



Middle School Matters Field Guide: Research-Based Principles, Practices, and Tools



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Introduction to the *Middle School Matters Field Guide*, Second Edition, March 2016

Since the beginning, a key and overriding focus of the George W. Bush Institute’s education work has been to ensure that all students reach high school prepared to succeed. The end goal is that all students graduate from high school ready for either college or post-secondary training that leads to a family-sustaining job.

In the summer of 2010, the Institute held two separate working meetings with key, nationally recognized researchers (who also had direct experience working in schools), school practitioners, national and state policy makers and influencers, and other partners with a keen interest in successful graduation.

Two factors became exceptionally clear from these meetings: 1) The importance of the middle grades in achieving these goals was not receiving the attention it deserved, and 2) a large body of high quality research exists on strategies already proven to help middle grades students—yet schools and educators don’t use, or know very little about, these strategies.

So, in 2010, the Institute began an endeavor to see how it could support middle schools across the nation, utilizing the best strategies as proven by the highest quality research.

The Institute developed a Strategic Plan, and late that year, a smaller group of sixteen noted researchers convened to begin compiling middle grades practices with strong research evidence of effectiveness. These strategies would be framed in a practical way to be easily understandable for all educators.

The group first identified key areas around which to frame the research, including reading, math, writing, cognitive science, school climate and culture, student behavior supports, and dropout prevention. The researchers then worked with others in the research field, as well as

practitioners, to write the *Middle School Matters Field Guide*. As you will see in the field guide, each research-based principle has practices and examples accompanying it to help the practitioner. Throughout the process, educators currently in practice were consulted regarding the clarity and practicality of all aspects of the field guide.

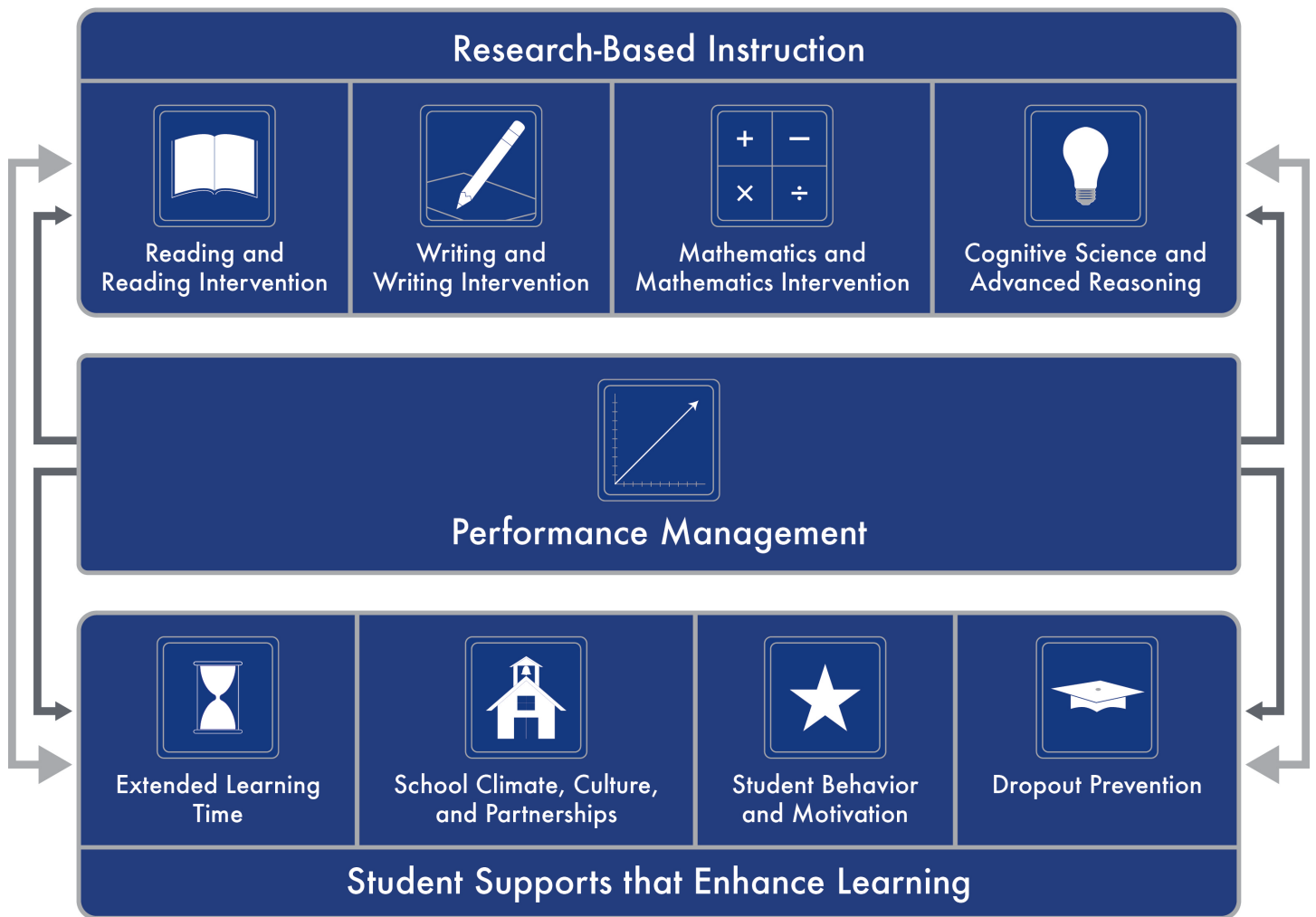
It took nearly two years to compile and edit the field guide and ensure it reflected all existing solid research and presented this research in a highly practical way for educators to use. That guide was used for the beginning years of Middle School Matters.

This version of the *Middle School Matters Field Guide* was updated in 2015 and adds recent high quality research principles. It has also been reorganized to make it even clearer for educator use.

The George W. Bush Institute and its partner, The Meadows Center for Preventing Educational Risk, are proud to have created this body of knowledge for middle grades educators. A compilation of these principles from the highest quality research has never before existed.

Our greatest hope is that school districts, middle schools, and teachers across the country will use this guide and find it to be a solid and helpful foundation for their programs and curriculum and daily practice.

Overview of the *Middle School Matters Field Guide, Second Edition*



We want to thank everyone involved in creating Middle School Matters. The current researchers working on the project are:

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We are most grateful to the many individuals who were involved in past meetings and processes to create the field guide but whose names are too numerous to mention here. Their names can be found on the Middle School Matters website at

<https://greatmiddleschools.org/resources/field-guide/middle-school-matters-research-platform-content-experts/>.

And, finally, we are exceptionally grateful to our funders, who have helped us immeasurably. Their support has allowed us to compile the knowledge and assist middle schools in Texas and beyond in putting this knowledge into everyday practice to improve outcomes for children.

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Additional Resources and Implementation Tools

The Middle School Matters Institute has developed resources and provided support opportunities that align with the research-based principles and practices in the field guide. These resources and toolkits are designed to bridge research to practice and support implementation of research-based strategies.

Resources for School Leaders: Tools to support a school's adoption and implementation of research-based practices (<https://greatmiddleschools.org/resources/resources-for-school-leaders/>)

Instructional Toolkits: Professional development modules, videos, and instructional materials aligned with specific research-based practices (<https://greatmiddleschools.org/toolkits/>)

Support Options: A variety of free and customized support options to assist with your implementation of research-based practices at the campus or district levels (<https://greatmiddleschools.org/support/>)

Visit our website at <http://www.GreatMiddleSchools.org>

Dear Colleagues,

We are fortunate to participate in this exciting endeavor with the George W. Bush Institute to gather the best available evidence to improve outcomes for middle grades students. The researchers who engaged in this work translated their expertise, knowledge of research, and experience working with teachers and schools into practical strategies that can improve middle grades education. The second edition of the *Middle School Matters Field Guide* is the result of these efforts.

Why is this summary of research necessary? The quality of research in education is uneven, which can make it very difficult for educators to know which research can best help their students. Our team set out to eliminate this guesswork by developing a field guide that makes the best research-based practices, interventions, and strategies easily accessible for middle grades educators.

The hallmark of research quality is design. Poorly designed studies have findings that are plausibly explained by something else. A study that looks at reading test scores of the same students before and after a new reading approach is implemented, for example, cannot separate the gains students achieved from the new approach from the gains they would have achieved from normal growth. Normal growth is, of course, a plausible explanation for the findings. Had the study used a control or comparison group as a benchmark of what would have happened without the new approach, it would have been able to determine that the findings were the result of the new approach. The use of a control or comparison group is fundamental to rigorous research—in fact, it is a defining feature of it.

The value of using research is that it tests (sometimes long-standing) principles and practices and identifies those that are more effective. It shows the direction of travel (“head north”) rather than a sequence of directions (“take route 539 for six miles, and then turn left...”). While explicit directions are desirable, knowing the direction of travel is important because of what it is saying *not* to do: in this case, don’t go south. It tells educators not to follow the direction of travel of ineffective approaches. For example, despite the multitude of published tests, guidebooks, professional development and workshops for educators focused on the concept of “learning styles,” currently, there is no adequate evidence base supporting the incorporation of learning styles into general education practice (Pashler, McDaniel, Rohrer, & Bjork, 2008). The field guide surveys large amounts of research and highlights the directions of travel that emerge for educators to then implement.

Researchers are trained to be skeptical. If a claim is advanced, researchers want to see the evidence for the claim. In this respect, researchers are like attorneys trying to establish guilt or innocence. A prosecutor makes a claim that a defendant committed the crime. The claim is not by itself proof of the crime; the prosecutor needs to put forward evidence supporting the claim. The defense attorney tries to refute the evidence.

Being skeptical in education means a claim that a new curriculum or new approach to teaching reading or math is more effective, for example, has to be supported by evidence. Applying skepticism in the day-to-day classroom means a teacher always asks whether an approach is benefiting students and is open to the possibility that other approaches might benefit them more. The best educators are learners themselves, and their teaching practices reflect that sensibility. This does not mean educators should be reading articles in research journals and attending research conferences on top of the many demands already consuming their time and attention. Other organizations and entities have developed standards for quality research and practices and are reviewing research for educators. For example, the What Works Clearinghouse has reviewed and rated more than 10,000 studies as of this writing.

Effective practices emerging from rigorous research and evidence have been tested and found to improve outcomes more than other practices (or strategies, or policies, or interventions; a variety of terms are used here). It is important to note that effective practices may differ from the latest styles or what was heard at a recent conference or webinar. The challenge for teachers is to take the proven strategies and incorporate them into their own classrooms.

This field guide is designed to help educators do just that. It includes research-based instructional practices, types of activities, expected teacher and student behaviors, specific strategies and tools, and other recommendations supported by research that have shown to be effective in improving student outcomes. The instructional practices highlighted in the field guide are general. They apply to all content areas (including science and social studies) and to all students in grades 6, 7, and 8, including students who are learning English. English learners need to develop fluency in academic vocabulary and language, as do students who are not English learners. Practices that improve literacy for native English speakers also work for English learners.

We appreciate that even the most effective practice from research may yield different results when implemented in school settings. Schools and districts are complex environments, and educators may encounter a variety of barriers or hurdles when implementing a practice. We believe the existence of these barriers and hurdles does not mean evidence and research should be ignored. It is better to start from a research-based practice and tackle implementation issues than to continue to use ineffective practices because they are familiar to educators and students.

Of course, ongoing research has the potential to identify new effective practices for the field guide. The George W. Bush Institute will continue to engage with researchers and practitioners across the country to share the latest rigorous research evidence as part of our commitment to supporting middle grades educators and their students.

Sincerely,

A handwritten signature in dark ink, reading "Mark Dynarski". The signature is fluid and cursive, with the first name "Mark" and last name "Dynarski" clearly legible.

Mark Dynarski (on behalf of the Middle School Matters Researchers)

Fellow, George W. Bush Institute

Reference

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, 9(3), 105-119.

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Chapter 1: Research-Based Instruction

Introduction

This section focuses on instructional practices that are based on rigorous intervention research conducted primarily over the last decade in reading, writing, mathematics, and cognitive science and reasoning. Many of these research-based instructional strategies apply across various content areas and are designed to enhance students' content area learning, increase engagement, and maximize students' ability to recall, apply, and synthesize information. For example, summarization strategies can be implemented in social studies, science, or language arts; class-wide discussion practices can be used in mathematics to explore problem-solving methods and enhance reasoning ability.

When these strategies are implemented school wide, students experience consistency (for example, one strategy for identifying main idea rather than seven) and have the opportunity to apply and practice strategies in various contexts. These repeated exposures help students generalize the use of these strategies to other areas—in and outside of school and beyond the middle grades.

The content dimensions included in this section on research-based instruction are

- Reading and Reading Interventions
- Writing and Writing Interventions
- Mathematics and Mathematics Interventions
- Cognitive Science and Advanced Reasoning

Practical tools for implementing these practices can be found on the following web page:

<https://greatmiddleschools.org/toolkits/>.

Reading and Reading Interventions

Extensive research and numerous syntheses have been conducted in the area of reading instruction and intervention for middle grades students with reading difficulties. In particular, the Institute of Education Sciences has issued a guidance document to assist schools in making research- and evidence-based decisions about improving instruction for adolescents with reading difficulties.¹ This section uses extant research and data to provide an overview of nine research- and evidence-based principles for improving reading achievement for all students and gives specific examples of research- and evidence-based interventions to support students who are reading below grade level. These principles are accompanied by specific practices that schools and teachers can implement, followed by examples of activities and lessons that can be used with students to improve reading.

In elementary school, reading may be considered an independent subject, but in middle school, reading is involved in all subject areas, so every teacher should be considered a reading teacher. Therefore, the reading strategies in this section should be implemented school wide, as part of a school culture that works toward high levels of student achievement in reading. Specific interventions and strategies are provided to support students who struggle to learn to read and perform below grade level, as well as students who are English language learners (ELLs). Providing opportunities for students to practice these reading strategies in every subject every day will enhance development of the reading skills they need to become better readers and more accomplished students.

Principle 1:

Establish school wide practices for enhancing reading for understanding in all content area instruction.

Providing appropriate and adequate reading instruction for middle grades students is the responsibility of all content area teachers (including those who teach English language arts, science, social studies, mathematics), and teachers of English language development classes for students learning English. There are several instructional practices that content area teachers can use to enhance reading opportunities for all students without detracting from content area instruction.

Practice 1: *Identify key words for learning, teach at least two words^a per class every day, and review one word from previous instruction.*

This practice can be readily implemented across all content area instruction and provides students with opportunities to expand their academic vocabulary, increase their background knowledge, and better understand the key ideas about which they are reading and learning. For example, a social studies teacher delivering a unit on political and economic systems could teach two new words that relate to the learning they will be addressing that day, such as *socialism* and *depression*. Then, the teacher could review a word that is related but was previously taught, such as *federalism*. One way teachers can accomplish this practice is to select words in a unit that are high priority and high utility. Assuming that a unit is three weeks long, a teacher can determine the key words students will need to know and explicitly teach them each week. The teacher and students can review the vocabulary in subsequent weeks as related content allows for further exploration of the terms, as well as opportunities

to use academic language in reading and writing about the content.

There are several ways important vocabulary words can be taught and reviewed, including the following three methods:

1. Teachers can take advantage of vocabulary maps² that use the key word and a student-friendly definition, show pictures of the word, provide related words, and give examples of how the word can be used.
2. Teachers can demonstrate the relationships between words using a concept map that starts with an overarching topic or concept and branches out along lines and arrows to component academic and technical vocabulary, examples, characteristics, and graphics or symbols.³
3. Teachers can teach key words that students use in their written and oral arguments for a debate or a structured discussion.^{4, 5}

The types of strategies described above support the learning of all students and are particularly helpful to students learning English.⁴ However, teachers need to be aware that students who are not yet proficient in English will need additional help to master academic vocabulary that may be familiar to native English speakers (e.g., words like *compare* or *analyze*).

^a Learning just two words a day is insufficient for students learning the English language or those who are seriously behind their peers; therefore, the number of new words per day will depend on the needs of the students.

Practice 2: *Instruct students to ask and answer questions while they read to monitor comprehension and learning.*

Students who are actively engaged while listening and reading are more likely to understand and remember what they hear or read.^{6, 7, 8} Teachers can promote this practice by instructing students in how to ask and answer questions while they are reading. Some questions teachers can use while modeling the practice include the following:

- What is about the “big idea” or main point of the reading?
- How does this relate to the vocabulary we are learning?
- In what way did the previous step, event, or action influence what happened?

- How does this key character or historical figure behave and why does he behave this way?
- How does the author support his or her point?

Teachers should “think aloud” to demonstrate how they consider what kind of information a given question is targeting, where in the text important information related to the question is located, and how to use information in the text to both answer a question and develop a question that can be used to self-monitor learning and comprehension.

Another way to help students be actively engaged in their reading is to ask them to develop one question to ask the class once they have completed their reading. Teachers can use sample question stems to help students develop their own questions.

PRACTICE 2 EXAMPLE APPLICATION: Sample Question Stems

- How did what happened at the end differ from _____?
- How would you compare _____?
- How do you think the author could have better written the _____?
- What do you think would happen if _____?
- How do you think _____ might have been prevented?
- How would you interpret _____?
- Why do you think the author _____?
- Who else do you think could have influenced _____?
- What was the most important finding related to _____?

Note: Generating questions will also be addressed in Principle 4, Practice 1, which expands on the use of comprehension strategies for self-monitoring while reading complex texts.

Practice 3: Teach students to comprehend the relationships among ideas using graphic organizers.

Graphic organizers (see examples in Figures 1 and 2) have been associated with improved vocabulary knowledge and comprehension, particularly when used with informational text.^{9, 10, 11} These learning tools have an advantage over traditional outlines because they can present a single visual display of the relationships among a variety of ideas in a text. The arrangement of the information on the page can support students in understanding how details support main ideas. Graphic organizers include matrices, webs, maps, and diagrams. The particular format of the graphic organizer should align with the purpose of the lesson. The examples that follow demonstrate the difference in how information is arranged to show a comparison-contrast and to show the steps of a process.

If the graphic organizer does not match the structure of the information, the value of the tool might be lost. Therefore, teachers need to provide appropriate graphic organizers and show students how to select or design these tools to support their understanding of content and concepts. Variations of graphic organizers are mentioned in Principle 1, Practice 1 (vocabulary and concept maps); Principle 7, Practice 1 (advanced organizers); and Principle 8, Practice 1 (learning logs).

When introducing a new graphic organizer, teachers should explain the format and what kind of information that it should contain. Then, teachers should model how to complete an organizer, using information or vocabulary from a text. Students need time to practice using the tool with feedback from their teacher before they can be expected to apply it independently.

PARTS OF A CIRCLE

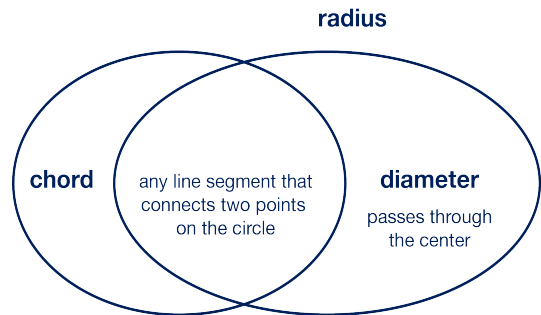


FIGURE 1. Example graphic organizer for comparing and contrasting the parts of a circle

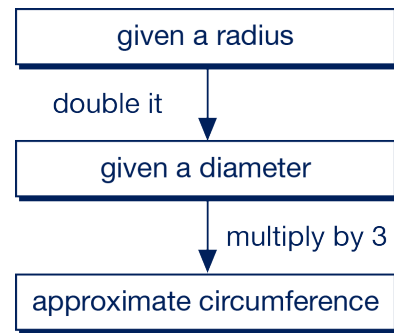


FIGURE 2. Example graphic organizer to show the steps in determining the circumference of a circle

Principle 2:

Teach word-meaning strategies within content area classes.

Middle school students' knowledge of general academic terms used across the content areas has been linked to their academic achievement.¹² But cross-discipline word knowledge is only part of what students need to know to be successful in their classes. Content areas (e.g., mathematics, science, social studies, English language arts) each have unique vocabulary used to communicate concepts and explain processes.¹³ These discipline-specific concept words are the center of learning the big ideas and are used in conjunction with general academic vocabulary to communicate essential information. Students need to learn what these words mean and how to use them within the multiple contexts of reading, writing, and speaking. Reviews of research on academic vocabulary instruction have found evidence of effectiveness for the following two practices: explicit instruction in important words and instruction in word learning strategies.^{5, 14}

Practice 1: *Provide explicit instruction for important words.*

Teachers identify the important academic or concept words students need to learn to master the key ideas being taught. They introduce these words with a picture, video, or other demonstration to make the words vivid.¹⁵ Teachers then engage students in a discussion about what the words mean and don't mean, extending this understanding to the text and important ideas they are learning. A critical next step for teachers is to return to these words regularly throughout the lesson and instructional unit to ensure that students can correctly use the words in speaking and writing tasks.¹⁶ It is important that students be taught the meaning of vocabulary words in the context of learning and also the multiple meanings of words. Exploring the different meanings of words as used

in different contexts is also recommended for supporting ELLs, who tend to know fewer words and fewer definitions for multiple meaning words than native English speakers.^{4, 17}

Resources for implementing this practice can be found online at the Middle School Matters Institute website:

- Vocabulary Maps Toolkit
<https://greatmiddleschools.org/toolkits/reading/vocabulary-maps/>
- Frayer Model Toolkit
<https://greatmiddleschools.org/toolkits/reading/frayer-model/>

Practice 2: *Provide instruction in word-learning strategies.*

Although explicit instruction is important (Practice 1), the sheer number of words students need to learn requires that they develop strategies for independently determining the meanings of unfamiliar vocabulary. One means of equipping students to understand the content area terms they encounter is to teach morphemes (prefixes, roots, and suffixes) and how they contribute to the meaning of words.^{5, 14} Research conducted with middle school students has found their awareness of morphemes is related to their academic vocabulary knowledge and contributes significantly to their reading comprehension.¹⁸ Other research indicates the practice of using morphemes systematically, coupled with multiple opportunities for practice, is particularly effective for English language learners.⁴ This process can be facilitated by applying learned morphemes to words used in different content areas.

PRACTICE 2 EXAMPLE APPLICATION: Morpheme Examples Across Content Areas

Root word: circu(m)—going or moving around

- English language arts: circumlocution = circum + locut + -ion
 - Math: circumference = circum + fer + -ence
 - Science: circulation = circu + lat(e) + -ion
 - Social studies: circumnavigate = circum + navig + -ate
-

Another word-learning strategy involves teaching word meanings directly through the use of a mnemonic word association and a picture that ties together the word clue and the definition.^{19, 20} The following is an example of this kind of mnemonic strategy:

PRACTICE 2 EXAMPLE APPLICATION: Making Mnemonic Connections for Words

Teachers can use the following figure to present the word *analyze* to students. The teacher would show the card to students and explain the mnemonic connections among the picture, the play on words with “ant’s eyes,” and the definition.

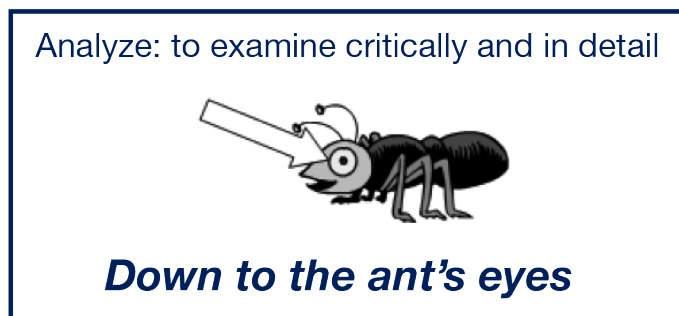


FIGURE 3. Example of mnemonic connection for the word *analyze*

Principle 3:

Activate and build appropriate background knowledge for understanding text content.

Researchers report that background knowledge is important to adolescents' reading comprehension.^{15, 21} A lack of prior knowledge can make reading and understanding informational texts particularly challenging for native English-speaking students and English language learners alike.^{22, 23}

Practice 1: *Instruct students to use text to support answers.*

Successful use of text evidence requires adequate preparation to help students attend to pertinent information as they read. The following are examples of anticipatory statements that could be used in the different content areas to stimulate students' thinking before reading:

- English language arts—The narrator in a story is a reliable source of information.
- Mathematics—It is always better to use π than 3.14.
- Science—It is important to keep everything as clean and free of bacteria as possible.
- Social studies—The use of trade embargoes is an effective diplomatic tool.

These statements are generated based on key concepts about to be encountered in a text and are considered anticipatory because students must determine whether they could or could not adequately support the statement on the basis of their prior learning. Asking students to consider these statements prior to reading about the targeted information makes them aware of their current understanding and beliefs. As students read the new text, they will look for additional or novel text evidence to support or amend their views. It is important to note that the statements are not phrased in a true-or-false format,

which would ultimately require students to locate and know a single, correct answer. Rather, the statements are open to alternative viewpoints that can be supported with evidence from different sources.

During and after reading the text, teachers should instruct students to consider whether the author presented text-based evidence for particular positions on the key ideas or concepts. Students should be asked to evaluate the evidence in the text and elaborate on why their initial views could or could not be supported. According to researchers, this technique requires students to identify related background knowledge in their memories to link to the statements and provide adequate justification for their responses.²⁴ When used in connection with text reading, it encourages students to return to important information to obtain further elaboration for their responses.¹⁵

Activating students' thinking about key concepts prior to reading is particularly important for assisting English language learners and students with learning disabilities in drawing upon relevant knowledge that can be used to support comprehension of new and unfamiliar information.²² It also focuses students' attention on what is most important in the text so that they are not distracted by interesting but insignificant details.

Principle 4:

Teach students to use reading comprehension strategies while reading complex text.

Students benefit from using reading comprehension strategies while reading complex text. Without sufficient instruction, adolescents tend to proceed through text with little understanding of what they are reading or awareness of when their comprehension has broken down.^{25, 26} Students' understanding improves when they can recognize they are not adequately understanding text and use "fix-up" strategies to build comprehension.²⁷

Practice 1: *Instruct students to generate questions while reading to build comprehension.*

Teaching students to generate questions while reading is one way of getting them to stop at regular intervals to think about what is being communicated and how the information relates across paragraphs. Studies have shown that this practice can increase comprehension of content area text for students of different ability levels.^{7, 27, 28} Table 1 shows the different levels of questions students can be taught to generate in support of their comprehension. Level 1 questions are the most literal because they are based on a fact that can be identified in one place in the text. Level 2 questions require students to combine information that is located in two different parts of the text. Level 3 questions relate information in the text to something the reader has experienced or learned previously.

Resources for implementing Practice 1 can be found online at the Middle School Matters Institute website:

- Generating Leveled Questions
<https://greatmiddleschools.org/toolkits/reading/generating-leveled-questions/>

Practice 2: *Instruct students to generate main ideas at regular intervals in a text.*

Another means of encouraging students to be active readers and monitor their own comprehension is to teach them how to generate a main idea statement for single or multiple paragraphs and to use the key idea to make connections to previous and current learning.³¹ Adolescents who learn to identify the explicitly or implicitly stated main ideas of a text demonstrate increased understanding and recall of important information.³² Using a strategy referred to as *Paragraph Shrinking*³¹ or *Get the Gist*,²⁷ students at a range of ability levels and language backgrounds have been successfully taught to use three steps to generate a main idea statement:

1. Identify the key "who" or "what" that is the focus of the paragraph or section.
2. Determine the most important information about what the key person, place, or thing has, is, or does.
3. Succinctly state the "who" or "what" and most important information about him, her, or it in a sentence.

Get the Gist will also be addressed in Principle 8, Practice 1, which expands on this and other strategies by having students work collaboratively on reading tasks.

	Level 1: Right There	Level 2: Putting It Together	Level 3: Making Connections
English language arts	Who is Atticus Finch in <i>To Kill a Mockingbird</i> appointed to defend?	How does Boo Radley show kindness toward Jem and Scout?	How is Atticus Finch similar to and different from the father figure in <i>Much Ado About Nothing</i> ?
Mathematics	What information is given in the problem?	What math symbols/language/equations will I need to represent the problem statement?	How do I know if my solution is reasonable?
Science	What is the rate of change of velocity over time?	What are two vector quantities included in Newton's Laws?	How is physics related to other sciences?
Social studies	When did the Berlin Wall fall?	What two events led to the end of the Cold War?	How was the Cold War different from a conventional war?

TABLE 1. Levels of Questions to Support Reading Comprehension^{29, 30}

Principle 5:

Provide intensive reading interventions to students with reading problems.

Although the expectation is that students will learn to read with understanding before advancing to middle grades, the reality is that many students reach the middle grades and are unable to read grade level text effectively and with understanding.

Students in middle grades with demonstrated reading difficulties have performed significantly better in reading when provided supplemental reading interventions that directly address their vocabulary, comprehension, and word-reading challenges.^{32, 33, 34, 35} This includes students who are English language learners experiencing difficulty beyond what is attributable to their language proficiency levels.

Practice 1: *Identify students who are two or more grade levels behind in reading and provide daily reading intervention.*

Students who have reading difficulties should be provided with approximately 50 minutes per day of supplemental reading instruction delivered by a trained professional^b who is focused on the student's instructional needs.³³ The first step in providing students with specific interventions is to identify whether the student's reading comprehension difficulties are a function of:

- Word reading or decoding problems;
- Word meaning or vocabulary problems;
- Insufficient background knowledge to understand text;
- Unusually slow or dysfluent text reading; and/or
- Inadequate use of reading comprehension strategies to promote reading comprehension.

Through diagnostic assessment, teachers can determine which of the above are contributing to reading difficulties and target their instruction.

The following is a description of an intervention that was associated with improved outcomes among students in grades 6–8.^{33, 34, 36}

^b This type of intensive reading intervention should include a research- and evidence-based intervention with a professional educator specifically trained in the instructional approach. This instruction would be based on the student's needs identified through diagnostic assessment.

PRACTICE 1 EXAMPLE APPLICATION: Phase II and III of a Reading Intervention

In Phase II of the intervention, the emphasis of instruction was vocabulary and comprehension, with additional instruction and practice provided for applying the word study and fluency skills and strategies learned in Phase I. Lessons occurred over a period of 17–18 weeks, depending on student progress. Word study and vocabulary were taught through daily review of the word study strategies learned in Phase I by applying the sounds and strategy to reading new words. Focus on word meaning was also part of word reading practice. Additionally, students were taught word relatives and parts of speech (e.g., *politics*, *politician*, *politically*). Lastly, students reviewed how to apply word study skills to spell words correctly. Vocabulary words for instruction were chosen from the text read in the fluency and comprehension component.

Teachers used similar activities three days a week during social studies lessons. Two days a week, teachers used novels with lessons developed by the research team. Fluency and comprehension were taught, with an emphasis on reading and understanding text through discourse or writing. Students spent three days a week reading and practicing comprehension of expository social studies text, and two days a week reading and practicing comprehension of narrative text in novels. Content and vocabulary needed to understand the text were taught prior to reading. Students then read the text at least twice with an emphasis on reading for understanding. During and after the second reading, comprehension questions of varying levels of complexity and abstraction were discussed. Students also received explicit instruction in generating questions of varying levels of complexity and abstraction while reading (e.g., literal questions, questions requiring students to synthesize information from text, and questions requiring students to apply background knowledge to information in text), identifying main ideas, and summarizing text. Strategies for addressing multiple choice, short answer, and essay questions were also considered.

Phase III continued the instructional emphasis on vocabulary and comprehension, with more time spent on independent student application of skills and strategies. Phase III occurred over approximately 8–10 weeks.

Principle 6:

Guide students during text-related oral and written activities that support the interpretation, analysis, and summarization of text.

Students understand, remember, and analyze text when provided with opportunities to reflect on what they read through discussions and written responses.

Practice 1: Foster discussion among small groups of students.

To encourage reading for understanding, teachers should provide opportunities for students to return to texts a number of times to explore, discuss, and revise their developing understanding of the ideas and concepts.⁷ These opportunities can be fostered through the use of reciprocal teaching, a multi-component strategy intended to support student comprehension.^{37, 38} To implement reciprocal teaching, the teacher initially leads discussion about the text until students learn to assume different roles for independently engaging in small group discussions. These roles include summarizer, questioner, clarifier, or predictor. After reading a short section of text (generally a few paragraphs at first, but increasing to several pages with practice), the *summarizer* highlights the key points for the group. Then, the *questioner* helps the group consider and talk about what was read by posing questions about anything that was unclear, puzzling, or related to other information presented. In this portion of reciprocal teaching, students could apply the question generation skills addressed in Principle 1, Practice 2 (*Instruct students to ask questions while they are reading or when listening to the teacher read to monitor comprehension and learning*) and Principle 4, Practice 1 (*Instruct students to generate questions while reading to build comprehension*) that will support asking about more than surface-level information.

The *clarifier* in the small group of students is responsible for seeking out portions of text that will help answer the questions just posed, although all members of the group participate in discussing the information and connecting ideas. By interacting in this way, students are driven back to the current selection and possibly, to other readings to look for text evidence in support of their responses. Finally, the *predictor* offers suggestions about what the group can expect to read in the next section of text. These suggestions activate relevant background knowledge, set a purpose for reading, and relate new information to that just discussed by the group.

It is important to explicitly teach each of the strategies or roles involved in reciprocal teaching before having students carry them out. Training in the procedures has led to greater reading comprehension outcomes for English language learners.³⁹

Practice 2: Instruct students in how to summarize text.

Summarizing text involves succinctly and coherently relating the main ideas and significant details of a passage. When adolescents are explicitly taught to work collaboratively on summarizing informational text, such as is done in reciprocal teaching, they reach higher levels of comprehension and retain more content information.^{27, 40, 41}

Teachers must thoroughly explain and model each step in the summarizing process multiple times with different types of text before students will be able to generate a summary in collaborative groups or, eventually, on their own. The following is an example of steps students can learn to follow to create a summary of text.⁴²

PRACTICE 2 EXAMPLE APPLICATION: Instruction in Summarizing Text

Using the following steps, students can learn to create a summary of text:

1. List all the main ideas in the passage.
 2. Underline the most important terms or phrases in the main ideas or cross out any information that is less significant.
 3. Combine related terms and phrases, and any significant details that can create a complete sentence. Repeat this step until all important information has been combined into sentences.
 4. Number the sentences in an order that will make sense and reflect the organization of the ideas in the text.
 5. Write a complete paragraph containing the sentences.
 6. Revise and/or edit the paragraph to finalize the summary.
-

Practice 3: *Enhance text understanding through teacher-guided conversations.*

Structured opportunities for students to interact with their teacher and peers in discussions about texts have been found to improve content learning and reading comprehension as well as the language acquisition of English language learners.^{15, 43} One approach called, “Questioning the Author” provides students with well-scaffolded instruction that supports their interactions with texts and with other students in the class as though the author were available to them for comment and conversations.⁴⁴ This approach is different from the self-questioning practices described in Principles 1 and 4, in part because it is more narrowly focused on the clarity and organization of the message being communicated by the author. The idea is to have students actively engage with text and think about the information and the way it is written from multiple perspectives. Students ask and answer questions in a lively teacher-led discussion. The teacher provides several distinct goals for reading and several queries that facilitate students’ success in reaching these goals.

The following procedures are necessary:

1. Select an engaging text that is either narrative or expository.
2. Assure students have adequate background knowledge to understand the text.
3. Identify key ideas and concepts prior to reading to support understanding and deep thinking about text.
4. Teach students to grapple with ideas while reading and evaluate how well and thoroughly an author communicated particular ideas. Also, teach them to watch for bias or lack of representation of alternate views in the writing.
5. Have students share what they are reading through discussion but focus on understanding the text—not on the discussion per se.
6. Direct the discussion through questions such as, “What is the author trying to tell us?” and “Why do you think the author is saying that?”
7. Guide students in learning that the text is relevant but an inadequate source of all information.

