About Collins Education Associates

How Did You Get That? Seven Strategies for Improving Written Responses in Math is a product of Collins Education Associates. For over 25 years, John Collins and his associates have conducted more than 10,000 workshops and have established long-term teacher training and consulting relationships with school districts of every type and size. Thousands of teachers and more than four million students have benefited from CEA’s work.

Collins Education Associates’ mission is to deliver high-quality resources and cost-effective training to improve students’ communication skills—especially written communication. Everything CEA produces is based on the best research and practice, has been tested in classrooms under a range of teaching conditions, and must make the most difficult job of the writing teacher—classroom management—easier.

Author, Bill Atwood, has presented hundreds of writing and math workshops and has consulted with schools across the country. Bill’s teaching experience spans kindergarten to graduate levels.

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Seven Strategies for Improving Written Responses in Math

The strategies presented in this book can be used to help implement the Common Core State Standards for Mathematics. “Seven Strategies” includes practical, proven techniques developed specifically for math teachers in grades two through ten. The strategies are designed to improve students’ performance in math classrooms and on high-stakes tests. The seven key strategies are:

1. Use quick writing prompts to draw out background knowledge.
2. Give frequent, quick quizzes.
3. Provide clear criteria for a complete answer.
4. Teach reading strategies for math.
5. Build math vocabulary.
6. Develop great math assignments.
7. Collect and share results with colleagues.

Also Includes:

- Survey of Math Practices
- Seven great, ready-to-use math writing assignments such as: The Klutz Book of Math, Analyze the Data, The Math Riddle, and four more
- Tips and techniques for teaching math vocabulary
- And, much, much more . . .

Seven Strategies for Improving Written Responses in Math

Grades 2-10
By Bill Atwood
How Did You Get That?

Seven Strategies for Improving Written Responses in Math

By Bill Atwood

Grades 2 to 10
Special Acknowledgment

Integrated throughout this text are example problems that were developed by the Massachusetts Department of Elementary and Secondary Education. The examples used are in the public domain and provide excellent models of the types of thought-provoking, written response questions students might encounter on the math portion of the Massachusetts Comprehensive Assessment System (MCAS). We embrace Massachusetts’ efforts to improve student achievement and believe that their exemplars, when used in combination with the Collins Writing Program, will improve student performance in mathematics. We gratefully acknowledge their work.
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Foreword

I first met Bill Atwood in 1995 and soon after I asked him to write this book. Collins Education Associates (CEA) needed a book that linked the Collins Writing Program directly to mathematics. It’s been a long time coming, but the final product, How Did You Get That?, is well worth the wait. The book reflects the lessons learned from Bill’s extensive classroom testing of his ideas and content. It is also a rare synthesis of Bill’s in-depth mathematics background, teaching experience, and amazing creativity. As an added bonus, Bill managed to keep his voice—the fun, authentic voice that makes his book a great read.

How Did You Get That? offers seven detailed strategies that will enable math educators to efficiently focus their instruction and improvement efforts. Bill begins his book with a twelve-question “Survey of Math Practices” that should serve as the basis of an annual or even bi-annual self-review for math teachers. I cannot imagine a better beginning to the school year than the math department getting together to take the survey and then using the results to plan their professional development program for the year.

In addition to the survey, other highlights are Strategies 4 and 5: “Teach Reading Strategies for Math” and “Build Math Vocabulary.” I call attention to these because one of the reasons math scores are low in this country is that they reflect not just one skill area—math, but three: math, reading, and in the case of open response questions, writing. How many times have we heard teachers lament that their students know the skills but somehow do not demonstrate that knowledge on the high-stakes test? How Did You Get That? acknowledges this complex reality and provides specific, practical strategies to help. For example, in his section on math vocabulary, Bill gives nineteen activities to help students master content and test vocabulary that they need to know to be successful.

Strategy 6, “Develop Great Math Assignments,” provides seven detailed, innovative math assignments that guide students through the writing process while deepening their understanding of math. If math teachers were to select only a few of these assignments and repeat them throughout the year, students would have a great opportunity to deepen their math knowledge while improving their communication skills. CEA’s action research studies show that giving students a detailed description of a writing assignment not only increases completion rates but markedly improves the final product.

Math teachers will love this book for its specificity, practicality, and the joy it conveys!

John J. Collins, Ed.D.
Founder, Managing Director
Collins Education Associates LLC
Introduction
Introduction

Once, when I was teaching at a school in Rhode Island, a parent told me about a conversation she had with her sixth grade son, Clarke. I was a new math teacher at the school and after the first few days of class, she asked Clarke how things were going in my class.

“Okay, I guess. I like Mr. Atwood, but I don’t think he knows much about math.”

The parent, concern on her face, asked the obvious follow-up question, “Why do you think that?”

“Well, I don’t know exactly. But, take today. Whenever I answered a question in class he would ask, “How’d you get that? How’d you get that?”

The mother, laughing a little, said, “Well, Clarke, maybe Mr. Atwood knows, but he wants to see if you know . . . .”

“No, Mom, he asks everyone ALL THE TIME! I don’t think he knows any of it!”

I spent years in classrooms teaching math, and my students would not show their work. I don’t know if it was unwillingness or inability, but it drove me crazy. The National Council for Teachers of Mathematics continued to emphasize problem solving, communication, the use of math vocabulary, and the idea that math is a language. Yet, I would find myself saying over and over again to every class, “Show your work! How did you get that? Is there another way to do it? Do you agree with the way Rachel explained it? And please, label and check your answers!” And, class after class, students struggled to explain, they rarely showed their work, rarely listened to each other’s explanations, and rarely checked anything over or labeled answers.

I read the simulated conversations in Marilyn Burns’ Collection of Math Lessons or the “dialogue boxes” in my math textbook and thought out loud, “How come this doesn’t sound like my class?” Maybe, on my best day, I would have four or five students batting around an idea, maybe three more would be listening, while 15 others looked on with glazed eyes or wriggling bodies—totally confused or totally bored. With the homework, I would often say, “If you solved the word problem on a calculator, just write down the operations you used and write what you punched in!” Yet, students would just write down the answer 16. I even had a code for my feedback on their papers. I wrote on their papers “SW!” which meant “show work.” Students wrote back “DIH” (did in head), a symbol I regretted showing them, as they used it in every situation.

I looked outside my classroom for the solution. My colleagues complained about the same thing, “They never show their work.” One eighth grade teacher said that he gave partial credit if students show the work even if the answer was incorrect. “Does that work?” I asked. He said, “The ones who showed the work before, still show the work. The others don’t.” Later, I attended math
workshops hoping to find some inspiring strategy to solve this problem. Mostly, I came away with activities—new ways of teaching a concept or ways to use some new manipulative or piece of software. Often these were helpful, but it never really got to the heart of the problem. After a while, I looked at the flyers in my mailbox with the feeling, “Been there, done that.”

In late 1995, some English and Social Studies teachers were going to a workshop called *Developing Writing and Thinking Skills Across the Curriculum* with John Collins. I had never heard of John Collins, but I heard that this was going to be about teaching writing in math class. I was thinking I don’t have time to teach the math. How am I ever going to find time to teach writing? Another part of me looked at these English teachers and I wanted to say, “Hey, I’ll start teaching writing if you’ll teach factoring or order of operations.” But, the other teachers really wanted to go, and, well, it was on a Friday and I thought I might sit in the back, get some correcting done, leave early, and have a long weekend.

