use of positive attribution statements.

If B. J. spent more time on challenging problems, we felt that this would be one indication of a shift in his attitude about effort versus luck. We also felt that if B. J. made more statements about how his hard work had helped him be successful, we would consider this another indicator of positive change.

The Instructional Process

The first day, before beginning any math instruction, Nadine introduced B. J. to the concept of attribution theory by performing a math task and intentionally getting incorrect answers. Her conversation with B. J. went as follows:

> *Tutor:* I got the wrong answer; I guess I made a mistake. Maybe this is a good time to talk about making mistakes when working math problems. Here are four cards with phrases on them that will help me explain what I mean (she showed B. J. four index cards, each displaying one of these phrases: "I was unlucky today," "I didn't try hard," "I'm just not good at this," "The task was too hard"). When I make a mistake in math, I may want to believe it's because I'm being unlucky that day, or because the task was just too hard. This could make me want to give up because I can't control how lucky or unlucky I am. If I believe I'm just not good at this, I could begin to feel I'm not smart enough, and then I would really feel like giving up. But I have found that most of the time, when I make a mistake and get incorrect answers, it's because I didn't try hard enough with the right strategies when I was working on the problem.

B. J. and the tutor then shared reasons for sometimes not trying with the right steps, such as being in a hurry, becoming distracted, not being interested, or not believing in oneself.

The math area that Nadine chose was measuring volume. She and B. J. met 4 days a week in the school library for the tutoring sessions, during his regular math period. During each succeeding 20-minute lesson, she taught B. J. to approach math problems using a learning-strategy approach (see box, "Eight Steps to Success").

During these sessions, Nadine provided instruction in positive attribution, as well as in the use of learning strategies. The tutor modeled several self-statements while demonstrating the learning strategies. The statements were examples of what successful students often say to themselves when working on math tasks (Shelton et al. 1985), as follows:

- I can probably do this problem because I've done similar ones successfully.
- If this problem feels kind of hard, that means I need to try a little harder; then I'll probably be successful.
- I'm usually successful when I work carefully and use the learning strategy correctly.
- If I make a mistake, I can probably find it and correct it.

As B. J. went through each lesson on measuring volume, the tutor reminded him to "say what helps you when you're being successful" (or being unsuccessful if he were having difficulty). B. J. and Nadine also found that the attribution statements helped them develop goals for their next session. For example, one day B. J.'s goal was to ask to re-do any problems he did incorrectly. Here is an exchange between B. J. and the tutor, showing an example of another goal:

> *Tutor:* How do you feel about your performance?
>
> *B. J.:* I did really good except for the multiplication mistake. I guess I should have checked my multiplication; my teacher's always telling us to do that.
>
> *Tutor:* Would it help if you make that a goal for next time—to check multiplication after working volume problems?
>
> *B. J.:* Yeah. I could write it down to remind myself.

To show attribution change over time, B. J. responded to a short self-report at the end of each session. The self-reports (Figure 1) showed B. J.'s attitude toward the math activity and his perceptions about reasons for his success or failure.

Eight Steps to Success with Learning Strategies

1. Model the learning strategy, verbalizing each step.
2. With the student, discuss the strategy steps, which you have written down and kept visible for reference.
3. Discuss the strategy's rationale and value.
4. With the student, simultaneously apply the strategy steps to a new problem while stating the steps (referring to the visual cues, if necessary).
5. Encourage the student to apply the strategy to another problem while stating the steps; watch the student and provide corrective feedback as needed.
6. Ask the student to apply the strategy to another problem without stating the steps; provide corrective feedback as needed.
7. Encourage the student to apply the strategy to a few math problems independently; check for correctness.
8. Ask the student to state the strategy steps from memory and show how he or she used them.

To evaluate the success of the instruction, Nadine gave B. J. between 5 and 10 problems to solve independently at the end of each session. Eighty percent of the problems were within an easy range, and 20% were within a challenging range. After B. J. completed these problems, Nadine recorded (a) the learning strategy steps B. J. knew by asking him to verbalize them, (b) the number of times the total strategy was applied by asking B. J. to show how he used the strategy with each problem, and (c) the number of correct answers. Nadine kept records of the time that B. J. spent on the easy and challenging problems, as well as the positive and negative self-statements he made during each session.

Results: The Success Cycle

Before the instruction, B. J. made negative self-statements only (e.g., "I don't want to do this; it's complicated"). After

Figure 1

Sample Self-Report

After reading each sentence, please place an 'X' on the line where you feel it should go.

My feelings about the task:

1. I thought this task was

very easy — kind of easy — just right — kind of hard — very hard

2. I gave this task

no effort — a little effort — good effort for awhile — a lot of effort — my best effort

3. On this task I think my answers were

all wrong — mostly wrong — half and half — mostly right — all right

On this task I was:

Successful because:

1.The task was easy

not important — kind of important — very important

2. I tried

not important — kind of important — very important

3. I was lucky

not important — kind of important — very important

4. I am capable/good at this

not important — kind of important — very important

Unsuccessful because:

1. The task was difficult

not important — kind of important — very important

2. I did not try

not important — kind of important — very important

3. I was not lucky

not important — kind of important — very important

4. I am not capable/good at this

not important — kind of important — very important

Six-Plus Steps to Positive Attribution in Math

1. Model correct strategy application, stressing the strategy's value to students.
2. Model positive attribution statements often as the kind of self-talk that successful math students use.
3. Model positive self-talk when discovering errors in your own work (or create intentional errors to discuss).
4. Allow students to periodically reflect on class math tasks and reasons for their success or failure through the use of self reports or journals.
5. Encourage students to keep personal records of the positive attribution statements they make when working.
6. Encourage students to set specific goals and use goal statements by doing the following:
   - Keeping a list of individual goals and reading them silently before beginning the day's assignment.
   - Self-checking test-taking goals, such as "Check all basic operations when finished," or "Read the directions twice."
   - Using positive attribution statements for test-taking, such as "I have done problems like this before so I can think positively about these," or "If I use my strategies carefully, I will probably be successful."

the instruction, B. J. used 24 positive and only 3 negative self-statements (e.g., "Success means 'Don't slack off,' so I won't"). His self-reports indicated that when B. J. felt unsuccessful, he perceived the level of task difficulty as more important than the amount of effort he exerted; but when he felt successful, he perceived the level of task difficulty as less important, and the amount of effort exerted as more important. Thus, B. J.'s attribution about the causes of his success or failure appeared to have shifted toward effort and away from luck.

B. J. also persisted longer and more frequently with challenging math problems. At the beginning of the instruction, he spent an average of 45 seconds/problem; by the last session, he was spending 105 seconds/problem and persisted on nearly half of them for 90 seconds or more.

Because B. J. better understood the value of using strategy steps, he was able to set more specific and realistic goals for his math lessons. In an earlier session, he stated this goal: "I need to get more problems right next time." In a later session, he made a specific goal statement: "I need to check the position of my protractor first." Although his changes in attribution and persistence did not immediately affect his math achievement, the changes may affect B. J.'s achievement over an extended period of time.

Attributions for All

To successfully combine strategy instruction with attribution re-shaping, you should model the strategy and self-statements, encourage reflection, and help students set goals and self-monitor them (see box, "Six-Plus Steps to Positive Attribution in Math").

For students with a history of failure in math—indeed, for all students—such positive reflections and self-statements could gradually change their perceptions about their ability to deal with challenge and their ultimate expectations for success. They would begin to see the connection between effort and success by experiencing it firsthand, see that learning strategies do "pay off," and thus be in greater control of their own learning.

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