It is believed that below grade-level readers are empowered by these types of interactions, because they profit not only from hearing their peers’ interpretations of text but also from observing other classmates work through issues comprehending text.⁴⁵

Principle 7:

Maximize opportunities for students to read and connect a range of texts.

Middle grades teachers have a range of readers in their classrooms, creating challenges when assignments require text reading. For this reason and possibly others, many classroom teachers require students to read very little either inside or outside of class time. Teachers also report that they increasingly rely on reading text aloud or using media, such as videos, to provide students with content knowledge because they perceive text reading as inaccessible to many students.⁴⁶ Yet for students to acquire skill in reading and understanding text, they must have opportunities to read a range of text types (e.g., textbooks, letters, descriptions, original documents, poetry). Findings of a study comparing teacher read-alouds to student silent reading of informational text suggest that students provided effective vocabulary and comprehension instruction can understand and recall content equally well when reading text silently.⁸ Teachers should consider implementing the following practices to enhance opportunities for students to read and respond to text.

Practice 1: *Provide an advanced organizer of the key ideas and key words to better prepare students to read text.*

Teachers can facilitate activation of students' background knowledge and supplement this background knowledge prior to reading. This is not the same as "front loading" where teachers tell students what they are going to read prior to reading. Activating and extending background knowledge assists students in successfully preparing to understand and learn from what they read.^{15, 21} Teachers can present (e.g., orally, on the board, or through a handout) and explain the key ideas and words, including any proper nouns, prior to reading. This will help correct any misconceptions and reduce the distraction of insignificant details. It will also help students understand

the vocabulary and focus on comprehending what they are reading. Activating and supplementing background knowledge, such as by using advanced organizers, is particularly important for English language learners and students with learning disabilities.^{22, 23}

Practice 2: *Read for a specified amount of time (e.g., 3 minutes) and then provide a prompt for student response.*

The amount of cumulative reading students do is associated with academic achievement.⁴⁷ Teachers should provide daily opportunities for students to read and respond to text for instructional purposes. The time allocated for this exercise can range from a minimum of 2 minutes for reading and 1 minute for responding, to multiple intervals of 3–4 minutes for reading and 1–2 minutes for responding.⁸ Students can be asked to respond to predetermined prompts such as, "What is the 'big idea' or main point of this section?", "How does the author describe _____?", or "What did you learn about _____?" Students can respond in writing using learning logs or orally by turning and talking with a partner for 1 minute.

Practice 3: *Have students participate in partner reading.*

Teachers can create reading partners by pairing a stronger reader and a slightly weaker reader, and then ask the pairs to take turns reading the same passage, with the better reader going first. Students can partner read for a specified amount of time (e.g., 3 minutes) and afterwards use 1–2 minutes to write about the main idea, write and answer a question, or summarize the text.³³ Repeatedly reading the text has the advantage of offering English language learners and those with reading difficulties a chance to (1) hear a peer model reading, (2) practice their own skills in reading aloud, and (3) review content multiple times to increase their understanding of new information.⁴⁸

Principle 8:

Organize students into collaborative groups for reading tasks.

Student involvement and learning can be enhanced through well-structured collaborative groups.^{41, 49} These groups can be designed to promote both individual and group accountability, and they can be used in English language arts, mathematics, social studies, and science classes. According to research, when collaborative groups are implemented two or more times per week, reading comprehension improves.²⁷

Practice 1: *Implement collaborative groups with strategic reading practices to improve student outcomes.*

Opportunities for students to collaborate with their peers can be beneficial if structured appropriately. Some teachers ask students to work initially in pairs and then move into a group; other teachers find it better to start with small cooperative groups. One example of a reading comprehension practice that uses collaborative grouping structures is Collaborative Strategic Reading (CSR) which has two important phases: Phase One, where students learn four reading comprehension strategies, and Phase Two where students work in groups to apply what they have learned.²⁷

The four reading comprehension strategies taught in the first phase include previewing text (*preview*), monitoring comprehension while reading by identifying key words and concepts that are challenging (*click*, when students understand the words; *clunk*, words students have trouble understanding), thinking about the main idea while reading and putting it into your own words (*get the gist*), and summarizing text understanding after you read (*wrap up*). Once students have developed proficiency using the four strategies with teacher guidance, they are ready to use these same strategies in peer-led cooperative learning groups.

Organizing Cooperative Groups: Experienced teachers are aware that students will not function equally well in a group and that groups are more effective when teachers carefully select students to make a well-functioning team. When implementing CSR, teachers assign approximately four students to each group with the following considerations: (1) each group should have a student who can serve as group leader, and (2) the group should consist of members with varying reading abilities. Teachers assign students to roles in the group and teach them to perform those roles. Assignment of group members rotates on a regular basis (e.g., every couple of weeks) so that students can experience a variety of roles. It is important that English language learners and students with learning disabilities be full participants and not be relegated to the easiest role all the time.⁵⁰ With appropriate support, all students can take responsibility for leading application of each of the four strategies in Collaborative Strategic Reading. Student roles help ensure that all group members have a meaningful task and participate in the group's success.

Resources for implementing this practice can be found online at the Middle School Matters Institute website:

- Collaborative Strategic Reading (CSR)
<https://greatmiddleschools.org/toolkits/reading/csr/>

What is the teacher's role when students are working in their cooperative groups? Teaching students their roles and how to implement them effectively within a cooperative group is an important first step. When students are working in their collaborative groups, the teacher's role is to circulate among the groups, listen to students' participation, read students' learning logs and, most importantly, provide clear and specific feedback to improve the use and application of the strategies. Teachers can help by actively listening to students' conversations and clarifying difficult words, encouraging students to participate, and modeling strategy usage and application.

PRACTICE 1 EXAMPLE APPLICATION: Four Roles for Students During Group Work

- 1. Leader:** Provides overall group management that includes keeping students engaged, guiding the group through the reading, and assuring strategy experts are doing their tasks and students are using their learning logs.
 - 2. Clunk Expert:** Reminds students to look for clunks as they read and use strategies to resolve clunks.
 - 3. Gist Expert:** Assures that students determine the most important “who” or “what” in the section of text they are reading and then identify key information to include in writing gists. The Gist Expert guides students to write gists with the most important information and no unnecessary details.
 - 4. Question Expert:** Helps students write and answer questions about the entire text they have read. Question Experts may use question stems (discussed in Principle 1, Practice 2) to help members of their group write successful questions.
-

PRACTICE 1 EXAMPLE APPLICATION: Learning Logs

It is expected that students will need assistance learning to work in cooperative groups, implementing the strategies, and mastering academic content. One way to provide structure is through the use of learning logs.²⁷ A learning log, or written record, promotes effective implementation of cooperative groups. A learning log can be revised or developed to suit the particular focus of the classroom teacher, but typically, learning logs provide a procedure for students to record key information about each of the four strategies: preview, click and clunk, get the gist, and wrap up. They also provide written documentation of the groups' functioning for the teacher to review. An example of a learning log template is provided in Figure 4.

Sample Learning Log	
Name: _____	Date: _____
Brainstorm: What do you know about this topic?	Predict: What do you think you will learn by reading this passage?
Clunks: List your Clunks for each section you read.	
The Gist (main idea): Write a Gist for each section you read.	
Write questions: Write questions using Who, What, Where, When, Why, or How.	Review: Write a summary of the most important information you learned.

Source: Adapted from Texas Center for Reading and Language Arts. (2000).⁵¹ For use in the classroom, this figure should be expanded to fill an entire page.

FIGURE 4. Sample Learning Log

PRACTICE 1 EXAMPLE APPLICATION: Steps for Applying Cooperative Learning Groups

1. Provide students with ample opportunity to practice the four strategies (preview, click and clunk, get the gist, and wrap up) so that they are sufficiently familiar with using them and, with prompting and support, can perform them independently in their groups.
 2. Assign students to mixed ability groups with a composition of talent and personality that allows them to be functional.
 3. Assign roles to group members. Typically having four students in each group works well, with each student assigned one of these roles: leader, clunk expert, gist expert, and question expert.
 4. Before assigning students to groups and after teaching the strategies, provide a model for how the group should work by selecting students to role play in front of the class.
-

Practice 2: *Implement team-based learning to clarify, apply, and extend students' understanding of text and content.*

Team-based learning (TBL) offers another means of having students work in collaborative groups.⁵⁴ To implement TBL for reading comprehension, teachers heterogeneously group four to five students to work together at least once every 10 days on a deeper examination of text. After providing explicit instruction in important words (see Principle 2, Practice 1) and building background knowledge (see Principle 3), teachers pose a complex question designed to guide students' learning of the content in a unit. For example, an American history teacher might ask, "Why were the American colonists willing to fight for their independence from the British?" Teachers lead an initial discussion about the question to prepare students to read the text and check students' understanding while they read the text.

A TBL Knowledge Application activity offers the small group of students an opportunity to return to the text after reading it to consider different perspectives, solve problems, or present conclusions.¹¹ In the American history class, students might be asked to compare two primary sources to examine Patrick Henry's and John Dickinson's perspectives on whether to separate the colonies from Britain and declare their independence. After working together to gather text evidence on the issues surrounding independence from England, the team would have to prepare a speech for the Second Continental Congress, either supporting independence or urging unity. The team would prepare arguments by using all information, readings, discussions, and activities from across the unit of instruction. Students would also prepare to address opposing arguments offered by teachers or fellow classmates.

The teacher would close the TBL Knowledge Application activity by returning to the complex question posed at the beginning of the unit and facilitating a final discussion of that question among students.

Principle 9:

Discontinue using practices that are NOT associated with improved outcomes for students.

Teachers and educational leaders are required to make daily decisions about students' learning and behavior. While educators would prefer to rely on evidence-based practice, determining what constitutes evidence-based practice can be a confusing and haphazard enterprise. Typically, educational leaders or teachers attend a conference or other educational venue and discover a new practice they hope will solve a problem. Often they are successful at promoting the implementation of this practice at the district- or school-level, resulting in professional development and other trainings to prepare teachers to implement the practice. New ideas and practices provide hope that change can benefit students. However, many of these ideas and practices are unproven and, therefore, result in false hopes for educators and disappointing outcomes for students.

Practice 1: *Take stock of all of the instructional practices and models that teachers are currently implementing and determine whether they are necessary and associated with improved outcomes for students.*

After making a list of all the reading-related practices you are using, determine if adequate evidence supports their continued use. This evidence may be derived from published studies that document effects of the specified treatment or from analyzing data in your school or district database that indicate how students are performing.

One common practice in middle grades is to attempt to assess and use learning styles as a means of enhancing outcomes, particularly for students from diverse linguistic and cultural backgrounds and students with special needs. Recent reports support considering students' individual learning needs and maximizing opportunities for all students to learn. However, the vast majority of instruments designed for educators to determine students' learning styles have no demonstrated reliability or validity.⁵² Furthermore, many of the practices recommended to enhance instruction linked to the learning styles of students have no demonstrated efficacy or clear connection to pedagogy.⁵³

The following website is a reliable place to identify evidence-based practices.

What Works Clearinghouse: <http://ies.ed.gov/ncee/wwc/>

Conclusion

The interpretation of the practical implications for the research on reading and reading interventions designed for use in the middle grades was derived from many sources and syntheses. In particular, the following syntheses were influential:

- Flynn, L. J., Zheng, X., & Lee, S. H. (2012). Instructing struggling older readers: A selective meta-analysis of intervention research. *Learning Disabilities Research & Practice*, 27, 21-32. doi:10.1111/j.1540-5826.2011.00347.x³²
- Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). *Improving adolescent literacy: Effective classroom and intervention practices: A practice guide* (NCEE 2008-4027). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/pdf/practice_guides/adlit_pg_082608.pdf¹
- Wanzek, J., Vaughn, S., Scamacca, N. K., Metz, K., Murray, C. S., Roberts, G., & Danielson, L. (2013). Extensive reading interventions for students with reading difficulties after grade 3. *Review of Educational Research*, 83(2), 163-195. doi:10.3102/0034654313477212³⁵

Multiple research studies informed the principles and practices presented in this section. The level of evidence for the findings ranges from relatively low to moderately high. However, for many of the practices, the findings are proximal to the tasks taught.⁴¹ For example, research on teaching word meanings in content area classes indicates that words that are deliberately taught and practiced are more likely to be learned than when not taught; however, less is known about the overall influence of these practices on vocabulary learning more broadly.⁵⁵

There is a moderately high level of evidence for teaching students to use reading comprehension strategies while reading text.⁴¹ Less is known, however, about how many strategies are necessary and whether the use of strategies generalizes to other types of reading. It is known that providing students with more background knowledge about a topic makes them more likely to comprehend texts on the topic. However, precise methods for extending background knowledge across the range of topics students are required to read and learn is less well understood.^{15, 21, 22, 23} It is known that students who demonstrate reading difficulties in the middle grades are responsive to interventions.³³ However, these interventions may require more extensive (multiple years) and intensive (daily small groups) instruction than schools currently have the resources to support.^{34, 35} No principle has been suggested for which there are not caveats and requirements for future research. These principles are based on the best and most current research, and schools implementing them in sensible and contextually responsive ways are likely to yield benefits for student learning.

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Writing and Writing Intervention

To be effective writers in the middle grades, students must understand that writing is a tool to support learning in all content areas. Students must master writing processes, knowledge, and skills to improve their effectiveness as writers. What follows is a description of seven important principles to help middle grades students develop their skills as writers and their use of writing to support their learning.

The first principle for Writing and Writing Interventions describes research- and evidence-based practices for using writing in all content areas. These practices include taking notes, summarizing what is learned, writing for specific purposes, and answering questions. The second principle defines the characteristics of a good writer, describes the writing and revision process, and provides specific examples of strategies to help writers improve. The third principle provides research- and evidence-based strategies for writing with a word processor and for developing keyboarding skills. The fourth principle provides practical ways to assess student writing that provide feedback to improve their writing and opportunities for them to assess their own writing and the writing of other students. The fourth principle also stresses the importance of assessing writing to identify students with writing difficulties who will need extra, intensive writing instruction.

The fifth principle describes methods for providing more intensive writing instruction to students who are in need of writing intervention because of difficulties in this area. The sixth principle cautions against traditional approaches to teaching grammar skills. Finally, the seventh principle examines ways to improve how writing is taught through professional development and opportunities for teachers to work together to contribute to the success of the middle grades writing program. Each principle is described and accompanied by specific practices and examples for schools to follow.

Principle 1:

Establish consistent school wide practices for using writing as a tool to support student learning in all content areas.

Writing about material read and presented in content classes improves students' learning and understanding.^{1, 2, 3, 4} Writing about ideas presented in a class or classroom text enhances learning because it affords greater opportunities for students to think about the ideas; requires them to organize and integrate the ideas into a coherent whole; fosters explicitness; facilitates reflection; encourages personal involvement with the concepts to be learned; and involves students transforming ideas into their own words.⁵ Moreover, when students paraphrase and convert text into their own words, they are not simply engaged in rote learning—a shallow form of learning.^{6, 7, 8, 9} To ensure that writing to learn occurs in all content areas, it needs to be a school wide goal.

Practice 1: *Ask students to analyze, interpret, or personalize in writing information that has been read or presented.*

When students write analyses, interpretations, and personal responses to reading and material presented in class, they develop broader and better understanding of that material. Examples of writing activities that encompass analysis and interpretation include: (1) analyzing and interpreting the motivations of a character in a novel; (2) writing a paper to show how to apply ideas presented in a science or mathematics class; and (3) analyzing material presented in a social studies class to develop a particular point of view. Examples of personal responses include writing a personal reaction to a historical event or writing about a personal experience related to material read or presented.

Practice 2: *Ask students to provide written summaries of material read or presented in class.*

Written summaries of material read or presented in class require students to consider the fundamental essence of the material. Students need to make decisions about which material is most important and how ideas are related one to another. The permanence of a written summary creates an external record of this synopsis that can be readily critiqued and reworked. As a result, summary writing improves comprehension of the material being summarized.

Practice 3: *Ask students to take written notes about material read or presented in class.*

Taking written notes about material read or presented in class enhances understanding. Note taking involves determining which information is most relevant and then transforming and reducing the substance of these ideas into written phrases or key words. Note taking requires students to organize the abstracted material in some way and connect one idea to another. They can then blend new information with their own knowledge to come to new and deeper understandings.

Practice 4: *Ask students to answer questions in writing about material read or presented in class.*

Answering questions about text or material presented in class can be done verbally, but there is greater benefit from answering questions in writing. Recording answers makes them more memorable, as writing an answer provides a second form of rehearsal. Written answers can then be available for review, re-evaluation, and reconstruction at a later date. In addition, having students create their own written questions to answer in writing can improve understanding because it requires students to think about what information is most important.

PRACTICE 1 EXAMPLE APPLICATION: Analyzing, Interpreting, or Personalizing in Writing Information Read or Presented in Class

Before, during, and/or after reading material for a class or participating in a classroom activity, students are asked to use writing to analyze, interpret, and/or personalize ideas. For example, before completing a science experiment, students are asked to write their predictions and rationale for each prediction. During the experiment, they are asked to revisit their predictions and justifications and revise as necessary. Once the experiment is completed, students revise their written predictions as needed and explain in writing the reasons for these changes. At each point, students' written predictions and justifications or explanations are used to foster discussion about students' beliefs, as well as their misconceptions about the topic of the science experiment.

Other examples of analyzing, interpreting, and personalizing writing activities that content teachers can use to promote student learning are listed below. Each of these activities can be used as a springboard for class discussion about the topic.

- **Guided journal writing:** As students read a short story for their language arts class, they keep a journal where they respond to it by answering one or more open-ended questions. For example, they can be asked to analyze why they think a character acted as he or she did and indicate what they would do in a similar situation and why.
 - **Analytic essay:** After a classroom presentation about the causes of the American Revolution, students might be asked to write an essay in which they identify what they think are the three main causes of the conflict and explain the contribution of each.
 - **Application essay:** After studying the principles underlying the operation of an inclined plane, students are asked to indicate in writing how they would use this principle to climb a hill, design a ramp to move material from a lower spot to a higher one, or design a plow.
-

PRACTICE 2 EXAMPLE APPLICATION: How to Teach Students to Summarize Material Read or Presented in Class

Students can be directly taught the following rules for how to write a summary:

- Identify or select the main information.
- Delete trivial information.
- Delete redundant information.
- Write a short synopsis of the main idea and supporting information for each paragraph.

A good starting point for teaching these rules is to begin with a paragraph of text. The teacher first explains each summary rule and its purposes. Use of the rules is then modeled as the teacher applies them to producing a summary of the paragraph. Modeling continues until students are ready to summarize paragraphs with teacher assistance. Guided practice continues until students can effectively apply the rules to summarize paragraphs by themselves. The teacher and class then begin to apply the rules to longer text, as well as class lectures.

Students can be directly taught how to write a summary using an outline as the starting point of the summary.

With this approach, summarizing centers on the creation of a skeleton outline of the material. For example, when summarizing text, students begin by creating a skeleton outline, starting with a thesis statement for the passage. Next, they generate main idea subheadings for each section of the text and add two or three important details for each main idea. They then convert their outline into a written summary of the whole text. As with the example of teaching summarization rules above, instruction begins with the teacher explaining the skeleton outline procedure and its purpose, modeling how to apply it, providing guided practices until students can apply it independently, and expanding its use to different types of text and classroom presentations.

PRACTICE 3 EXAMPLE APPLICATION: Structured Note-taking Procedures

Structured note taking involves creating a written organizational structure for material read or presented in class.

The Cornell Note-Taking Method

1. With this note-taking system, students divide their paper into two columns: a note-taking column on the right and a question and/or key word column on the left. The bottom two inches of the page are left blank and are not divided by the line between the two sections. This will later serve as a summary section for the notes.
2. Notes from class or from reading material are written in the right-hand column (i.e., note-taking column). These notes are paraphrased from the main ideas of the text or lecture. In addition to text, symbols and abbreviations can also be used to record information.
3. Relevant questions or key words that will help with future study are written in the left-hand column.
4. After notes have been completed, students can write a brief summary on the bottom two inches of the page. When using the notes as a study aid, students can cover up the note-taking column to answer questions or define key words on the left side of the page.
5. The Cornell note-taking method needs to be explicitly taught, with teachers describing the procedure and its rationale, modeling how to apply it, and providing guided practice in its use.

Concept Mapping

Concept mapping is another approach for helping students organize their notes about material read or presented in class. Students place each important concept in a circle and then show how the concepts link together using words and lines. One way of teaching this strategy is to first present a model of an *expert concept map* for a particular reading. After discussing this map, students then practice completing other *expert maps* that are incomplete, moving from more to less complete maps, until they can create their own map for material read.

1. Students are introduced to expert-created models.
 2. Students complete partially filled in expert models.
 3. Students are given word lists and concept links to help them create their own concept maps.
 4. Students create concept maps independently.
-

PRACTICE 4 EXAMPLE APPLICATION: Answering Questions in Writing and Teaching Students to Generate Their Own Written Questions

Answering questions in writing involves writing responses to questions given at specific points during a classroom activity (before, during, or after) or questions inserted into text or presented at the end of it. For example, students may be asked to write short answers in full sentences to four questions (one detail, two inferences, and one main idea) after reading a segment of text, after which they check and correct their responses before reading the next segment of text.

Generating questions in writing is a strategy in which students create written questions about information presented in class or material read. For instance, when teaching students to write and answer questions about material read, they are first taught the difference between a good and bad question. They then practice generating and answering their own questions about text. If they cannot answer one of their questions, they generate a new one that can be answered. A sequence for teaching this question-generation strategy is presented below:

1. Students are given models of questions written by the teacher.
 2. Students identify good and poor questions, indicating why each is good or poor.
 3. Students are taught to identify main ideas that serve as the core of the questions they will generate.
 4. The teacher models how to generate good questions.
 5. Students practice generating questions with teacher assistance until they can do so effectively.
-

Principle 2:

Explicitly and systematically teach students the processes, knowledge, and skills of effective writing.

To write effectively and use writing as a tool to support learning, students must master basic writing processes, knowledge, and skills.¹⁰ Students must be knowledgeable about the characteristics of good writing and the features of specific types of text (e.g., persuasive writing), and they must possess effective strategies for planning, drafting, revising, editing, and sharing such texts. Students must be able to construct sentences that are grammatically correct and accurately express their intended meaning and purpose. Basic writing skills, such as spelling, must be mastered so that they do not interfere with other writing processes. Because writing tasks are contextually bound (e.g., the nature of persuasive writing differs across disciplines), teachers in each discipline must take responsibility for teaching students how to use writing in their discipline, and such efforts need to be coordinated across departments within a school.

Practice 1: *Analyze and emulate model text to discover the characteristics of good writing and the features of specific types of text.*

Students' writing is influenced by their knowledge of the characteristics of good writing and of the specific text type they are creating.^{11, 12} Students can acquire this knowledge by analyzing and emulating exemplary models.^{3, 13, 14} Research suggests that the use of models is an effective strategy for providing middle grades students with illustrations of genre-specific features, such as the essential elements of a persuasive argument, as well as for developing their awareness of more general aspects of good writing, such as word choice and sentence construction. Having students analyze model text also provides teachers with an authentic segue into another beneficial strategy: establishing specific product goals.^{15, 16} Given the relative ease and demonstrated efficacy

associated with using models and product goals, teachers should consider using these two procedures with each type of writing they expect from their students.

To realize the benefits of using models, teachers should first clarify exactly what they want students to learn. For instance, a social studies teacher who will be teaching students how to write a persuasive argument might begin by reviewing the relevant grade-level standards. With that framework in mind, the teacher would next select several model texts that effectively illustrate those criteria. Several kinds of texts can serve as models, including compositions that teachers write specifically for the purpose of modeling, writing samples from students themselves, and authentic texts. Many middle grades teachers find that authentic texts related to topics students find personally relevant and interesting work well as initial models. The social studies teacher might, therefore, select several recent newspaper editorials about potential cuts in school funding because students have expressed sincere interest and concern about how this reduction affects them.

As noted previously, teachers can readily pair the use of models with another strategy shown to improve middle grades student writing—establishing product goals.¹⁴ Research suggests that goals are most effective when they are specific and at a level of difficulty that is challenging, yet attainable.¹³ Given that students in most middle grades classrooms represent a range of writing proficiency levels, it is often necessary and beneficial to use a combination of common goals (i.e., features and qualities of writing that apply to all students in the class) and individualized goals (i.e., features and qualities of writing that are selected based on each student's strengths and needs).

Using the previous persuasive writing example, the class-developed list of "Must Haves!" could serve as the framework for common goals. Collaboratively, the teacher and each student (or, in some instances, the teacher and a small group of students who have similar writing strengths and needs) would identify additional individualized goals. As students' writing skills develop, their goals should be

revised to ensure they remain appropriately challenging. As will be described in Principle 4, specific product goals can be used as a guide for assessing student growth.

PRACTICE 1 EXAMPLE APPLICATION: Model Texts

To initiate students' analysis of model texts, the social studies teacher could interactively think aloud and pose questions that direct students' attention to the targeted text elements and qualities.

I see the author started with a series of questions. Why do you think that is? What does the author do in this section to convince us of her position? How do the content and format of this author's conclusion compare and contrast with the others we've examined?

Once students develop a basic understanding of the criteria in question, the teacher could then facilitate a class discussion that results in the development of a list of essential features (or what students might refer to as "Must Haves!") for persuasive arguments based on the analysis of the newspaper editorials. For example, they might generate the following five features:

1. An introduction that gives the position.
2. Multiple reasons that make sense and have details.
3. Evidence and examples for each reason.
4. Possible arguments against the position.
5. A convincing conclusion.

Working in pairs or small groups, students could next analyze other model texts. What follows is an example of how the teacher could guide and support students during this activity by breaking it down into a two-step process.

Step #1: As you read the text, use colored pencils to underline each "Must Have!" for a persuasive argument.

- An introduction that gives the position. RED
- Multiple reasons that make sense and have details. BLUE (Number each R1, R2, R3...etc.)
- Evidence and examples for each reason. GREEN (Number each R1-D1, R1-D2...etc.)
- Possible arguments against the position. PURPLE
- A convincing conclusion. BROWN

Step #2: Look back at the text and answer the following questions:

1. Did the author include all of the “Must Haves!”? If not, what was missing?
 2. What do you think the author did well?
 3. What recommendations would you offer to the author to improve the text?
-

PRACTICE 1 EXAMPLE APPLICATION: Establishing Product Goals

Below are examples of persuasive argument goals for two students. Each reflects the common goals established by the social studies class (i.e., “Must Haves”) but is individualized to meet the students’ unique needs.

Aida.

Aida includes few, if any, of the necessary elements in her persuasive writing and expresses herself using very simplistic language. Therefore, her goals are:

- Include an introduction that gives my position.
- Include at least three reasons that make sense and have details.
- Include evidence and examples for each reason.
- Include a possible argument against my position.
- Include a convincing conclusion.
- Use exciting, interesting, “come to life” words to make my argument more convincing.

Miguel.

Miguel’s persuasive arguments already include most of the key elements, but his sentence structure tends to be repetitive and he does not include transitions between ideas or paragraphs. Therefore, his goals are:

1. Include an “attention grabber” introduction that gives my position.
 2. Include at least five reasons that make sense and have vivid details.
 3. Include evidence and examples for each reason.
 4. Include at least two arguments against my position.
 5. Include a “hit it home” convincing conclusion.
 6. Use different kinds of sentences—including questions—throughout the text.
 7. Use transition words to guide the reader.
-

Practice 2: Model and teach strategies for planning, drafting, revising, editing, and publishing written work.

In order to write effectively, students need to learn a variety of strategies for carrying out the various processes involved in writing.¹⁰ Strategies for planning, drafting, revising, editing, and publishing text are among the key elements that students must learn. Students also need to learn to use these strategies flexibly, selecting the right strategy for a specific task and effectively adapting selected strategies as needed. Teachers should employ a gradual-release model when teaching writing strategies, where the strategy and its rationale are described and discussed, the strategy is modeled by the teacher, guided practice in applying the strategy is provided, and deciding when and how to apply the strategy in new writing situations is emphasized.

Explicitly teaching middle grades students how to use writing strategies has a dramatic effect on multiple aspects of writing, including overall quality, length, number of genre elements, and time spent planning.^{3, 11, 18, 19} Teachers interested in helping their students become strategic writers need to first identify what strategy or strategies would be appropriate and beneficial for students to learn. For instance, different strategies would need to be selected for situations in which one or two students experience difficulty brainstorming and organizing their ideas, versus a small group of students struggling to accomplish a specific writing task, versus an entire class finding it extremely difficult to revise writing in meaningful ways.

Along with considering the strategy that should be taught, teachers need to decide which instructional approach is most likely to help students learn to independently apply the strategy. A substantial body of empirical research shows that one specific instructional model, Self-Regulated Strategy Development (SRSD), is particularly effective with diverse populations of students, including those who are in middle school.^{3, 11, 13, 17, 19, 20} SRSD uses explicit and systematic instruction to help students learn strategies for planning, drafting, and revising text, as well

as strategies for accomplishing specific writing tasks, such as writing a persuasive argument or expository essay. With SRSD, students increase their writing knowledge and learn to use the same self-regulation procedures that skilled writers rely on to manage the writing process (e.g., goal setting, self-monitoring, self-instruction, self-reinforcement). Other noteworthy characteristics of SRSD include individualized instruction, criterion-based rather than time-based learning, authentic writing tasks, a positive classroom environment, and collaboration among teachers and students. SRSD instruction occurs in six flexible, recursive stages:

1. **Develop Background Knowledge:** Students are taught relevant background knowledge they will need to understand and use the strategy successfully.
2. **Discuss It:** The strategy is introduced and its purpose and benefits are described and discussed.
3. **Model It:** Teacher, peer, and/or collaborative modeling are employed to show how the strategy is used.
4. **Memorize It:** Students engage in a variety of activities to learn the steps of the strategy.
5. **Support It:** The students practice using the strategy in a series of scaffolded composing activities.
6. **Independent Use:** Students independently apply the strategy in appropriate contexts.

Many SRSD strategies include mnemonics to help students remember and apply the steps. An example of one SRSD strategy to improve middle grades students' expository writing is shown in Figure 1 (additional SRSD examples are described in Practice 5 and can be found in the work of Graham, Harris, and colleagues).^{17, 21}

Three excellent Web-based resources for learning more about SRSD follow:

Project Write

<http://www.kc.vanderbilt.edu/projectwrite>

The Iris Center: Self-Regulated Strategy Development (SRSD)

<http://iris.peabody.vanderbilt.edu/module/srs/>

The Iris Center: Improving Writing Performance

<http://iris.peabody.vanderbilt.edu/module/pow/>

Resources for implementing this practice can be found at the Middle School Matters Institute website:

- **Writing Strategies and Self-Regulated Strategy Development Toolkit**
<https://greatmiddleschools.org/toolkits/writing/writing-strategies-and-srsd/>

PLAN & WRITE: A Strategy for Planning and Drafting Expository Essays

How do you plan a good essay? Follow steps in PLAN :	
P ay Attention to the Prompt	Read the prompt. Decide what you are being asked to write about and how you will develop your essay.
L ist Main Ideas	Brainstorm possible responses to the prompt. Decide on one topic and then brainstorm at least ____ main ideas for the development of your essay.
A dd Supporting Ideas	Think of details, examples, or elaborations that support your main ideas.
N umber Your Ideas	Number major points in the order you will use them.
How do you plan more as you go? Follow steps in WRITE :	
W ork from your plan to develop a thesis statement.	
R emember your goals.	
I nclude transition words for each paragraph.	
T ry to use different kinds of sentences.	
E xciting, interesting, million-dollar words should be used.	

FIGURE 1. Example of Self-Regulated Strategy Development Strategy.^{22, 23, 24, 25}

Practice 3: *Teach students how to construct more complex sentences.*

A basic skill is crafting ideas into sentences that accurately express the writer's meaning and intention.¹⁰ This skill requires being able to use a variety of different types of sentences, ranging from simple to complex, to create text that is clear and can be read fluidly. Strategies for teaching sentence construction skills include teaching students how to combine simpler sentences into more complex ones; deconstructing complex sentences into simpler ones; and expanding sentences by including additional details in an existing sentence. One benefit of these strategies is that usage and grammar skills are acquired as a byproduct of combining, deconstructing, and expanding sentences.^{25, 26} Teachers should employ a gradual-release model in which the sentence construction skill is modeled and students are provided guided practice in applying it, as it is essential that instruction include students applying the taught skill to their own writing in order for them to truly grasp the concept.²⁷

Resources for implementing this practice can be found at the Middle School Matters Institute website:

- **Sentence Combining Toolkit**
<https://greatmiddleschools.org/toolkits/writing/sentence-combining/>

PRACTICE 3 EXAMPLE APPLICATION: Sentence Combining Skills Instruction

Targeted sentence skill: Constructing a sentence with an adverbial clause, using a connecting word (*because, after, until, and when*).

Sentence combining involves teaching students to construct more complex and sophisticated sentences through exercises in which two or more basic sentences are combined into a single sentence. To teach students how to write a complex sentence with an adverbial clause using a connecting word, the teacher first models how to combine two smaller sentences that allow such a construction. Modeling may involve a single connecting word (e.g., *because*) or provide several connecting words from which the teacher makes a choice (e.g., *because, until, when*).

Model combining: “My friends went to the fair.”

 “My friends wanted to have fun.” (because)

Into one sentence: “My friends went to the fair because they wanted to have fun.”

The teacher should continue to model combining such sentences, but ask the students for help. Once students have mastered the basic idea through teacher modeling, they should practice combining similar small sentences into a single complex sentence with an adverbial clause. This practice can be done independently, in small groups, or both. Teachers should provide students with needed assistance and feedback on the correctness of their combinations. Very importantly, students should be asked to apply what they learned in their writing. This can be done by asking them to revise a prior piece of writing so that they combine smaller sentences into a complex sentence with an adverbial clause using connected words, or by asking them to write new text where they demonstrate the use of this skill. This basic teaching format (Figure 2) can be used to teach a variety of different kind of sentences.

Teaching Format	Action
Model	Demonstrate the skill and establish why it is important.
Guided Practice	Provide students with assistance until they can apply the skill correctly and independently.
Application	Ask students to apply the skill when they write (monitor performance and provide individualized support, as needed).

FIGURE 2. Sample Teaching Format for Teaching Different Kinds of Sentences

Practice 4: *Refine students' spelling, grammar, and usage skills.*

Judgments about the quality of a student's writing are influenced by factors other than the quality and organization of their ideas. Papers with spelling, grammar, and usage errors are judged more harshly than papers without such miscues.^{28, 29} Such judgments are even less favorable for typed papers than they are for handwritten ones.³⁰ In addition, needing to devote conscious attention to grammar and spelling may disrupt students' other writing processes. For example, having to think about how to spell a word while in the middle of writing a sentence may cause the student to forget the rest of the sentence.^{31,}
³² Given the relationship between foundational skills and writing processes, it should not come as a surprise to learn that when middle grades students are provided with opportunities to improve their foundational skills (such as spelling and handwriting), the quality of their compositions improves.³³

PRACTICE 4 EXAMPLE APPLICATION: Connecting Word Meaning to Spelling

One way to refine middle grades students' spelling skills is to teach them how word meanings and spelling skills are connected. A first step in this process is to teach students the meaning and spelling of common Greek and Latin roots, along with common prefixes and suffixes.