It turned out the workshop was fantastic. It was full of practical ideas and insights, and it shifted the way I thought about writing. The presenter was talking about writing as *thinking on paper* and saying that students needed lots of practice and immediate feedback on their writing. They needed a clear focus. Teachers needed to be specific about what they were looking for in a piece of writing. Most importantly, Collins said, these efforts had to be sustainable—they couldn’t be more work for the teacher, and they had to shift the responsibility for learning to the student. He didn’t suggest a math journal full of letters from student to teacher that I had tried and found unmanageable. He didn’t push writing biographies of famous mathematicians or using subordinate clauses. Instead, the workshop offered *Five Types of Writing*, each with a specific goal:

<table>
<thead>
<tr>
<th>Five Types of Writing</th>
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<tbody>
<tr>
<td><strong>Type One</strong></td>
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<td><strong>Type Two</strong></td>
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<td><strong>Type Three</strong></td>
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<tr>
<td><strong>Type Four</strong></td>
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<tr>
<td><strong>Type Five</strong></td>
</tr>
</tbody>
</table>

At first, some of it sounded like writing for English teachers, but soon it became clear that much of it got right to the heart of my problem, *show me your thinking*. Type One and Type Two assignments would do that. And, *show me your thinking in a clear and logical way*, seemed like Types Three, Four, and Five. These Five Types of Writing were tools I could use to encourage thinking on paper, and then help shape it to be more thorough and complete.
In this book I will extend what I learned in that first workshop to show how I adapted it to my math classes and to offer practical classroom strategies to get students to show their work. This skill is increasingly important for several reasons. First, most states include open response or open-ended math questions* on their high-stakes tests. These are the types of questions that ask students to show or explain their work, questions that ask students to work backwards to prove or justify an answer, or to come up with something original. This requirement has brought a new urgency to the task of getting students to respond more clearly and completely.

Second, regardless of whether or not you have to prepare students for such a test, improving written responses in math is critical. Students who can explain their work clearly will have gained a deeper understanding of the process of problem solving. They will be more likely to see how one problem is connected to another and better able to express themselves in any situation that calls for communicating mathematically. In fact, I tell students that being better able to explain something clearly is not just a math skill—it is the skill needed to be a manager, a business owner, a professional, or a leader.

* In this book I will refer to the questions that require students to show their work as “open response” questions.

The goal of this book is to describe seven important strategies that have the power to improve open responses. The strategies are all supported by many research studies. All are sustainable, practical, and easy to implement. Most importantly, all the strategies fit four core principles I will introduce in the next section: writing as thinking; strategic teaching focus; coordinated effort; and student responsibility and engagement.
Five Types of Writing

**Type 1: Capture Ideas**

Type One writing gets ideas on paper—brainstorming. Type One is timed and requires a minimum number of items or lines. Questions and/or guesses are permitted. Evaluated with a check (✓) or minus (–).

**Type 2: Respond Correctly**

Type Two writing shows that the writer knows something about a topic or has thought about the topic. It is a correct answer to a specific question, graded as a quiz. *One draft.*

**Type 3: Edit for FCAs**

Type Three has substantive content and meets up to three specific standards called focus correction areas. It is *read out loud* and reviewed to see if the draft meets the following criteria: completes the assignment, is easy to read, and meets standards set by the focus correction areas. Revision and editing are done on the original. *One draft.*

**Type 4: Peer Edit for FCAs**

Type Four writing is Type Three writing that is *read out loud* and critiqued by another. *Two drafts.*

**Type 5: Publish**

Type Five writing is error free and of publishable quality. *Multiple drafts.*

**For All Types**

For all types, skip lines. For Types One and Two, label the type on top left-hand side of paper. For Types Three and Four, list focus correction areas on top left-hand side. Type Three and Four papers should be saved and used to practice editing skills.

©2003, John J. Collins, M.D. More information about FCAs is available at Selecting and Focusing Focus Correction Areas available from the distributor of this paper. For information about the products, services, and consulting services available from Collins Educational Associates Inc. (CEA), contact CEA at 397 Main Street, P.O. Box 957, West Newton, MA 02186. 1-800-932-4677.
Principles for Improving Performance
Principles for Improving Performance

In her terrific book, *Never Work Harder Than Your Students*, Robyn Jackson (2009) distinguishes between strategies and principles. She says that “strategies” are the discrete behaviors, the specific practices, the bag of tricks from which teachers select, while “principles” are a way of thinking about why these practices work. She argues that master teachers have integrated the facts of teaching into their thinking and do things automatically. It looks like they have a gift. But actually, on the inside, they are rigorously applying a few simple principles. This book is a collection of seven strategies—things you can do to improve performance. But, as Jackson suggests, these strategies should be part of a greater vision—a greater mindset. For me, the mindset is captured by the following four principles that guide all my work in schools. With careful attention to these four principles, I believe school progress can be exponential.

- Writing is thinking.
- Broad visions need strategic focus.
- Coordinated effort accelerates change.
- Student engagement and student responsibility drive learning.

Writing Is Thinking

In 1993 the state of Massachusetts developed a new mathematics test. The test contained both multiple-choice questions and open response questions in which students had to show and explain their thinking. In the first year the results were not impressive. For example, in one career and technical school, 73% of the students skipped *every single open response item*. In 2005 I visited a small school in Northern Ohio. The administration told me 83% of the ninth grade class skipped *every single open response item*.

In 2005 I visited a small school in Northern Ohio. The administration told me 83% of the ninth grade class skipped *every single open response item*. In many schools, students would prefer to skip an open-ended question than try to explain their thinking. Yet, these items are often the best gauge of a student’s thinking, and they are worth the most points. Why do students skip them so readily? The answer is not a simple one. It may be due to the length of the problems and the amount of reading required, but often, the first part of these questions is easier to solve than the multiple-choice questions. It may be that students don’t understand that *writing is really just thinking on paper*. And, too often, despite teachers’ plaintive cries of “show your work,” students don’t get enough practice putting thoughts on paper.
Broad Visions Need Strategic Focus

I often travel to high schools where teachers ask me, “How come the students don’t know their math facts?” Or they say, “I feel like I have to reteach everything: percents, area, congruence, probability, coordinate graphing, slope . . . why don’t they know these basic ideas?” I go to middle schools and I hear the same thing, “Am I the only one teaching this?” Often, in fourth or fifth grade, teachers will say, “When I ask them what they know about fractions, they look at me like I’m the first person to say denominator. Yet, I know that they had this. Didn’t they?” The question is: Why don’t students know some of these basic ideas? Is it because no one is teaching them?

In most cases the answer is no; it’s the opposite. The reason many students don’t know these basic ideas is not because no one is teaching it; it’s because everyone is. But no one is teaching them really well, in great depth. Teachers try to cover all of the standards required by their state or the textbook series and, as a result, they race through, so students never really develop a complete understanding of the critical concepts, and the next teacher has to teach them all over again.

Once, a teacher told me that she had a class that looped (she was their fourth grade teacher and then had the same class in fifth grade). She complained that her students claimed they had never seen something even though she knew she had taught it. She told her students she wasn’t buying it. She gave them some time to recall, and within a few minutes, they did remember. I think sometimes we don’t realize students do remember and know more than even they think they do; they just need time to go back and access their knowledge.

The main point here is that teachers need more focus. Teachers have broad visions—I want my class to be able to communicate mathematically, to understand that math is a language, to see practical applications of math in everyday life, to inspire them—but often, teachers don’t have enough strategic focus. What specifically are you willing to own? For what concepts, vocabulary, and skills will you proudly announce, “I will stake my reputation on this!”? After determining which skills and concepts you plan to give increased attention, it is important to make it clear to the students and parents. And, we have to be clearer about what constitutes them knowing it. What does a good, written response look like? What makes a clear and accurate graph? When you say show or explain your work, what do you mean? What should students focus on?

This final piece is critical because teachers must define excellence if they want students to be excellent. Feedback must be clear, and student work must be measured against specific criteria. Researcher John Hattie (1992) analyzed almost 8,000 educational studies, then wrote “The most powerful single modification that enhances achievement is feedback. The simplest prescription for improving education must be ‘dollops of feedback’” (p. 9). Looking at student work and giving students timely feedback not only helps set the direction for the next lesson, but may be the most important thing that happens in a day. However, asking students to write more means more correcting for the time-strapped teacher. This is why we need to focus our feedback, make it completely transparent, so students know exactly what a clear, logical, and concise response is. Strategic focus refers not only to curricular focus but also to a sharper focus on the nitty-gritty of student work. What then does the student’s response tell us about what the student really knows?
Coordinated Effort Accelerates Change

Let’s imagine that you have just discovered an incredibly useful strategy that has really helped students understand and remember something. For example, as a first grade teacher, you explained how the greater than sign (>) is like a greedy duck or a hungry alligator gobbling up the larger number. Or maybe, as a fifth grade teacher, you taught students to quietly read their solutions out loud to check for accuracy. Suddenly, students are not making the same mistakes they did before; they are finding errors and correcting them. In Algebra One, you require students to write all formulas empty of numbers before solving problems, and you insist students box their answers and include the correct units. But, if you are the only one in your building with these expectations, do you think they will stick? My experience in schools tells me emphatically—no! It often takes longer than one year for students to form concepts, build habits, and use the strategies you introduce. I don’t mean to suggest that using the strategies in this book won’t make a tremendous difference in the performance of your students; I believe they will. However, if these strategies are used in a coordinated way across grade levels, student performance will soar.