One way to introduce common prefixes or suffixes is to start with a word-sorting activity in which two or more patterns are contrasted (e.g., words ending in *-able* and *-ible*). With word sorting, a master word is established for each spelling (*debatable*, *edible*). The teacher then takes other *-able* and *-ible* words and sorts them into the appropriate category, providing clues about the meaning of the two suffixes (i.e., “able to do, or fit to do”) and how to tell when to use each (i.e., when *-able* is removed from the word, a complete word is usually left, whereas a complete word is not typically left when *-ible* is removed). The teacher solicits student help in sorting the words until the class can define the meaning of the two suffixes and the basic rule for spelling them. Students can then generate their own *-able* and *-ible* words, identifying exceptions to the rule (e.g., *accessible*). In addition to word sorting, students can be asked to study the spelling of specific *-able* and *-ible* words and generate permissible words by adding *-able* to Old French and Anglo-Saxon words (e.g., *lament*) or *-ible* to common Latin roots (e.g., *aud*).

Another activity for refining middle grades students' spelling words involves having them add prefixes and suffixes to common Greek and Latin roots (e.g., *meter*, *tele*, *oper*) to make as many permissible words as possible. For this exercise, students should also define each word.

Principle 3:

Establish word processing as the common medium for student writing.

Word processing makes the writing process easier.³⁴ It is easy to change, add, delete, and move electronic text produced on a word processor. Word processors include software—such as spelling and grammar checkers—that assist writers, and printed electronic text is neat and easy to read. Word processors can be connected to other electronic sources (such as the Internet), where information about writing topics can be located. Students who use word processing as their primary medium for writing make greater progress over time than those who rely on paper and pencil.^{3, 13, 34, 35} Thus, middle grades students must be taught computer skills if they have not already acquired them.

Practice 1: Make enough word processors available in the school so that all students can use them to complete writing assignments.

Today, students do most of their writing outside school on computers or other electronic devices. Students need to use the same writing tools at school as they use at home—tools that they will eventually use at work. The available evidence also indicates that students who use word processing (versus pen or paper) as their primary means of composing at school show greater improvements in the overall quality of their writing.^{3, 13, 34, 35}

Access To Computers

Most middle grades classrooms have one or two computers—not nearly enough for students to use word processing as their primary tool for writing in the classroom. While the eventual goal should be that each class has enough computers so students can do most or all of their writing via word processing, many middle grades schools likely need to build capacity over time. One starting point is to create word processing labs where

students or classes can work on their writing. Another starting approach is to have rolling word processing labs where computers are stored on a cart and brought directly to the classroom. In either case, schools will need to add additional computer capacity and mechanisms for maintaining equipment if middle grades students are to use word processing as their primary writing tool in all content classes.

Practice 2: Teach keyboarding skills and how to use word processing programs and software.

The positive benefits of word processing are limited or negated for students with little word processing experience or poor typing skills. These students typically produce better compositions when writing by hand than they do when composing via word processing.³² Consequently, students need to become fluent typists and learn how to use word processing and software designed to support their writing.

Instruction In Word Processing

Typing instruction is not part of most middle grades schools' curriculum anymore. Learning how to touch type and use a word processor should be offered as an elective or embedded within a specific content class. Such instruction should be limited to those students who need it, however, because many middle grades students will already have good typing and word processing skills.

Principle 4:

Assess and monitor student writing to improve instruction and identify students who require more intensive writing instruction.

Assessing student progress in writing provides teachers with needed information for adjusting classroom instruction.^{30, 37} Assessments also provide a mechanism for identifying students who need more intensive assistance with writing or writing instruction.³⁸ In addition, teaching students how to evaluate their own writing and establishing procedures for them to provide and receive feedback about their writing from their peers helps students improve their writing.¹⁴

Practice 1: Monitor students' progress as writers.

When teachers assess or monitor a student's writing progress, it has a positive impact on the student's overall progress as a writer.^{36, 37} Such assessments range from frequently (weekly) assessing student classroom writing in terms of ideas, organization, voice, word choice, sentence fluency, and usage/conventions, to judging (at least yearly or more often) student performance on more formal and standardized writing measures. Such assessments provide teachers with information on the effectiveness of their writing instruction and whether they need to make changes in what they are doing. These assessments also provide mechanisms for identifying students who need more intensive assistance and instruction in learning to write.

The complexity of writing necessitates that assessments be multi-faceted and target both writing processes (i.e., planning, drafting, revising, editing, publishing) and products (the texts students produce in response to a writing task).

Observations.

Although there is limited research on validated ways to assess student writing processes, many teachers find it beneficial to gather data by carefully observing students while they compose and examining their written work for relevant information.

For example, teachers can seek answers to questions such as:

1. How long does the student spend planning before actually writing?
2. Does the student use any tools or techniques to organize ideas before drafting (e.g., graphic organizers or outlines)?
3. When the student revises and edits his or her work, are meaningful improvements made to the text?

Teachers can also have conversations with students to learn about their writing knowledge and attitudes.^{39, 40} Examples of questions that could be used for this purpose include the following:

1. What are some of the ways good writers plan what they want to say before they begin writing?
2. When you revise your writing, how do you go about doing so?
3. What kinds of writing do you enjoy?
4. How do you think writing relates to your future goals?
5. What do you think are your writing strengths?
6. What do you think would help you become a better writer?

Rubrics

To assess the quality of students' writing products, many middle grades teachers use analytic and/or primary trait rubrics. An analytic rubric is a criterion-referenced scoring guide that targets characteristics that are generally associated with good writing. A commonly used example is the 6+1® *Trait Rubric* which targets ideas, organization, voice, word choice, sentence fluency, conventions, and presentation.⁴¹ There is a 5- and 6-point version of the 6+1® *Trait Rubric* for middle grades students.

These rubrics can be downloaded for free at
<http://educationnorthwest.org/resource/464>

Analytic rubrics can be beneficial for identifying a student's relative strengths and needs, monitoring a student's writing development over time, and planning and differentiating instruction.

In contrast with analytic rubrics, primary trait rubrics are developed for specific writing genres or tasks. Primary trait rubrics can be used to evaluate the overarching goals and purpose(s) of a particular writing task (e.g., present a clear, convincing argument) and/or specific text features

(e.g., thesis statement, supporting reasons with details, conclusion). Because primary trait rubrics are more closely aligned with writing tasks, many middle grades teachers find them helpful for assessing and developing student content-area writing skills (e.g., a historical narrative, a science lab report). Teachers who want to create a primary trait rubric often begin by consulting the relevant grade-level standards to identify appropriate criteria for the targeted writing task. Figure 3 presents an example of a simple primary trait rubric an eighth grade teacher in Texas might develop using the five criteria for imaginative stories found in the state's English language arts and reading standards.⁴² To develop a more sophisticated version of this rubric, the teacher could expand the scoring scale (e.g., 0–4) and write performance descriptors that correspond to each score for each element.

Although rubrics may have potential benefits, it is recommended that middle grades teachers use them in combination with other assessment practices—such as feedback from adults and peers and self-evaluation—that research suggests will produce positive and consistent improvements in students' writing.^{28, 37, 43}

Name:		Story Title:	
Elements	0 Not Evident	1 Evident, but Would Benefit from Further Attention	2 Evident and Well-Developed
Sustains reader interest			
Includes well-paced action and an engaging story line			
Creates specific, believable setting through the use of sensory details			
Develops interesting characters			
Uses a range of literary strategies and devices to enhance the style and tone			
Comments:			

FIGURE 3. Sample Primary Trait Rubric for an Imaginative Story

Curriculum Based Measurement

Another research-validated form of assessment for writing products is writing curriculum based measurement (W-CBM).⁴⁴ W-CBM can be used to identify students who are experiencing writing difficulties (screening) and monitor students' writing progress over time (progress monitoring). With W-CBM, teachers administer short probes at regular intervals to quantify a student's level of writing proficiency.⁴⁵ W-CBM is appropriate for use with all middle grades students but is recommended, in particular, for students who are experiencing writing difficulties because it is highly sensitive to small increments of progress. Middle grades students should be given 30 seconds to think about and plan their text and 7 minutes to write. The prompts used for W-CBM probes can be narrative or expository, as appropriate for a particular student and subject area.

Scoring W-CBM:

The recommended scoring procedure for W-CBM is correct minus incorrect word sequences (CIWS). CIWS is calculated by subtracting the number of incorrect word sequences from the number of correct word sequences, which is described as follows:

- **Correct Word Sequences (CWS):** The total number of adjacent, correctly spelled words that are syntactically and semantically correct within the context of the sample. When scoring for CWS, a vertical line is first placed where a sentence should end and then all incorrect words are underlined. Correct word sequences are marked by putting an upward-facing (blue) caret above the two words.
- **Incorrect Word Sequences (IWS)** are marked by putting a downward-facing (red) caret below the two words. Carets are also placed at the beginning of each sentence to score for correct/incorrect capitalization and at the end of each sentence to score for correct/incorrect punctuation.

- **Correct Minus Incorrect Word Sequences (CIWS):** The number of IWS (final count of downward facing [red] carets), subtracted from the number of CWS (final count of upward facing [blue] carets).

Although there are other scoring options for W-CBM (e.g., total words written and words spelled correctly), they demonstrate less technical adequacy than CIWS with middle grades students.^{46, 47, 48} Figure 4 is a W-CBM sample produced by a sixth grade student scored using CIWS (Figure 5). In this instance, the student was given a choice of several story starter prompts, such as:

1. *One day, we were playing outside the school and...*
2. *I was talking with my friends when all of a sudden...*
3. *It was a dark and stormy night...*
4. *I found a note under my pillow that said...*
5. *One day I went to school but nobody was there except me...*

An important step with W-CBM is graphing the data; the visual representation helps both teachers and students monitor progress over time. To identify students who have, or are at risk for, writing difficulties, it is recommended that both rate of growth (slope) and level of performance be considered (i.e., compared to the average of the class).

The following Web-based resources are recommended as a starting point for readers interested in learning more about W-CBM:

Procedures for Scoring Writing Samples

http://www.progressmonitoring.org/pdf/RIPM_Writing_Scoring.pdf

Using CBM for Progress Monitoring in Written Expression and Spelling

http://www.studentprogress.org/summer_institute/2007/Written/Writing_Manual_2007.pdf

It was a dark and stormy night. . . .

It was a dark and stormy night. Paige and her friend Mallory were walking back home from school, when they began to heard mysterious noises. Rather than fleeing in terror, the two girls eagerly jogged towards the sounds. They found the source in a alleyway, where they saw slimy, green creatures with large purple teeth. The creatures advance upon the girls, and tried to coax them towards their bonfire. Mallory, the pretty, but not too bright girl shuffle toward the fire. Paige, the smart, pretty girl pulled her away. They dashed into to the night, chased by the squeeling aliens. What the girls didn't know was that the aliens had a special recipe for female human adolescents; broiled with a dash of salt, and a sprinkle of Mrs. Dash.

FIGURE 4. Middle Grades Student's W-CBM Narrative Writing Sample

**USING CIWS, THE SCORE FOR THIS PROBE WOULD
BE: 92**

$([CWS = 115] - [IWS = 23] = 92 \text{ CIWS})$

**The explanation for each Incorrect Word Sequence
(IWS) is as follows:**

1. Incorrect tense (should be *hear*)
2. Incorrect spelling (should be *eagerly*)
3. Incorrect spelling (should be *source*)
4. Incorrect word choice (should be *an*)
5. Incorrect tense (should be *advanced*)
6. Incorrect spelling (should be *coax*)
7. Incorrect word choice (should be *there*)
8. Incorrect tense (should be *shuffled*)
9. Missing end punctuation (should have a *period*
after fire)
10. Repeated phrase (*to* is not necessary)
11. Incorrect spelling (should be *squealing*)
12. Incorrect spelling (should be *adolescents*)

FIGURE 5. CIWS Scoring for Student Writing Sample

Practice 2: Provide students with feedback about their writing.

A long-term staple of writing instruction is for teachers to provide students with feedback about one or more aspects of their writing. Such feedback can range from written comments that identify writing strengths and aspects of a composition that need revision (and why), to observations on the student's progress in learning specific writing strategies, knowledge, and skills. Feedback can also include conferencing with students to determine what they are trying to accomplish, and providing them with supportive and constructive feedback about these efforts and the resulting written product.

It is important for middle grades teachers to remember that feedback should at once inspire and support students' development as writers. We next highlight several characteristics of feedback that are most likely to meet those important aims.^{49, 50, 51, 52}

- Teacher feedback does not need to be given on everything students write, nor does it need to be extensive. For example, constructively highlighting a limited number of things a student needs to work on is more effective than identifying everything that could be improved.
- Clear and appropriate criteria should be the foundation for feedback, and students should be aware of these criteria before they begin writing. For example, Aida and Miguel's persuasive argument goals (described in Principle 2, Practice 1) could serve as the framework for feedback the teacher provides to each student.
- Feedback should be clear, specific, and explanatory, such as: *Laura, you might want to spend some time further developing your setting. As I read, I found myself wanting to know more about where and when the story took place.* Generic feedback (e.g., *Nice job*, *Revise*, or *Setting needs work*) is not perceived by students as helpful and is unlikely to promote improvement in their writing.
- Always include affirmation, reinforcement, and praise as part of feedback to students. When offering constructive criticism, be sure the tone is positive and encouraging. Provide comments that will help students think critically and creatively about possibilities for revision, rather than specifically directing or requiring a particular change. Thus, a teacher might write: *I think this idea is really interesting. Can you expand it so we better understand how it relates to the other parts of your text?*
- Offer feedback that helps students understand how their writing is experienced by the reader. Providing the reader's point of view can be achieved through the use of techniques such as providing personal reactions (e.g., *Wow! I was not expecting that to happen!* or *This section made me really understand a new aspect of your character.*), posing questions (e.g., *Did you intend for your reader to wonder if the protagonist was still alive? If so, it certainly worked with me!*), and offering suggestions (e.g., *In this paragraph, is there a way you can really emphasize how the experience made you feel? I think that would really help the reader understand what you went through.*).
- Ensure feedback is appropriate, given a student's current level of development and writing proficiency. Accordingly, teachers can ask themselves:
 - Will the student be able to understand and successfully respond to the comments I offer?
- If it is anticipated that a student might have difficulty with revisions, support and resources can be provided by including comments such as:
 - Why don't you sign up for a conference later this week and we'll work on this together?
 - Check your text book on p. 79 to see a couple of examples of this pattern.

- Jamal has become really good at using dialogue in his writing and he said he'd be happy to show you some of the ways he does it. Why don't you talk with him and then come share what you learned with me?
- Provide students with feedback at multiple points during the composing process, not just after they submit the final draft. Feedback given during planning, drafting, and revising should target writing strategies, substantive text elements and qualities, and subject-matter content. Feedback related to writing conventions (e.g., spelling, punctuation, usage) and the overall appearance of the text (e.g., handwriting, spacing) is best left for the editing and publishing stages.
- Help students understand and appreciate that feedback is offered to help them become better writers, not just to improve their grade—which is what many middle grades students believe. Teachers can do this by focusing on students' effort and persistence, along with highlighting subsequent opportunities for learning and improvement. For instance, a teacher might comment:
 - I'm not sure this essay represents your best effort. Let's work together tomorrow to identify what to change to make something you are proud of.
- Create opportunities that increase the likelihood students will carefully read and use the feedback offered to them. For example, after handing back a draft with comments, teachers can have brief conversations with each student and pose questions, such as:
 - What did you think the strengths of your paper were?
 - Based on my feedback, what do you think I saw as the strengths?

- What are your goals for the next draft?
- Another strategy is to have students attach an "Author Memo" when they return a revised version of their work. This memo should summarize how they responded to feedback.

Practice 3: *Teach students how to give one another feedback about their writing.*

When students give feedback to their peers on what they write and, in turn, receive feedback from their fellow students, it has a positive impact on writing performance.^{49, 50, 51, 52} Peer feedback is also advantageous because it (a) provides another audience for student writing beyond the teacher, (b) helps students internalize the criteria for good writing, and (c) reduces the amount of feedback teachers need to provide.

Middle grades teachers have found that both peer partners and peer groups can be successful. The former has the advantage of being a bit more time efficient (students have to read and respond to the writing of only one other person), whereas the latter offers students a broader perspective and response to their writing. In some instances, teachers separate peer revision from peer editing to increase the likelihood that students will offer each other substantive feedback related to writing features and qualities (revising), rather than just commenting on surface-level issues, such as conventions and appearance (editing).

Research suggests that incorporating peer feedback into the writing process is most effective when teachers provide students with appropriate training in providing feedback and structure the peer feedback process. Examples of what middle grades students need to learn to successfully participate in and contribute to peer feedback experiences include providing a peer with helpful (i.e., specific and descriptive) feedback, offering recommendations in a non-judgmental way, accepting constructive criticism from others in appropriate ways, and

demonstrating the skills that are essential for all successful cooperative learning experiences (e.g., active listening, respecting confidentiality). Although training and structure are important for the success of peer feedback with students of all ages, they are particularly salient for middle grades students because of these students' heightened sensitivity to social interactions, strong desire for peer acceptance, and tendency to be self-conscious.

An example of a strategy to structure the feedback process is shown in Figure 6. During the first step, pairs of students provide each other with feedback targeting writing features and qualities (revising). During the second step, the focus shifts to writing conventions (editing). To help students provide meaningful feedback to their peers, specific criteria (e.g., a rubric, a set of goals, a series of prompting questions) are used in both steps. This strategy for peer editing is flexible and could be adapted by teachers to meet the unique needs of their students and the targeted writing task.

Some middle grades teachers find it beneficial to initially discuss and model the peer feedback process by sharing a piece of their own writing with students and facilitating a discussion about how a peer might review and respond to the text. Within that context, students can be guided to consider the kinds of feedback that would and would not be helpful to an author. Students might also generate sentence starters that can be used to help structure the feedback they provide to their peers:

- *When I read this part, I thought about...*
- *This sentence is really effective because...*
- *I was a bit confused by ____ because...*
- *I don't quite understand _____. Did you consider....?*

The teacher can also model appropriate ways to receive constructive criticism and manage emotions:

- *I worked really hard on that part, so it's disappointing that you didn't understand what I was trying to say. But, thanks for pointing it out. I'll see if I can make it better.*

Fishbowl observations^a and role-play can also be used to develop students' understanding of how they can make the process successful.

Finally, teachers are likely to find peer feedback most effective when it is used in combination with instruction and strategies that target revision. If students do not know how to effectively revise a piece of text, they are unlikely to be able to offer meaningful feedback to another author, nor will they be able to respond to the suggestions provided by a peer.

^a Fishbowl observations consist of some students participating in role-play while others analyze and observe their behavior. Then there is a whole-group discussion about the observations of the participants and the observing students.

Sample Peer Feedback Strategy	
Step 1: REVISING <ul style="list-style-type: none">• Listen carefully and follow along as the author reads aloud.• Tell the author what you liked about the paper. Remember to be specific and to explain why you liked something.• Switch authors and repeat the steps above.• Carefully reread the paper to yourself.• Use the assignment rubric to offer helpful comments and suggestions. Make notes on the draft.• Discuss your feedback with the author.	Step 2: EDITING <ul style="list-style-type: none">• Discuss the revisions you made.• Carefully reread the revised paper to yourself.• Use the editing questions to offer helpful comments and suggestions. Make notes on the draft.• Discuss your feedback with the author.

Source: Adapted from MacArthur, Schwartz, and Graham (1991)⁵³ and Stoddard and MacArthur (1993).⁵⁴

FIGURE 6. Sample Peer Feedback Strategy

Practice 4: *Teach students how to assess the quality of their own writing.*

To become skilled writers students must develop the ability to accurately assess the strengths and weaknesses of their own writing in order to better direct how specific papers are revised, as well as set goals for aspects of their writing that are in need of more general improvement.^{14, 37} Self-evaluation procedures range from teaching students to use a rubric to assess the merits of specific features of their writing (e.g., ideation, organization, voice, vocabulary, sentence formation, and conventions), to teaching specific strategies for evaluating a first draft of a paper for substantive (e.g., clarity) or mechanical (e.g., misspelled words) lapses, to teaching students how to detect mismatches between what they intended to say and what was written. Teaching such self-assessment procedures has the added benefit of helping students learn the characteristics of good writing while providing another avenue for writing feedback (albeit a personal one).

Although some middle grades students may already demonstrate proficiency with self-assessment, most need to be taught the purpose and process of evaluating their own writing. One way to help students develop the ability to reflect upon and critique their own writing is to pair self-assessment with self-recording—that is, recording the information learned as a result of self-evaluation.¹⁷ Self-

recording can be done in a variety of ways, such as marking a response on a rubric and/or visually representing data on a graph or chart. The method selected should be relatively quick and easy to use and be perceived by the student as acceptable and beneficial. What follows (Figure 7) is an example of how the goals established for a particular assignment (and in this case, also a particular student, as previously described in Principle 2, Practice 2) can be used as the basis for self-assessment and self-recording. The questionnaire focuses Aida's attention on comparing her writing with each of her goals and also serves to guide her subsequent revisions. Graphing the number of goals met before and after revision helps Aida see improvement over time (Figure 8).

As with teacher and peer feedback (Practices 2 and 3), students must be able to make meaningful revisions in response to information gleaned through self-evaluation. In other words, it would be doing Aida a disservice to have her evaluate and record her use of exciting, interesting, “come to life” words if she didn't know what they were or how to integrate them effectively into text.

An excellent Web-based resource for learning more about self-assessment and other forms of self-regulation (e.g., goal-setting, self-instructions, self-reinforcement) is <http://cehs.unl.edu/secd/self-regulation/>

Aida's Self-Evaluation Questionnaire		
Questions to Ask Myself	YES Kudos to me!	NO Focus here during revision.
Did I include an introduction that gives my position?		
Did I include at least three reasons that make sense and have details?	R1: R2: R3:	R1: R2: R3:
Did I include evidence and examples for each reason?	R1: R2: R3:	R1: R2: R3:
Did I include a possible argument against my position?		
Did I include a convincing conclusion?		
Did I use exciting, interesting, "come to life" words to make my argument more convincing?		
Total	_____ out of 10	Summarize Revision Goals Below
My revision goals:		

FIGURE 7. Sample Self-Evaluation Questionnaire

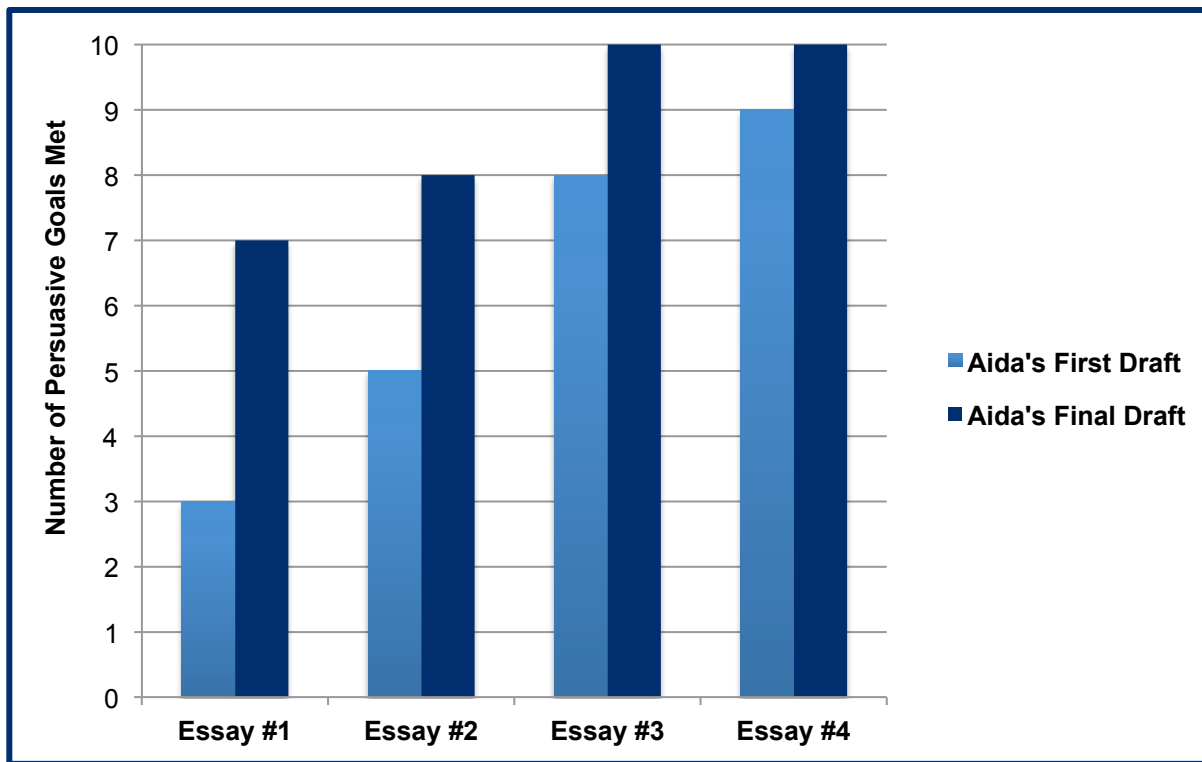


FIGURE 8. Sample Graph of Student Goals Met Before and After Revisions

Principle 5:

Provide extra assistance and instruction to students who experience difficulty learning to write.

Students who experience difficulty effectively using writing as a tool for learning, communication, and self-expression will require extra support to become effective and skilled writers. Schools need to develop procedures for identifying these students and providing them with explicit instruction in developing basic knowledge, strategies, and writing skills.

Practice 1: *Provide students with intensive and extra instruction to acquire the strategies, knowledge, and writing skills that still need to be mastered.*

Even when schools and teachers apply the most effective writing methods available, some students will nonetheless experience difficulty learning to write.⁵⁵ If these students are to become skilled writers who can use writing as an effective tool for learning, communication, and self-expression, they require extra instructional assistance to acquire essential writing strategies, skills, and knowledge. To provide effective instruction, schools must have methods in place for identifying students who need extra assistance, and for determining the type of extra assistance each student needs. Then, intensive instruction can be focused on the particular skills and strategies that require additional attention.⁵⁶

Identify Struggling Writers.

The writing assessments described in Principle 4, Practice 1 can help educators identify students who have, or are at risk for developing, writing difficulties. For example, with W-CBM, a student's rate of growth (slope) and level of performance can be compared with the average slope and average level of performance for students in a particular class or grade-level.

Norm-referenced writing assessments can also be beneficial for identifying students who need extra assistance because these assessments allow educators to compare a student's level of writing proficiency to a normative sample. Norm-referenced tests help educators answer questions, such as the following:

1. Is the student's current level of writing achievement within the expected range for his or her current age and/or grade-level?
2. How does the student's writing proficiency compare with his or her achievement in other academic areas (e.g., reading, mathematics)?
3. How do the students' writing-related skills (e.g., spelling, grammar) compare with each other?³⁹

Two examples of comprehensive norm-referenced tests that are commonly used with middle grades students are the *Woodcock-Johnson Tests of Achievement—Third Edition* (WJ-III) and the *Wechsler Individual Achievement Test—Third Edition* (WIAT-III).^{57, 58} The WJ-III includes six subtests that target written language: Spelling, Writing Fluency, Writing Samples, Editing, Sounds of Spelling, and Punctuation and Capitalization. The WJ-III also includes a Handwriting Legibility Scale that can be used to analyze the handwriting a student produces in conjunction with the Writing Samples subtest, or any other written product. The WIAT-III includes three writing-related subtests that are appropriate for middle grades students: Spelling, Sentence Composition, and Essay Composition. Whereas the WJ-III and WIAT-III can be used to assess achievement in multiple academic areas, the *Test of Written Language—Fourth Edition* (TOWL-4) is a norm-referenced instrument designed specifically for the purpose of assessing various facets of written language.⁵⁹ The TOWL-4 includes seven subtests: Vocabulary, Spelling, Punctuation, Logical Sentences, Sentence Combining, Contextual Conventions, and Story Composition.

Diagnostic assessments that target a particular domain of writing can also be beneficial for identifying students who need extra assistance and for gathering information about a student's unique strengths and areas of need—which is essential to plan an appropriate intervention.³⁹ For

example, if a student is having difficulty with spelling, educators might elect to gather data with an assessment such as the *Spelling Performance Evaluation for Language and Literacy* (SPELL-2).⁶⁰ SPELL-2 is individually administered via a multimedia CD-ROM computer program. After a student completes the SPELL-2 assessment, the program generates a detailed report that summarizes the student's strengths and needs, suggests appropriate learning objectives, and identifies relevant word study lessons in the corresponding curriculum, SPELL—Links to Reading and Writing.

Readers interested in learning more about SPELL-2 are encouraged to see the descriptions and case studies presented in works by Apel, Masterson, and Hart and visit <http://www.learningbydesign.com/>.^{61, 62}

Provide Appropriate Intervention.

Once a student's writing needs are identified, an appropriate evidence-based intervention must be selected and implemented. Although there are instances when struggling writers require support that is not generally used with typically developing writers (e.g., speech to text software), the majority of practices shown to be effective for most struggling writers are not radically different from those recommended for all middle grades students. To illustrate, there are practices that have a moderate or strong positive impact⁶³ with students who experience writing difficulties (i.e., struggling writers with and without learning disabilities), and among them were:

- Teach students strategies for planning, revising, and editing their compositions.
- Have students work cooperatively with other struggling writers to plan, draft, revise, and edit their compositions.
- Set clear and specific goals for what students are to accomplish in their writing.

- Use word processing and related software as a primary tool for writing.
- Teach text transcription skills (handwriting, spelling, and typing).

There is significant overlap between these recommendations and those presented in Principles 1–4. Students who struggle with writing in particular need instruction that is more intensive, explicit, systematic, and individualized.^{64, 65} A large body of research documents that intensive, explicit, systematic, and individualized instruction has a strong positive impact on the quality of writing produced by all middle grades students. The effect is particularly robust for students who struggle with writing, including those with disabilities.

Self-Regulated Strategy Development (SRSD; described previously in Principle 2, Practice 2) is an evidence-based approach that was developed specifically to meet the needs of students who experience difficulty with writing.^{17, 18, 20, 64, 66} Intensive, explicit, systematic, and individualized, SRSD instruction helps students gain relevant writing and genre knowledge; learn strategies that guide the basic steps in the writing process (e.g., planning, drafting, revising, and editing); learn strategies for accomplishing specific writing tasks (e.g., a personal narrative, a persuasive argument, an expository essay); learn procedures for regulating the writing process (e.g., goal-setting, self-monitoring, self-instructions, self-reinforcement); and develop positive attitudes towards writing. What follows is an example of how SRSD instruction could be used as a supplemental intervention to address the needs of middle grades students who struggle with writing.

PRACTICE 1 EXAMPLE APPLICATION: Writing Intervention with Self-Regulated Strategy Development

A team of eighth-grade teachers uses assessment results to determine that several students are experiencing significant difficulty revising their writing. In their content-area classes, the students receive feedback on their writing from their teachers and participate in peer revising groups (as described in Principle 4, Practices 2 and 3). However, an examination of students' revision attempts provides clear evidence that they are not responding successfully to feedback. Nearly all the changes they make target writing conventions—in other words, they are editing, not revising. At a grade-level team meeting, it is decided that the students will participate in a supplemental intervention to increase their knowledge of how writers can effectively revise their compositions (e.g., adding, deleting, and re-organizing text; expanding on ideas) and learn a strategy that will guide them through the process of revision.

The SRSD instructional model is used for the intervention, which consists of 30 minute sessions that occur twice a week in the school library. Instruction begins with the teacher leading a discussion about the ways authors meaningfully revise their work. Students are introduced to the strategy (represented by the mnemonic REVISE, shown in Figure 9), and the teacher interactively models its use several times. The students also learn how a word processor can be used to facilitate revision. The teacher then supports students while they practice using the strategy to guide their revision of content-area writing assignments. Because SRSD instruction is criterion-based, the intervention ends for each student when he or she is able to independently and successfully apply the strategy to revise compositions assigned by the content area teachers.

REVISE: A Strategy for Revising Text	
<i>Students are provided with two sets of cue cards (6 Evaluate cards and 4 Verbalize cards) that guide and prompt their use of the strategy. Prior to using the strategy, they establish one or two goals for themselves (e.g., add more details and examples so my paper is more convincing to the reader).</i>	
<u>R</u>ead Your Essay	Read your essay aloud softly. Highlight places where you think changes should be made and ask yourself if you need more ideas. Use a caret ^ to indicate where you will add something.
<u>E</u>valuate the Problems	Evaluate the problems. <i>Use the Evaluate Cards.</i> <ol style="list-style-type: none"> 1. This doesn't sound quite right. 2. Part of the essay is not in the right order. 3. People may not understand what I mean. 4. I am getting away from my main point. 5. This is a weak or incomplete idea. 6. The problem is _____.
<u>V</u>erbalize What You Will Do	Verbalize what you are going to do to fix the problems. <i>Use the Verbalize Cards.</i> <ul style="list-style-type: none"> • ADD: Include more information, examples, details, etc. • DELETE: Take something (a word, phrase, or sentence) out. • REWRITE: Say it (a word, phrase, or sentence) in a different way. • MOVE: Arrange information (a word, phrase, or sentence) in a different way.
<u>I</u>mplement the Changes	Implement the changes.
<u>S</u>elf-Check Your Goals	Self-check the goals you set for yourself. Make other revisions based on these goals.
<u>E</u>nd by Rereading and Making More Changes	End by rereading your revisions. Make any additional changes that will improve the writing.

Sources: De La Paz, Swanson, & Graham (1998)⁶⁷; Harris et al. (2008).¹⁷

FIGURE 9. Sample Strategy for Revising Text

Practice 2: *Teach students how to use word processing programs and software that provide assistance for targeted writing strategies and skills.*

Some middle grades students continue to experience difficulty with specific aspects of writing (such as spelling, handwriting, planning, or evaluation), despite strong efforts by teachers and schools to teach these writing skills and processes. For these students, schools should teach students how to use word processing programs and software that provide students with assistance with these challenges.³⁵ For example, word prediction programs reduce the number of key strokes needed to write individual words, addressing the needs of students who experience continued difficulties with the motor aspects of typing. Planning software provides students with help in organizing their ideas for writing, whereas automated computer-scoring programs now provide feedback on what students write.

Using Word Processing Software With Students

Students need to be taught how to use word processing programs and software that provide them with specific assistance in carrying out targeted writing strategies and skills. This includes explaining the purpose of the program or software and how it works. Teachers should model how to apply a program or software and then provide guided practice until students can use it independently and effectively.

Practice 3: *Provide to students experiencing difficulties intensive and extra instruction in using writing as a tool to support content learning.*

While all writers benefit from using writing as a tool for learning, students who are experiencing difficulties learning to write often need extra instruction in how to use these tools effectively.^{1, 2, 13, 68} Writing to learn strategies, such as note taking, summarizing, and analyzing/interpreting, are complex learning tools. Many less-skilled writers will need to be taught these writing procedures through a gradual-release model in which the technique is described, modeled (possibly repeatedly), and practiced on real learning tasks with assistance and feedback from the teachers until students can apply the model successfully and independently.⁶⁹ The Pathway Project provides an exemplary illustration of how this type of instruction can be used to successfully teach analytic writing skills to middle grades students who are English language learners.

Readers interested in learning more about the Pathway Project cognitive strategies approach to reading and writing instruction are encouraged to see the research published by Olson and colleagues and visit <http://www.nwp.org/cs/public/print/resource/2487>.^{70, 71, 72, 73}

Principle 6:

Discontinue using practices that are NOT associated with improved outcomes for students.