In Good to Great, the economist Jim Collins (2001) writes about companies that transformed themselves from merely being good to being the best in their field, outperforming all others by large margins. He writes that one of the key ingredients in these transformative companies is to focus around one central idea. The companies did not change direction every few years depending on the next new idea. He likens it to a giant flywheel with everyone pushing on it together. Once the flywheel starts to turn, its acceleration and momentum are explosive and dramatic. He notes that when the transformed company bursts on the scene with stock returns ten and twenty times its competitors, everyone looks for a simple reason: a new chief executive officer, a new product or strategy. But what they don’t realize is the dramatic change began many years before with a slow, gradual coordinated effort—a million pushes on the giant flywheel. For teachers, the million pushes on the flywheel begin with agreeing on and implementing a set of small practices.

Student Engagement and Student Responsibility Drive Learning

One of the most difficult challenges in teaching is finding the time to do it all. When I was in the classroom, I’d find myself sometimes racing around as if I passed the papers out more quickly, I would have time to complete the lesson, clarify the instructions, make the announcement, and give the homework. As I raced around, many students needed me to repeat directions, clarify, modify, locate, and motivate. Some students had lost their worksheets, they wanted to know when they could retake the test, what’s going to be on the test, and so on. I’d whirl around to the overhead, back to students, to the whiteboard, to the hallway, and to the copy machine. By the end of the day, I was often exhausted. By last period, when I’d look out at my students, they didn’t look half as tired as I was.

In this book, my challenge is to suggest effective teacher-friendly techniques that are not
more work for you. If the strategies add to your workload, I doubt you will do them. In other words, not only do these techniques and ideas have to be simple and powerful, but they have to make your life better, easier, and more efficient. Before this starts to sound like an infomercial, let’s be clear; all the running around I described in the previous paragraph is not helping the students. You can’t do more of the work. The students have to meet you halfway. In fact, I think we need to find ways to make the students be more engaged and take more responsibility for their own learning. But, we can’t just say it; we have to put in place practices that force them to be more engaged, to be more productive, and to take more responsibility for their learning. This is what really drives learning. And it often begins with making students more aware of how they learn. In Classroom Instruction that Works, Marzano et al. (2001) write that “Students can effectively provide some of their own feedback. We tend to think of providing feedback as something done exclusively by the teachers. Research indicates, however, that students can effectively monitor their own progress” (p. 99). Engaging students in judgments about their own learning and helping them understand how they learn will enable them to learn beyond your classroom for the rest of their lives. So, at the end of the day, students should be tired, and maybe you are, too, but not as tired as if you did all the work yourself.

These four principles guide this book: Writing is thinking, broad visions need strategic teaching focus, coordinated effort accelerates change, and student engagement and responsibility drive learning. For me, they are the critical pieces to not just getting better responses in math, but improving schools in general.
Survey of Math Practices
I am a big fan of surveys. I remember in that first Collins workshop, there was a survey about how often we used certain writing practices. All of the practices seemed like good ideas, and I remember inflating my scores. I basically lied to myself saying, “I do that. Well, not exactly, but I want to do that . . . .” It’s only human nature to aspire to be better. However, before beginning something new, you need to get a sense of where you are starting, set some goals, and then find ways to reach them. Surveys can help us do that.

On the next page is a quick survey of math practices, things you might do in your classroom. Do not agonize over the questions, and if you don’t teach math directly (i.e., if you provide classroom support or are an administrator), answer the questions as if you were the one in charge of the classroom. Which practices would you do most often? Be honest; the survey won’t help you if you wildly inflate your scores. And, yes, you can use half scores if you need to.
Taking the Survey

Use the key to answer each question with a number. Then total your score.

4 = daily
3 = two or three times a week
2 = two or three times a month
1 = once or twice a term
0 = never

1. How often do you engage students with quick writing prompts to draw out background knowledge or make them puzzle over something they are about to learn? _____

2. How often do you ask questions in written format that promote higher-order thinking? _____

3. How often do you assess students with one or two quick, written quiz or open response questions—assessments that require short but clear answers and then are collected, corrected, and returned quickly? _____

4. How often do you use “test language” (compare, evaluate, justify, compute, the following, not, the figure below . . .) in your questions? _____

5. At the overhead or board, how often do you model your thinking as you work toward a complete and accurate response to an open response math question? _____

6. How often do you have students score an open response question using clear and specific criteria that aligns to your state or district’s math standards? _____

7. How often do you teach students literacy strategies to show them how to read and understand math questions? _____

8. How often do you engage students in activities that strengthen and review math vocabulary and the most important graphics? _____

9. How often do you have students create their own math questions with graphics to match? _____

10. How often do you develop and assign compelling, real world assignments in math and use specific criteria to score them? _____
11. How often do you review your state or district standards and use them to plan common assessments with colleagues? _____

12. How often do you bring samples of student work to department or grade-level meetings in order to assess understanding, compare data over time, and plan strategies going forward? _____

Total Score: _____

Survey Results

What do the scores tell you? If you are competitive, you could add up your numbers to get a total score. The higher your score the more of these strategies you are using. However, getting a perfect score of 48 is not the goal because doing everything on the survey everyday is not the best use of your time.

It is more valuable to look at the score of each individual question. Given that the most precious resource in the classroom is time, analyzing how you spend your time is critical. Obviously, “teaching the math” is what should take up the vast majority of class time. But how do you do that? How do you make decisions regarding what is the most effective way to teach the math, and what additional, underlying skills need to be bolstered to support learning the math?

The survey should give you a sense of where you spend time trying to improve open response answers. If you rarely do any of the practices above, then it is my hope that you can add to your repertoire. If you are regularly trying many of the ideas from the survey, this book may help you increase their effectiveness. Additionally, by discussing and sharing your strategies with colleagues, you can begin to take on some of these challenges together, building on what works from previous grades.

Before moving on to the next section, go back and put a star next to three practices that you feel are vitally important. Star the ones that you feel would really make the most difference in improving open response answers. As you read on, look for ways to develop these strategies in your classroom.
The Seven Strategies
The Seven Strategies

1. Use quick writing prompts to draw out background knowledge.
2. Give frequent, quick quizzes.
3. Provide clear criteria for a complete answer.
4. Teach reading strategies for math.
5. Build math vocabulary.
6. Develop great math assignments.
7. Collect and share results with colleagues.
Strategy 1: Use Quick Writing Prompts to Draw Out Background Knowledge

Type One Writing

Writing is the litmus paper for thought. (Sizer, 2003)

If you ask me, ‘What is the one thing you’d do to help teachers teach math more effectively?’ I would train them to listen and to be able to ask questions that would pursue the thinking of the child. Until we work to understand what a child is thinking, it may remain undetected by the teacher in the child’s head. And there is cognitive research to show this as well, that we hold on to our misperceptions and don’t readily give them up. (Bogen, 2008, p. 4-5)

As an educational consultant, I get to visit many math classrooms all over the country. The number one problem I observe and hear discussed is how to get and keep students engaged. In one of my first consulting jobs I was to spend a day observing high school math classes. I was extremely excited because, as a teacher, I almost never had the opportunity to observe other teachers in action. Curious to see how teachers handled different topics, I reported to a geometry class at 7:45 A.M. It was a winter day and, like many schools, the heat was cranked up and a little uneven. As a result, this windowless classroom was a little on the warm side. I took my seat in the back as the teacher began by taking attendance, then asking about the homework, and showing solutions on the overhead projector. His explanations were lucid and his voice pleasant. His presentation was very smooth, the result, perhaps, of having modeled these solutions hundreds of times.

For the first ten minutes I was fascinated, watching everything, taking detailed notes on his examples, his choice of vocabulary, and the way he recorded the steps. I even noted that he wore white gloves so he wouldn’t get marker on his hands. After awhile I couldn’t help feeling a little sleepy. I shook my head and when I looked up again, he had moved on to today’s lesson, still at the overhead. Again, very clearly—he obviously knew his stuff. But, as I peered around, I noticed many students were supporting their heads with their hands as if their heads had become much too heavy. Several students had given up the battle to sit upright and put their heads on the desks.

There were a few students volunteering answers and some taking notes, but the majority were fading. I looked up at the clock 15 minutes into the lesson, and now I felt myself nodding. I started thinking, “If I could just close my eyes for a second . . . maybe if I shield them with my hand and pre-
tend to look down at my notes . . . what’s wrong with me? Didn’t I get enough sleep? Come on Bill, you are the consultant, focus on this lesson.” And, on and on it went as I fought to stay awake.

We have all had the experience of trying to stay engaged when someone is speaking to us, but I think we forget what it is like to be back in school moving from classroom to classroom, subject to subject all day long. Often, students are studying subjects that are not of their choosing. Despite this, they are expected to listen, wait while others talk, take notes, pay attention, and learn. The problem is compounded when you add 20-28 students of different abilities and attitudes, add in poor acoustics, background noise, and announcements. If you are in middle or high school, hormones!

A recent study found that in 85% of classrooms fewer than one-half of the students were paying attention (Learning 24/7, 2005). This study was based on 1,500 classroom observations, and it does not surprise me. I struggled to capture student attention and get students engaged in my classroom, and found it extremely challenging.

Before the Collins workshop, I tried to get more students involved by brainstorming. As part of my plan for teaching fractions, I would call out to students, “What do you remember about fractions?” I would then record student ideas on a sheet of chart paper. More often than not, many kids would give a blank stare or say, “We never had that,” but after some wait time, three or four hands would go up. Unfortunately, they would be the same three of four students who always raised their hands. It would be the four highly verbal students—the ones whose ideas dominate every lesson.

Haley, straining to extend her arm to maximum height, would say, “What do I know about fractions? Numerator!” And then Jason, without even raising his hand, would call out, “Denominator.” Not to be outdone, Haley would come back with, “Part of a whole.” Then Kristin, realizing she hadn’t spoken in the last thirty seconds, would chime in with, “They can be written as decimals.” Then it would go back to Jason, “And percents.” Haley, just back from math camp, would end with, “Equivalent, mixed numbers, improper, I even know about complex fractions!” I would record their ideas on chart paper and be impressed, thinking, “Wow, I really launched that lesson well. My class knows quite a lot about fractions!”

What I didn’t realize was that these weren’t the thoughts of my class—these were the thoughts of three or four students, the ones who always participated. When I became more aware of this, I worked hard to call on other students increasing my “wait time” and letting students know I’d be calling on them. On my best days, I would maybe have 12 out of 20 students engaged and I would be thinking, “Wow, I’m on track for Teacher of the Year! I had 12 students engaged! I’ll bet there will be a message from Disney on my voicemail when I get home. They will want me to go on tour with my strategies.” What I didn’t think about was 12 out of 20 means only 60% of the students were actively engaged, and that means 40% were not engaged. Many of these unengaged students hadn’t even considered what I was asking, much less formulated a response. Brainstorming may be a great idea, but what I was doing isn’t really brainstorming.

As described in his book, Improving Student Performance Through Writing and Thinking Across the Curriculum, John Collins (2007) reviewed decades of research on brainstorming and concluded that brainstorming in the classroom can be more effective if written and follows three
rules: it has a time limit, a quota for the minimum, and a prohibition against negative feedback. It is evaluated on a simple check or minus scale. Collins calls this form of written brainstorming Type One writing. Following the Collins model, a much better approach for the brainstorming I just described would be, "When I say fractions, what comes to mind? Write four lines and try to add at least one labeled picture. You can write questions if you want to or need to fill the quota." See Sample 1 below for a student response.

Sample 1: Type One Writing in Math

- Fractions are mind. All shows numbers. Most on them are easy. They've got hundreds and tens of things. Sometimes I don't like them. I've never had to use them. I've only used them in tests.

- Nicholas

- \[
\begin{array}{c}
\frac{12}{20}
\end{array}
\]
In Type One writing, students write their names and date on the upper right-hand corner and then write Type One on the upper left. This way, everyone will know this is brainstorming—no repercussions for incorrect ideas, misspellings, or poor grammar. It is only graded for effort and is designed to draw out background knowledge and generate ideas. As you can see, the student in Sample 1 received a check for his effort because he completed the quota within the time limit.

Type One writing is marked as a check or a minus, no check plusses or check minuses. It is writing that allows students to take risks. Here, a fourth grader writes, “Fractions are weird (weird). All thows (those) numbers.” In fact, he is quite right. There are numbers everywhere with fractions. Also, he shows he knows something of the most common fraction. “I ueyley (usually) got hundreds and tenths of things.” Isn’t that true? Mostly, we are a decimal society. Most interesting to me is the small drawing at the bottom. Here, Nicholas goes beyond a simple understanding. He has shown a shaded area model for 20ths. And he seems to have shown that 12/20 can be broken into 6/20 + 2/20 + 2/20 + 2/20. He also has represented the fraction with the fraction bar (vinculum)—all from a quick two to three minute write.

Another Type One prompt on this same topic might begin by showing four or five representations of fractions on the board:

\[
\frac{3}{4} \quad \text{😊😊😊😊} \quad \begin{array}{c}
\text{missão} \\
\text{20ths}
\end{array}
\]

When you have students’ attention, say, “You have two minutes to list four things you notice about what I have on the board.” Again, if the students complete or surpass the quota (in this case, list four things), they get a check on their paper. If they elect not to try it, they get a minus. That’s it, a simple prompt designed to get all students engaged, draw out background knowledge, and work to call their attention to the idea that fractions can be represented in several forms. (See Samples 2 and 3 of student responses from fourth grade.)
Sample 2: Type One Writing in Math

Type 2

All the fractions
1 hand was upside down

3 squares: yellow 1/2 square white

3 red line

3/4 of 100

These all 3/4 showing a different way of 3/4
In Samples 2 and 3, you can see that students are picking up on the idea of equivalent fractions—“a different way of 3/4” and “all related to fourths.” They are also trying to express the idea of one out of four by saying, “odd man out.” Having students at first develop the concepts in their own words will help them learn the vocabulary in a deeper way than just giving them the definition. Note that the student Sample 2 picked up on the fact that the number line had only “3 lines,” but yet represented fourths. This is a difficult measurement concept and one that can be explored as it emerges. Also, the student is picking up on percents out of 100. If students had the opportunity to “turn to your partner and add something,” they could learn from each other.
Benefits of Type One Writing

**Student Thinking**

Type One writing has many benefits for both the student and the teacher. First of all, all students are thinking. Everyone has a few minutes to construct a response on paper. Marilyn Burns is the author of hundreds of articles and many books on the teaching of mathematics. She wrote, “Writing encourages students to examine their ideas and reflect on what they have learned. It helps them deepen and extend their understanding. When students write about mathematics, they are actively involved in thinking and learning mathematics . . . . Writing helps students sort out, clarify, and define their thinking” (Burns, 1995, p. 13). In our first sample, the student seems to only know about tenths and hundredths of things, but he produces an area model showing 12/20 in his drawing. Getting everyone engaged in thinking helps with class management. Students are busy, involved in making meaning, and with the check system, they know it counts! During this two to three minutes, no one is talking, fooling around, disengaged, tuned out, or getting up, and it helps set the tone for the class. You expect serious work from them; this is not a class where all the ideas are coming from the teacher. They must contribute!

Because of the low-risk nature of the prompt, all students would be at work drawing, writing, and building fluency, maybe even using math vocabulary, and, all the while developing confidence. Students would be getting good practice generating ideas and putting thoughts on paper—not skipping questions that look hard.