Teachers and principals must make decisions about student learning and behavior each day. While it is preferable to rely on evidence-based practices when teaching writing, determining what constitutes evidence-based practice can be a confusing and difficult process. In addition, teachers may currently use teaching practices that are ineffective, such as the traditional approach to teaching grammar. With the traditional method, a grammar skill is defined and practiced in a decontextualized manner (e.g., selecting the right tense for a verb in a sentence from three options) or practices such as sentence diagramming are employed.^{3, 13} There are, however, effective practices for improving student grammar in writing, such as contextualized grammar instruction with scaffolded authentic practice and sentence combining instruction (See Principle 2, Practice 3.).⁷⁴

Practice 1: *Take stock of all of the instructional practices and models currently implemented and determine whether they are necessary and associated with improved outcomes for students.*

It is important to identify classroom practices and determine whether there is evidence to support them. Examining the results of published, empirical studies is the preferred way to determine whether a particular practice is validated by sound research. Because there is a relatively large—and growing—body of literature related to adolescent writing, reviewing all the available research would be a daunting and impractical endeavor. To make the process more efficient, educators are encouraged to first consult several recent meta-analyses related to writing. These offer a systematic and succinct summary of the literature and report the effectiveness (i.e., strength and consistency) of multiple practices.^{3, 11, 13, 19, 25, 34, 37, 75, 76, 77}

What follows are other text and web-based resources that summarize relevant research and offer recommendations for practice.

Four recommended books that summarize high quality writing research and—based on that research—describe recommendations for classroom practice:

Applebee, A. N., & Langer, J. A. (2013). *Writing instruction that works. Proven methods for middle and high school classrooms*. New York, NY: Teachers College Press.⁷⁸

Graham, S., MacArthur, C., & Fitzgerald, J. (2013). *Best practices in writing instruction* (2nd ed.). New York, NY: Guilford.⁷⁹

MacArthur, C., Graham, S., & Fitzgerald, J. (2015). *Handbook of writing research* (2nd ed.). New York, NY: Guilford.⁸⁰

Olson, C. B. (2010). *The reading/writing connection: Strategies for teaching and learning in the secondary classroom* (3rd ed.). New York, NY: Pearson.⁸¹

Two recommended journal articles that summarize research-based recommendations for writing instruction and assessment with students who experience difficulties with writing:

Olinghouse, N. G., & Santangelo, T. (2010). Assessing the writing of struggling learners. *Focus on Exceptional Children*, 43(4), 1-27.³⁹

Santangelo, T., & Olinghouse, N. G. (2009). Effective instruction for students who have writing difficulties. *Focus on Exceptional Children*, 42(4), 1-20.⁴⁰

Recommended websites for information about effective adolescent literacy practices:

1. What Works Clearinghouse:
<http://ies.ed.gov/ncee/wwc/>
2. Best Evidence Encyclopedia:
<http://www.bestevidence.org/>
3. Teaching LD Current Practice Alerts:
<http://teachingld.org/alerts>
4. Center on Response to Intervention:
<http://www.rti4success.org/>
5. The IRIS Center's Resource Locator:
<http://www.iris.peabody.vanderbilt.edu/resources.html>
6. The Carnegie Council for Advancing Adolescent Literature: <https://www.carnegie.org/about/our-history/past-programs-initiatives/#literacy>
7. National Center for Learning Disabilities:
<http://www.nclld.org/>
8. AdLit.org: All About Adolescent Literacy:
<http://www.adlit.org/>
9. The National Council of the Teachers of English:
<http://www.ncte.org/>

After determining there is adequate research evidence to support the use of a particular writing practice or model, an important second step is reviewing school-based data (e.g., results from state or national writing tests, W-CBM, other forms of assessment) to verify that the positive outcomes reported in the literature are being realized with the students in a particular middle grades setting. If they are not, it is essential to investigate why the discrepancy is occurring, make appropriate modifications, and monitor the impact of the changes. For example, there is considerable research showing SRSD produces meaningful

improvements in middle grades students' writing. If a school adopted the SRSD model as part of its writing curriculum, but students were not showing the expected gains, questions such as the following might be considered:

- *Did teachers receive adequate professional development?*
- *Are appropriate strategies being selected and taught?*
- *Are the instructional stages being implemented with high fidelity?*

Finally, where there is an absence of published research supporting the efficacy of a writing practice currently being implemented, educators must use school-based data to systematically evaluate whether that practice results in positive outcomes. Moreover, because writing curriculum and instruction can have a differential effect with diverse populations (e.g., students with disabilities, English language learners, students with varying levels of writing proficiency), data should be disaggregated and carefully analyzed.⁸²

Principle 7:

Improve teacher capacity to teach writing and use it as a tool for learning.

Many middle grades teachers are not adequately prepared to teach writing. The reasons for this range from teacher preparation programs that do not emphasize how to teach writing to a lack of in-service preparation by the school or district on writing instruction. Lack of preparation is especially problematic for teachers in science, social studies, and mathematics.⁸³ If middle grades students are to learn to write effectively and use writing as a tool to support learning of content material, their teachers must become more knowledgeable about effective writing practices.

Practice 1: *Provide ongoing in-service professional development to all teachers to increase their capacity to teach writing.*

Many teachers receive little to no preparation in college in how to teach writing to middle grades students.^{83, 84} This lack of preparation is unnecessary as a variety of evidence-based practices for teaching writing have been identified.^{3, 11, 13, 19, 25, 34, 37, 75, 76, 77} To ensure that teachers are familiar with effective writing practices, ongoing in-service preparation should be provided by the school or school district. School leaders should clarify expectations for school wide practice with regard to writing and provide in-service and support on these practices for all teachers in the school.

Consistent with the description and recommendation for professional development offered in the *Performance Management* section of this guide, professional development focused on writing should be intensive and ongoing, focused on the ways writing can be used to support content area learning and targeted at prioritized areas of need. One example of a model that meets these goals is the National Writing Project (NWP). The NWP consists of a 200+ sites located at colleges and universities across the United States. Among the professional development opportunities offered by the NWP are invitational summer institutes to train teacher-consultants to lead school-based improvement, on-site in-service programs, continuing education courses, and practitioner research initiatives.

Interested readers are encouraged to visit the NWP's website at <http://www.nwp.org>

Practice 2: *Have teachers create learning groups to share their best writing practices and work together to discover new ones.*

Teachers' personal experiences are an often-underused resource for increasing the capacity to teach writing. Teachers within and across disciplines should be encouraged to form groups to teach one another best writing practices and collaboratively improve classroom writing instruction and the use of writing to support student learning. Such groups can operate during the school year or the summer, and they can involve teachers from multiple schools. When teachers work together in this way, less experienced teachers benefit from the knowledge of more seasoned teachers.

Conclusion

The seven Writing and Writing Interventions principles are based on meta-analyses of writing intervention research. This includes three meta-analyses of experimental and quasi-experimental writing intervention studies conducted by Graham and colleagues for the Carnegie Corporation of New York: *Writing Next*,¹³ *Writing to Read*,⁵ and *Informing Writing*.²⁸ The principles are also supported by nineteen other meta-analytic reviews that focus on particular types of research (e.g., single subject designs), particular practices (e.g., writing to learn, word processing, formative assessment), and/or particular groups of students (e.g., students with learning disabilities).^{1, 2, 3, 4, 11, 14, 18, 19, 25, 33, 34, 35, 36, 37, 38, 64, 75, 76, 77} The carefully selected, high-quality individual studies cited in this chapter offer additional support for the principles and practices and complement the meta-analytic findings. Consequently, each of the seven principles are supported by relatively strong evidence involving multiple empirical studies, even though there are no studies examining the impact of applying the recommended principles in unison. Research examining the combined effects of the principles is needed, and future studies should investigate this issue.

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Mathematics and Mathematics Interventions

Mathematics includes knowledge and skills that are used to access science, technology, engineering, and mathematics applications and careers and that improve reasoning and analytic thinking. Given the importance of algebra for success in high school and beyond, many states have moved to increase student expectations in this area.¹ Thirty-four states now require Algebra I or its equivalent for graduation.¹ Despite the effort to increase expectations, achievement data indicate students continue to struggle to attain proficiency, especially those with disabilities and difficulties. As a result, the National Mathematics Advisory Panel³ convened, and a careful examination of the research evaluating the effectiveness of instructional practices for struggling learners was launched. The following nine key principles reflect research in mathematics education synthesized by the Panel and the Institute of Education Sciences.^{2, 3, 4, 5}

Principle 1:

Establish school wide practices for enhancing mathematics understanding within relevant content area instruction.

Mathematics is a foundational tool that can be used across many content areas (e.g., integrated science, social studies, health). Doing so provides students with important opportunities to practice and apply mathematical tools and skills. Therefore, it is important that content area teachers consider the mathematics relevant to their discipline and expect students to be able to use their mathematical knowledge and skills to better understand and communicate what they are learning in other content domains.

Practice 1: *Encourage students to apply their understanding of mathematics concepts and procedures to draw conclusions and propose solutions about history, science, social studies, economics, and other content areas.*

In many cases, content area teachers will find instances in which mathematics can be used to summarize, illustrate, explain, or analyze information. Reference materials, textbooks, and primary source documents frequently include related information that can be displayed graphically; summarized using statistics, including measures of central tendency; and/or interpreted to draw conclusions and make predictions.

Practice 2: *Ask students to analyze events and phenomena from a quantitative perspective and use their analyses to develop arguments and provide justifications.*

Many content disciplines (e.g., history, science, mathematics) are taught in an isolated fashion but are related in important ways. For example, many historical events can be described as a human response to natural phenomena (science) and can be summarized and analyzed using data (mathematics). While reading and writing help with acquisition and comprehension, mathematics and quantitative reasoning (e.g., economic analysis, historical trends, epidemiological analysis) can help with interpretation and broadening perspectives.

PRACTICE 1 EXAMPLE APPLICATION: Apply Mathematics in Science

A physical science teacher will find daily opportunities for students to collect and analyze data based on their observations. For example, students may be studying objects, such as marbles or toy cars, moving at a fixed distance. They can record the time each object takes to move the distance and from that information determine the speed as a function of distance and time. These observations can be organized in tables and graphics, and conclusions can be drawn about the objects' features that result in differences in speed. This type of mathematics application can be expanded further to include proportional reasoning by having students examine how the speed changes with varying distances.

PRACTICE 2 EXAMPLE APPLICATION: Quantitative Reasoning in Social Studies

Quantitative reasoning can be used in teaching social studies by having students examine sources regarding population changes, technological advances, and timelines to draw conclusions about the factors (e.g., warfare, migration, etc.) that contributed to specific historic events. For example, a social studies teacher might introduce students to the spice trade. Students today are likely to struggle to understand why spices were so valuable in the fourteenth century. However, when presented with data comparing the value of today's common spices with their value to Europeans in the 1300s, students will quickly understand why people risked their lives to search for new markets. Students can use their quantitative reasoning to explore predictions for similar risks people take today.

Principle 2:

Use a universal screener to identify students at risk for mathematics difficulties and to determine interventions to provide these at-risk students. Monitor the development of mathematics knowledge and skills of identified students.⁴

The universal screener^a ensures that schools can identify students who will likely need support beyond the typical core instruction provided in the general education classroom. Subsequent progress monitoring should be used to continue to track the effectiveness of interventions. The frequency of progress monitoring should reflect the level of support needed, with more vigilant monitoring used for students with greater needs.

Practice 1: *Identify a system for screening and progress monitoring that prioritizes content and skills necessary for subsequent mathematics development.*

The content of the universal screener should reflect mathematics knowledge and skills essential for grade-level proficiency. The specific content selected should relate to the domain in which potential risk is being evaluated. For example, if the assessment system is screening for potential risk in algebra and algebra readiness skills and knowledge, the universal screener should target content knowledge and skills related to algebra and algebra readiness.

Practice 2: *Select a cut score for screening that balances the need to help the most at-risk students with the resources available.*

In a universal screening system, cut scores are used to identify ranges of scores along the distribution that might indicate risk status. For example, three cut-scores could be established to identify students who might be at risk for failure and the significance of the risk. In this model, the distribution of scores could be divided into three categories to indicate students who might have minimal risk of failure, students who have some risk of failure, and students who have significant risk of failure.

A number of factors should be considered in determining the appropriate cut score used in screening. Ensuring that children who need additional support are accurately identified and that resources are available to provide the additional support are two essential considerations.

^a A universal screening is a quick assessment that allows for repeated testing of all students on skills of interest. This kind of screening is used to determine the efficacy of the curriculum and instruction and the level of student proficiency in a specific area (e.g., mathematics, reading). Then school administrators and teachers can analyze the data by group, by individual student, and by specific skill to make decisions about interventions to improve student outcomes. These screeners are typically given to all students at three time points in a year.

Principle 3:

Help students recognize number systems and expand their understanding beyond whole numbers to integers and rational numbers. Use number lines as a central representational tool in teaching this and other rational number concepts.^{4, 6}

There is growing understanding that students' preparation for success in algebra lies in their proficiency with numeracy.⁶ Numeracy, often called "number sense," refers to a "child's fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics and to look at the world and make comparisons."⁷ Numeracy includes students' conceptual understanding of number systems and of the properties and operations that govern lawful application during problem solving. Numeracy also relates to students' ability to extend generalizations about one number system to another. By generalizing, students can apply their knowledge of concrete numbers to algebraic reasoning.

Practice 1: *Use measurement activities and number lines to help students understand that fractions and decimals are numbers and share number properties.*⁸

Using number lines is an effective way to illustrate that fractions and decimals have magnitude similar to whole numbers. Measuring objects using number lines with fractions demonstrates to students that fractions have magnitude. For example, the following illustration (Figure 1) shows how a simple number line with fractions can be used to measure a common object.

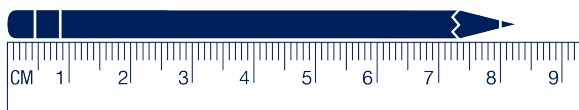


FIGURE 1. Measuring common objects with fractions

Practice 2: *Provide opportunities for students to locate and compare fractions and decimals on number lines.*

By accurately placing fractions and decimals on a number line, students learn to make relative comparisons. Comparing fractions and decimals facilitates students' understanding of the role magnitude plays in increasing precision of measurement.⁹ Relative comparisons, as such, also help students justify the reasonability of their answers. A sample number line for comparing fractions is provided in Figure 2 within the *Practice 2 Example Application*.

Practice 3: *Use number lines to improve students' understanding of fraction equivalence, fraction density (the concept that there are an infinite number of fractions between any two fractions), and negative fractions.*

Comparing and extending number lines uses visual representations to develop students' understanding of equivalent fractions. Placing increasingly smaller fractions on a number line illustrates a unique characteristic of rational numbers: They can represent increasingly precise values between whole numbers. A sample number line is provided in Figure 3.

PRACTICE 2 EXAMPLE APPLICATION: Sample Lesson for Comparing Fractions

Objectives: Students will be able to connect fractions to a number line and use a number line to identify equivalent fractions.

Instruction: Compare fractions on the number lines such as those in Figure 2. Select one pair of equivalent fractions (e.g., $\frac{3}{4}$ and $\frac{6}{8}$) and explain to students that these fractions are equivalent because you can multiply the numerator and denominator of one fraction by the same number (e.g., 2) to get the other fraction. Point out that when fractions are equivalent, they are located on the same place on the number line.

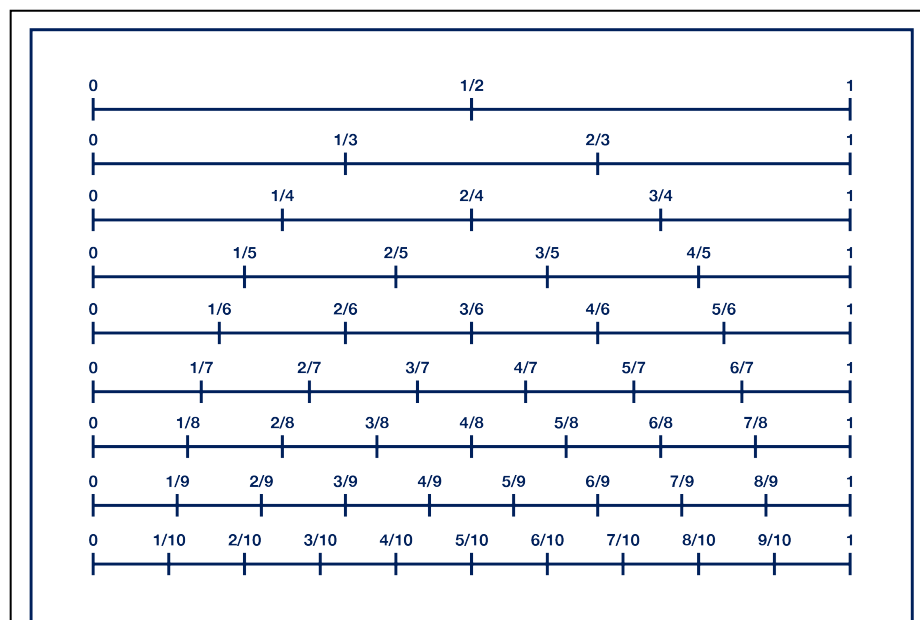


FIGURE 2. Number Line Representations for Comparing Fractions

Practice 4: *Explain that fractions can be represented as common fractions, decimals, and percentages, and develop students' ability to translate among these forms.*

Students must learn that numbers are representations of values and that these representations can be expressed in different forms. Students need to be able to transition between these different forms efficiently. For example, students should understand that

$$\frac{8}{10} = 0.80 = 80\%$$

Just as number lines can be used to develop an understanding of equivalent fractions, they can also be used to demonstrate equivalence among representations of rational numbers. For example, the illustration in Figure 3 demonstrates how a number line can be used to emphasize equivalence between fractional representations and decimal representations, such as

$$0.4 = \frac{4}{10} = \frac{2}{5} \qquad 0.4 < \frac{1}{2}$$

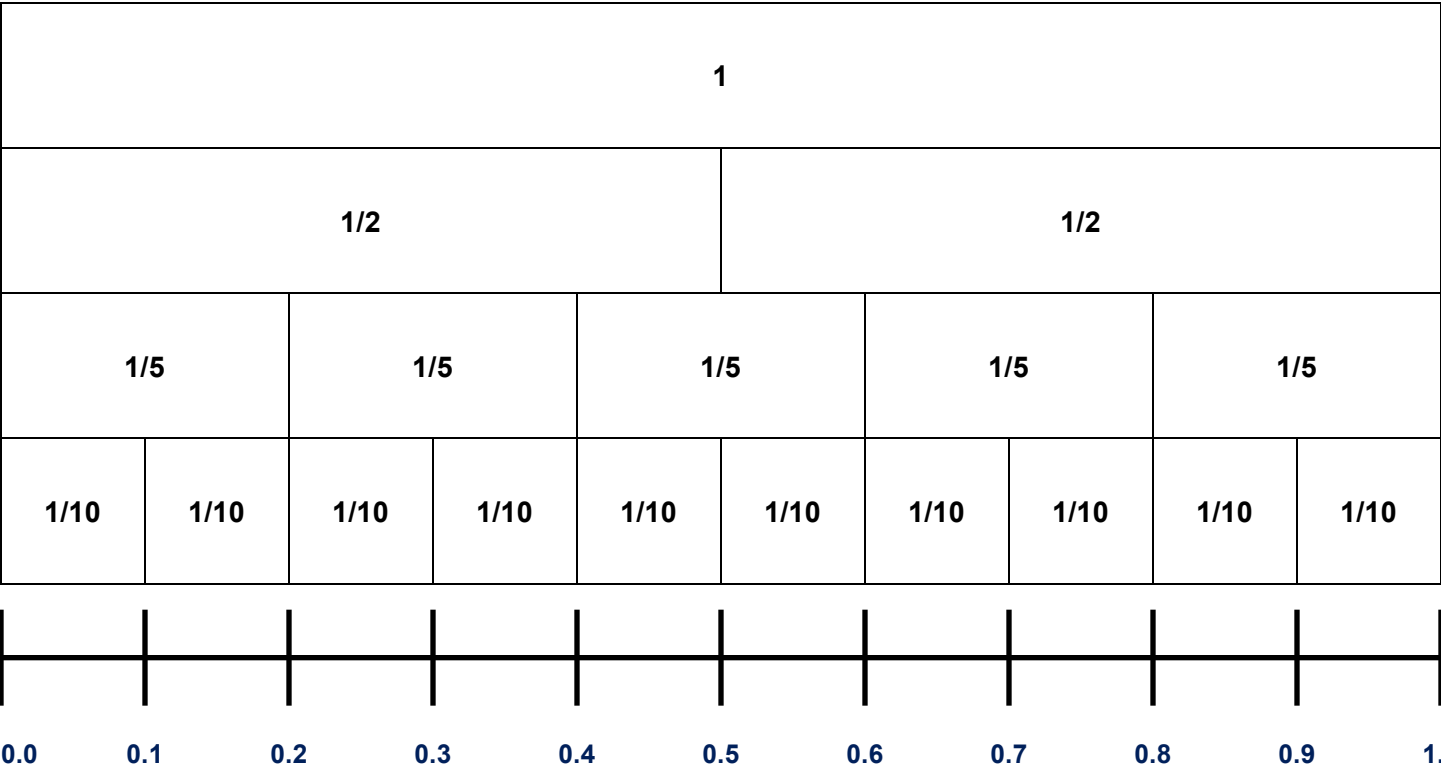


FIGURE 3. Number Line Representation of Equivalent Fractions

Principle 4:

Develop students' conceptual understanding of mathematics and provide ample opportunities to improve procedural fluency.^{3, 4, 10}

Ultimately, the goal is to improve students' abilities to apply mathematics knowledge to solve problems. Evidence suggests that overall outcomes are improved when students develop conceptual understanding of mathematics in addition to procedural fluency.¹¹ A balanced approach to instruction helps students understand why procedures for computations with fractions and other number systems and algebraic expressions make sense. For students receiving intervention, specific amounts of allocated time should be spent on improving procedural fluency.

Practice 1: *Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.*

Students' application of mathematical procedures should be based on a strong conceptual foundation. This foundation can be built by demonstrating mathematical procedures through physical and representational models. For example, the illustration in Figure 4 can be used to help students understand the need to find a common denominator when adding fractions.

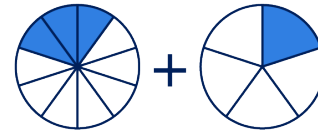


FIGURE 4. Representation for Finding Common Denominators

Resources for implementing this practice can be found at the Middle School Matters Institute website:

- **Visual Representations Toolkit**
<https://greatmiddleschools.org/toolkits/math/visual-representations/>

Practice 2: *Use meaningful fact practice activities for students lacking a strong foundation in math facts.*

Practice, not drill, is necessary to learn any new skill. This is especially true in mathematics. To aid in computational efficiency, students need comprehensive knowledge and recall of math facts for addition, subtraction, multiplication, and division. To begin, teachers should assess the fluency of students. If students experience difficulty with fluency, teachers should explicitly teach early numeracy and operations concepts. Daily practice activities, conducted for a brief amount of time, can improve math fact fluency. Technology can also be used for math fact practice.

Practice 3: *Address common misconceptions regarding computational procedures.*

Students' errors can provide valuable information to guide instruction. Often, students generally understand the procedure but inadvertently make mistakes when executing computations. However, in some instances, these mistakes represent persistent misconceptions or misapplications. Through his research, Ashlock identified three basic categories of computational errors: (a) wrong operation, in which the student uses an inappropriate operation to solve a problem, (b) computational error, in which the student uses the appropriate operation but makes an error involving basic number facts, and (c) defective algorithm, in which the student uses the appropriate operation but makes a non-number fact error in one or more steps of the operation.¹² Defective algorithms often result when students over-generalize procedures without relying on standard algorithms or a foundational understanding of the procedure, as is illustrated in the *Practice 3 Example Application*. These misconceptions need to be addressed in instruction to prevent chronic errors.

In terms of algorithms, students should learn a standard algorithm for each distinct type of computation. A standard algorithm is a set of steps that will work for a type of computation problem (e.g., multi-digit multiplication). Teachers can expose students to other strategies to provide different options for approaching novel problems.¹ However, students should not be forced to demonstrate fluency with all strategies.

Practice 4: *Present real-world contexts with plausible numbers for problems.*

Students often find solving problems that are situated in real-world examples to be motivating and relevant to their experiences. Teachers should take care, however, to use real-world contexts that are meaningful while still maintaining the intended mathematical ideas.¹³

PRACTICE 3 EXAMPLE APPLICATION: Proportional Reasoning

In proportional reasoning, teachers commonly teach students the strategy of cross-multiplying. Students become proficient at the procedure but do not understand why cross multiplication is a lawful, efficient way to solve a problem involving a proportion.

$$\frac{2}{3} = \frac{x}{6}$$

When cross-multiplied, this is $3x = 12$, and $x = 4$.

However, if students understand that equivalent fractions represent the same magnitude and, by definition, they can multiply both sides by the same number and the fractions remain equivalent. Therefore, if students multiply both sides by the product of the denominators the result is:

$$\frac{2}{3}(18) = \frac{x}{6}(18)$$

When simplified, this is:

$$\frac{36}{3} = \frac{18x}{6}$$

$$12 = 3x, \text{ and } x = 4$$

Cross multiplication is efficient, but unless students understand the underlying mathematics, it could lead to errors and possible misconceptions.

Principle 5:

Provide explicit and systematic instruction during instruction and intervention.³

In core instruction, teachers often engage students in learning about a new topic or procedure by having them explore the mathematics teachers believe will be involved. Due to the large teacher-student ratio, the guidance during practice, the corrective feedback during instruction, and the review may be insufficient to help struggling students make progress toward expected outcomes. Students having difficulty with mathematics require explicit and systematic instruction that includes modeling concepts, procedures, and proficient problem solving processes; verbalizing thought processes; guided practice; corrective feedback; and frequent cumulative review.¹⁴

Practice 1: *Include explicit teacher or peer modeling and demonstrate key concepts and skills.*

Students who struggle in mathematics need an instructional model from a teacher or a more proficient peer that is clearly communicated and that illustrates the steps in the mathematical procedure so the learner can repeat them successfully.^{15, 16} The teacher should use precise language to present clear models, and these models should include examples to illustrate concepts and demonstrate procedures. By verbalizing the thinking involved in completing the model, the teacher helps students develop the critical thinking skills and the vocabulary that will guide them through similar problems in the future.¹⁷ As students develop understanding, instruction will expand to a broader range of examples that may increase in complexity.

Resources for implementing this practice can be found at the Middle School Matters Institute website:

- **Peer-Mediated Instruction Toolkit**
<https://greatmiddleschools.org/toolkits/math/peer-mediated-instruction/>

Practice 2: *Include worked examples of key concepts and skills.*¹

A teacher's or peer's modeling may include worked examples that the teacher or peer analyzes and discusses in the context of the step-by-step algorithm or process used to work the examples. For example, in the *Practice 1 Example Application*, a teacher could present the work (written in the left column) and use the think-aloud presented in the right column.

Practice 3: *Gradually transition from teacher-modeled problem solving to student-directed problem solving.*

Students need to develop independent problem solving strategies. It is helpful to provide students with a framework for problem solving, such as a step-by-step checklist or mnemonic that reminds students of the problem-solving process. This process can involve coaching and prompting that decreases as students become more proficient.

PRACTICE 1 EXAMPLE APPLICATION: Proportional Reasoning Using a Think-Aloud Strategy

In the following example, a teacher provides students with explicit instruction on how to change a mixed number to an equivalent fraction.

Example	Teacher Think Aloud
$2\frac{2}{3}$	How can I convert this to another fraction with the same value?
$= 1 + 1 + \frac{2}{3}$	First we convert the whole number 2 to two ones.
	How can I add whole numbers to the fraction? I have to also make them fractions.
$= \frac{3}{3} + \frac{3}{3} + \frac{2}{3}$	Next, we convert the whole numbers to fractions with the same denominator as two thirds.
$= \frac{8}{3}$	Can I add these fractions? Yes, they have the same denominator, so I add the numerators. 3 plus 3 plus 2 equals 8. The answer is eight thirds.

PRACTICE 3 EXAMPLE APPLICATION: Transitioning from Teacher-Modeled Problem Solving to Student-Directed Problem Solving

In the example below, the teacher uses questions to guide students thinking through a proportional reasoning problem:

For every 30 students at school, 10 bring their lunch. If there are 700 students in the school, how many total students bring their lunch to the cafeteria?

- Let's highlight the key information. What two quantities are being compared? Highlight those two numbers.
- From this situation, can you write a proportion comparing two ratios? Why would it be important to include the units that are being compared? (To make sure that the proportion is comparing the same ratios)
- What is this problem asking? (How many students bring their lunch to the cafeteria if there are 700 students in the school?)
- Now, let's plan how to solve this problem. What quantities am I comparing? (Number of students bringing lunch to the cafeteria and total number of students)
- What do I know? (10 out of 30 students bring their lunch; there are 700 students in the school.)
- What quantities go together? (10 students bring their lunch for every 30 students; x students bring their and 700 total students in the school.)
- What am I looking for? (The number of students who bring their lunch out of 700 total students)
- How would I set this up?

$$\frac{\text{students eat in cafeteria}}{\text{total students}} = \frac{\text{students eat in cafeteria}}{\text{total students}}$$

Practice 4: *Include opportunities for students to talk aloud about the skills, knowledge, or problem-solving procedures they are learning.*

Encouraging students to verbalize the procedures for problem-solving and their rationale for each step will increase awareness of their thinking. This verbalization may initially need to be modeled by the teacher or a peer.^{16, 17} (See the *Practice 4 Example Application*)

Practice 5: *Provide immediate and corrective feedback with opportunities for students to correct errors.*

Struggling learners are often unaware of their mistakes. Immediate and corrective feedback clarifies their understanding and reinforces accuracy. In the following example, a student is using multiplication to find equivalent fractions. (See the *Practice 5 Example Application*)

Practice 6: *Include sufficient, distributed, and cumulative practice and review.*

Many struggling learners need sufficient practice and review to develop mastery. Often, students remember more when they are exposed to the new information on two occasions (instead of just one) and when there is time between those two occasions.¹⁸ This practice is called *delayed review*.¹⁹ In addition, by distributing types of problems across assignments, students can experience overlearning of these topics or skills, and students learn to discriminate among operations and strategies.²⁰ An example would be to include a few review problems on homework and classwork each night for a few weeks and then once a week after that. This practice is associated with improved retention.

PRACTICE 4 EXAMPLE APPLICATION: Encouraging Students to Talk About their Thinking

Situation
<p>You buy 2 packages of pencils for \$4. How much would it cost to buy 12 packages?</p>
<p>Teacher: I see that you use different ways to find the answer. Mark, can you tell us how you solved the problem?</p> <p>Mark: Sure. I knew that if I could figure how much 1 package costs, then I could multiply it by 12 to get the cost of 12 packages. You can buy 2 packages for \$4, so you know 1 package is \$2. So, I can multiply \$2 by 12 to get \$24 for 12 packages.</p> <p>Teacher: Mark, how did you find out that 1 package is \$2?</p> <p>Mark: Oh, since 2 packages was \$4, I divided \$4 by 2, to get the cost of 1 package, \$2.</p> <p>Teacher: Okay, and do you remember what we called it when we found the cost of 1 package?</p> <p>Mark: The unit rate?</p> <p>Teacher: Yes! The unit rate is the cost for one package.</p>

PRACTICE 5 EXAMPLE APPLICATION: Immediate and Corrective Feedback

Example of Reva's work

$$\frac{2}{3}(2) = \frac{4}{3}(2) = \frac{8}{3}(2) = \frac{16}{3}$$

Teacher: Reva, explain how you found these equivalent fractions and how you know they represent the same magnitude.

Reva: Well, I multiplied each one by the same number, 2, to get the next fraction.

Teacher: What is the only number that we can use as a multiplier to get an equivalent fraction?

Reva: 1.

Teacher: That's right. Right now you are multiplying each fraction by $\frac{2}{1}$.

What would you have to multiply each fraction by to get an equivalent fraction and still use 2 as the multiplier in your numerator?

Reva: $\frac{2}{2}$?

Teacher: That's right! Let's go back and use $\frac{2}{2}$.

Principle 6:

Instruction should include strategies for solving word and algebra problems that are based on common underlying structures.¹⁷

For Word Problems:

Common word-problem structures have growing support in literature and have been successfully employed in mathematics instruction for some time.²¹ Intervention programs are increasingly focusing on these structures in an effort to help students identify the relevant information in a problem. From this information provided in the structure, students can systematically identify an effective approach to solving the problem.

Typical word-problem structures for additive word problems include combine, compare, and change. Structures to solve multiplicative word problems include equal groups, comparisons, and combinations. While these problem structures should be a focus of instruction in the elementary grades, middle grades students may need a review and additional practice solving word problems with these structures. Often, at the middle grades, students solve multi-step additive and multiplicative word problems that include whole or rational numbers and feature information from tables, charts, or graphs.

In the middle grades, a common problem structure relates to ratios. Problems that involve ratios generally include two problems that are being compared and ask the student to use that comparison to find a missing number.²² The problem below illustrates this:

Problem:

Each time Jim inserts 2 tokens into the gumball machine he gets 3 gumballs. How many gumballs would he get if he puts in 20 tokens?

The numbers being compared are 2 tokens and 3 gumballs. The missing number is the number of gumballs he would receive if he put in 20 tokens. This problem

structure is common to ratio problems. After students work several problems of this type and learn how to identify the common structure, they are able to categorize this as a ratio problem.

For Algebra:

Teaching students to focus on problem “structure helps students make connections among problems, solution strategies, and representations that may initially appear different but are actually mathematically similar.”¹

For example, the equations $2x + 8 = 14$, $2(x + 1) + 8 = 14$, and $2(3x + 4) + 8 = 14$ may look different, but to solve each equation 2 is multiplied by a quantity and 8 is added to sum to 14.

Practice 1: *Include systematic instruction on the structural connections between known, familiar, and novel word problems.*

Teach an organizational strategy for setting up and solving problems. Then, help students identify underlying structures of problems across a range of examples to ensure generalization. Students who receive instruction in finding the underlying structures in problems are able to solve problems more efficiently because they have a schema for the problem and do not have to relearn how to set it up with each new problem they encounter. They also are better able to recognize meaningful features of a problem, such as the following example problem, and do not rely on key words or superficial features of the context.

Examine the *Practice 1 Example Application*. Students who have been explicitly taught how to identify the features of a ratio problem rather than seeing its superficial structure will see that there are two compared numbers in each of these problems. However, in the third problem, students would look at the question and would determine that it is a problem that doesn't require a ratio.

PRACTICE 1 EXAMPLE APPLICATION: Proportional Reasoning Word Problems

Problem: Felicity rides her bike at a rate of 4 miles per hour. How many hours will it take her to ride 22 miles at a constant rate?

Problem: The gas mileage for Elijah's car is 22 miles per gallon. How many gallons of gas would it take to drive 432 miles at a constant rate?

Problem: Each time Susan's mom deposits \$100 in Susan's savings account, she also deposits \$50 in Susan's brother's account. How much money does she have to deposit each time?

Practice 2: *Teach common problem types and their structures, as well as how to categorize and select appropriate solution methods for each problem type.*

Proficiency with problem solving depends on the student's ability to see common problem types and connect them to viable solutions. Struggling students need to receive explicit instruction on organizing information presented in word problems, on common problem types, and appropriate solutions.^{23, 21}

Resources for implementing this practice can be found at the Middle School Matters Institute website:

- **Schema-Based Instruction Toolkit:**
<https://greatmiddleschools.org/toolkits/math/schema-based-instruction/>

PRACTICE 2 EXAMPLE APPLICATION: Teaching Common Problem Types—Ratio Problems

Problem	Teacher Language
<p>The ratio of the number of girls to the total number of children in Ms. Robinson’s class is 2:5. The number of girls in the class is 12. How many children are in the class?</p>	<p>Step 1: Find the problem type.</p> <ul style="list-style-type: none"> Read and retell problem to understand it. Ask if the problem is similar or different from other problems. Is this a ratio problem?
<p style="text-align: center;">Ratio Problem</p> <div style="text-align: center;"> </div>	<p>Step 2: Organize the problem.</p> <ul style="list-style-type: none"> The number of girls in the class is 12. The ratio of the number of girls to the total number of children in Ms. Robinson’s class is 2:5.
$\frac{12 \text{ girls}}{d \text{ children}} = \frac{2}{5}$	<p>Step 3: Plan to solve the problem.</p>
$\frac{12 \text{ girls}(5d)}{d \text{ children}} = \frac{2(5d)}{5}$ $60 = 2d$ $30 \text{ children} = d$	<p>Step 4: Solve the problem.</p> <ul style="list-style-type: none"> Multiply both sides by the product of the denominators. Simplify and multiply both sides. Divide both sides by 2.