**Teacher Time**

Another benefit of Type One writing is that for the next two to four minutes, you, as teacher, would have some time: time to find your glasses, work on your lesson plan or seating chart, or whatever you may have misplaced. Then you can wander the room and look at student responses, see students you are worried about. You would actually have a minute to look at the data (what the kids write) and use it to direct the lesson. You might know whom to call on to start your discussion. This technique dramatically improves class discussions because now everyone has something to say.

**Meta-Cognition**

The emphasis on meta-cognition—students thinking about their thinking—is a third critical benefit of Type One writing. Often students say, “We never learned this!” because they haven’t had the opportunity or the coaching to recall what they may know. Students need time to stop and think! In his book *Teaching with the Brain in Mind*, Eric Jensen (2005) says students should be primed to activate their memories (p. 140).

For example, if I asked you what you had for dinner last night, your first response might be, “I have no idea; I can’t even remember what I had for breakfast.” However, if I gave you a couple of minutes, focused you on what day of the week yesterday was, reminded you what was on television, or the weather, it’s very likely you would find that place in your brain where the information is
stored. Students need this same opportunity. We often think of writing as a way for teachers to find out what students know, but it is equally important for students to find out what they know.

**Visual Models**

A fourth benefit particular to the prompt with fraction pictures is that it gets students in the habit of studying a visual model, connecting ideas with images seen in other contexts from other years, and noticing details they might otherwise overlook. One of the biggest problems on standardized test questions with graphics is that students race to get to the question, never pausing to look carefully at the key details in the graphic. For students who struggle to read, pictures are incredibly important (see Strategy 4). This Type One prompt with six figures slows students down, forces them to look carefully, and make connections, all the while searching the part of the brain that stores and processes visual images.

**Differentiation**

Finally, Type One writing allows for differentiation. I noted earlier how difficult it is to teach groups of students with mixed abilities. In this case, students with lots of background knowledge can write that \(\frac{3}{4}\) can also be written as \(\frac{6}{8}\) or \(\frac{9}{12}\), and they might note that \(\frac{75}{100}\) is missing from my pictures. They can write that \(\frac{3}{4}\) is actually three times larger than \(\frac{1}{4}\) and that the number line could be divided even further by cutting each section in half again to get eighths. They may wonder, “Does that mean that \(\frac{1}{4}\) divided by two is \(\frac{1}{8}\)?” Others may write, “I always think of fractions and pizza. I love pepperoni on my pizza. If it had pepperoni, I’d eat four fourths.”

If you found all students just wrote, “You drew \(\frac{3}{4}\) . . . that’s all I know,” then change the prompt next time to: “I’ve drawn some representations of the fraction \(\frac{3}{4}\) on the board. Can you think of some other ways to represent it? If not, look at my drawings. Where would you see these in real life? You may use some of the words on the word wall to get you started.” Or, you could say, “These drawings were some models for fractions on last year’s state test. Can you make up a question for one of them?” It is this ability to reflect on your prompt and change it if needed that will make all the difference in the depth and quantity of thinking that your students produce.

**Suggestions on Using Type One Writing**

**Use Type One All the Time!**

Despite the benefits of Type One writing, the only time I see teachers use it is at the beginning of the year or at the beginning of a unit. Teachers ask, “What do you know about algebra?” “What do you know about probability?” “What do you know about measuring?” Teachers have been coached to draw out background knowledge and to build KWL charts (what do you Know, what do you Want to know, what did you Learn) before launching a new topic. This is a perfectly good practice, but it only scratches the surface. I believe you should be using Type One writing in some form almost every day. You can use it to open your lesson, recapture attention in the middle, or close it.
Use Type One to Break Down Problems

Type One writing can be used to break complicated problems down into manageable steps. In his terrific book, *Teach Like a Champion*, Doug Lemov (2010) argues that breaking problems into manageable parts is crucial. One way of doing that is to take a problem and ask students to simply write what they know in the problem and what they need to find out.

You might post the problem above to sixth graders and then say, “Don’t try and solve it. Just record (or even draw) the two pieces of information you know and one thing you need to find out. You have three minutes.”

In many word problems or open response problems, understanding what the question is asking and identifying the key information is a major tripping point for many students. Repeated Type One assignments, which develop this critical skill, improve students’ abilities to focus on the key parts of the problem without getting too wrapped up in the situation itself. Breaking down the problem solving process will make the problem more manageable for students. (See Strategies 3 and 4 for more on this.)

Use Type One to Get at the Most Important Core Skills

The idea of breaking down the problem leads to another excellent use of Type One: getting at the core skills and concepts to solve a complicated problem. In *Knowing and Teaching Elementary Mathematics*, Liping Ma compares mathematics understanding in the United States and China. She writes that Chinese teachers, “Have a clearer idea of what is the simplest form of a mathematical idea . . . . They pay particular attention to the first time an idea is introduced in its simplest form” (Ma, 1999, p. 47). She notes that many skills and algorithms are made up of knowledge packages and that profound understanding of fundamental mathematics is built on a deep understanding of these base or foundational packages. For example, when multiplying a two-digit number, you must not only have a solid understanding of the distributive property, but also of place
value. On an even more basic level to “carry” the one, you must also have the skill Chinese teachers call “decomposing a number.” Twelve can be broken into one ten and two ones. Asking the right Type One question helps identify and strengthen the underlying skills critical to solving a problem. In this case, you might pose this question: Is 34 x 3 the same thing as 30 x 3 plus 4 x 3? How do you know? Write three lines.

Or, you might model on the board: “34 x 3? I don’t feel like doing that problem. Too hard. I’m going to do 30 x 3. Let’s see, that is 90. Hmm, now I’ll do 4 x 3 = 12. Put it together, 90 + 12 = 102. Can I do that? Why? Write three lines or more. Is there another way to do it?”

Another example of using Type One to focus on a core knowledge packet comes from algebra. State tests often include problems about growing shapes similar to the one below.

The blob below is growing in a regular and predictable way. It covers up five neighborhood blocks after one hour, eight blocks after two hours and so on.

A. How many blocks will be covered after five hours?
B. If the shape has covered 85 blocks, how many hours old must it be?
C. Can you write a rule that describes this growth for any number of hours?

This problem requires students to see growth, predict future growth, and understand how growth can be tied not just sequentially to the shape before, but to the interval. Ultimately, students need to be able to write a rule or algebraic expression that describes the growth. Before students attempt problems like these, you could ask several terrific Type One questions. For example, “In three written lines or more, what do you notice about this growing shape?” Perhaps, even better would be, “In three written lines, what parts of this growing shape stay the same? What parts change? How do you know?” Or, maybe best of all, “Draw a picture of the next shape in this series, and include three written lines telling why you drew it that way.”

This prompt allows students to focus on some of the key knowledge pieces (Liping Ma’s “packages”) in this problem. It helps students identify the part of the shape that stays the same (the algebraic constant) and the part that changes. It forces students to visualize the next shape and try to put into words what they are thinking. In the discussion that follows the Type One assignment, the teacher will gain great information about how students are approaching this problem.
What you will often find is that students will write something like, “I added another row and another column from the shape before . . . .” Students often see the sequential connection but not one that connects the shape’s size to the interval; in this case, a five hour blob is a five-by-five with the four corners added. This interval to size connection is much more helpful than a sequential one when trying to generate a rule. For example, if you need to know a 10 hour blob, it would be better not to have to draw all the blobs up to 10 to figure it out. To get the students to this point, the teacher can then follow up with questions like, “Can you picture a 10 hour blob? What does it look like? How about a 7 hour blob? Is there a way to relate the blob’s size to the hour it is on and not just to the shape before?” From this we have the rule: hours times hours + four corners which may eventually become \( y = 2x + 4 \).

Another example from algebra would be the following image:

A Type One question might be, “What do you notice in the picture? Write three lines.” Or you might say, “List three things you know are true based on this picture.” With this prompt, you are attempting to attack a key underlying skill simplifying an equation. If 2 blocks = 10 cans, then 1 block = 5 cans. Once this core knowledge is established, many other things are true: 3 blocks = 15 cans; 4 blocks = 20 cans. This is a necessary knowledge piece because without this fundamental understanding students will never be able to answer a question which asks students to substitute and then compare two new quantities as in the next example.

**Strategy 1**

5 cans balance 2 blocks

4 blocks balance 1 star

*How many cans will balance 1 star? Show or explain your work.*
In this example, you need to be able to play with (simplify or find other equal equations for) the balance scale on the left. If you can double both sides, you know four blocks balances 10 cans. Then you can substitute 10 cans whenever you see four blocks. They weigh the same. Now the problem is a snap. Four blocks balances a star, so that means 10 cans also balance a star.

It is the job of the teacher to identify the key knowledge packets and then to find the right Type One assignment to launch this lesson. As Liping Ma (1999) writes, “If the students have the concept thoroughly the first time it is introduced, one will get twice the result with half the effort” (p. 115). Type One writing helps to get everyone engaged in this endeavor.

**Use Type One to Focus on Mistakes or Potential Mistakes**

Another use of Type One writing is to focus on mistakes. In a very concrete way, Type One can help students see flaws in thinking and discuss misunderstandings, increasing the awareness that most learning comes through making mistakes and correcting them. I want students to be able to explain why an answer is wrong—to predict where they might go wrong in any situation. There is a heavy emphasis on meta-cognition in these types of prompts. I want students to consider strategies that will help them not make the same kind of mistakes over and over. For a very basic example, look at the following graphic from a third grade test question. What mistakes do you think students will make on this question?

The pictograph that follows shows the number of each kind of butterfly caught by the students in Ms. Gray’s class.

**How many butterflies did the students catch in all? Fill in the bubble for your answer.**

<table>
<thead>
<tr>
<th>Kind of Butterfly</th>
<th>Number of Butterflies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monarch Butterfly</td>
<td><img src="image1" alt="Monarch Butterfly" /></td>
</tr>
<tr>
<td>Swallowtail Butterfly</td>
<td><img src="image2" alt="Swallowtail Butterfly" /></td>
</tr>
<tr>
<td>Buckeye Butterfly</td>
<td><img src="image3" alt="Buckeye Butterfly" /></td>
</tr>
</tbody>
</table>

**KEY**

Stands for 3 butterflies

If you have spent any time teaching third grade, I’m sure you are thinking, *they won’t look at the key or know how to apply the key*. Another possibility is that students will focus on the monarch category only. Or, they may not know how to count by threes.
As you can see, choice A contains the answer most students will choose. Choice B appears to be another distracter while choice C may be the result of multiplying by two not three. Use a Type One prompt to make students think about why these answers are tempting, why we use keys on pictographs, and what we can do to make sure we interpret the graph correctly (read it over carefully, look at all the answer choices, be aware that pictographs almost always have keys). This will deepen their understanding of not only graphs, but of how to approach these kinds of problems. In his wonderful book, _Teach Like Your Hair’s on Fire_, Rafe Esquith (2008) notes that having students examine the multiple choices really helps students see how tests are designed.

The next step, of course, is to have students design their own multiple choice questions to make students apply this knowledge of error analysis. We will look at this strategy more in Strategy 4.

**Use Type One to Promote and Take Risks with Higher-Order Thinking**

The Learning 24/7 study (2005) cited earlier noted that out of 1,500 classroom observations, only 3% showed evidence of higher-order thinking. Three percent! Type One writing is an excellent way to insure that students are regularly getting opportunities to practice these skills in a low risk way. All too often teachers ask low-level questions like: “Find 1/2 x 1/4.” “What is the area of this square?” “Can you plot the ordered pair (3, 2)?” “Find the mean, median, and mode of this set of numbers.” While all of these are important, they don’t do enough to challenge students.

Asking students to compare, contrast, predict, work backwards, extend, generalize, and interpret are critically important tasks. For example, try asking students to make up a question that has an answer of 5 meters or create a real world situation that matches 2 1/2 divided by 1/4.
Higher-Order Prompts for Type One Writing

Bloom’s Taxonomy

**Remembering**
- What did we do in class yesterday with these shapes? Write four lines.
- List three things you remember from yesterday.
- I drew this picture on the board yesterday. What do you remember about it? Write four lines.
- List four or more geometry words from yesterday’s class. Which one is most important? Write three lines.

**Understanding**
- Try to write a quick description of area that John (who was absent) can understand. Write three lines or more.
- Why do you think area is measured in squares and not in circles? Write three lines.
- The area of this rectangle is twelve. I found it by counting all the squares. Some people would just do 3 x 4. Try to explain why this works in four lines or more.

**Applying**
- This rectangle has an area of twelve square units. Can you draw a different rectangle with the same area? Draw and label at least one other rectangle. See if you can get them all.
Strategy 1

- I put these shapes in order from smallest to greatest by their area. Did I do it right? Explain in two lines or more.
- Take a look at these four pictures on the overhead (different people working in real jobs). Do you see any situations where they might need to know about area? Describe as many as you can, but get at least three. If you are not sure, write three questions.

**Analyzing**

- How do you think I could find the area of this strange shape? Describe your method in four lines or more.
- Look at the area of these rectangles and these triangles. Do you see a pattern? Describe what you notice in four lines or more.

**Evaluating**

- John found the area this way. Do you think he’s right? Do you think that’s the best way? Why or why not? Write four lines or more.
- The problem asked Sally to find the area of the shape and show or explain her thinking. Do you think she gave a good answer? Why or why not? Write four lines or more.
- Which of these two area problems do you think is harder? Why? Write three lines or more.
- What are some of the most common mistakes students will make on this area problem? List at least two.
- Can you explain why Susan made this mistake or give her some advice? Write three lines or more.

**Creating**

- Can you create a new area problem for us to do tomorrow? Include a drawing and a question. Try to make your question clear but challenging.
- After looking at these pictures of people using area, can you think of another situation where it might come up in real life? Draw a quick sketch or describe your idea in three lines or more.

**NOW YOU TRY IT**

Take another math concept you must teach: number lines, place value, multiplication, fractions, in/out boxes, slope, coordinate graphing, fractions, median/mode, bar graphs, probability, etc. Can you write a Type One question from several categories of Bloom’s Taxonomy?

**Questions and Problems**

There are many other uses and examples of Type One writing that can help develop the thinking skills needed in math. Many of them are outlined in the sample prompts in the list at the end of Strategy 1, and others will be discussed in more detail in later sections of the book.
However, before I go any further, let me address the four main objections you may be formu-
lating in your mind: How do I find the time? Don’t I have to correct Type One writing? What if stu-
dents don’t want to write? How can I use this with special education students and English
Language Learners?

**How do I find the time?**

As many teachers know, the first five minutes and the last five minutes are perhaps the
most important minutes of the whole class. Yet, over and over again, the question teachers ask is,
“How do I find the time?” Researchers have found that teachers in the United States
spent relatively long segments of time checking homework compared to Japanese teachers (Stigler
& Hiebert, 1999). While asking students about homework may seem a good idea—the homework I
assigned was important, I need to give feedback on it, I want to show how last night’s homework
will connect to today’s lesson—what usually happens is the teacher asks, “Any problems on the
homework?” Half the students reply, “No.” The other half whisper, “What homework? Did we have
homework?” Then perhaps one student will ask about a problem and off we go, reviewing home-
work problems. It is not unusual to see 50-70 percent of students not engaged during this part of
the class.

One way to put this time to better use is to say or write on the board, “Type One writing! What
problem on the homework was difficult for you? Why was it difficult? Write four lines. You
have three minutes. If nothing was difficult, which problem do you think would be difficult for some-
one else? If you didn’t do the homework, I want four lines explaining why not?” Now, everyone is
working, recalling what the homework was and thinking about what they might want to ask while
you take attendance, walk around the room and check to see who has done it, or settle any prob-
lems that happened in the hall or at recess. This is similar to the “Do Now” required in many
schools in New York City. It’s also similar to “warm up problems,” but the advantage here is it puts
the focus on the homework if that was important to you and doesn’t add another unrelated thing
you have to check. I make students put these Type Ones in their notebooks next to their notes for
the day. If the homework was a worksheet, I might have them write on the back.