Principle 7:

For students who struggle in mathematics, instruction and intervention materials should include opportunities to work with representations of mathematical ideas.²⁴ Teachers should be proficient in the use of these representations.

As discussed in Principle 4, Practice 1, evidence suggests that using visual representations during instruction can improve students' conceptual understanding and procedural fluency. For students who are struggling, research indicates that using visual representations during lessons may improve students' overall outcomes in mathematics, pre-algebra proficiency, problem-solving skills, and procedural fluency. Many mathematics textbooks provide little information about using visual representations, so teachers should use explicit instruction to introduce and explain all visual representations to students.²⁵ Through carefully sequenced instruction, visual representations appear to help students transition from concrete models of mathematical ideas to abstract mathematical representations. Moreover, students can use visual representations to develop strategies for translating word problems into abstract numerical statements.

Practice 1: *Employ visual representations to model mathematical concepts.*

Foundational understanding of mathematics depends on seeing its application to physical and visual models. Intervention instruction should incorporate concrete and visual (i.e., semi-concrete) representations of mathematical concepts to develop foundational knowledge. Instruction, however, should use representations as a support for mathematics learning rather than a focus of the lesson.²⁶

Practice 2: *Explicitly link a visual representation or model with the abstract mathematical symbol or concept.*

To learn to interpret and comprehend abstract mathematics, students must see and understand how a visual representation can be translated into abstract numbers and number sentences. See Figures 1, 2, 3, and 4 for visual representations related to fractions. See the *Practice 2 Example Application* on the following page for an example related to algebra.











Practice 3: *Use consistent language across similar representations.*

Students will be better able to perceive similarities across representations if language is consistent and precise. For example, interventionists should use the same mathematically precise language when using concrete models, visual representations, and abstract mathematical notation. (See *Practice 3 Example Application*)

Resources for implementing this practice can be found online:

- **Visual Representations Toolkit**
<https://greatmiddleschools.org/toolkits/math/visual-representations/>

PRACTICE 2 EXAMPLE APPLICATION: Matched Concrete, Visual, and Abstract Representations

3 + X = 7		
Solving the Equation with Concrete Manipulatives (Cups and Sticks)	Solving the Equation with Visual Representations of Cups and Sticks	Solving the Equation with Abstract Symbols
A 		$3 + 1X = 7$
B 		$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$
C 		$\frac{1X}{1} = \frac{4}{1}$
D 		
E 		$X = 4$
Concrete Steps A. 3 sticks plus one group of X equals 7 sticks B. Subtract 3 sticks from each side of the equation C. The equation now reads as one group of X equals 4 sticks D. Divide each side of the equation by one group E. One group of X is equal to four sticks (i.e., 1X/group = 4 sticks/group; 1X = 4 sticks)		

PRACTICE 3 EXAMPLE APPLICATION: Consistent and Precise Language

In the *Practice 2 Example Application*, you can see how solving for an unknown number in an equation is displayed using concrete examples, visual representations, and numerals. In all three forms, the language should be consistent.

For example, in Step A, the teacher and students can say: “Three sticks plus one group of some number of sticks is seven sticks.”

Step B: “Subtract three sticks from both sides.”

Step C: “One group of unknown number sticks is four sticks.”

Step D: “Divide each side of the equation by one group.”

Step E: “The unknown number sticks is four sticks.”

Principle 8:

Establish a school wide plan to identify and improve teachers' mathematical and pedagogical content knowledge.

Mathematical content knowledge refers to teachers' understanding of the precise mathematics that underlie the content being taught. "Teachers must know in detail the mathematical content they are responsible for teaching and its connections to other important mathematics, both prior to and beyond the level they are assigned to teach."³ Teachers with a deep understanding of mathematics possess a conceptual understanding of the entire elementary and middle grades mathematics curriculum that goes beyond simply being able to execute the algorithms.²⁷

Pedagogical content knowledge refers to the integration of mathematical content knowledge with knowledge of students, learning, and the influences of pedagogy on instructional practice.²⁸ Pedagogical content knowledge should inform the design and delivery of instruction, as well as interactions with students during the learning process. Specifically, teachers' pedagogical content knowledge is elicited when reasoning through mathematical explanations that arise in response to students' questions, analyzing textbooks and instructional aids for appropriateness and/or alignment with instructional objectives, and creating instructional materials, such as tests and homework exercises.

The research demonstrating the impact of teachers' mathematical and pedagogical content knowledge is limited and often is not designed to evaluate causal relationships. However, numerous mathematics education researchers and mathematicians hypothesize that

teachers' mathematical and pedagogical content knowledge is highly correlated with student achievement.³ Wu notes the impact on student engagement stating, "teachers who can make transparent what they are talking about (cf. definitions and precision), can explain what they ask students to learn (cf. reasoning and coherence), and can explain why students should learn it (cf. purposefulness) have a much better chance of opening up a dialogue with their students and inspiring them to participate in the doing of mathematics" (p. 6-7).²⁹

Practice 1: Assess teachers' needs in relation to mathematics content knowledge and mathematics pedagogical content knowledge across content areas.

To accurately target professional development, mathematics teachers' depth and breadth of mathematical and pedagogical content knowledge should be assessed.³⁰ Because mathematical reasoning should be integrated across relevant content areas, professional development may be needed for teachers responsible for other content areas. Needs assessment tools are available to assist administrators, instructional coaches, or other teacher leaders in gathering this information (See Center on Instruction in Mathematics: <http://www.centeroninstruction.org/identifying-professional-development-needs-in-mathematics-a-planning-tool-for-grades-3-7---second-edition>).

A needs assessment can include teachers' self-reflection of their strengths and limitations, as well as an objective test of their knowledge and skills. Results from the needs assessment should be used to tailor professional development to support individual teacher's needs and to structure and inform the work of teacher professional learning communities.

PRACTICE 1 EXAMPLE APPLICATION: Steps for Conducting a Needs Assessment

1. Determine the purpose of the needs assessment and how the results will be used.
 2. Determine who will administer the assessment, when, and how data will be analyzed and reported.
 3. Identify the population of teachers who will take the needs assessment. Different populations might need differently designed needs assessments.
 4. Identify what type of information is needed (e.g., self-perception, objective data, program evaluation).
 5. Design the data collection instrument to capture the type of information needed.
 6. Collect and organize data.
 7. Analyze data based on the purpose of the needs assessment.
 8. Use results of the needs assessment to inform design of professional development.
-

RESOURCE FOR EVALUATING QUALITY AND IMPACT OF PROFESSIONAL DEVELOPMENT

The Council for Chief State School Officers (CCSSO) analyzed evaluations of teacher professional development programs in mathematics and science. In conducting their review, they evaluated programs' effects on student outcomes, teacher content knowledge, and instructional practices. Additionally, they considered the quality of the research design and instruments used in making the evaluation. Reports published by objective organizations such as CCSSO provide a good resource for gathering information about the quality and potential impact of professional development programs.

Practice 2: *Select and implement high-quality professional development that acknowledges different teachers' needs.*

To effectively change teachers' practices, professional development opportunities should align with the standards and expectations proposed by Learning Forward (formerly the National Staff Development Council):

<http://www.learningforward.org> for staff development.

Most importantly, professional development should be targeted to support individual teachers' needs. Because it takes time to build and grow professional knowledge, professional development should be delivered over time. Moreover, effective professional development should be situated within a collaborative environment, often within learning communities or by encouraging discourse among colleagues. All professional development opportunities should be evaluated for alignment with these expectations prior to implementation.

Practice 3: *Improve teachers' knowledge and understanding of making practice decisions based on research evidence and student data.*

A culture of using evidence to guide instructional decisions should focus on two types of activities.

First, student performance data should be systematically gathered at points before, during, and after instruction to guide instructional and programmatic decisions. Teachers and administrators should understand the types of data needed, how to collect and analyze data, and how to make decisions and communicate regarding the results.

Second, research- and evidence-based solutions should be integrated into teachers' and administrators' practices. Teachers and administrators should engage in ongoing professional development by reading research literature on mathematics instruction and interventions and by considering how these practices can be implemented within the local context. Moreover, administrators should cultivate a school climate that allows for experimentation and implementation of evidence-based practices in a supportive environment. Administrators and colleagues can work with teachers to support fidelity of implementation of research- and evidence-based practices.

Principle 9:

Discontinue using practices that are NOT associated with improved outcomes for students and teachers.

For students who are struggling in mathematics, it is essential that teachers employ practices that are supported by research. Fortunately, there are a number of resources available that describe and exemplify these practices. What follows are two recommended resources:

IES Practice Guide, *Assisting students struggling with mathematics: Response to Intervention (RtI) for elementary and middle grades*.⁴

http://ies.ed.gov/ncee/wwc/pdf/practice_guides/rti_math_pg_042109.pdf

What Works Clearinghouse (Identifies research on programs as opposed to practices):
<http://ies.ed.gov/ncee/wwc/>

Practice 1: *Examine the evidentiary bases of practices currently used in teaching mathematics and identify and eliminate practices that are contraindicated by existing evidence.*

There is a growing body of evidence regarding effective practices for teaching mathematics in middle grades. Research has been summarized on specific topics including instruction on fractions⁶ and teaching struggling learners in mathematics.⁴ While these documents represent important strides in knowledge about how best to provide instruction in middle grades mathematics for different types of students, even the document authors acknowledge that sufficient evidence to answer many important questions is lacking. For example, in the IES practice guide on struggling learners, it is recommended that instruction include motivational strategies for students who are receiving additional intervention in mathematics. However, there is little research available to support this recommendation. Rather, this recommendation comes

primarily from the opinion of experts based on findings and theories in related areas or indirect evidence.

It is important that teachers and school leaders understand the current state of the evidence on mathematics instruction and how to use the evidence to examine their practices. Furthermore, it is very important that, in understanding the available evidence, teachers understand what is not known. It is also important for teachers to understand that in many cases, the available evidence focuses on elementary schools. However, in the absence of more substantial evidence, it is wise to consider this evidence and how it might relate to middle grades students.

For example, the use of manipulatives to teach mathematical concepts receives a lot of attention. Many online sources, print articles, and textbooks recommend the use of concrete objects to help students understand how mathematical ideas apply in the real world. These concrete objects (e.g., fraction bars, algebra tiles, abacus) are referred to as manipulatives because it is believed that students benefit from hands-on manipulation of these objects in developing their understanding of how mathematics works. The majority of research supporting manipulatives has been with students in the elementary grades; however, the research base related to the use of manipulatives to support mathematics learning in the middle grades is emerging.³¹ Therefore, there are many questions that research has not yet answered, such as:

- How long do students need to manipulate these objects before they are ready to move to visual representations?
- If students already demonstrate understanding of a concept, do they need to go back to using the manipulatives to ensure they are not moving procedurally without sufficient foundational understanding?
- Which manipulatives help develop strong conceptual skill in each mathematical content area?

While awaiting more research across more mathematical content areas to address these and other questions, teachers should use their professional judgment on the necessity of hands-on activities and when they are most appropriately used in the classroom. Teachers should take this opportunity to conduct their own research using manipulatives. They can collect and analyze data to determine what is best for their students.

Practice 2: *Monitor student learning formally and informally and use trend data to determine whether and how to adjust current practices.*

Research summaries, such as those referenced above, provide answers to questions about the effectiveness of practices in particular contexts. Therefore, regular adjustments to instruction will be necessary. Decisions to make adjustments should be informed by multiple sources of student data. Decisions can be made at multiple levels: program, classroom, or student level. For example, based on grade-level data derived from state tests, a school may

determine that a particular instructional program is not working for their students. A particular teacher may find that, based on periodic assessments of students' performance on a particular topic, additional support is needed for a group of students in the classroom in order for them to make sufficient progress.

Finally, progress monitoring with a single student or a small group of students may reveal that instructional adjustments need to be made to ensure that they learn a particular concept or skill or develop fluency with a particular procedure. For at-risk students, teachers should graph progress-monitoring data to determine whether these students are making adequate progress within their current mathematics program. Adequate progress may be determined by comparing the student's slope (i.e., trend in growth) to normative slope data or by comparing to a benchmark score.⁵ If students do not demonstrate adequate progress, teachers should make instructional adaptations or changes. Continued progress monitoring will allow teachers to understand whether such adaptations and changes are beneficial for the student.

PRACTICE 2 EXAMPLE APPLICATION: Using Informal Data from Analyzing Student Work to Guide Instruction

A teacher has introduced equivalent fractions and has assigned a few practice examples for students to complete in groups. The group work requires students to determine whether two fractions are equivalent and to justify their answer. Each group successfully completes the assignment and appears to understand equivalent fractions. However, after reviewing their independent work the following day, the teacher notices a small group of students do not seem to understand that equivalent fractions, by definition, represent the same magnitude. Though the fractions have a different numerator and denominator, they are equivalent. Often, the students' equivalent fractions have different numerators but the same denominator. Based on this classroom data, the teacher makes the decision to use group work time to reteach the concept of equivalent fractions to this small group of students.

Conclusion

Mathematics is widely recognized as an important factor in furthering educational attainment and improving job market potential. A strong basis of mathematical education allows countries to develop the human capital needed to make scientific and technological advancements.³ The principles and practices described in this section were derived from several sources including practice guides provided by the Institute of Education Sciences, meta-analyses in the research literature, and the report from the National Mathematics Advisory Panel (NMAP; 2008). Despite the importance of mathematics in everyday lives and to students' future academic success, many questions about how to teach mathematics effectively to the broadest range of students in the middle grades remain unanswered. Many of the principles and practices included in this section are supported by rigorous research. In instances such as Principles 1 and 2, where less rigorous research is available, principles and practices are based more on professional experience and clinical observations in schools. In addition, several areas that are currently considered important to mathematics learning have very little support in the research literature but warrant further investigation. For example, teacher knowledge of mathematics and how to teach mathematics are undoubtedly important to student achievement. Yet, only emerging evidence exists to support schools' efforts to provide professional development.

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Cognitive Science and Advanced Reasoning

Advanced reasoning and critical thinking skills typically undergo rapid expansion during adolescence and are refined in complexity and maturity throughout adulthood. Adolescence is an optimal, yet vulnerable, stage of cognitive development of higher-order thinking, reasoning, and problem solving. American adolescents are falling behind students in other developed countries in acquiring crucial advanced reasoning skills. The middle grades are referred to as a transitional black hole in education: The child moves out of the supportive and engaging learning environment of elementary school and into an environment with increased personal choices, with greater risk for failure, dropping out, and developing some form of addictive behavior.

Teachers can implement cognitive and reasoning principles to promote learning across all content areas in the middle grades. The cognitive principles of learning are based on reports from (a) the National Academy of Sciences,¹ (b) a practice guide for teachers by the Institute of Education Sciences in the U.S. Department of Education on *Organizing Instruction and Study to Improve Student Learning*,² (c) and a joint initiative between the Association of Psychological Sciences and the American Psychological Association on Lifelong Learning at Work and at Home.³ The recommendations here reflect the wisdom of these reports, which are based on scientific evidence, rather than being consensus opinions of experts. What follows are seven key principles and related practices from this research.

Principle 1:

Distribute presentation, practice, and testing over time.

It is more effective to distribute the presentation of materials, practice, and tests over time than to block the learning experiences in a short time span.^{4, 5, 6, 7, 8, 9}

Teachers can promote delayed re-exposure to the material through homework assignments, in-class reviews, quizzes, and other instructional exercises. Tests or challenges can help promote distributed learning experiences and slow forgetting.^{6, 10, 11, 12, 13, 14}

Practice 1: *Present material at different points in time in different contexts.*

Teachers can present the same or similar material at different times throughout a course. Presenting the same idea in different contexts is particularly helpful in allowing students to understand it from multiple perspectives.

Practice 2: *Test or challenge students frequently.*

Teachers should give frequent tests, quizzes, or assignments to force the student to regularly focus on the material and to distribute the practice of these skills to improve learning and retention. Instead of always labeling these “tests,” teachers can call them “challenges” to foster motivation.

Practice 3: *Use cumulative tests.*

Teachers give cumulative tests because this practice encourages students to restudy earlier course material and thereby distribute their practice.² Students benefit more from repeated testing when they expect a cumulative final exam than when they do not expect a final exam.¹⁵

PRACTICE 1 EXAMPLE APPLICATION: Presenting Material Across Multiple Contexts

Teachers could present many contexts for students to learn about the Great Irish Potato Famine that last from 1845 to 1852:

- Learning about the history of Ireland
 - Learning about fungus infections in crops
 - Learning how a problem in one country can influence other countries
 - Learning how a disease spreads in a population over time, including an exponential formula
-

PRACTICE 2 EXAMPLE APPLICATION: Game Playing

Educational games can motivate students while also testing knowledge of facts or difficult concepts. A well-designed game can both challenge students and frequently expose them to material.

It is important that the game design be built on principles of learning science. Most commercial games are not designed for learning but rather for entertainment. Teachers should examine evidence provided by game designers on the impact of the game on learning. If they are uncertain about the quality of the data, they should solicit advice from researchers at reputable universities and organizations and from school districts.

Principle 2:

Ground ideas in active, engaging experiences.

Concepts need to be grounded in activities that require students to actively engage in experience that relates to a real-life application of the content.^{16, 17, 18, 19} Learners benefit from visualizing a picture of the concept, manipulating its parts and aspects, and observing how it functions over time, particularly in real-life contexts. Experiential learning is important when there is a need for precision of ideas and communication, particularly when content is first introduced, and it is beneficial to integrate experiential representations with more abstract representations.^{20, 21, 22} Stories have concrete characters, objects, spatial layouts, and activities that bear some similarity to everyday experiences so they can be used to facilitate understanding and memory.^{18, 20, 21, 22}

Practice 1: *Present visual depictions of core concepts and ideas.*

Teachers should present pictures, diagrams, graphs, and other visual depictions of the core concepts in the curriculum. Students have trouble learning abstract notions if they are not grounded in concrete representations. Whenever an abstract notion is presented, it needs to be accompanied by a supporting visual image.

Practice 2: *Encourage students to manipulate aspects of core concepts.*

Students acquire an embodied representation of core concepts when they can manipulate parts and entities and observe the consequences. Whenever a student performs an action accurately, it is likely that the student has mastered the concept. Mastery is entirely uncertain in the absence of student action.²²

Practice 3: *Capture content in stories.*

Teachers should weave essential concepts into stories with concrete agents, spatial settings, objects, parts of objects, and organized action sequences. Stories can bring abstract content to life.^{23, 24, 25} For example, telling a good story is a better way to help students understand history than asking them to memorize a list of dates, locations, and events. Science teachers can tell stories of how researchers discovered new theories or put a theory into practice.

PRACTICE 2 EXAMPLE APPLICATION: Hands-On Student Activities

Science labs provide an excellent opportunity for students to get a hands-on experience with science laws and concepts. Dropping objects of different weights or mass from a building to illustrate Newton's laws is an obvious example of how hands-on experience can teach an important concept.

Another example in mathematics is the activity of graphing data that students collect, such as the number of hours spent studying over time or the amount of algae in water samples in different locations in a city.

Computer environments with interactive simulation are an excellent way of learning about complex systems. Students can manipulate parameters and see what happens in simulations, and they can learn about difficult concepts, such as causal propagation, trade-offs between variables, and managing limited resources.

Principle 3:

Provide timely, qualitative feedback on students' learning activities.

Feedback helps learners tune their knowledge representations, skills, and strategies to include relevant and useful content.^{26, 27, 28, 29, 30, 31, 32} The feedback can be supplied by people, computers, or constraints of the world. The feedback may identify and correct errors and misconceptions (errors of commission) or help fill missing information (errors of omission). The optimal timing of the feedback varies for different tasks. Immediate feedback supports correct information, prevents elaboration of incorrect information, and helps students acquire skills of self-regulated learning; however, it does have the potential to interrupt organized activities.^{27, 29} Teachers should provide feedback on complex material that qualitatively explains correct and incorrect information, as opposed to merely flagging that an answer is incorrect or giving the student an overall score.^{27, 28, 29, 30} A large amount of negative feedback may cause students to disengage because of feelings of low self-esteem and self-efficacy.

Practice 1: Give students timely and accurate feedback on their performance.

Teachers should provide accurate, timely feedback about students' ideas, answers, test items, solutions, writing, performances, and other tasks. Computer programs can provide immediate, accurate feedback to students on the answers, solutions, and essays they generate, whereas it may take a few minutes to a few weeks to receive answers from teachers.³⁰ However, computer-generated feedback may be less meaningful to students because it is less personal.

Practice 2: Include qualitative explanations in feedback for complex material.

Teachers should explain why answers are correct or incorrect rather than merely giving numerical scores or positive/negative feedback. Qualitative explanations state why an answer is right or wrong. The characteristics of a good explanation include:

- Identifying the elements in an answer that are problematic or particularly good (e.g., This statement is false.)
- Providing steps in a logical way or giving causal justification for the feedback (e.g., This word is incorrect because ____.)
- Contrasting a faulty piece of information with a correct piece of information (e.g., The numbers should decrease rather than increase because ____.)

Practice 3: Adjust negative feedback to what the student can emotionally handle.

Teachers should not provide students with a large amount of negative feedback, which can lead students to tune out. This can be accomplished by assigning easier tasks or by withholding feedback about unimportant errors.

PRINCIPLE 3 EXAMPLE APPLICATION: Providing Just Enough Challenge

Problems in a mathematics text are often scaled on difficulty, such as easy, medium, or difficult.

A student might get discouraged when assigned a large number of difficult problems that he or she answers incorrectly, resulting in negative feedback. To prevent boredom and discouragement, the teacher might assign an easier problem but say to the student, “Try this problem. It may be a challenge, but I bet you can handle it!” When the student readily solves the problem and receives positive feedback, his or her confidence, self-esteem, and self-efficacy increase.

Other students might get bored when not challenged. These students need to be assigned more difficult problems to work on.

There is a *zone of challenge* for most students according to the Goldilocks principle,²⁹ where problems or texts are not too easy, not too difficult, but just right. Computers can calibrate this level by tracking the performance of each student and scaling materials based on difficulty.

Principle 4:

Encourage the learner to generate content.

Students should be encouraged to actively generate language, content, solutions to problems, and reasoning rather than passively processing the new material.^{33,34, 35,}

^{36,37} It is not surprising that tutors learn more than tutees in peer tutoring because tutors are often more engaged with the material, while tutees are passive recipients of it.^{38, 39, 40}

Free recall or essay tests that provide minimal cues often produce better learning than recognition tests and multiple choice tests that require only that a student recognize correct answers. Outlining, integrating, and synthesizing information produces better learning than rereading materials or other more passive strategies. *Writing and Writing Interventions* describes ways to improve students' writing skills and support the active generation of information. Some computer programs provide immediate feedback on writing; however, it may not be as effective as a teacher's feedback when writing needs to be precise and make subtle discriminations.

Practice 1: Assign tasks that require writing or other forms of generation.

Teachers should assign tasks that require students to generate ideas, write, perform actions, solve problems, and reason. Students should not merely be passive recipients of information.⁴¹

Practice 2: Arrange for students to teach other students.

Teachers should set up peer teaching or tutoring that requires the student teacher/tutor to actively generate content. All students should have the opportunity to serve in the role of a teacher/tutor.^{40, 42}

PRACTICE 2 EXAMPLE APPLICATION: Students Helping Students Activities

Teachers can use different ways to encourage students to tutor their peers and thereby benefit from active generation of information:

1. Pair students and have them take turns teaching topics to each other.
 2. Present a difficult problem to the class and ask students to raise their hand as soon as they solve it. The first student to raise his or her hand presents the solution to the rest of the class.
 3. Use the jigsaw method, whereby students are divided into groups and are asked to solve a problem. Each group member is given a particular piece of the solution that the other group members need to learn about. In this activity, students teach one another information in service of a concrete goal.
 4. Ask groups of students to write justifications for their positions, and then have each student vote for a particular position on a controversial issue (e.g., how to solve world overpopulation, how to minimize global warming).
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Principle 5:

Select challenging tasks that require explanations, reasoning, and problem solving.

Learning is facilitated when students need to construct explanations during the course of grasping difficult concepts or solving problems through reasoning.^{35, 43, 44, 45,}

⁴⁶ Explanations consist of causal analyses of events, logical justifications of claims, and rationales for actions. Explanations are elicited by deep questions, such as *why*, *how*, *what-if* and *what-if-not*, as opposed to shallow questions that require the learner to simply fill in missing words, such as *who*, *what*, *where*, and *when*.⁴³ Training students to ask deep questions facilitates comprehension of material from text, classroom lectures, and electronic media.^{47, 48} One method of stimulating explanations, reasoning, and deep questions is to present challenges, obstacles to goals, contradictions, scenario breakdowns, and difficult decisions that place the learner in cognitive disequilibrium.⁴⁸ Such “desirable difficulties” slow down initial learning, but promote long-term retention and transfer.^{48, 49}

Practice 1: Assign tasks that require explanation-based reasoning.

Teachers should assign challenging tasks that require the students to explain their reasoning. The *Reading and Reading Interventions* section of this document provides different techniques to promote explanation-based reasoning. Types of explanation-based reasoning include:

- **Cause-effect:** Understanding how one action or event can cause another.
- **Problem-solution:** Defining the problem (or dilemma), explaining potential causes or background context of

importance, identifying all possible solutions, and selecting an optimal solution based on context, resources, etc.

- **Claim-evidence:** Making a claim, a potential answer to a question or a problem, using evidence (data or other evidence) to support it, and providing an oral or written justification of how the evidence supports the claim.
- **Claims-logical conclusion:** Reviewing claims and evidence at detailed levels, leading to claim justification; then investigating processes to determine whether sufficient evidence exists at the aggregate level to support each particular claim or group of claims and to draw a logical conclusion.

Practice 2: Ask students deep questions and train students to ask deep questions.

Teachers ask deep questions, such as *why*, *how*, *what-if*, *what-if-not*, and *so-what*, rather than shallow questions such as *who*, *what*, *when*, and *where*. These teacher questions encourage the construction of explanations. If encouraged to do so, students will ask deeper questions and achieve deeper standards of comprehension. What follows is an illustration of using a question taxonomy.^{48, 49}

Practice 3: Present desirable difficulties that place the student in cognitive disequilibrium.

Teachers should present challenges that involve obstacles to goals, contradictions, system breakdowns, trade-offs, anomalies, and other types of desirable difficulties. The resulting cognitive disequilibrium will stimulate deep questions, explanations, reasoning, and problem solving.

PRACTICE 2 EXAMPLE APPLICATION: Using a Question Taxonomy

Students can be explicitly instructed in the types of questions that lead to deeper standards of comprehension. Questions vary in depth and also how much information the student needs to provide in an answer:

1. **Verification.** Is X true or false? Did an event occur? Does a state exist?
 2. **Disjunctive.** Is X, Y, or Z the case?
 3. **Concept completion.** Who? What? When? Where?
 4. **Example.** What is an example or instance of a category?
 5. **Feature specification.** What qualitative properties does entity X have?
 6. **Quantification.** What is the value of a quantitative variable? How much? How many?
 7. **Definition.** What does X mean?
 8. **Comparison.** How is X similar to Y? How is X different from Y?
 9. **Interpretation.** What concept or claim can be inferred from a pattern of data?
 10. **Causal antecedent.** What state or event causally led to an event or state? Why did an event occur? Why does a state exist? How did an event occur? How did a state come to exist?
 11. **Causal consequence.** What are the consequences of an event or state? What if X occurred? What if X did not occur?
 12. **Goal orientation.** What are the motives or goals behind an agent's action? Why did an agent do some action?
 13. **Instrumental/procedural.** What plan or instrument allows an agent to accomplish a goal? How did an agent do some action?
 14. **Enablement.** What object or resource allows an agent to accomplish a goal?
 15. **Expectation.** Why didn't an expected event occur? Why doesn't some expected state exist?
 16. **Judgmental.** What value does the answerer place on an idea or advice? What do you think of X? How would you rate X?
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PRACTICE 3 EXAMPLE APPLICATION: Using Counterintuitive Facts to Stimulate Student Thinking

Students are often fascinated, confused, or sometimes even disturbed by facts that clash with their knowledge or beliefs. Examples of counterintuitive facts are that whales are mammals rather than fish, that violent crimes are decreasing in the United States, and that setting fires in forests sometimes helps the ecology.

Cognitive disequilibrium is experienced, and students try to restore clarity (equilibrium). They want to know how and why and to receive explanations. It is good to challenge students with counterintuitive facts, particularly ones that illustrate important material. Teachers are encouraged to:

- Identify facts that conflict with students' beliefs.
 - Ask students to defend positions that are different from what they believe (as is done in formal debates).
 - Ask students to explain the fact or why an event occurred.
 - Ask students to find counterintuitive facts in different media and to verify that the facts are accurate by accessing reliable sources.
-

Principle 6:

Design curricula, tasks, and tests in different contexts, media, and practical applications.

Knowledge, skills, and strategies acquired across multiple and varied contexts are better generalized and applied flexibly across a range of tasks and situations.^{50, 51, 52, 53, 54}

Information is encoded and better remembered when it is delivered in multiple modes (such as verbal and pictorial), sensory modalities (such as auditory and visual), or media (such as computers and lectures) than when delivered in only a single mode, modality, or medium.^{52, 53, 54, 55}

Cognitive flexibility increases when there are multiple viewpoints and perspectives about a phenomenon^{55, 56, 57} because multiple layers of knowledge interconnect facts, rules, skills, procedures, plans, and deep conceptual principles. Cognitive complexity and multiple viewpoints are helpful when learners face transfer tasks that have unique complexities that cannot be anticipated proactively. There are benefits in connecting and interweaving both abstract and concrete representations of problems in the domains of mathematics, science, and technology.^{20, 57, 58,}

⁵⁹ These research- and evidence-based practices are described as follows.

Practice 1: *Vary the context and applications of tasks and problems.*

Teachers should assign tasks and problems in different contexts and practical applications. This variability gives students opportunities to apply knowledge and skills to new situations.⁵⁴

Practice 2: *Present learning materials through multiple media.*

Teachers can combine graphics with text, graphics with spoken descriptions, speech sounds with printed words, and other combinations of modalities to vary how they present materials. Graphic depictions with spoken descriptions are particularly effective for subject matters in science and technology.

Practice 3: *Encourage students to construct ideas from multiple points of view and different perspectives.*

Teachers should encourage students to assess claims from different points of view, using different empirical evidence and including both pros and cons. A singular monolithic mindset does not support cognitive flexibility and variability in representations. An example of how to encourage students to construct ideas from multiple viewpoints is to have them justify a position that is opposite to what they believe in a debate.

PRACTICE 3 EXAMPLE APPLICATION: Multiple Viewpoints for Examining Chemical Reactions

In chemistry, students are often fascinated by the role of catalysts in chemical reactions. Students can explore the dynamics of a particular chemical reaction from multiple viewpoints, such as:

- An animation with the molecules before, during, and after the presence of the catalyst
 - A graph that plots the presence of different chemicals as functions of time
 - A mathematical formula that captures a diffusion process over time
 - A chemist pouring chemicals together and presenting the catalyst
-

Principle 7:

Promote self-regulated learning.

Children and adults have very limited metacognition^{46, 60, 61} (i.e., knowledge or judgments of memory, comprehension, learning, planning, problem solving, and decision processes). In fact, most adults are not good at calibrating their own comprehension of text and at planning, selecting, monitoring, and evaluating their strategies of self-regulated learning.^{46, 60, 61, 62} Therefore, teachers need to provide explicit training, modeling, and guided practice before students can acquire adequate strategies of comprehension, critical thinking, meta-comprehension, and self-regulated learning. These skills can be acquired and applied in a learning environment that allows students to have knowledge and control over their own mastery of knowledge, skills, and strategies.^{46, 63} These research- and evidence-based practices are described in more detail as follows.

Practice 1: *Train students on metacognition and strategies for self-regulated learning.*

Explicit instruction is often needed for acquiring abstract cognitive content and strategies. Teachers should use well-designed, explicit instruction that is structured, scaffolded, and intensive in different contexts and practical applications.

Practice 2: *Provide students with an open learning environment.*

Open learning environments allow students to take responsibility for their learning by selecting resources to learn more about a topic, gathering and manipulating data to understand the problem, and working with peers. Teachers should provide individual students with fine-grained feedback about their mastery of different aspects of the learning. Students should then use the feedback as a guide to select and work on mastering different knowledge, skills, and strategies. By taking the initiative to fill in gaps in learning, students acquire self-regulated learning skills.

PRACTICE 1 EXAMPLE APPLICATION: Teaching Students Metacognitive and Self-Regulating Learning Strategies

There are many commercial books and programs on how to study and manage time, and these are often helpful. Researchers have also identified a number of metacognitive and self-regulated learning strategies that help with time management. These strategies guide students on setting goals, formulating plans to achieve goals, monitoring progress on goals, revising goals after receiving feedback, applying relevant learning strategies, and reflecting on learning activities to improve the goal-setting process. A list of these strategies, along with definitions, is an important start in helping students manage their own time; however, application of the strategies takes considerable time and feedback.

Students are generally not very good at comprehension calibration, the ability to evaluate how well they comprehend material. The common problem is that low comprehenders believe they understand material when they do not. Fast ways for them to evaluate their level of understanding are asking them to paraphrase, summarize, or think aloud about the text's meaning. Poor learners quickly discover that they do not understand because they have trouble generating content in the verbal protocols. Therefore, requiring students to give feedback about content allows them to learn how to accurately calibrate their own comprehension of material.

Conclusion

The principles and practices informed by research in this section can be applied to all content areas in middle grades education. For example, physical education teachers can use these strategies to help students retain information, such as the rules of sports and different sports strategies. More importantly, these principles and practices can provide students with study skills they can use with the more rigorous coursework of high school, where they may experience final exams for the first time. Therefore, the more these principles and practices can be adopted and implemented school wide, the more proficient students will become in their use. Middle grades students will then have the skills they need to succeed in high school, postsecondary education, and future careers.

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Cognitive Science and Advanced Reasoning

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Chapter 2: Student Supports That Enhance Learning

Introduction

Moving from the protective environment of an elementary grades classroom—where in most cases, students spend the day with the same teacher and the same group of students—to the middle grades—where students may need to rotate between three or more teachers and interact with a larger group of students—can be challenging and intimidating for students. This transition often results in a reduction of the number of friendships in students' lives,¹ which can be an additional adjustment. Research indicates that when students transition to the middle grades, there is an increase in incidents requiring school discipline (e.g., in-school suspension) for disturbance to the class learning environment or unwillingness to follow rules.² There is also evidence of a predictive association between the number of disruptive behavior incidents during elementary and middle grades years and school failure in high school, even when socioeconomic status and intellectual differences are taken into consideration.³ Middle grades students need common academic behavior and academic expectations, rewards, and consequences. Think of a middle grades student's experience throughout the day. If it is vastly different from classroom to classroom, he or she will not internalize strong behavioral and academic norms.

This chapter identifies ways schools can support middle grades students through these challenges. First, we describe what research has shown to be effective school wide strategies for reducing the risk of students' dropping out or disengaging from school. Second, we show how to develop and maintain a school climate and culture that emphasizes high academic achievement and student success supported by every member of the school faculty, and we emphasize effective strategies for forming a school-family-community partnership. Third, we describe specific school wide strategies for behavior support through the use of clear and common expectations. We also present targeted activities to motivate students and improve attendance, as well as academic and social behavior. Finally, we outline the expectations for effective extended learning opportunities that enable students to continue to learn in a way that is integrated with their regular school day and are also geared towards meeting students' needs. The following content dimensions are included in this chapter on student supports that enhance learning:

- Dropout Prevention
- School Climate, Culture, and Partnerships
- Student Behavior Supports and Motivation
- Extended Learning Time

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Student Supports That Enhance Learning

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Dropout Prevention

Five research- and evidence-based¹ principles have been proven to reduce the risk of students' dropping out or disengaging from school. First, specific indicators should be identified and data should be collected and monitored to understand changes in student performance, attendance, and engagement in school. Second, at-risk students should be paired with an adult advocate who is committed to their success. Third, students should take advantage of personal tutoring and develop study skills to improve their confidence in their own academic potential. Fourth, schools should use programs that recognize improvement in behavior and academic achievement, as well as those that teach strategies for healthy behavior and academic progress. Fifth, schools should find ways to enhance academic achievement by personalizing the learning environment so that it feels smaller, more intimate, and more conducive to focused learning, and so that staff can connect with students more frequently.

Principle 1:

Use data systems to help identify students who are at risk of falling off the path to high school graduation.

Identifying a set of research- and evidence-based indicators that predict which students might be at risk of dropping out and then regularly analyzing data relative to these indicators are the critical first steps in identifying at-risk students who should be considered for extra services or supports.

Practice 1: *Use data to identify incoming students with histories of academic problems, truancy, behavioral problems, and retention.*

Student absences, grade retention, low academic achievement, and behavior problems are key indicators that students are more likely to drop out.^{2, 3, 4, 5, 6, 7, 8, 9, 10, 11} Schools should review data for incoming students on their attendance, grade retention, disciplinary issues, and weak academic performance. Schools should also review information from previous teachers about students' motivation, academic potential, and social skills, as well as any instructional challenges the teachers encountered. Since elementary school teachers have regular interaction with their students, collecting information from prior teachers is likely to be especially useful for incoming middle grades students. School leadership teams and teachers can monitor data at the grade-, classroom-, and student-level to examine how many and which students are chronically absent (missing more than 20% of school days), have disciplinary placements, and/or did not meet the state assessment standard in the prior year. Schools can analyze this data to identify patterns and trends, and then systematically act on the information using research- and evidence-based programs and policies.

The National High School Center provides resources and tools that schools can use to develop their own early warning systems.

<http://www.betterhighschools.org/ews.asp>

Practice 2: *Continually monitor the academic and social performance of all students.*

Schools should monitor students' progress by regularly reviewing report cards, test scores, and discipline referrals. Schools can then use these data to identify students who may have recently experienced a life event, academic challenge, or other social or behavioral problem that could foreshadow a higher risk of dropping out.^{11, 12} Schools should designate a staff member or team to regularly monitor data and follow up with students when needed. Follow up could be done through student advisories or adult advocates (see Principle 2).

Practice 3: *Monitor students' sense of engagement and belonging in school.*

Collecting data and monitoring the school climate and teacher-student interactions will help identify areas for improvement. Schools can survey students periodically or conduct small group interviews to learn about students' perceptions of the school climate and their sense of belonging and engagement.^{13, 14, 15} This data can help identify whether current efforts are effective in improving school climate and engagement, and where to focus reform efforts (if needed).

Sample surveys for collecting data on student engagement and motivation can be found in a report available at

http://ies.ed.gov/ncee/edlabs/regions/southeast/pdf/rei_2011098.pdf

Principle 2:

Assign adult advocates to students who are at risk of falling off the path to high school graduation.

Students' personal and academic needs should be addressed through a meaningful and sustained relationship with an adult.^{16, 17} The adult should be responsible for addressing the student's academic and social needs, communicating with the student's family, and advocating for the student. The adult advocate should be thoroughly trained prior to being assigned a student, and the adult and student should have time to meet regularly.

Practice 1: Select adults who are committed to student success.

An adult advocate should be assigned to work individually with students who are at a high risk of dropping out and have been identified through a process, such as the one described in Principle 1. The advocate is a case manager who should interact with the student, offering guidance and support on matters inside and outside of school, modeling positive behavior and decision-making skills, and being an encouraging and trusted person in the student's life.

The adult advocate could be a teacher, community member, or social worker. He or she should be based primarily at the school and should be persistent, believe in the ability of all students to succeed, be willing to work cooperatively with families and school staff, and be skilled in advocacy and communication.^{16, 17}

Practice 2: Keep caseloads low.

The programs that have been studied kept caseloads for adult advocates low (under 20). Moving to larger caseloads would have unpredicted effects, and larger caseloads preclude advocates from spending meaningful time engaging with students and resolving issues.

Practice 3: Match students with adult advocates purposefully.

Purposefully matching students and adults increases the likelihood that the relationship will thrive. Matches should take student needs into account so that the adult can effectively advocate on the student's behalf and adapt activities according to the student's interests and goals.^{17, 18, 19} It is important to provide advocates with whom students can identify: advocates should reflect the cultural and ethnic diversity of the students they are mentoring for greater success.¹⁶

Practice 4: Provide training to advocates on working with students, parents, and the school staff.

Training should be provided to adult advocates so they can work with students, parents, and school staff to reduce dropout rates. Training should include an overview of resources available for students and their families and strategies for communicating with both students and families to better understand their needs in order to connect them to appropriate resources.

Examples of activities adult advocates should be trained in include (i) assisting students in overcoming obstacles ranging from transportation to school to poor relationships with teachers, (ii) helping students develop career goals and postsecondary plans, (iii) working with students on academic progress by monitoring the completion of homework assignments, and (iv) working with teachers to learn about students' academic difficulties. Advocates can also help a student's family by referring a parent to potential jobs or school training programs, or by making appointments with or providing transportation to support service agencies.

Practice 5: *Establish a regular time in the school day or week for advocates to meet with students.*

Consistent meetings between the advocate and the student provide accountability and allow the advocate to give guidance or praise successes.^{20, 21} The amount of time needed for meetings depends on the severity of the student's problems; some students need the structure of daily meetings, while others may need only weekly meetings to stay on track.

More information about the use of adult advocates can be found at

<http://www.checkandconnect.org/>

Principle 3:

Provide academic support and enrichment to improve academic performance.

Providing academic support, such as tutoring or enrichment programs, helps address skill gaps and enriches the academic experience for students who may be bored or disengaged. Academic struggles may play a role in students' feeling alienated from school, so incentives, such as leadership opportunities in academic areas or rewards for improved performance, may help increase academic and student engagement.^{16, 22, 23, 24}

Practice 1: *Provide individual or small group support in test-taking skills, study skills, or targeted subject areas, such as reading, writing, or mathematics.*

Academic support may be one-on-one or small group interactions and can include test-taking and study skills or enrichment courses. About 10–12 weeks long, enrichment courses target a particular subject area, such as reading, writing, or mathematics, and include teaching strategies designed to engage students (e.g., whole class discovery lessons or differentiated individual and small group instruction).^{25, 26} Academic support can be provided by adults or peers and can occur during advisory periods, at lunch, or during study skills periods built into the schedule.

Practice 2: *Provide extra study time and opportunities for credit recovery and accumulation through after-school, Saturday school, or summer programs.*

After hours and summer school programs address several primary academic needs of at-risk students, including providing support during the transition from middle grades to high school. These programs can also monitor credit accumulation and provide academic enrichment aimed at increasing student engagement. In after hours or summer school programs, students can work closely with teachers individually or in small groups to complete the coursework or credits²⁶ they need to catch up. These programs also help students hone the academic skills they need for future academic success.

Schools can also provide summer school enrichment programs to increase engagement. During the program, which may last between 4 and 6 hours per day for 4–6 weeks, students are exposed to a variety of experiences that target key academic areas, such as mathematics, science, or reading.²⁷

Principle 4:

Implement programs to improve behavior and social skills.

Schools can help students identify, understand, and self-regulate their emotions and interactions with peers and adults. Doing so can help mitigate problematic and disruptive behaviors both in and out of the classroom as students learn how to interact and communicate positively. This type of skill development also helps students consider the long-term consequences of their actions.

Practice 1: *Use adult advocates to help students establish attainable academic and behavioral goals.*

Adult advocates (see Principle 2), mentors, teachers, or counselors can help students set realistic goals for interacting with peers and teachers at school, progressing academically, or improving in other areas.¹⁶ Students can take responsibility for their behavior by setting personal benchmarks such as “turn in daily homework” or “attend all classes in a week.”

Practice 2: *Recognize student accomplishments.*

Students should be provided with frequent positive rewards and recognition for accomplishments based on their progress towards goals. Teachers should hold recognition ceremonies and make calls home to acknowledge students’ meeting goals, improving attendance, or completing exceptional schoolwork.^{16, 28}

Practice 3: *Teach strategies to strengthen problem-solving and decision-making skills.*

Problem-solving or decision-making curricula can be integrated with existing curricula, or students can participate in a life-skills course. Students should be targeted for participation in small group seminars, possibly facilitated by adult advocates or other staff teams during advisory periods, to help them develop these skills.^{1, 16, 17, 29, 30, 31, 32, 33, 34} Topics should include problem recognition and evaluation, goal setting, planning and organization, anticipating roadblocks, and controlling anger and expressing emotion. Emphasis should be placed on developing cooperative learning skills and positive relationships with staff, teachers, and students.²⁷

Practice 4: *Establish partnerships with community-based program providers and other agencies, such as social services, welfare, mental health, and law enforcement.*

External factors may be the root cause of problematic classroom behavior and/or low achievement. Coordination with community-based program providers, social services, child welfare, and law enforcement agencies will help students meet needs outside of school.^{16, 27, 34, 35}

PRACTICE 4 EXAMPLE APPLICATION: Behavior Program (Larson & Rumberger, 1995)

The Achievement for Latinos through Academic Success (ALAS) program initially was developed and tested in a heavily Latino middle school in Los Angeles and showed significant effects in reducing dropout rates. ALAS students received 10 weeks of problem-solving instruction and two years of follow-up problem-solving prompting and counseling, along with school survival problem-solving instruction. Key themes of the ten-week course were teaching students how to do the following:

- Recognize when a problem first begins.
 - Identify and define problems clearly.
 - Control impulsive reactions.
 - Overlook irritations that are best ignored.
 - Identify emotions.
 - Set clear and realistic goals for the short- and long-term.
 - Evaluate one's own competence for solving a problem.
 - Think of a variety of potential solutions.
 - Develop a step-by-step plan.
 - Anticipate the roadblocks and pitfalls when taking action.
 - Be assertive and socially appropriate when facing peer pressure or criticism.
 - Sustain persistence and effort when frustrated.
 - Control anger and express emotions appropriately and effectively.
-

Principle 5:

Personalize the learning environment and instructional process.

A personalized learning environment is one in which students and teachers know one another.^{24, 26} In this type of environment, the more extensive personal interaction allows teachers to get to know each student's strengths and preferred way to learn. Students who interact with teachers more often will feel more engaged in learning.

Practice 1: Implement team teaching and smaller classes.

One way to provide more teachers per student is to pair teachers in the same classroom, which provides for common lesson-planning and decision-making^{36, 37} and gives students access to more than one teacher who can offer individualized attention or new perspectives. Smaller classes are another way to support more teacher-student interaction.^{36, 37} While there is no research to indicate whether any particular class size is optimal for middle grades, smaller classes will generally be advantageous to some extent, assuming teachers take advantage of the relatively small teacher-student ratio and time afforded to them to address individual student needs.

Practice 2: Use the school schedule to create extended time in the classroom.

Implementing block scheduling, extended class periods, or advisory and study periods provides more time for student-teacher and student-student interactions during the day.^{26, 36, 37} Students also have the opportunity to explore topics in greater depth both in groups and as individuals working with the teacher.

Practice 3: Foster after-school activities and encourage participation in them.

Schools should encourage extracurricular activities, such as participating in sports, clubs, or after-school field trips; listening to guest speakers; forging postsecondary partnerships; or joining service groups. Research indicates that participation in outside activities helps create a stronger sense of engagement in the community, encourages students to connect with peers and teachers, and provides a setting in which creative activities can be pursued beyond the rigors of classroom instruction.³⁸

PRACTICE 1 EXAMPLE APPLICATION: Small Learning Communities in the Middle Grades

The Talent Development Model incorporates the idea that innovative approaches to school organization and staffing can increase student efforts and teacher effectiveness.

Consistent with that philosophy, Talent Development schools establish separate learning communities of 200 to 300 students. These small learning communities are organized into vertical houses with teaching teams (two or three teachers) responsible for fewer than 100 students. This model also encourages schools to limit the number of different specialized teachers assigned to each student in middle grades (semi-departmentalization) and, when appropriate, has teachers stay with students for more than one grade level (looping).

The resulting small, stable learning communities are meant to—and do—encourage students, teachers, and families to establish strong bonds and caring relationships.

More information about the Talent Development middle school model can be found at
<http://www.talentdevelopmentsecondary.com/>

Conclusion

The principles and practices in this section draw heavily on the guidelines recommended in the IES practice guide for dropout prevention,³⁹ which itself draws on the intervention reports of the What Works Clearinghouse (WWC); as such, the evidence is generally drawn from effectiveness research that meets the WWC standards for validity. The principles summarized in this chapter are grounded in the most valid evidence available at the time this document was written: the authors reviewed the research literature that underpins the WWC intervention reports and practice guides and then tailored the recommended practices to the middle grades and to other principles laid out in the MSM Platform.

The principles presented here are state of the art, based on evidence-supported approaches effective in reducing dropping out. Many areas of education research suffer gaps, and dropout prevention is no exception. Investments in research on dropout prevention occurred in the 1990s and tapered off as attention (and support for research) shifted in recent years to other topics related to the No Child Left Behind Act. A few prominent models to reduce dropout have emerged recently, such as Talent Development³⁷ and First Things First.³⁶ Generally, however, continuing large-scale experimentation to examine different approaches and programmatic strategies is lacking. Nonetheless, waiting for more to be known is ill advised. Dropping out continues to be common and needs to be addressed. Just as waiting for more evidence of effective medical treatments should not preclude using the most effective treatments currently known, we need to do what we can now for students who are disengaging from school.

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School Climate, Culture, and Partnerships

To support middle grades students and their families in improving student success, schools can create a shared vision for high academic achievement and success that is supported by the entire school staff and that reflects the vision of the community for its children. This involves developing a shared belief among staff members that they can collectively enable students to succeed and the creation of a school environment in which mutually supportive relationships among students, teachers, and parents can develop. Then there can be a focused school wide effort to improve attendance, behavior, and student achievement.

Secondly, school, family, and community partnerships are important to maximize learning opportunities and success for students. Engaging families can begin by communicating the school's high academic expectations for the students. In addition, parents and other family members can be provided with education that will improve understanding of the steps students need to take to be successful in reaching high academic and educational attainment. Such education can also convey how families can support their children in completing the steps and actions that will lead to such attainment. Students and their families may have needs that the school cannot provide for; therefore, it is important to find community resources and partnerships that can be matched to students' needs so that community resources are appropriately leveraged to support families and provide for their needs.

The following section lays out principles for schools to follow in implementing change that will affect the school climate, culture, and partnerships (across schools, families, and communities) in a positive way.

Principle 1:

Create a *can do* school culture marked by a shared mission among the staff members that centers on academic achievement and a shared belief that they can collectively enable students to succeed.

In the middle grades, students interact with a wider array of adults than they did in the elementary grades, and students need to receive a consistent and common message—that they can and will learn and achieve. This experience needs to be actively built and managed. In particular, when educating large numbers of students with high degrees of educational and behavioral challenges, as is often the case in high-poverty environments, adults need high levels of collective efficacy and trust to create the uniform and consistent experiences students need to succeed.^{1, 2}

Practice 1: *Organize the school around teams of teachers working collectively with a common set of students that is stable and of a manageable number.*

The principal should provide teacher teams with a common work time; facilitation and training around working as a team; access to information on effective practices; benchmark data on student performance, progress, and engagement (attendance and behavior); and mechanisms for obtaining additional supports for their students. The principal also needs to actively empower teacher teams and hold them accountable for raising student achievement.

Practice 2: *Establish a distributive leadership structure so that all key stakeholders are involved in school decision-making and committed to do what it takes to raise student achievement, with time and effort invested in mission building among the staff.*

For example, within organized teacher teams, one teacher should serve as the team leader responsible for organizing and facilitating teacher team meetings and serving on a school wide leadership committee. Principals can empower teacher teams by establishing clear parameters under which they can exercise authority (i.e., alternating the daily schedule within their team, establishing incentive systems for good student behavior and work, deciding how to apply small discretionary funds to advance student achievement, setting up a schedule for peer-based classroom observations, or selecting at least some of the core improvement goals they will work on for the year). Principals should then hold team leaders and their teams accountable for productive and focused collaborative work and gains in student achievement.

PRACTICE 1 EXAMPLE APPLICATION: Methods of Teacher Team Organization

There are a number of different ways to organize teachers and students to create teams of teachers working with a common set of students. In sixth grade, for example, one teacher could teach mathematics and science to two or three classes of students, and another could teach English and social studies to the same classes of students. The schedule could be organized so that both teachers have collaborative work time scheduled when their classes are taking electives.

Alternatively, the school can be organized on a block schedule consisting of four longer periods and one shorter period, with students organized into homerooms that travel together throughout the day. A four-person team consisting of a mathematics, English, science, and social studies teacher could then teach the same set of students and have a collaborative work period during the shorter period when students are in electives.

Principle 2:

Create a school environment in which mutually supportive relationships among students, teachers, and parents can develop.

Student success is greatest when teachers, students, and parents are collectively working together to enable student success.^{2,3} The actions of each group can positively reinforce the others or work at cross-purposes. If any one group feels unsupported by the other, it can lead to reduced effort.

Practice 1: *Use surveys to gather information on school climate and culture.*

Schools should use validated survey instruments to annually survey students, teachers, and parents about their views on the school climate and culture, their sense of school belonging, and the effort they put forth.

Practice 2: *Use teams of parents, teachers, administrators, and students to analyze survey data and to create and implement action plans based on the needs the survey identified.*

The creation of teams of parents, teachers, administrators, and students who can analyze the results and use them to create yearly action plans to improve student-teacher-family relationships is also recommended.

Principle 3:

Engage in school wide efforts to increase student attendance, promote positive behaviors, and increase student effort (where needed).

It is during the middle grades that students make an independent decision about their level of school engagement. When significant numbers of students are chronically absent, regularly misbehave, or put forth limited effort, their behavior can have substantial negative impacts on school wide academic success.² If these behaviors reach a critical mass, they need to be addressed with school wide prevention and action, rather than on an individual basis.

Practice 1: *Measure and analyze data on chronic absenteeism, suspensions, and sustained mild misbehavior.*

At the grade and classroom level, principals and teachers should track and monitor how many students are missing 10 to 19 percent and 20 percent or more of school days; how many attend nearly every day; and how many engage in behaviors that lead to suspensions, mild sustained misbehavior, and office referrals. Principals and teachers/school teams should analyze the data to identify patterns and trends and then act upon the information.

Practice 2: *When chronic absenteeism and student misbehavior are at significant levels, implement evidence-based, whole-school strategies to prevent and reduce these behaviors.*

Typically, effective programs come to an agreement among the adults at the school on what constitutes good attendance and appropriate behavior so that these behaviors can be set as expectations and reinforced. Public announcements that recognize students who exhibit good behavior are important because they clearly communicate that this outcome is important. The results of

this positive reinforcement are increased attendance and improved behavior at the classroom and individual levels. In the same way, consistent reactions to poor attendance and behavior (e.g., every absence brings a constructive response from the school) and problem-solving responses/mechanisms when students do not respond to school wide efforts² will help bring about the needed change.

Attendance is an area where benchmarks can be set, data can be collected, and parents can become involved to ensure on-track-to-high-school readiness for middle grades students. Recommendations to improve attendance rates include the following:⁴

- Gather data on attendance in a way that is informative to direct future action. For example, keep track of the number of students who have good attendance (absent 5 or fewer days per year), moderate absence (10 to 19 days per year), chronic absence (20 or more days per year), and extreme absence (40 or more days per year).
- Reach out to students with absenteeism to let them know they are missed, learn more about why they are absent, and help them solve any challenges.
- Recognize individual good attendance, as well as classes that reach attendance goals.
- Provide an opportunity for students to make up missed assignments.
- Survey students about their reason for missing school, any concerns they may have about school safety, and their level of engagement in school.
- Identify clusters of students (by homeroom or other grouping) that have more negative feelings about their experience at school than other students to problem-solve issues that may be specific to their experiences as a group.

PRACTICE 1 EXAMPLE APPLICATION: Using Data to Understand Absences

A sixth grade team had been working hard to reduce the level of chronic absenteeism among its students and was making some progress, but it also noticed that a subset of students had not responded to their efforts to date. The team charted the attendance of these students by day for three months and invited members of the school's student support team, which included an assistant principal, the counselor, and a part-time social worker, to look at the data with them. This collaboration helped them recognize that most of the absences were occurring at consistent times across the months. The counselor and social worker shared that most of the students came from families that were struggling economically, and the absences seemed to be occurring at the times when family resources were low.

The teacher and student support teams connected with local community-based organizations to organize food and clothing resources to be available at the school during these predictable time periods so that by coming to school, students could get help with their needs.

Principle 4:

Focus the school-family partnership on communicating to students the importance of high academic and educational aspirations and showing the steps that need to be taken to actualize these aspirations.

In early adolescence, students need to hear a combined and consistent message from school and home that it is important they attend school, behave, and try, and that if they do, there is a clear and understandable pathway to adult success. Parents have goals and aspirations for their children but sometimes they lack an understanding of what is needed to improve their academic success and preparation for postsecondary success. This work with parents is a two-way communication to connect the goals of the family, the needs of the student, and what is needed for success in the middle grades and beyond.

Practice 1: *Provide parents, supportive adults, and students with information on the important role the middle grades play in high school readiness, high school graduation, and postsecondary success.*

Parents, supportive adults, and students need to be informed through multiple means, such as mailings and emails, about start-of-year meetings, report card conferences, and similar school events. The importance of regular attendance and hard work needs to be particularly stressed as, historically, the middle grades are often viewed as a resting place between elementary and high school while students go through the developmental changes of early adolescence. The data, however, is clear that students who develop poor attendance habits in middle grades, do not complete their assignments, and begin to get in trouble have considerably lower odds of high school and postsecondary success. This message needs to be communicated to parents, supportive adults, and students early and often.

Practice 2: *Create and provide parents and students with ready access to high school readiness benchmarks.*

Beyond information on the importance of middle grades success, it is important to provide parents, supportive adults, and students with an easy-to-understand set of benchmarks to let them know the student is on track for high school readiness. These key individuals should be provided information on what is considered good attendance (missing 5 or fewer days in a year) and what constitutes acceptable course performance (B or better average) and behavior (showing evidence of employing the positive academic and healthy behaviors). Likewise, off-track behaviors (missing 20 or more days, failing core courses, and exhibiting sustained misbehavior) and the extent to which students are currently exhibiting these behaviors should also be communicated. These benchmarks should be accompanied by tips on how students can improve.^{5, 6}

Practice 3: *Make adult participation a critical part of your process.*

Create mechanisms to foster participation by parents or supportive adults that recognizes their interests but accommodates real-world constraints. One evidence-based approach is to form an action team that focuses on one core goal each year. *Action teams* are composed of parents, teachers, school administrators, and, often, students and community members. These team members interact with the schools to identify key needs that can be enhanced through parental and/or community involvement. Team members can develop action plans based on evidence-based practice, distribute roles and responsibilities among team members to implement plans, and meet regularly to review progress and adjust actions. Often, these plans are year-long campaigns with focused and sustained efforts on clear and meaningful tasks. They have been shown to have greater impact than more generalized efforts to increase parental involvement.⁴

PRACTICE 2 EXAMPLE APPLICATION: Creating Student Engagement in Their Own On-Track Status

Three times a year, students could participate in a report card conference in school with an adult who is not their teacher. Following a rubric, the student and adult could examine the report card and discuss obstacles to success and strategies for improvement. Once a year, the student could lead this conference and invite his or her parent(s) or guardian(s) to attend. Part of the conference would be a review of the extent to which the student is on track to succeed in high school, where evidence of attendance, behavior, effort, and academic performance is examined. The outcome of the conference would be either recognition that the student is on track or development of a plan of action for him or her to get on track. If a plan is developed, it would be signed by the student, parents, and teachers so all parties acknowledge the needed change and plan of action. Progress would then be reviewed in the next conference and changes made to the plan if needed.

Principle 5:

Conduct student-need and -asset analyses and select community partners and supports based on student need. Design and manage a plan to link community supports to success in school and use common metrics to gauge their impact.

Too often, community supports are co-located in schools but not integrated into the school day or directly linked with student needs in school. Schools often say yes to multiple community partners, believing any support will help, but by not selecting supports against an analysis of student needs or holding community support organizations to common outcomes, impacts are often minimal, and at times, more distracting than beneficial. Schools should invest in coordinating this community support and involvement.

Practice 1: *Create and maintain on-site, in-school coordination and monitoring of community support programs.*

Evidence indicates that the impact of community supports is maximized when there is on-site, in-school coordination; when partner selection is driven by needs assessment and evidence of impact; and when there is close monitoring of student participation and its impact on student outcomes to ensure that the right students are getting the right supports with the intensity required. To help ensure success with community supports, all partners should align their impacts against a common set of metrics linked to student success in school (see *Practice 1 Example Application*).

PRACTICE 1 EXAMPLE APPLICATION: Schools and Communities Working Together

The leader of a school calls together all of the community organizations that work in the school. He or she asks them to appoint a coordinator who can be a single point of contact. The leader also asks the groups to work collectively with him or her to achieve the school's top priority of the year, which is to ensure that all students complete their assignments successfully and on time. The leader asks the community groups to design a plan where they align their resources against this goal and meet with him or her quarterly to assess progress.

Conclusion

All of the principles in this section are supported by a moderate-to-solid evidence base ranging from regression studies and quasi-experimental matched comparison studies to randomized control trials. The importance of a *can do* culture and mutually supportive school climate is grounded in a research synthesis by the Mid-continent Research for Education and Learning¹ and studies of the Chicago Consortium on School Research.⁷ While the latter focused on K–8 schools in Chicago, much of what was learned is directly applicable to middle grades intervention and can be applied here.

School, family, and community strategies are supported by the extensive research conducted by Joyce Epstein and her team at Johns Hopkins University,⁸ as well as others in the field, and recent quasi-experimental and randomized control studies conducted by the Communities In Schools program⁹ upheld the power of organizing community supports against a needs assessment, having these efforts organized by on-site coordination, and measuring success by common metrics.

Some of the practices and most of the practice examples shown in this section are best-practice applications based on current understanding supported by or derived from the foundational research described above. While these practices and examples have not been rigorously evaluated to date, the data support their use.

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Student Behavior and Motivation

The mission of public schools is not only to impart academic knowledge to students but also to educate students to become productive, well-functioning citizens. Positive behaviors contribute to a student's success in school, while maladaptive behaviors prohibit learning. In fact, past research has found preliminary evidence that behavioral skills are not just important for the social development of students but that both positive and negative behavior shows relationships with academic outcomes.¹

Similarly, for students to succeed, they need to try to master their schoolwork and push through the difficulties they will encounter. Yet, the evidence is clear that the more years a student spends in school, the more their motivation to do so wanes. According to two Gallup polls of public school students, eight out of ten elementary students report high levels of academic effort even in the face of challenges, but just six out of ten middle grades students and only four out of ten high school students report the same.^{2, 3} These results signal changes in how students view their relationship to schooling as they age. It is in the middle grades that students tend to formulate an independent answer to the question, "Is schooling for me?" Some students conclude that, even when boring or hard, school is a place that will help them achieve important life outcomes. They have a sense that they belong there and are cared for and that if they try, they can succeed. Other students come to believe that school is largely an unpleasant and even sometimes hostile environment where they feel alone and unsupported. As a result, they seek to simply endure it for as long as they can with the minimum amount of effort and investment required. This internal decision on the value of schooling and their connectedness to it, as well as the subsequent decline in motivation through the middle grades, is greatly shaped and influenced by actions taken by middle schools. For example, the Gallup polls show large declines through the middle grades in the percentage of students reporting that they received recognition for "doing good schoolwork in the last week."^{2, 3} In short, at the very time students are looking for reaffirmation that schooling is for them, teachers start providing less regular feedback to students (i.e., that if they try, they will succeed and that adults in the school value their effort).

According to research, there are three key principles schools should implement to support student behavior, and there are three areas where schools can increase student motivation in the middle grades. What follows are descriptions of these principles, which are related to improved student outcomes, as well as specific practices—actions that schools can take to accomplish each principle. As appropriate, an illustration is provided to show how the practice might be implemented.

Principle 1:

Consistently teach, model, and recognize appropriate and positive academic and social behaviors across all classrooms.

By modeling, teaching, and encouraging appropriate behaviors, educators can significantly reduce students' antisocial and maladaptive behaviors that reduce and inhibit effective classroom instruction and student learning.⁴

Practice 1: *Modify and reduce maladaptive classroom behavior through consistent teaching, modeling, and recognition of positive classroom behaviors.*

A strong body of evidence at the elementary school level, and growing body of evidence at the middle grades level, suggests that maladaptive classroom behaviors, such as acting out, being disrespectful, and not paying attention, can be modified and reduced through consistent teaching, modeling, and recognition of more positive classroom behaviors.⁴

Maladaptive classroom behaviors can be reduced by teaching students how to appropriately and respectfully gain attention from adults and students, how to effectively participate in group activities (disagree without being disagreeable), and how to develop emotional awareness and self-regulation (learn to recognize situations or behaviors that lead to negative behaviors and have alternative strategies ready). The following table provides strategies.

Positive behaviors need to be taught like any other skill—by breaking them down into concrete, teachable steps, explaining to students the rationale for learning the skill, creating opportunities for guided and independent practice, prompting and cuing students about the use of the behavioral skills, and recognizing the effective use of the skills. In order for students to internalize the new behavioral norms, they need to be consistently taught and recognized across the classrooms students participate in. What follows are some sample topics for teachers to use with students to assist them in developing appropriate behavior skills.

STRATEGIES FOR DEVELOPING APPROPRIATE BEHAVIORAL SKILLS

A structured plan for academic instruction centered on developing behavioral skills is needed. Some recommended instructional strategies are provided in Table 1.

Strategy	Description
Introduce skill	<ul style="list-style-type: none"> Explain the specific appropriate behavioral skill to the students. Provide examples of why it is a school norm.
Provide clear steps	<ul style="list-style-type: none"> Break down the skill for appropriate behavior into a few concrete steps that can be modeled and practiced.
Model	<ul style="list-style-type: none"> Provide examples of how the skill is applied in different settings. Use role-play and stories to demonstrate the behavior you want to see.
Guided and Independent Practice	<ul style="list-style-type: none"> Provide time for students to practice the behavior independently and with other students through role-play guided by the teacher. Have the teacher provide feedback afterward.
Reminders	<ul style="list-style-type: none"> Provide a prompt to remind students to use their skill(s) whenever a situation arises.
Feedback	<ul style="list-style-type: none"> Provide feedback with specific information about the positive ways that students implemented the new skill. Make suggestions to move students toward improved mastery of the skill, if needed. (Over time, such prompts and encouragement can be reduced.)
Reinforce	<ul style="list-style-type: none"> As students continue to learn and apply new skills, periodically review and reinforce prior skills.

Source: Adapted from Epstein, et al. (2008)⁴

Table 1. Instructional strategies to help students develop skills for appropriate behavior

TOPICS FOR DEVELOPING APPROPRIATE BEHAVIORAL SKILLS

Teachers can assist students with developing appropriate behaviors by providing examples, guided practice, and feedback in the following areas:

- Gaining attention from the teacher in an appropriate and respectful manner
 - Gaining attention from peers in an appropriate and respectful manner
 - Taking turns sharing, communicating ideas, cooperating, and problem-solving during small group settings
 - Self-monitoring and self-managing one's social behavior and completion of academic work
 - Developing emotional awareness, tolerance, self-regulation of emotions, and personal responsibility
-

Principle 2:

Provide classroom instruction in self-monitoring and regulation, academic organization and study skills, goal setting, persistence, and healthy behaviors.

Self-monitoring and regulation, academic organization and study skills, goal setting, persistence, and healthy behaviors have all been linked to academic achievement.⁴ In the past, students who developed these behaviors, often through home or out-of-school experiences, succeeded in achieving greater academic excellence. Since it is imperative that all middle grades students be on a path to high school and college- and career-readiness, it is important to provide all students with the opportunity to acquire these essential skills.

Practice 1: Teach academic and healthy behaviors that support success in school.

Provide entering middle grades students with learning experiences that explicitly teach academic organization and study skills, as well as self-monitoring and regulation. The content of the course can be organized around career exploration and college readiness, which then provides a context for teaching goal-setting and healthy behaviors (e.g., stress management, proper diet and sleep, etc.). For example, through a series of career exploration and goal-setting activities, middle grades students can take a self-assessment to show them a broad range of careers that match their interests. Students could then be asked to research the educational qualifications of these careers by using the Cornell note-taking method learned in class.

Practice 2: Embed the self-monitoring and regulation, academic organization and study skills, goal-setting, persistence, and healthy behavior skills into the academic courses students take throughout the middle grades.

For students to internalize the academic and healthy behaviors they are taught, the behaviors need to be applied throughout students' middle grades experience. Teams of teachers can work collectively during common planning periods to infuse reminders and explicit uses of the behaviors into students' core courses. Additionally, teacher teams or the entire school can collaboratively identify a small set of positive academic and healthy behaviors, and formally incorporate student progress in these areas into report cards or progress reports. Students who are identified as needing improvement in a given area should then be provided additional learning experiences.

Practice 3: Provide students with opportunities to practice and employ these skills through service learning projects, as well as high interest and participatory electives with strong cognitive content like drama, debate, and robotics.

One good way for middle grades students to develop important academic and healthy behaviors is through activities linked to their developmental needs, including activities for adventure and camaraderie. Service learning, in which teams of students participate in the design and execution of a service project, as well as electives that combine rich cognitive content with teamwork, performance, and tangible outcomes over relatively short durations (a few weeks or a month or two) are particularly well-suited for this task. What follows are types of opportunities and activities students can participate in to practice healthy behaviors.

PROVIDING STUDENTS WITH STRUCTURED HEALTHY BEHAVIOR OPPORTUNITIES

Many activities can be structured at school to engage students and allow them to practice healthy behaviors. A few suggestions are provided in Table 2.

Type of Opportunity	Description of Activities
High Engagement Electives	<ul style="list-style-type: none"> • Debate • Drama • Robotics • Chess • Other educational experiences that students can engage in and derive success from despite areas of academic weakness
Adventure and Camaraderie	<ul style="list-style-type: none"> • Group projects • Service learning opportunities • School improvement (facilities, morale, etc.): <ul style="list-style-type: none"> ○ Plant a garden ○ Plan a school spirit activity ○ Paint a classroom
Recognition for Achievement of Goals	<ul style="list-style-type: none"> • Development of class goals by students with teacher support • Development of goals related to behavior by students • Class recognition upon goal completion
Learning Organizational and Self-Management Skills	<ul style="list-style-type: none"> • Study skills and organizational skills (e.g., note-taking, time management, study strategies) taught and modeled by teachers • Positive social skills and conflict resolution modeled by teachers and practiced by students through role-play

Source: Adapted from Balfanz (2009)⁵

Table 2. Opportunities to practice healthy behavior while building on student strengths and interests

Principle 3:

Establish processes for identifying problem behaviors early, diagnosing their causes, identifying effective interventions, applying the interventions at the scale and intensity required, and monitoring their effectiveness.