Another excellent use of Type One comes at the end of class, another critical time according
to Jensen. He points out that the brain needs time to pull together ideas, to consolidate them, and
form new synapses (Jensen, 2005, p. 131-134). At the end of class, just before assigning the
homework, you might say, “We have two minutes left. I want you to make up an open response
question that I could use as a quiz for tomorrow’s class.” This might be better than, “Write three
things you learned, or three key ideas from today” because it is higher up in Bloom’s Taxonomy.
This question asks students to not only be aware of the key ideas but to apply and synthesize them
to create a new problem based on the key ideas.

Type One writing can occur anywhere, anytime. In the sleepy high school geometry lesson I
described at the beginning of this section, a Type One prompt to transition from the homework to
the lesson would have been the perfect antidote to the lethargy gripping the class: “Yesterday we
discussed finding the tangent of the angle. Now, take a look at this situation with the lighthouse.
Where do you think tangent might apply? Write five lines or more."

Type One writing can be done while waiting for a piece of technology to reset, waiting for a teacher to return (perhaps called away into the hallway for a moment), waiting while papers are being collected or passed out, or whenever the teacher needs a few minutes, but doesn’t want to hand out photocopied worksheets or spend hours correcting.

**Do I have to correct Type One writing?**

As you will remember, Type One writing is not corrected for accuracy or conventions (capitals, end marks, etc.), only for effort and getting ideas down. This does not mean it can’t be used as a formative assessment to find out what students know. However, I usually ask questions that either don’t have a right or wrong answer or questions where I don’t expect mastery. I often phrase these Type Ones as follows: “What do you think...? Can you remember...? How many ideas can you...?” Students who don’t know anything about the topic can always write questions about the material. If students make an effort to put thoughts on paper and fill the quota, they get only a check—not a check plus, not a check double plus—just a check. I do collect some Type One writing and read it, and sometimes even write back. For example, if the Type One asks, “In seven to ten lines, how is it going so far in math? You have four minutes.” I may very well want to read this and see how much time students are spending on homework. Before parent conferences or before writing my evaluation reports, I often ask students to write as if they were the teacher. “What would you say about your progress so far this year?” This free writing exercise helps students set goals, and it might give you new insights.

Sometimes, however, Type One writing is a quick exit ticket and I just read the ideas, make some mental notes, and recycle. I just want to use the last moments from a class to have the students consolidate their knowledge, review what they have learned, and raise questions. I want these data, but I do not feel compelled to give it back to students; it’s like the evaluations I pass out in workshops. For the most part, I want to know how I did and what I should do differently next time. When deciding how to use Type One on any given day, keep in mind that students need to feel there is a reasonably strong possibility that you will evaluate their work.

**What if students don’t want to write?**

You may be thinking: This sounds good, but I know several students who will not want to write in math class. When you start this program, you will find students who feel exactly this way. What do you do? Generally, it depends on the student. In *The Skillful Teacher*, Jon Saphier, Mary Ann Haley-Speca, and Robert Gower (2008) describe skillful classroom management as the ability to know what response is needed for which student in which situation. There is not a “one size fits all” solution to this question. Joan Countryman (1992) responds to some students who genuinely want to know why we write in math class this way,

*This is math. You know, it’s fine to get the right answer, but what good is that answer if you can’t explain it to anyone (p. 2)?*
Other students need a reminder that class participation and effort are a big part of their grade, and Type One writing is a way of measuring their participation. If your entire class resists, you can try praise. “This is the first time since 1927 that the whole class got all checks on this Type One!” I know a teacher who has success with a reward system. “If most of us get a check today, I will add five brownie points to this jar, and when the jar is full of brownie points, I’ll be bringing in brownies!” Generally though, if students see that this is important—that you are going to use this information and that they will be sharing it with their classmates—I find they accept it as another part of class, just like raising hands. However, I have several specific suggestions to make Type One writing more appealing.

1. **Make the prompts interesting, intriguing, or perplexing.** There is nothing worse than Type Ones that are all the same. “What do you know about, what do you know about, what do you know about . . . ?” Creating more interesting prompts can go a long way to getting students involved. The key is often to think of a good prompt or show a dramatic picture or timely diagram. I often go to the *USA Today* website and find graphs that I can use.

![Shoes scoring most World Cup goals](image)

*Type One: “Does the graph above prove that Nike shoes help you score more? Explain your thinking in five lines or more.”*

2. **Tell a story.** For example, instead of saying, “What do you know about probability?” say, “I want to tell you what happened to me yesterday.”

I was heading to school yesterday. The weather guy was saying he thought there was an 80% chance of rain, so, without looking, I reached into the closet and I grabbed one of my two umbrellas (secretly hoping I picked the black one and not my wife’s pink, flowery one). Then, I remembered an article that said more eye injuries happen
by poking eyes with umbrellas than in all of the other sports combined. Can that be true? I wondered. It’s more likely to be stabbed by an umbrella than killed during a bull fight. When I stopped ruminating on the umbrella, I realized that since it was Friday, and traffic was usually worse on Friday, I would probably be late. It would be unlikely Route 6 would be as crowded, so I chose that route. In the car, I heard the Red Sox were 3:1 underdogs against the Yankees, and that last night a triple play had occurred, a feat that only happens 1 in 1,400 times! I wondered if I should have played professional baseball, then remembered that the number of people who make it to the major leagues out of the total number who try is 1 out of 100,000 or .001% which is easier than winning the lottery (1 in 18 million), but still not likely. Looking at the clock, I saw the time was 7:57. I was certain to be late. I would never be able to travel the last three miles in three minutes. All these thoughts danced in my head as I drove, and then I thought, “If I tell my students this story, what’s the likelihood they will think I’m crazy?”

Type One: “What did you notice about my story? Listen while I tell you again, and write down what math topic you think we’ll be studying next, and why? Write four lines or more.” Often, I’ll put the story on the overhead, ask for specific examples of probability, and look at vocabulary related to probability (see underlines).

3. Another excellent Type One prompt is to act something out or model something. For example, model how to set a graph or read a word problem. Think out loud, and then ask students, “What did you see me do? What was going on in my head?” Model something with algebra tiles or other manipulatives, or model how not to do something. Make the classic mistake when adding fractions or subtracting across zeroes. Ask students, “What did I do wrong? What should I have done?”

4. Vary the form of the Type One. Instead of always asking students to write five lines, vary the form of student response. Ask them to write lists, draw and label pictures, fill out graphic organizers, write questions, and make up answers that are wrong, but tempting.

5. Vary the medium. Ask students to write on index cards, post-it notes, the whiteboard/blackboard, computers, huge sheets of newsprint taped to the wall, white paper or personal whiteboards. If you don’t have a class set of whiteboards, put sheets of card stock in transparency sleeves and have students write on them with whiteboard markers. On really hot days when putting your arm on the paper creates a sweat mark, I sometimes allow students to use invisible pencils and write in the air. Students need more variety.

6. Allow occasional group Type Ones. I see a lot of group work in classrooms, but all too often a few students are doing all the work. And unfortunately, we mostly test students individually. However, group Type Ones can create a good energy. “With your partners, come up with as many polygons names as you know.” Or, put sheets of newsprint around the room and allow students to
travel in groups, carousel brainstorming (see Strategy 3 for more ideas on this). Give everyone a
whiteboard marker and have students come silently to the board and find a space to write as many
examples of real life use of decimals, fractions, and percents as they can in the time allotted. Take
them outside with sidewalk chalk to create a Type One mural with representations of numbers, frac-
tions, or graphs on the playground.

7. Turn the Type One into a think/pair/share. I often have students write for three minutes and
then draw a line under what they have written. Next, they turn to a partner and share, then add new
ideas from their partner below the line. “Writing below the line” can be especially effective if you
combine this with either a little competition or cooperative learning. One of my favorites is the Fam-
ily Feud™ top ten list. I say, “I surveyed 100 math teachers and the top ten answers are on the
overhead (covered by post-it notes). Here’s the question: “What are the key vocabulary words asso-
ciated with this figure?” List at least eight (or other appropriate number) on your paper. You have
two minutes.”

On the overhead I will have secretly written ten terms and covered them with post-it notes:
rectangle, parallelogram, quadrilateral, polygon, area, perimeter, right angles, closed, length, width,
sides, dimensions, symmetry, etc.