The earlier problem behaviors are identified and understood, the more likely that an intervention will succeed. If schools do not have a well thought-out process for early identification that matches interventions to student needs and monitors them for effectiveness, student supports tend to be ad hoc, uncoordinated, driven by triage, and, as a result, both expensive and ineffective.

Practice 1: *Implement an intervention framework generalized to student attendance, behavior, and course performance.*

Effective intervention frameworks will include whole-school prevention programs, targeted supports of moderate intensity or duration delivered to groups of students, and cases managed with one-on-one or one-on-few support. Schools should make early warning indicator data available to teacher teams and other adults who provide student supports (counselors, community-based organizations, and national service corps members). Schools should also analyze the data to ensure that student supports of sufficient intensity and scale are available. On a regular basis, teacher teams and other student support providers should meet and review the early warning indicator data, assign students to appropriate interventions, monitor student progress and intervention effectiveness, and make adjustments as needed. An example of this follows in the *Practice 1 Example Application*.

It is important to view effective classroom instruction and academic intervention in each core content as the cornerstone of school wide prevention, while recognizing that a subset of students will need support beyond a good lesson every day. Early warning and multi-tiered intervention systems also need to be integrated into school wide data efforts led by the school leadership team and should not be seen as stand-alone activities done by a separate team of student support providers. A few recommendations for steps to understand and change student behavior are shown in Table 3.

PRACTICE 1 EXAMPLE APPLICATION: Teacher Communication

In the middle grades, multiple teachers often share students. Therefore, it is important for teachers to have time and opportunity to talk with each other about shared students who need to change their behavior. During these meetings of teacher teams, the following activities can be used to gather information and generate strategies for handling student behavior challenges⁶:

- Share observations about a specific student's behavior (time of day, frequency, setting, etc.).
- Share ideas about action steps a teacher can implement in the classroom to address the behavior and reduce the impact on the rest of the class.
- Share lesson plans or lesson plan ideas for engaging students in a way that might reduce the behavior.
- If the student is shared by multiple teachers, other teachers can exchange information about the extent to which the behavior occurs in their class, the triggers, and any strategies that work to reduce or eliminate the behavior in their class.
- Share strategies for engaging parents in a discussion about the behavior of their child.
- Involve the school principal if a change in school policy would help address the behavior for this and other students.

Action Steps	Considerations
Describe the behavior and its effect on student learning.	<ul style="list-style-type: none"> • Be concrete in the description of the behavior. • Include details about the setting in which the behavior occurred. • Specify the time and frequency of the behavior. • Explain the extent to which the behavior impacts the student's learning and/or the learning of others.
Consider factors that may contribute to the student's behavior.	<ul style="list-style-type: none"> • Is the behavior influenced by cultural or linguistic differences? • Does the student have the academic skills to complete the task that was required when the behavior occurred? • Does the student have the necessary behavioral skills for the situation in which the behavior occurred? • Has there been any new stress or trauma in the student's life or family?
Gather data on the frequency and setting of the behavior.	<ul style="list-style-type: none"> • What patterns exist between the occurrence of the behavior and other environmental settings? <ul style="list-style-type: none"> ○ Location of behavior ○ Time(s) of day, class periods ○ Subjects or classes where behavior occurs or does not occur ○ Assignment student is working on ○ Level of difficulty of the assignment • Specific peers or adults present when the behavior occurs • Ask parents if the behavior occurs at home and the context of its occurrence. • Ask other teachers if the behavior occurs when the student is in their classroom and the context of its occurrence.
Identify what or who might be instigating or reinforcing the behavior.	<ul style="list-style-type: none"> • What need might this behavior be fulfilling? • Is there a certain environment that seems to trigger the behavior? • Are there certain students or adults who are with the student each time the behavior occurs? • Are there any specific curriculum or instruction variables that seem to trigger the behavior? • Are there certain seating arrangements where the behavior is more common (rows, small groups, pairs)?
Identify what happens after the behavior in terms of teacher and student reactions.	<ul style="list-style-type: none"> • How does the student react after the behavior? • Is the student being positively reinforced by the teacher or the students after the behavior? • Are there any consequences that might be reinforcing the behavior?

Source: Adapted from Epstein, et al. (2008)⁴

Table 3. Action steps for identifying problem behaviors and their causes

Practice 2: *Connect teachers to one another or to mentors to help with ongoing problem solving, student behavior, and any other classroom management needs.*

If data reviews identify a classroom or group of classrooms with higher than average attendance, behavior, or course performance problems, assign a peer teacher, mentor, or instructional coach to observe the classroom. Then, depending on what is learned, either develop targeted professional development supports that address the issue or provide the classroom with additional student and family support. When a particular classroom or set of classrooms exhibits higher than average problematic behaviors, it is typically for one of two reasons: (1) either the teacher has not yet developed the set of classroom management and instructional delivery skills needed to succeed with the students, or (2) the level of student and family need in the particular classroom is very high. What is required in these situations is a neutral investigation of the classroom dynamics from someone who can either provide or design the additional teacher supports needed or who can work with the school leadership and teacher teams to enhance the level of student and family support being provided. In some cases, the solution may involve changing classroom dynamics by altering the composition of students in the classroom.⁶

Principle 4:

Make the value of schooling personal.

We often tell students that schooling is essential for their success in life. This is often communicated in broad terms: “If you don’t go to college, you won’t get a good job.” For middle grades students who are 11 and 12 years old, this is a distant reality. A growing number of studies have shown, however, that small activities that cause students to reflect on and make connections between what they are learning and their current and future lives can have strong, positive impacts. Emerging research also suggests that when these connections include a potential link to the wider world beyond oneself, effort on even tedious but important learning tasks is increased.⁷

Practice 1: *Engage students in activities that allow them to reflect on the influence school will have on their future life and goals.*

Having students write short reflective paragraphs every few weeks on the usefulness of specific course material (what they are currently learning in math, English, science or social studies) to their lives has been linked to higher levels of interest in the material and course grades.⁸ A variation on this is to have middle grades students create time capsules that show what their lives will be like at age 25 and the impact that schooling and important decisions and actions had on their life. In both cases, the key seems to be not simply telling students that school matters for their future lives, but providing them the opportunity to actively reflect on it in very personal ways.

Principle 5:

Create a sense of belonging for all students.

The middle grades are a very tough time for students' sense of self and perception of feeling welcomed by others. Research indicates a key intervention is to show students that a sense of not belonging at the start of a new phase of schooling, (e.g., entering the middle grades), is normal and fades over time. This helps shift student perspective from an internal one, such as "I don't fit in," to an external one—that all sixth graders feel like this in one way or another.

Practice 1: *Include information on social integration in middle school transition programs.*

The evidence suggests that middle grades transition programs are likely important and that they should include more than just purely logistical information (e.g., *here is how your schedule works* or *this is how lockers open*). Including material on social integration into middle school and how all students often feel out of place at the start but find that these feelings fade over time, may help students make a smoother transition.

The emerging evidence also indicates the merit of sharing older middle school students' essays, in which they discuss how they initially felt out of place but found a sense of belonging, and then asking incoming students to write essays on how they relate to these feelings.⁹

These preventive efforts may also have to be paired with more targeted efforts like anti-bullying campaigns.

Practice 2: *Carefully frame academic tasks to reduce the risk of stereotype threats.*

A related challenge for some students is a stereotype threat. There are widely disseminated beliefs in our society that individuals from different racial and ethnic groups, as well as genders, "naturally" perform better or worse on different academic tasks. A growing body of research has shown that these stereotypes can have very subtle but profound impacts on a student's sense of belonging and motivation in school. High-quality research has shown that the impact is greatest on the most challenging problems or toughest academic tasks. In these circumstances, just small amounts of distraction caused by the student reflecting on the stereotype diverts enough mental focus to undermine success on tasks that require all available mental effort to complete. The research has also shown that a stereotype threat can be manufactured for anyone. We are all susceptible to the shadow of doubt in our ability to succeed on tasks.¹⁰

Be careful in how tasks are described to students and parents, and when possible, reduce the potential for a stereotype threat (e.g., by pointing out, "Research has shown that boys and girls perform equally well on these types of math problems.")¹¹

Principle 6:

Connect students' academic success to effort.

It is often in early adolescence that students become increasingly exposed to views that abilities are fixed (e.g., a student is “good at math” or “bad at writing”). This leads students to focus on their perceived strengths and withdraw effort from areas of perceived challenge. This viewpoint breaks the critical connection between effort and academic success. If students come to believe they are good at a subject because they are “smart” or not good at a subject because they are “bad at it” (e.g., “I am not a math person.”), then their overall level of effort may well decline.¹²

Practice 1: *Set high expectations for students and clearly communicate those expectations and the belief in their potential to succeed when providing feedback to students.*

A growing body of interdisciplinary research has shown that direct instruction in advisories or as part of core instruction, as well as teachers' communication with students, makes it possible to push back against views on ability-driven outcomes. Students can be taught that making errors is normal and leads to useful learning opportunities. This strengthens students' belief that with effort and productive persistence, they can succeed on challenging tasks, learn new things, and improve their academic skills. This in turn leads to greater effort by students and, through it, higher grades. For example, research has shown that middle grades students are much more likely to revise essays if they receive feedback that says, “I am giving you these comments because I have high standards and I know you can meet them” rather than a more neutral statement like, “Here is some feedback on your paper.”¹³

Practice 2: *Eliminate the use of indiscriminate incentive programs and unearned praise.*

Research has shown that two common approaches to improving student motivation, incentives and generic praise, either don't work or work only in narrow circumstances and can often have unintended negative consequences. While it is true that people broadly respond to incentives, it is also clear that building effective incentive systems to increase student effort is very difficult and often counter-productive. Compelling evidence has shown that incentives work only when the action being incentivized is fully under the control of the student and is directly related to important school outcomes. Thus, incentives have been shown to be more effective in increasing the number of books elementary students read than in having middle grades students improve their grades or attend school more regularly. Students can directly control whether they read another book, but they often do not fully know or understand how to raise their grades.¹⁴

There is also clear evidence that if not well conceived and executed, incentive systems can lead to decreased effort among some groups and across many students over time. For example, if students conclude they will never perform well enough to receive an incentive, they may in fact decrease their engagement and effort. Incentives may also inhibit students from seeing the value of the activity itself, and eventually, the lure of the incentive may decrease, leaving them less motivated over time.

Evidence also shows that indiscriminate praise or recognition of participation does not lead to increased motivation. Unearned praise sends the signal that effort does not matter. As the Gallup polls^{2, 3} show, the key feedback students are looking for, and what currently declines precipitously in the middle grades, is not praise for being who they are, but rather recognition for doing good schoolwork.

Conclusion

There is growing experimental literature showing the benefits of school wide positive behavior strategies and lesser literature on school wide attendance campaigns. The evidence base for teaching positive social and academic behaviors across classrooms is well explored in an Institute of Education Sciences (IES) practice guide,¹⁵ which provides recommendations for reducing high school dropout rates and presents intervention strategies that have been proven to work.

In recent years, a fair amount of high-quality research has shown that when educators help middle grades students develop a strong sense that schooling is for them and support them in their academic efforts, students can succeed academically. The other good news is that, by and large, this research has shown that relatively small changes in what schools do and how teachers interact with students can have substantial impacts on increasing student motivation.¹⁶

In addition to the IES guide on dropout prevention,¹⁵ an increasing number of quasi-experimental and randomized control trials have shown positive impacts of providing instruction in academic organization, self-regulation, and goal setting. Since these studies focused on a single component or program, the impact of more comprehensive and integrated efforts has yet to be determined; however, early identification of problem behaviors and how to meet them is supported by a wealth of research in the public health domain. Some of the practices and most of the practice examples shown in this section are best-practice applications based on current understanding supported by or derived from the foundational research described above. While these practices and examples have not been rigorously evaluated to date, the data support their use.

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Student Behavior And Motivation

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Extended Learning Time (ELT)

Middle grades schools can provide students with opportunities to learn outside the school day. The best opportunities should be integrated with the regular school day by connecting with the academic program students already participate in.^{1, 2, 3, 4} School staff should align any program with what is going on in the school. This might include aligning with important deadlines (e.g., student project due dates) or extending other key academic activities. To ensure participation in extended learning time, programs should be geared toward meeting the needs of students and making sure that both parents and the community are aware of the programs. What follows are five research- and evidence-based principles to ensure the success of extended learning programs.

Principle 1:

Align the Extended Learning Time (ELT) program academically with the school day.

To improve academic performance, Extended Learning Time (ELT) programs need to align with what students experience during the school day. The ELT program coordinator should communicate regularly with school staff and can work with a designated coordinator from the school to ensure frequent communication takes place. Cooperation between programs and the school helps ELT programs evaluate student needs and provide more effective instruction and services.^{1, 2, 3, 4}

Practice 1: *Use ELT program coordinators to develop relationships and maintain ongoing communication between schools and the ELT program about student academic performance and personal and social issues.*

The ELT coordinator has a critical role to ensure instructional components of the ELT program are aligned with the school day. Coordinators need to obtain information from school staff to guide instruction in the ELT program, through communication with key school staff and/or participation in school meetings and committees. The following are a few ways that coordinators can maintain communication with a school:

- Attend school staff meetings
- Participate in common planning periods
- Serve on school leadership teams
- Participate in parent-teacher organizations

When possible, the ELT coordinator should be housed within the school and be present during daily school hours. By being more visible to students and teachers, the ELT coordinator can create more opportunities to communicate

with teachers, principals, and counselors,⁵ build stronger relationships, and better understand the needs of students.

Practice 2: *Designate a school staff person to coordinate communication with ELT programs.*

Schools should designate a staff member as the school's coordinator to work with the ELT coordinator or with coordinators from multiple ELT programs, if relevant. The school coordinator should be the first point of contact for ELT programs and should ensure that ELT instruction is aligned with school goals.

Practice 3: *Connect ELT instruction to school instruction by identifying school goals and learning objectives.*

Information from the school and district is the basis for prioritizing ELT activities being designed to raise academic achievement. ELT programs can help students develop skills that support classroom instruction, such as learning how to plan, take notes, develop an outline, or study for an upcoming test. When promoting the use of skills from ELT during the school day, instructors should coordinate with classroom teachers to ensure the relevant skill aligns with classroom instruction and does not disrupt classroom routines.² Field trips or cultural activities that are part of the ELT program should connect to something the students are learning in school to help them see how what they learn in school relates to their real-life experiences.

Practice 4: *Coordinate with the school to identify staff for ELT programs.*

ELT programs have several roles for which effective classroom teachers are well suited. Teachers can serve as ELT coordinators, particularly during summer programs when they might not face conflicting demands on their time from regular teaching schedules. When funding is available to hire effective teachers from the school to serve as ELT instructors, these teachers can use their experience and knowledge of instructional methods to maximize academic gains for participating students.

PRINCIPLE 1 EXAMPLE APPLICATION: Collaborating to Make the Most of ELT

Schools with ELT should set aside three weekly meetings of about 45 minutes each (up to two hours per week) for teachers to coordinate regular- and extended-day activities. Administrators should attend each meeting and identify common themes and hurdles to help make the most of ELT programs.

Grade/subject meetings: For these meetings led by department heads, all teachers in a grade and subject (such as seventh-grade English language arts teachers) meet to review specific curricular objectives and approaches for tackling them. Material to be covered in regular- and extended-day lessons is reviewed.

Cluster meetings: Facilitated by one teacher, these meetings are attended by teachers responsible for clusters, including subject area teachers of mathematics, ELA, science, and social studies. The cluster groups of teachers discuss individual student progress, curricular issues, and opportunities for cross-curricular collaboration. Material to be covered in the regular- and extended-day lessons is reviewed. Teachers who facilitate the cluster groups may or may not be rotated to allow other teachers the opportunity to participate.

School improvement planning: At these meetings, all teachers in the school review the school's improvement plan and progress toward its objectives. The school administrator chairing the meeting reviews various indicator data and identifies milestones and a plan for reaching them. How the extended day program is supporting school improvement should be reviewed at every school improvement meeting.

Principle 2:

Maximize student participation and attendance.

ELT programs should determine which factors are preventing students from participating and work with schools and parents to address the factors. Parents are critical to participation because they have a strong say in which programs they believe are beneficial to their child, and children generally value their parents' judgment.⁶ Important factors parents take into account when deciding whether their child can participate in an ELT program include location, transportation, timing, length, program offerings, and frequency of services.⁶

Practice 1: *Design program features to meet the needs and preferences of students and parents.*

The ELT program should gather information from parents through a survey and talk with school staff to identify the needs of students and parents, and responses should guide how the program organizes and provides its services. One priority of ELT programs should be to work with schools and districts to ensure design features make the program accessible.^{2, 7, 8, 9} For example, parents often prefer the use of school facilities for services, which eliminates the need to transport students to another location after school,¹⁰ an option that is often not practical for working parents. If the program is not located at the school, or if the program is serving students from multiple schools, schools and districts should ensure that transportation to and from the program is readily available and affordable (or provided at no cost), and that adult supervision is provided while students are being transported.

Practice 2: *Promote awareness of the ELT program within schools and to parents.*

ELT programs should regularly inform parents, teachers, and other school staff about program activities and outcomes. Programs can use websites, flyers distributed at parent meetings, notices on school bulletin boards or in school newsletters, email (if appropriate), social media, and word-of-mouth to provide program location, hours of operation, and contact numbers. The information may need to be available in multiple languages.

Schools can work with ELT providers to promote participation. Teachers and administrators can identify and recruit students who might benefit from participating in the ELT program even one or two days a week. Teachers can provide referrals or informational materials to parents, or give the program a list of students they believe need academic assistance.^{2, 11, 12, 13} Teachers or school administrators can also remind students at the end of the school day about attending the after-school program.

Practice 3: *Use attendance data to identify students facing difficulties in attending the program.*

Program coordinators should systematically collect ELT program attendance data and use it to identify students with low attendance. ELT staff can follow up with school staff to see if the attendance problem extends to the school day. ELT staff could also coordinate with school staff to contact parents and determine the reason for the absences.^{5, 7, 14} Programs can consider using reward incentives, positive reinforcement, or special privileges to encourage regular attendance.

Principle 3:

Adapt instruction to individual and small group needs.

ELT is an opportunity to supplement learning from the school day and assist students whose needs extend beyond the instruction they receive in the classroom. Since ELT programs are shorter than the school day, instruction must be focused and targeted. Determining the most appropriate skills to teach and the right level of difficulty and pace is critical to effectively individualize instruction while making it challenging in practice.^{15, 16} To provide targeted help, instructors first need to assess and document students' academic progress. The assessment can then be used to provide students with instruction that accommodates their level of development and rate of learning.^{15,16}

Practice 1: Use formal and informal assessment to inform academic instruction.

ELT programs can use assessments administered during the school day—combined with input from classroom teachers—to individualize instruction. General assessments can measure a student's content knowledge and mastery of a topic and point to skills that should be emphasized during instruction. The information from assessments should be used to adapt the content, pace, and approach in ELT instruction.^{1, 14, 17, 18, 19, 20, 21} If additional information about student progress is needed, ELT instructors should incorporate formal and informal assessments into tutoring and homework assistance time.^{7, 14, 20, 22}

Practice 2: Break students into small groups and use one-on-one tutoring if possible.

Ideally, ELT programs should use one-on-one tutoring to provide academic instruction to students.^{12, 13, 17, 18, 23, 24} A one-to-one ratio enables the most attention for students and facilitates the continuous assessment of student progress and academic needs.¹⁵

If resources are limited and do not allow for one-on-one tutoring, three to nine students can be grouped,^{2, 10, 14} especially when there will be opportunities for students to work independently.^{15, 16, 24}

Practice 3: Provide professional development and ongoing instructional support to ELT instructors.

In order for ELT instructors to adapt instruction to meet the individual needs of their students, all ELT teachers should participate in a professional development and support program. Schools and districts may have high-quality training and professional development resources, and it may be to the school's benefit to be involved in the training of ELT instructors, many of whom may be classroom teachers or paraprofessional staff. Schools should provide professional development and discuss training options with the ELT program coordinator. Schools should also consider involving ELT program instructors in training and professional development courses at the school and district levels.

EXAMPLE PROGRAM: Enhanced Mathematics Instruction in an After-School Program¹⁴

Using out-of-school time to focus on middle school mathematics instruction has been shown to improve mathematics scores on standardized tests. A study looked at enhanced mathematics instruction using Harcourt School Publisher's *Mathletics* program, which was built around five mathematical themes, or strands: (1) numbers and operations, (2) measurement, (3) geometry, (4) algebra and functions, and (5) data analysis and probability. The program is designed to teach skills that should have been learned in prior school years but were not mastered by students.

Teachers in the after-school program used a planning guide to diagnose each student's performance on the pretests and determine which program activities were appropriate. Students charted their daily progress with a "My Math Fitness Plan" chart, which listed assignments and their completion.

Based on the pretests, students were grouped by grade, with separate materials for grades 2 through 5. Lessons averaged about three hours a week, either in four, 45-minute lessons or in three, 60-minute lessons. Periods were modeled after a gym exercise session, with a short warm-up problem for all students, two, 15-minute workout rotations focused on individual skill-building, and a final whole group cool-down activity related to the warm-up activity.

After the initial warm-up exercise with the teacher, students broke into groups or worked individually during the workout section of the class, with two, 15-minute rotations. The teacher worked with the groups to go over solutions and develop math skills. While teachers worked with groups, other students worked on their own to complete skill packs or computer math activities; some students worked in pairs on math games as well.

Over the course of a week, the teacher tried to meet with each student at least twice, with the goal of having students complete work on at least one or two skill packs per week.

More information about this example of an after-school program can be found at
<http://ies.ed.gov/ncee/pdf/20084021.pdf>

Principle 4:

Provide engaging learning experiences.

ELT programs typically are voluntary and must compete with other activities to attract students; therefore, instruction must be engaging to overcome fatigue and distractions. ELT activities should be interactive, hands-on, learner-directed and related to the real world while remaining grounded in academic learning goals.^{1, 8, 25} Fortunately, ELT programs have the flexibility to provide engaging opportunities for student learning.

Practice 1: *Make learning relevant by incorporating practical examples and connecting instruction to student interests and experiences.*

The ELT program should use tools or materials to which students can relate. ELT staff should identify the academic concept being taught and then find practical examples and relevant material to support that learning objective. When possible, programs should consider integrating academic content using an overarching program theme or final project to reinforce different learning activities and make learning more meaningful.^{5, 8, 9, 19, 26}

Practice 2: *Make learning active through collaborative learning and hands-on academic activities.*

ELT instruction should encourage students to think actively about and interact with academic content. ELT programs can encourage interaction between peers by pairing struggling students with more advanced partners to help grasp difficult concepts.²⁷ ELT instructors can break students into groups to work together to solve a problem or to rotate through learning stations, although effective group exercises can be less formal and as simple as having a group of three students complete a mathematics problem together.^{28, 29} ELT programs can use role-playing activities to make experiences real and meaningful for

students.^{30, 31} Hands-on activities can also be helpful in reinforcing academic content.³²

Practice 3: *Build adult-student relationships among ELT program participants.*

Positive and supportive relationships with adults can help students feel connected to the ELT program and invested in its academic material.^{7, 11, 22, 26, 27, 33} ELT programs can help build adult-student relationships through activities such as field trips, and the programs can help engage students by personalizing activities to fit their interests. As instructors get to know their students, they can pinpoint students' interests, relate academic content to their context and interests, and encourage them to have high expectations.²² To be most effective, ELT programs need to hire staff with backgrounds and interests that complement those of their students.^{5, 25} ELT programs can then use relationship-building activities to help staff get to know students and become invested in their outcomes.^{11, 22}

Principle 5:

Assess program performance and use the results for program improvement.

In implementing the ELT program, organizers should use *formative* evaluations to assess how a program has progressed and which program aspects are working well and *summative* evaluations to assess how effective a program has been in achieving its goals, which usually will include improving student academic outcomes. Both types of evaluations are instrumental in program improvement efforts and should be used in tandem.

ELT providers should put internal mechanisms in place to monitor staff performance and collect data related to program implementation. Schools or districts should then be responsible for evaluating program impacts on students. Evaluation findings can be used to identify problems and develop potential solutions, evaluate conditions under which the program is most effective, or make comparisons with the performance of other programs. These findings can be especially valuable in making long-term decisions about which strategies and programs should be continued or replicated in other areas.

Practice 1: *Develop an evaluation plan for ELT programs.*

An evaluation plan should include evaluation objectives and research questions, as well as details for data collection and analysis processes. The plan should contain information about the outcomes that will be used in the evaluation, the data that will be collected to measure those outcomes, and how data will be gathered. The plan should also outline the timeline for carrying out various

components and describe how results will be disseminated and used.

Practice 2: *Collect program and student performance data.*

Program implementation data, student outcome data, and feedback from other stakeholders regarding satisfaction with the program should be gathered.²³ Program activity should be monitored as closely as possible, since the more detail available about implementation, the easier it will be to identify specific areas for improvement. The school ELT coordinator should have a lead role in program monitoring.

Practice 3: *Analyze the data and use findings for program improvement.*

Schools should analyze the data on implementation, student outcomes, and satisfaction, and use findings to improve the program. Schools should look for inconsistencies between what ELT providers proposed to do, how the program has actually been implemented, and identify patterns in the data that suggest problems areas, such as irregular attendance on certain days of the week. Districts can then use a larger data set to look for patterns across schools or across ELT providers. Schools should share their evaluation results with the ELT program to encourage growth and improvement, and then work collaboratively with the program to develop strategies that address areas of concern.

PRINCIPLE 5 EXAMPLE APPLICATION: Using Data for After-School Program Improvement—The Providence After School Alliance Initiative³⁴

The Providence After School Alliance, a citywide consortium that began in 2004, emphasizes continuous improvement using both performance and evaluation data.

To set up its performance data, the Alliance reviewed established quality standards from other cities and adapted them to meet their needs. The Alliance then used quality measures to develop indicators and assessment tools, and installed an information system to collect and analyze the data. The system manages data on enrollment, participant background and demographics, attendance, retention, and programming schedules. The system's reporting feature supports analysis by individual programs, groups of programs, and providers, and allows the Alliance to track students with different patterns of participation and attendance. The system is also used to manage logistics, transportation, and program attendance.

The data were also linked with the school district's data, and the Alliance worked with a consultant to identify patterns and correlations in the two databases, such as links between after-school program attendance and school outcomes. Alliance managers use reports to regularly share participation numbers with the board of directors, the city council, funders, and other interested parties.

The Alliance also contracted for a three-year evaluation of its outcomes on young people with two main components: an implementation study that included an evaluation of the Alliance's quality strategy, and an outcome evaluation that follows a cohort of sixth graders, looking at grades, test scores, and attendance. The outcome evaluation includes a survey of participants and nonparticipants, and focuses on social and emotional competencies.

More information about this example of an after-school initiative (and four others) can be found at
http://www.rand.org/pubs/technical_reports/TR882.html

Conclusion

As with dropout prevention, the practices and principles for ELT rely on the recent IES practice guide,³⁵ adapted for this field guide for a middle grades context. After-school and extended-day programs have emerged relatively recently (the federal effort to support after-school programs only began in 1998 and the first evaluation of that program ended in 2005). Research in these areas is, therefore, limited and has considerable gaps. The IES practice guide synthesized research from various strands related to after-school and extended-day programs, but significant questions remain. Some concerns include how program exposure (sometimes called “dosage”) relates to effectiveness, whether there is comparative effectiveness of different delivery models, and whether there is a tradeoff between using after-school time to develop academic skills versus other skills or proficiencies, such as music, art, dance, and cultural understanding. It has been suggested that developing other competencies contributes to stronger school engagement, but the topic is currently being explored; likewise, the highly varied landscape of after-school providers, contexts, and program designs suggests that caution is appropriate for any general statement about programs.

The broad literature review undertaken for the IES practice guide has the advantage of thoroughness and objectivity; the latter aspect in particular is often lacking in the charged policy environment of after-school programs. Practices not included here are likely to have a weaker evidence base.

The IES Practice Guide can be found at:

http://ies.ed.gov/ncee/wwc/pdf/practiceguides/ost_pg_072109.pdf

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Chapter 3: Informed Decision Making

Introduction

The No Child Left Behind Act of 2001 (NCLB) increased awareness of educational accountability and the need for greater focus on educational outcomes. Education stakeholders—from school boards to parents, teachers, superintendents, and even state legislators—are now using data as an important lever in education reform. This is a necessary condition for implementing performance management as a framework for improving school and student performance. For the purposes of this discussion, the term performance management has been borrowed from the field of business to describe an approach to building the capacity of educators at all levels to use data to prioritize activities that advance core goals, measure progress toward meeting these goals, and make informed decisions about the best ways to improve student achievement. Looking systemically at how all the components of the education system work together to support student learning is the primary goal of this new management approach.

While much of the strategic planning for performance management happens at the district level, implementation happens at each school site in a school district. School principals are on the front line, carrying out new programs, interventions, and curriculum and instruction. As managers of teacher and student performance, principals need information about how every part of the school is operating. Education indicators provide leaders with new understanding of capacity and productivity to meet students' educational needs and can inform teachers and other educators of progress on improvements to the education system. Annual trends and outcomes, as well as day-to-day information on attendance, course performance, behavior, etc., are needed to monitor and fine-tune system performance. A primary goal of performance management is to aid schools and staff as they shift from an attitude of compliance to a new commitment to continuous improvement.

What follows are five practical and evidence-based principles that can be used to develop and implement effective performance management strategies in the middle grades, along with a description of the rationale behind each principle, and a few specific practices and examples that schools can follow to ensure success. These principles provide direction on using data to improve instruction and learning, monitoring progress toward goals, and evaluating the effectiveness of decisions.

Performance Management

Principle 1:

Establish and communicate a strong commitment to evidence-based decision making.

Research evidence has shown it is vital that school leadership establish and maintain a vision for school wide data use if it is to succeed.^{1, 2, 3, 4, 5, 6, 7} School leadership must create an expectation for using data to inform decisions regarding instruction and student performance by establishing processes and practices and providing appropriate tools. Principals' perceptions toward data use have been found to be positively correlated to student achievement, and teachers with high use of data have been found to have students with higher assessment scores in middle school.⁸ In fact, general data use practices and perceptions of teachers have been found to be significantly related to outcomes for students in mathematics at the middle school level. Research evidence has shown that it is important to ensure these supports are in place to foster a data-driven culture within the school.

Practice 1: *The principal establishes a school wide data team with ongoing responsibility for promoting and ensuring effective data use.*

Principals should engage a variety of stakeholders (assistant principals, department heads, teachers, parents,

and students) on the data team to ensure an understanding of all data within the school related to learning and student achievement. The data team should model how to effectively use data to improve student performance through data-informed instructional decisions.

A collaborative model should be promoted through a *distributed leadership*⁹ culture where administrators and teachers share in the responsibility for using data in an inquiry cycle to ask questions, share ideas, and make decisions to improve instruction and learning. School cultural issues related to implicit power relationships can ruin such collaboration,¹⁰ and care should be taken to ensure the process is truly collaborative.

Principals should consider existing ties among staff, networks, and central actors that can be leveraged to create a successful data use culture.¹¹ For example, knowing who teachers already go to for advice and mentoring and structuring data use teams that leverage these existing networks can improve data use reform in schools. Leaders also cannot forget the need to build capacity first within their own leadership network of assistant principals, instructional coaches, counselors and other leaders within a school. These leaders need the same capacity for data use to support teachers and model best practices. In this manner, there may be a less centralized structure for data use, with variation depending on the needs of the group of teachers supported by each leader.

PRACTICE 1 EXAMPLE APPLICATION: Key Data Team Activities

The following are key activities the school wide data team can include in its plan to support this project:

- Publish a school wide data collection calendar.
 - Publish a data directory so staff know which departments collect and maintain different types of data and when data is reported.
 - Adopt an Early Warning Indicator system to identify at-risk students.
 - Review source data systems to ensure data is available.
 - Determine reports that users will need and get feedback on report layout from end users.
 - Plan for training of data entry staff to ensure data quality and security.
 - Plan for training and coaching of classroom teachers on how to use data to drive improvements in the classroom.
-

Practice 2: Develop a data-use plan that articulates activities, roles, and responsibilities.

Communicating professional expectations for data use is an important first step for school leaders who seek to develop a culture of data use. More recently a framework for building a culture of data use has been proposed, which includes the following five elements:¹²

- 1. Clarifying Expectations for Data Use:** There are clear expectations about how to use data, and these expectations change over time as skills for data use grow. District, school, and teacher leaders frame consistent messages about how data can be used to support teachers' professional capacity and student learning.
- 2. Ensuring Access to Data:** Data are accessed, coordinated, filtered, and prepared in ways that allow educators to quickly and efficiently analyze and interpret them to answer key questions and address important teaching and learning issues.
- 3. Making Meaning from Data:** Teachers have opportunities to collectively make sense of what the data indicate and to explore how to move from data to evidence that will inform instruction. Protected time is available, focused on making meaning from data, and supported by the use of consistent inquiry-based practices.
- 4. Building Knowledge and Skills to Use Data:** Teachers learn the key skills required to support data use, including strategies for data analysis and assessment literacy, and using data to inform instruction. Adequate time for professional learning is

integrated into daily practices and supports teachers in building content knowledge and data analysis skills over time. Professional learning is differentiated to support teachers' specific learning needs.

- 5. Leading a Culture of Data Use:** Leadership nurtures and supports a culture of data use and develops organizational structures that include time and resources to conduct ongoing data dialogue, as well as feedback that will support users in acting on new knowledge. Acting on knowledge is supported at the administrative, teacher, and student levels. Leaders' use of data is central to helping educators interact around issues that will lead to improved learning outcomes.

Schools should assess the current status of their data use to identify which of the five elements are not in place and need to be addressed. Next, the school wide data team should develop a well-articulated plan for attainable and measurable data use that takes into account school-specific culture and constraints. The plan should a) identify the types of data and frequency of review needed to document progress toward goals, b) link data to specific practices or strategies implemented, and c) develop a process to identify appropriate interventions. Roles and responsibilities for monitoring specific data should be clearly articulated. The plan should be reviewed and revised annually based on the changing needs of the students and school. Teachers should be given time to reflect on the results of their data plans to promote learning and to inform the next plan.¹³ The strategic value of gathering each piece of data should also be defined annually. A sample data use plan for a mathematics department is shown in Table 1.

Month	Assessment	Who Collects Data?	Who Shares Data?	How Are Data Shared?	Progress Goals
Ongoing	Weekly analysis of student work samples	Mathematics teachers	Mathematics teachers	In small groups monthly	
January	Open-ended response item assessment (used as baseline)	Mathematics teachers	Department chair	Weekly mathematics department meeting	At least 35% of students meet the benchmark (set at baseline)
February	Ongoing Progress Monitoring Activities				
March	Open-ended response item Assessment A	Mathematics teachers	Department chair	Weekly mathematics department meeting	At least 50% of students meet the benchmark (set at baseline)
April	Ongoing Progress Monitoring Activities (state assessment typically April/May)				
May	Open-ended response item Assessment B	Mathematics teachers	Department chair	Weekly mathematics department meeting	At least 65% of students meet the benchmark
June	Reflection on the end-of-year state standardized assessment results	Principal	Principal and mathematics department chair prepare presentation	End-of-year mathematics department meeting	40% of students will meet proficiency in mathematics

Source: Adapted from Boudett, City, and Murnane (2008); p. 153¹⁴

Table 1. Sample Mathematics Department Calendar for Monitoring Progress

Practice 3: *Develop common understanding of key terminology among all data users.*

The data team should adopt a common vocabulary for discussing and using data to reduce misunderstanding and improve implementation. Terms such as achievement, evidence, and intervention should be clearly defined and understood by all staff. In most cases, terms should be defined at the district level and communicated to educators at all levels. During data team meetings, take time to discuss key terminology to ensure common understanding of words, goals, and data. Document these definitions and ensure all team members refer back to the definitions in discussion. In conversations with teachers and staff, school leaders should use these terms consistently to check for understanding and encourage others to do the same.