Students pair up and compare lists, checking any words they have in common. Then, they
add two words below the line that their partner had that they didn’t. If they had exactly the same
words they have to think of two new words to add. Then, they discuss/argue/determine which are
four words from their combined list of 16 are most likely to be on my list and star them. I call this
writing below the line check, add, and star. If I have a headache on that day, I have students make
their lists, pass it to someone else, and silently, they add new thoughts. After they are done, we
play the Feud, with groups guessing which words are on my list. This becomes our word wall list.
Sometimes I add student words that were not on my original list as we play. “Interior angles sum to
360 degrees! That’s a good one. Let’s add 360 degrees.”

You can do this game with anything: the top five words that will be on the test Friday; top
five mistakes students will likely make on this problem; top ten math graphics you’ll see on the
state test; top ten uses for percents; top five words that often imply addition; top five state test
words related to math. You can also play in the middle of a unit—not just at the beginning. Thus,
you play with words and ideas that students should know because you’ve been working with them
for a while. The point is that this kind of game not only gets students engaged, it makes them make
judgments about the importance of what they are learning. It helps them determine what is critical
and will be on the test. They also have to give evidence to a partner about why they think so. These
are all critical higher-order thinking skills, yet, this game is quick, fun, and practical. They will re-
member having played it.
How can I use this with special education students and English Language Learners (ELL)?

Special education students having an Individualized Education Plan (IEP) may have some initial trouble with Type One writing. How do you say to a child, “You have three minutes, write five lines” to a student with an IEP that states that he cannot take timed tests? Type One writing can be modified for these students. You can lower the quota or ask for labeled drawings. I often just approach the student and quietly whisper:

Teacher: “How many lines you think you can give me?”
Student: “Two?”
Teacher: “How about three?”
Student: “Okay.”

For others I will start them off, often writing for them. I take their pencil and start writing, “I don’t know anything about fractions, but . . . ,” I tell them, “Just get something down; don’t worry. If you know nothing, you can write I know nothing!” I often model on the board or act out what to write if you can’t think of anything, I can’t think of anything but . . . it looks kind of like that number line thing. And the other one looks like a pie that someone ate a part. I have no ideas about that other one except it looks like a group of people. Generally, I would like everyone to attempt the Type One with a time limit and a quota. In his book, A Mind at a Time, Mel Levine (2002) suggests that for many students with attention issues, giving a time limit actually helps them focus. Additionally, students who struggle to form words and tend to worry about spelling are relieved—spelling doesn’t count in this Type One writing. For kids with perfectionist tendencies, the time limit is a benefit because they realize it can’t be perfect, and they have to write quickly or they won’t finish. For students with processing or word retrieval issues, I want them to get practice in a low risk way; by practicing, they improve.

Eric Jensen (2005) wrote, “The view of the ‘static’ brain is decidedly out of date. Yes, the most amazing thing might be that human beings have the capacity and the choice to be able to change our own brains . . . yes, genetics plays a part, but even your most frustrating students can improve” (pp. 10-13). With increased practice, many students can improve in their ability to both generate ideas and record them on paper. As far as English language learners go, find a way to modify the prompts so that they can write something. I often allow them to copy part of the prompt in their answer and add labeled drawings. For these students, this kind of activity is critical. They must acquire the vocabulary to succeed. Often, I will say, “Look at the shapes on the board. How are they the same or different? Please use as many words from our word wall as you can.” On the word wall are angle, side, area, perimeter, length, width, concave, closed, polygon, regular, obtuse, acute, right, and so on. This helps everyone.
NOW YOU TRY IT

Create a prompt to match a graphic. Look at the graphics below. Then choose one and write three different Type One prompts that might go with the concept. You may use the list of prompts at the end of this Strategy 1 section to help you.
Nelda spelled $7/10$ of the words correctly.

and/or

Mandy spelled $3/4$ of the words correctly.

The first eight positions of a pattern are: N, S, E, W, N, S, E, W, . . .

<table>
<thead>
<tr>
<th>Input ($x$)</th>
<th>Output ($y$)</th>
</tr>
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<tbody>
<tr>
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<td>6</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

A. cube  B. rectangular prism  C. square pyramid  D. cone
What’s the volume in cubic inches of the aquarium below?

18 in.
24 in.
12 in.
Matt surveyed 24 students and asked them what their favorite vegetable was. The circle graph below shows the results of his survey.

<table>
<thead>
<tr>
<th>Number of Siblings</th>
<th>Classmates with that Number of Siblings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>++++ 1</td>
</tr>
<tr>
<td>1</td>
<td>++++ !!!</td>
</tr>
<tr>
<td>2</td>
<td>++++ ++++ 1</td>
</tr>
<tr>
<td>3</td>
<td>++++</td>
</tr>
</tbody>
</table>

Matt surveyed 24 students and asked them what their favorite vegetable was. The circle graph below shows the results of his survey.
Type One Writing: Sample Prompts

Remember, Type One writing is a brainstorm, is usually timed, and has a quota. The quota is the minimum number of lines or number of things students know or notice. It can take the form of some number of written lines, a list, a drawing, or labeled diagram, and it can be modified for special education students. It is simple to evaluate (✓ or —) based on evidence of thoughtful effort.

1. Before we read/discuss/watch/visit, predict (in five lines or draw) what this next section will be about, this word means, or the shape looks like.
2. Give me three lines (or a picture) about what we did in class yesterday. Or, write a quick summary of the lesson or what you learned.
3. Based on yesterday, what do you think we’ll do today? Write five lines or more.
4. Watch me model this ______. What did you notice? Write four lines or more.*
5. Look at the following graphic and write three things you notice. Or, what patterns do you see here? Write three lines.*
6. Look at the following graphic, text, or statement. Write three (other) things you know are true.*
7. Look at the following graphic. Write four key words/phrases that are associated with it or you would use to describe it.*
8. Look at the following graphic or piece of text. Write two questions that might be asked.
9. One hundred math teachers were surveyed—here’s the question. Name a math word (or a mistake, or a question, or strategy) associated with this graphic or problem.*
10. In three or more lines, how would you describe the characteristics (attributes, traits, properties) of ________________________________?
11. After looking at this graph (table, line plot, etc.), write five lines about questions you have. What other information would be useful? What other way could it be displayed?
12. What is one of the most common mistakes students make in this situation? Why? What suggestion would you make to avoid the mistake?*
13. On this multiple choice question, why do you think many students chose B? Explain in two lines or more. What is another tempting but wrong answer? Why?
14. In this experiment, problem, or situation, what do you predict will happen?
15. Describe what you think would happen if this variable (number, shape, scale) were changed.*
16. Look at this pattern, then draw or describe what comes next. Explain why you drew it that way.*
17. How are _______ and _______ the same or different? Write/draw four lines. (Use with a picture.) What other problem does this remind you of? Why? How is the structure of this word problem the same as the one we studied yesterday?*

18. What problem on the homework was difficult for you (or someone else)? Explain why.

19. In this chapter, what is most difficult/easy for you? Describe something that is easier now than before. How can you learn this best? How could you study or remember this better?*

20. How should I teach this differently next year?*

21. Now that the test is over, how prepared were you? On a scale of 1-10, how do you think you did? How could you have studied differently? What is a question that I could have asked on the test but didn’t?*

22. What do I need to know about you as a math student?

23. What five key terms/ideas/drawings will be on the quiz or are the most important? Why?

24. Write an open response question(s) I could start class with tomorrow.*

25. What key information is missing/given in this question?

26. What are the key things you must understand to solve a problem like this? What would happen if this number (variable) were changed (doubled)?

27. What do you think are the first steps to solve this problem? What do you know already and what do you need to find?*

28. What score would you give this response? Why?

29. In real life, where do you think you would _______ ? How could you apply this to _______ ? How does this connect to what we studied or did before? How does this relate to _______ ?*

30. Describe an experiment/study/plan you might do to answer this question/solve this problem.

* Indicates high priority, frequently used Type One prompts.
References


Learning 24/7 (2005, April 7). Classroom Observation Study. Study presented at the meeting of the National Conference on Standards and Assessment in Las Vegas, Nevada.


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