Examples of definitions for key terminology related to indicators follow:

Key Performance Indicator (KPI): A measure of how well the organization performs an operational, tactical, or strategic activity that is critical for the current and future success of the organization. Distinguished from other indicators, KPIs are those indicators most critical to gauging progress toward objectives. KPI can include both leading and lagging indicators.

- **Lagging Indicators:** Data that are reported on an annual basis, typically for accountability purposes, such as performance on standardized assessments, annual attendance, and yearly discipline referrals. Lagging indicators are used to inform goals, policies, and practices; such historical data are typically insufficient to inform action without consideration of more current data reported at multiple time points within a year.
- **Leading Indicators:** Data reported at multiple time points within the year, such as daily attendance, interim benchmark performance, or discipline referrals. Leading indicators should be used to inform action that is taken with students, schools, and districts.

Early Warning Indicators (EWIs): EWIs are indicators reported multiple times a year that have empirical evidence demonstrating their predictability of whether a student is on the right path toward success on any essential outcome.

PRACTICE 3 EXAMPLE APPLICATION: Establishing Shared Meanings, Perceptions, and Definitions

In a study of district efforts¹⁵ to develop common understanding for data use, four important considerations were identified that could be considered when establishing a common language around data use in schools.

1. *Working Collectively*: Encouraging broad participation, a sense of community, development of relationships, and working together towards a common understanding.
 2. *Valuing the Process*: Focusing on the value of the process rather than the outcomes, moving beyond having the correct chart to supporting one another through activities that enhance collaboration and produce a shared language.
 3. *Allowing for Self-Determination*: Leveraging differences in interpretation and strategies to promote innovation, such as new ways to look at a problem balanced with efforts to create a common language.
 4. *Continuing the Work*: Understanding that this is an ongoing, never ending, iterative process of creating and updating a shared language around data use for teaching and learning that includes accounting for turnover and the need for onboarding of new staff into this performance management culture.
-

Principle 2:

Identify and monitor indicators aligned with campus goals.

While instrumental to understanding issues and points for improvement, having access to quality data does not, by itself, solve educational challenges. Rather, it is the use of data and information to inform decisions that makes a difference. Determining what actions to take to address issues can be an overwhelming and time-consuming task; using data to identify points for improvement can be streamlined by the identification and monitoring of the most important indicators. The identification of such measurement efficiencies can begin with the alignment of campus goals to particular actionable indicators.

Practice 1: Review lagging data to determine performance goals.

Developing a habit of inquiry based on observable data, rather than preconceived assumptions about students, allows for deeper knowledge of the issues.¹⁶ Through a culture of continuous improvement, appropriate time can be invested in identifying issues and root causes of performance challenges. Data investigations should begin by reviewing historical performance, which provides an understanding of where success has been achieved and what challenges continue to surface because little progress has been made. Discussion of these issues can lead naturally to further investigation and insight and to the development of shared goals for school personnel.

After shared goals for the school have been set, each teacher can personalize the goals by looking at lagging data for his or her students. The *Practice 1 Example Application* provides a set of questions teachers can ask as they identify goals and determine additional data to collect.

While a school goal might be to increase the percent of students meeting a particular standard on a benchmark assessment, a teacher of accelerated students may need to set a higher goal for his or her students. Without including this option to personalize goals, some teachers may feel that use of data to inform teaching and learning does not apply to them, since their students have already met a prior passing standard.

PRACTICE 1 EXAMPLE APPLICATION: Sample Questions to Guide Goal Setting and Data Collection

Teachers can answer questions, such as these below, as they set goals and collect data after examining lagging data for their own students:

- *Goal Identification*
 - Who will you collaborate with to determine your goals?
 - What are your goals?
 - What are some activities that support your goals?
 - What are some measurable and observable objectives you can set that relate to your goals?
- *Data Collection*
 - What data do you currently have access to and what have you learned by looking at that data?
 - What else do you need to know?
 - Who is responsible for collecting that data?
 - How can you get access to that data?

Note: These questions are informed by a recursive data-based decision-making model by Cramer, Little and McHatton (2014); pp. 392-393.¹⁷

Practice 2: *Determine indicators for measuring progress toward goals.*

Once goals are clearly defined, the school wide data team should determine a set of indicators to systematically measure progress toward meeting these goals.

Individually, each indicator should show the progress toward meeting a specific goal. Collectively, the indicators should tell a story about how well the student, teacher, or school is performing now and will perform in the near future. A good indicator typically possesses the following characteristics:

- is accepted by and meaningful to the end user;
- tells how well goals and objectives are being met;
- is simple, understandable, logical, and repeatable;
- shows a trend;
- is defined unambiguously;
- is timely; and
- is sensitive.

Most importantly, select indicators focus attention on what matters most and drive appropriate action. Using a defined process for developing performance indicators and supporting metrics enables the school to quickly identify and add new metrics as changes occur and new issues surface. This process involves considering the issue or goal the indicator must address and conducting a review of research supporting potential related indicators.

Examples of EWI Data to Review

Robert Balfanz of Johns Hopkins University notes specifically that poor attendance, behavior issues, and course failures as early as sixth grade place students at risk of eventually dropping out of school. Frequent monitoring of such performance indicators, or EWIs, helps educators quickly identify and address the needs of struggling students and empowers district and campus leaders to focus and shift resources where they are needed most to meet student and school performance goals.

Practice 3: *Establish targets for indicators based on school goals.*

Once indicators are selected, baseline data should be established to identify the current status on each indicator and to set performance targets. If the school year has not yet begun and current performance data are not available, use historical performance data, such as averages from the previous year, as a starting point. Care should be taken to set realistic, near-term targets aligned with annual district and campus goals. If the gap between the baseline and goal is very large, multiple, more immediate targets might be set for a particular indicator so that staff can see the minimum performance gains needed throughout the school year to be on-track for achieving goals. These intermediate targets can be used to identify trends and spotlight areas in need of special attention and/or intervention. Each target should be communicated verbally to all staff and viewable within campus performance management dashboards.

Principle 3:

Guide and support teachers in the use of data to meet the needs of students and to support them in reaching their goals.

Research supports making data part of an ongoing cycle of instructional improvement.^{3, 18, 19, 20, 21, 22} The inquiry cycle of gathering data, developing and testing theories, and modifying instruction is fundamental to using assessment data to guide instruction. Principals should provide guidance, support, and tools to ensure teachers are knowledgeable and prepared to use data effectively to inform classroom decisions. The school wide data team, through example and support, should strive to develop the capacity of the entire school community to use data to drive decision making. This can be accomplished through professional development, data meetings with teachers, and ongoing guidance on data-informed decision making.

Practice 1: Provide targeted professional development and ongoing data support.

Using data to drive decisions that improve student and school performance requires open and honest dialogue among teachers, administrators, parents, and other stakeholders. Discussions focused primarily on data for accountability purposes often stop short of determining root causes. Differentiating performance management efforts from accountability and compliance fosters open discussions about data, possible root causes of poor performance, and potential solutions. Such dialogue necessitates a common language around indicators, what they measure, and how they will be acted upon. A clear understanding of these indicators can also help educators better understand their role in meeting targets and overall goals (see *Practice 1 Example Application*).

To gain support and foster open communication about data, professional development can ensure that all staff and stakeholders understand the following:

- *Why the indicator was selected, including supporting evidence from research:* Ensure that alignment with district and campus goals and strategies is communicated as the primary reason for the selection of the indicators and that this alignment is clear and meaningful;
- *Exactly what the indicator measures:* While by name some indicators may seem straightforward, specifics regarding data elements and calculations used in the indicator help ensure that everyone clearly understands what is being measured and uses a common language to discuss status of the indicator; and
- *How the indicator will or will not be used:* To gain commitment from educators, there should be a clear understanding that EWIs and other indicators will be used to inform decision making to improve student performance and are not punitive in nature.

Assessment data provides teachers with a rich source of data to support instructional improvement. The following are four recommendations²³ for successful professional development to help teachers use student assessment results to improve instruction:

1. Provide support for an effective work group by setting clear expectations and goals for the work.
2. Focus on school-based data that relates to teachers and their classes to make activities more authentic.
3. Devote professional development time to working with each teacher's classroom data.
4. Provide a forum, such as "data teams," for sharing ideas about using data to improve instruction among teachers.

When teachers were asked about their professional learning needs around data use, the following common needs were found:²⁴

- How to ask appropriate questions of data (to guide analysis and use);
- How to access and operate district data systems;
- How to gain basic knowledge and skills in data literacy and interpretation;
- How to integrate data use into day-do-day practice;
- How to share information via collaboration; and
- How to implement the process of knowledge codification (moving from tacit to explicit knowledge).

One of the most valuable experiences teachers can have while learning a new computerized data system is to practice data use with their own classroom data. Without this practical application, training in computer data systems lacks the professional learning experience needed to improve data use.

A framework for professional learning around data use should include the following components:²⁴

- *Data Capture:* Accessing and organizing data in preparation for an inquiry activity
- *Meaning Making:* Interpreting data and choosing next steps, such as instructional change
- *Information Sharing:* Sharing data knowledge and expertise with others in the school
- *Knowledge Codification:* Sharing documents and processes that are used consistently within the school community

A major value of this framework is that professional learning is not seen as individually focused, but rather includes mechanisms for preserving knowledge and making that knowledge accessible to others throughout an organization. This should lead to greater sustainability of the culture of data use.

To promote a culture of using data to improve student outcomes, professional development must also be connected with the daily work of the school staff so they see the value and relevance of the use of data to their own work. Because of time constraints and workloads, a flexible, blended professional development approach that provides opportunities for online, on-demand, and face-to-face training should be used. The examples at the end of Practice 1 provide additional information to guide schools in their work with teachers around data.

Teachers can consider these questions as they reflect on students' data that they have collected and reviewed:¹⁷

- What are the data telling you about the issue you identified and the related goal?
- What action will you take based on this data?
- Who else will you involve that can share the responsibility or support you in your work?
- How can you involve parents or other stakeholders?

To use data to inform instruction, teachers need to develop Data Literacy Skills.¹³ There are three areas of data literacy skills:

- *Problem focused skills:* Framing a question, identifying problems, and making decisions
- *Data-focused skills:* Being able to access, generate, and interpret data
- *Process-focused skills:* Knowing how to engage in collaborative inquiry and evaluate cause and effect

- *Data quality skills*: Understanding strengths and limitations of data collection and reporting tools

Development of these skills should not happen in isolation, but within the context of instructional improvement in collaboration with colleagues where everyone contributes to the inquiry process.

PRACTICE 1 EXAMPLE APPLICATION: Using Data for School Improvement

Provide opportunities for teachers to learn how data use can contribute to school improvement:

- It provides a structure for achieving school goals.
 - It encourages connecting data analysis to instructional changes.
 - It builds an awareness and appreciation for the role of a principal in school improvement by supporting teachers to improve their practice.
-

HONEST REFLECTION AROUND DATA

At the 2009 Conference of the Council of State School Officers, a district reported that in their work with school data, they realized a majority of students were high performing, but some were persistently low performing. Schools were missing Annual Yearly Progress (AYP) because they could not move the achievement of these students. The district worked with school leaders to look deeply at their data, focusing specifically on persistently low-performing students. They discovered that the stated district and school goals of having high expectations and meeting the needs of all students were not being practiced consistently. The district and schools began honest conversations about addressing the needs of all students. They implemented several changes that included restructuring time and changing teacher assignments. They also made changes in how the students were taught. If the district had not been willing to be honest about their needs based on the data, to be reflective about their practice, and to spend that extra time, they would not have discovered this important key to making AYP.

NEEDS ASSESSMENT

Data should be gathered to evaluate the needs of the school staff and assess professional development. The following are some guidelines to follow for successful professional development:

- Assess needs and target resources to address them
 - Set goals and keep track of whether they are being accomplished
 - Track the impact of staff development efforts
-

Practice 2: *Designate a school-based facilitator who meets with teachers to discuss data.*

The school principal should designate a data facilitator or coach to provide a systematic way for teachers to use data to inform instructional decisions. The role of the data facilitator is to increase the capacity of teachers to use data to identify student needs and develop appropriate action plans. This can occur through monthly meetings with teachers to discuss student performance data, identify trends, and consider appropriate responses. By modeling how to use data to gauge progress toward learning goals and drive instructional decisions, data facilitators can help teachers feel more confident in their own abilities as they develop a better appreciation for the value of using data to manage student performance.

The school-based facilitator can also add value by providing teachers with a structured protocol for reviewing data (see *Practice 2 Example Application*). Without structure, teachers may tend to classify students in ways that are not helpful to improve teaching and learning, such as referring to kids as the “fast kids” or the “slow kids,” rather than focusing on teaching practice or other areas teachers can have influence over. The facilitator should push for “depth of inquiry” discussions, which involve the following higher-level thinking skills: analysis, synthesis, critique, goal setting, reflection, and monitoring.²⁵ Conversations that are less effective focus on telling information, retelling, describing, and storytelling.

One approach for working toward depth of inquiry uses a concept of “zooming in” and “zooming out” when looking at data.²⁶

- *Zooming in:* Taking a look at a particular event or activity and developing a deeper understanding of the practices and perspectives at that moment in time. What patterns are observed? What can be inferred from the data?
- *Zooming out:* Consider the instructional routines, ways of teaching and learning related to the data. For example, classroom practices, school rules, or other context that influences behavior and learning.

The following are some effective behaviors for supporting teachers in data use to improve teaching and learning:²⁵

- Providing targeted advice, such as for a particular grade level, rather than general advice across all grades
- Focusing on factors impacting data that teachers can influence (e.g., language deficits) rather than factors beyond teachers’ control (e.g. poverty levels, parenting)
- Providing direction about what data to collect
- Advancing the inquiry process by encouraging synthesis of knowledge discussed
- Summarizing team discussions, progress, and establishing an action plan with next steps
- Providing resources (research literature, reports, and tools) related to the team discussion

PRACTICE 2 EXAMPLE APPLICATION: Using Data to Improve Teacher and Student Attendance

A school district in Texas was trying to improve mathematics achievement for 9th grade students. School data revealed that absentee rates for teachers were a serious concern. The schools implemented strategies for talking to teachers when they returned from an absence and discussed strategies with teachers for improving attendance (such as taking the car to the repair shop on the weekend). Teacher attendance improved, as did 9th grade achievement.

At another Texas high school, the campus leadership team discovered from its review of student data that there was a high student absentee rate for the six weeks before the state assessment. Student absences were associated with poorer performance on the state assessment the previous year. The school implemented strategies to improve student attendance in the six weeks before the state assessment and saw an increase in test scores beginning that year.

Practice 3: Dedicate structured time for staff collaboration.

For data use to be part of a school's culture, principals need to ensure teachers collaborate with other teachers and school staff to analyze, interpret, and understand changes and trends in data. Meeting times should be structured so that teachers and facilitators come prepared with the data, have sufficient time to think about teaching and learning and then test their theories with the data, and conclude with practical data-based action steps they can take into the classroom to improve learning and reach achievement goals. Effective principals must monitor the outcomes of this work so that teachers not only talk about data, but also change their practices as part of a continuous improvement cycle. The latter step is the part of performance management that takes the lessons learned from data and turns them into actions, raising the bar for expectations in the use of data and changing teacher behavior in the process.

The more that professional learning can be infused into the routine workday of teachers, the more effective the learning opportunity.¹⁵ Everyday tasks such as attendance, grading, and lesson planning are opportunities for data discussions. It is important to make relevant content connections, such as bringing mathematics teachers mathematics-related data in line with their instructional scope and sequence. It is also important for teachers to have time to work with and share their knowledge in a community, such as middle school grade-level teams. These relationship-supportive structures can equip teachers with the data use skills they need and also develop expertise that can be shared within the larger community.²⁵ Positive peer pressure in these groups can also encourage changes in data use practice for more resistant teachers.

The *Practice 3 Example Application* that follows describes how this approach was carried out in one middle school.

A sample planning tool to help data team meetings focus on progress monitoring is provided in Table 2.

PRACTICE 3 EXAMPLE APPLICATION: Ask Important Questions

Boston's McCormack Middle School²³ decided to ask this question:

Are particular middle school math teachers especially effective at teaching certain topics?

The results showed that the school had some teachers whose students outperformed the state average on a subset of questions on the 8th grade state assessment. Teachers shared their specific strategies for teaching the topics related to these questions during interviews. This information was used to guide professional development the next year.

You never know what can be accomplished with just one person asking one question—so step up and ask!

Data Type	Indicator and Measurement Activity	People Involved	Schedule for Gathering Data	Schedule for Sharing and Interpreting Data
Short-term data	Individual conference with students about one of their work samples	Classroom teacher	Individual conferences with five students per week (record notes on conference sheet)	Teachers share key findings at grade level team meetings October through April
Short-term data	Observe small group discussions related to a class assignment	Principal, assistant principal, representative from the school wide data team	Once in the fall (November) and once in the spring (March), conduct student-focused classroom observations	Post-observation discussion with teacher the same day his or her class is observed Findings across observations of teachers shared at whole-faculty meeting (December, April)
Medium-term data	District benchmark assessment	Classroom teacher, principal, assistant principal, data team representative	Administer benchmark assessment to all students at the start of the school year (September), middle of the year (December), and end of the year (April) Classroom teachers review scores of their own students	School wide data team creates report with data displays and presents the findings at a whole-faculty meeting Grade-level data reports with data displays are provided to grade-level teams for deeper discussion during grade-level team meetings.
Long-term data	Use of state assessment end-of-year test results to determine annual yearly progress	Principal, assistant principal, data team representative	Administration of state assessment in May Provide teachers with results in September for planning for the new year.	Data team provides report and data displays for the faculty at the first whole school faculty meeting in September led by the principal

Source: Adapted from Boudett, City, and Murnane (2008); p. 148¹⁴

Table 2. Sample Team Meeting Plan for Progress Monitoring

In addition to grade-level team meetings, vertical alignment meetings that include a data discussion can also be important. In this approach, school goals are examined across grades, with a focus on common activities, expectations, and vocabulary, in addition to cross-curricular and cross-grade activities. It can be helpful for teachers of one grade to understand how standards were taught the prior year and recognize when they are teaching a standard for the first time. Vertical team discussions can support alignment of instruction and assessment across the grade levels to support the school goals.

PRACTICE 3 EXAMPLE APPLICATION: Vertical Alignment Meeting Agenda

Lee Middle School in the San Angelo Independent School District shared the following sample agenda:

English and Language Arts Department Vertical Alignment Meeting Agenda

- School wide mathematics activities related to school goals
 - Modeling the think-aloud process for good writing in all ELA classes
 - Discussion of how to evaluate reading/writing intervention effectiveness
 - Selection of academic vocabulary for the next six weeks and use of Frayer Model with words
 - Review of vertical team goal: Use of Leveled Questions to improve student understanding
-

It is important to have a checklist or protocol for data meetings to articulate objectives and roles, determine an action plan, and then revisit the action plan over time and make adjustments.¹³ The facilitator plays a vital role in making sure each person shares information and also listens to others. In addition, keeping the focus on evidence prevents discussions of topics like “a child not caring about school” and replaces them with topics like “a child not turning in assignments” and possible solutions.

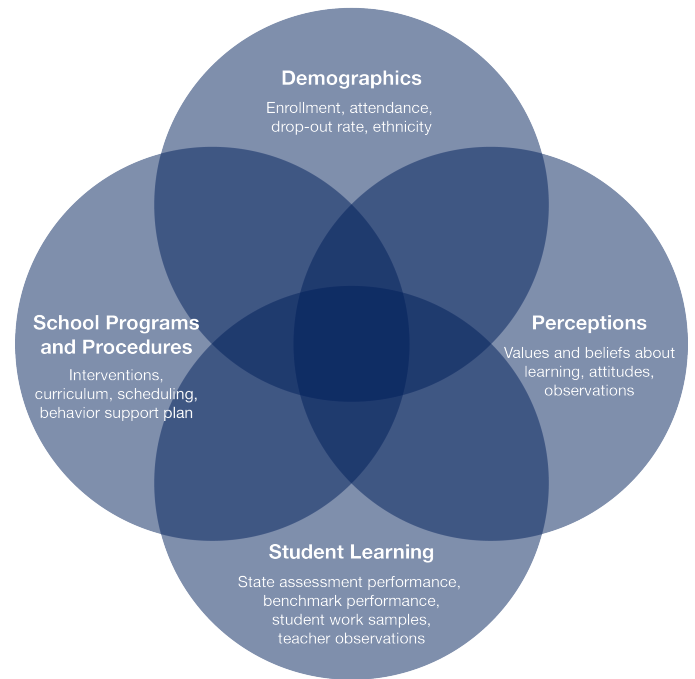
In 2014, The Regional Educational Laboratory Northeast and Islands created a toolkit entitled “Practitioner Data Use in Schools: Workshop Toolkit.” They describe this toolkit as being “designed to help teachers and administrators use education data more systematically and accurately.”²⁷ The toolkit includes activities for teams of practitioners to investigate specific questions and make decisions about instructional planning. There are many valuable resources for maximizing the structured time teachers spend examining data to improve teaching and learning.

<http://ies.ed.gov/ncee/edlabs/projects/project.asp?ProjectID=400>

Practice 4: Organize and prepare a variety of data about students and student learning.

Recent research shows that small collaborative structures (e.g., grade level teams) that meet regularly support learning; in addition, research demonstrates that short targeted learning sessions focused on one new data use skill can be more effective than a longer, more extended professional learning experience.¹⁵ Furthermore, it is important that teachers immediately apply what they have learned to their own data. Keeping the time and learning task short allows teachers to receive immediate feedback to modify their practice. Finally, learning from one short session should be connected to the next session so that knowledge accumulates and skills are strengthened.

Examining student work is one way teachers can learn about differences in teacher expectations, content covered in other classes, and variances in student understanding that can inform instructional decisions. To best understand these differences, a variety of data should be collected in addition to state assessment indicators; focusing only on state assessments can result in teachers' aligning instructional practices with the assessment, which is exacerbated by pressures of high stakes accountability. Schools should also include instructional practices as data to explore relationships between specific practices and student performance.^{28, 29} Conducting benchmark or interim assessments can provide data throughout the year to monitor progress and inform instructional decisions. As illustrated in Figure 1, additional data to consider in instructional decisions are demographic data, attendance and behavior data, perception data from questionnaires and surveys, and school process data (e.g., instructional practices used at a school).



Source: Adapted from Bernhardt (2006); p. 11³⁰

Figure 1. Dimensions of Data Available for School Analysis

Practice 5: *Interpret data and develop theories about how to improve student learning.*

Teachers can better understand the needs of different classes by examining data to interpret areas of relative strength and weakness for each class. Teachers can then use this information to prioritize time and make instructional decisions. Triangulation of data using multiple indicators can inform theories about student learning patterns and plans to test those theories. For example, using the EWIs discussed earlier, teachers and principals can use attendance, course grades, and behavior data to design a summer intervention for at-risk students. Talking to teachers and parents about student needs and factoring in those results can further strengthen this plan.

The school data facilitator can work with teachers to help them identify the intersection between two or more indicators (e.g., demographics and student learning; demographics, perceptions, and student learning). This information can then be included in an effective professional development program for teachers that focuses on use of data to improve instruction and student learning. However, it is vital that teachers receive data in a timely manner so they can analyze it and change their instruction as needed.³¹ Receiving data too late is a chief complaint of teachers who would prefer to have real-time data to change instruction before they even complete a unit of study. When the data arrives late, it may no longer be relevant to what is currently being taught, which leaves teachers no motivation to analyze the data or to use it to inform changes to practice.

Practice 6: *Modify instruction to test theories and increase student learning.*

Instructional changes can be made to improve student achievement by examining time allocation, assessing the scope and sequence of curriculum, identifying students for interventions, learning new instructional strategies, aligning expectations of teachers in the same grade level, and vertically aligning curriculum across grade levels.

PRACTICE 6 EXAMPLE APPLICATION: Using Data to Understand Individual Student Needs

The following are examples of ways state assessment data reports can be used to understand the needs of diverse learners, according to teachers in New York City²⁰ who engaged with student data three to six times a year:

- Determine the strengths and weaknesses of each class.
- Focus on and provide more practice in areas where a class scored low.
- Look at ways to integrate low-scoring content areas throughout the year.
- Spend less time on content areas where students score well.
- Use data about student strengths and weaknesses to make yearlong pacing and lesson planning decisions.
- Create student learning groups based on student-level data.
- Individualize assignments based on student-level data.
- Use data to create peer tutoring pairs comprised of a low- and high-performing student in an area.
- Identify students who are near the cut-point for meeting the passing standard for targeted interventions and provide them with extra school resources.
- Use assessment data in addition to other sources of classroom data (observation, class assignments, homework, quizzes, and tests) to better understand student needs and progress and to make decisions about student grouping and assignments.

The New York City teachers found this kind of interaction with class-level data important for their own instructional planning because it revealed required standards and skills they had not been teaching. For areas where students were scoring low, this interaction helped teachers assess how they were teaching a skill or concept and obtain ideas for successful strategies from other teachers. The interaction also allowed new teachers to better understand content standards and how they are assessed and thereby better understand what to teach.

Principle 4:

Guide and support parents and students to stay on track to postsecondary success by selecting goals and monitoring their progress toward those goals.

Teaching students to look at data to understand their own performance, set goals for learning, and monitor progress toward those goals can motivate them to achieve more. Families can also use data to stay informed about their child's progress and learn more about the overall performance of the schools that serve their children. For this communication to occur, data must be reported in a user-friendly format and be aligned with both learning objectives and long-term goals that schools and families share, such as graduation and college readiness. Research supports teaching students to examine their own data and set learning goals.^{3, 32, 33, 34}

Practice 1: *Explain expectations and assessment criteria.*

Teachers can explain the expectations for student performance for the year and how they relate to long-term goals by setting explicit goals for individual learning and tying these to students' personal goals. Assessments aligned with these goals provide students and teachers with a means to evaluate progress throughout the academic year. Reports of student data in a user-friendly format can have the following benefits for students and their families.²⁰

- They can provide a starting point for discussion among parents, students, teachers, and administrators regarding student progress toward learning goals.
- They can provide concrete examples of areas of strength and weakness for a child connected to content standards.
- They can promote conversation about types of curriculum supplements and activities students and their families can use to achieve their goals.

PRACTICE 1 EXAMPLE APPLICATION: Guiding Students to Take Ownership of Their Learning

Teachers in New York City²⁰ found a few ways to help students take ownership of their learning through use of personalized data. Here are some examples:

- Provide students with a binder that contains their performance data report, along with information on performance by content standard.
- Discuss the performance data report with students, including the structure of the report, what the scores mean, and how to find areas of strength and areas in need of improvement.
- Meet individually with students to discuss strengths and weakness as identified by their performance data report. (See sample student conference sheet below.)
- Have students write down three areas they would like to improve based on the performance data report. Students can be provided with times each week to work on these areas using supplemental curriculum materials and then check their understanding by practicing with released test items.

Student Name:	
Date:	
Class and Period:	
Skill to Focus On:	
Teacher's questions:	Summarize what the student was asked to think/talk about
Student's responses:	Summarize the key points from the student's response
Student's understanding:	Describe what the student's response reveals about his or her understanding of the concept or skill that was the focus of this conference.
Implications for Instruction:	What changes will be made to instruction based on the student's response?

Source: Adapted from Boudett, City, and Murnane (2008); p. 142¹⁴

The following is an example from Lee Middle School in San Angelo Independent School District of a grade 8 student goal sheet co-created with a Social Studies teacher.

MY 8TH GRADE SOCIAL STUDIES GOAL

I, _____, understand that my goal for my American History course is to meet _____%, which is above the average expectation. I understand that I must work hard every day and take something from every assignment and lesson in order to ACHIEVE my personal goal.

My teacher and I will accept no less from me! We accept nothing less than the best, and I promise to give and do my best, and to aim high!

(Signature) _____

Assessment Name	My Achievement	Reflection
Curriculum Check #1: Exploration & Colonization		
Curriculum Check #2: Causes of the Revolution & Revolutionary War		
Curriculum Check #3: Articles of Confederation, Constitution, Bill of Rights		
Fall Semester Exam		
Curriculum Check #4: New Republic & Jacksonian Era		
District Spring Benchmark		
8th Grade Social Studies State Assessment		

Practice 2: *Provide feedback to students that is timely, specific, well formatted, and constructive.*

For feedback to be informative, it should be given in time for students to improve their understanding and be specific enough to provide concrete information about what and how to improve. For example, providing a student with practical examples could motivate them to improve while also providing a model of expectations.

Practice 3: *Provide tools that help students learn from feedback.*

Provide students with a paper or computer-based tool to use when responding to feedback, such as correcting items that were incorrect following an example or answering a list of questions to improve the learning that results from the feedback process.

Practice 4: *Use students' data analyses to guide instructional changes.*

Using data, students can identify individual goals they want to achieve, or an entire class can identify instructional areas in need of review. Teachers can use this information to plan lessons that target students' needs and motivate student learning.

PRACTICE 4 EXAMPLE APPLICATION: Student Goal Setting and Action Plan

Below is a sample student goal sheet shared by Lee Middle School in San Angelo Independent School District to support students in setting goals and having an action plan to prepare for the end of year state mathematics assessment.

Name: _____ Date: _____

My Math Goal is: _____

I, _____, pledge to do my best to achieve this goal. I pledge to review the objectives and ask question on topics that I do not understand.

State Assessment Review

Parent/Guardian,
Please initial in the boxes below verifying that your student has gone over the review handout on the dates provided. Each day is worth 20 points for a total of 100 points toward a test grade. Thank you for helping your child prepare for the state test.

Date	Monday	Tuesday	Wednesday	Thursday
Initials				

Principle 5:

Ensure that school-level and student data needs are incorporated into districtwide data management system planning and implementation.

While research supports the creation and maintenance of a comprehensive data management system that meets the needs of the teachers and school instructional leaders,^{3, 6, 35, 36, 37, 38, 39, 40, 41} many schools are not directly involved in making decisions about the data management system used in their district.

Recent research has shown that when districts attempt to set a mission about data use, there are several challenges that hinder performance management.¹⁵

- Lack of common understanding about data use for teaching and learning
- No structured time for learning how to use data
- Difficulty designing and implementing data-related activities for teachers and leaders
- Lack of an integrated data system

Schools should participate in identifying recommended requirements for the data systems relative to user needs and in planning the implementation of new data systems to inform teaching and learning. Schools should advocate for district professional development time to engage in performance management learning opportunities.

Practice 1: *Involve a variety of stakeholders in defining user requirements for the system.*

The following stakeholders all have different data needs and should be included in the discussion of selecting a data system that will meet these needs: administrators, counselors, information technology staff, support staff (e.g., attendance clerks), teachers, parents, and students. The school wide data team should be able to effectively represent the data needs of these stakeholders to inform the school principal and district administration about data needs on an ongoing basis, not only when selecting a new data system.

Principals, in particular, need data tailored for their needs. Examples of how data can inform the work of school administrators include the following:

- Based on the data, what are the areas of need where we should target resources?
- What are the results of investments the school is making in interventions, professional development, or other improvement efforts?
- How can this data inform school planning activities?
- How does this data help to support conversations school administrators will have with different stakeholders (parents, teachers, and other administrators)
- In what ways should professional development be shaped based on this data?

Ensuring data is presented in a user-friendly format is critical to long-term, consistent use of data by staff. Pre-formed reports provide summaries of data and are available for viewing and printing with little or no input from the user. A report of class achievement results on a state assessment is an example of a pre-formed report. For advanced users, query tools allow users to browse through data and create customized reports.

For example, a teacher could select a specific class and look at student achievement by a specific subgroup of students.

The following three aspects of effective data system implementation have been identified:¹⁵

1. *Integrated, centrally-supported systems:* Systems should allow connection among educators, leaders, and campuses within the district so that when students move from one campus to the next, their needs can be met spontaneously. The system is less about storage and more about a web of student support.
2. *Widespread, easy access:* The goal is for educators at all levels to be able to take in information from multi-dimensions and respond in real-time in order to be responsive to student needs. This requires access to a variety of data (e.g., period attendance for a child for not only the period a teacher teaches the child, but also all other periods) without barriers. However, the access also needs to be user-friendly, despite the variety of robust interrelated data available within the system. A well-designed user interface reduces the time it takes an educator to access the needed data, allowing more time for the review and use of the data.
3. *Collegial relationships:* A growing trend is to develop data systems that support collaboration, sharing expertise, and leveraging knowledge. For example, a system could recommend resources (print, electronic, or in-person) on a particular topic for support. Similarly, data systems can be developed where a group of people who support a particular student can share information among the group, such as strategies that have been found effective, to better address student needs.

PRACTICE 1 EXAMPLE APPLICATION: Teacher Analysis of Data by Class Section

Provide a user-friendly data interface to access state and district assessment results that is customized for teachers according to each class they teach with the following information:

- *How did my students do?* This part of the report can provide data for students grouped by state standard and whether the student performed far below to far above standard.
 - *What do my students need to learn?* This part of the report can provide data related to how students did according to the state's key ideas or objectives, as well as in comparison to other students in the city, district, or state.
 - *What tools are on the Web?* Student and class needs can be identified and prioritized using previous year's assessments. If possible, this part of the report can provide teachers with a description of the skill or standards to be targeted, common causes of learning difficulties in those areas, and research-based instructional strategies with links to external resources (i.e., instructional materials) that are district- or state-approved.
-

Today, districts have many options to choose from to organize their student data. Some districts have the capacity to develop the desired data management system with user-friendly reports for administrators and teachers. Other districts do not have that capacity, so they look for product vendors. It can be a challenge to identify which of the many products available is best for your district and school needs. Below are a few things to consider:

- **Attendance:** Can the product display attendance by class period? Many products display daily attendance, but significantly fewer can display period attendance. This is important in states where daily attendance is taken at a certain period of the day (e.g., second period). Students then learn they may skip other periods without notice since administrative reports only include the period where daily attendance is recorded. Consider the amount of learning a child is missing by skipping one or two periods a day over time. User-friendly reports with “red flags,” or other mechanisms for highlighting students with more than 2 period absences in a week, can be helpful for administrators and teachers in identifying and providing support to students to keep them on track for success.
- **Grades:** Can the product manage a variety of types of grade data (e.g., numeric, letter, by standard)? Many districts and a few states are moving toward standards-based grading. In these states, it is important to have a data system that can help track student mastery of grade-level content standards. In addition, some districts have moved away from letter grades (where a grade of F relates to 50 points and all other letter grades are associated with 10 additional points) to numeric grades: 1, 2, 3, and 4. It is important that the product selected for data management be aligned to the grading system a district or school selects.
- **Behavior and Interventions:** Can the product track the type of behavior incidents, type of follow-up with students and their families, and types of interventions? Do all teachers and administrators working with a child

have access to this type of data? Consider how important it is for one teacher to know whether another teacher or administrator has had contact with a child and/or his or her family so that the teacher can be part of a system of support for the child instead of working in isolation, unaware of what each person in a school is doing. In addition to tracking contact with students and their family, it is important to have a single place to access information about interventions or other supports a student has received, the start date, any data on progress they have made toward their goals, and when they are exited from a program or stop receiving intervention services.

- **User-friendly Reports:** How well does the product allow the user to obtain data at a classroom level, student level, and period level, as well as within and across types of data? For some purposes it is important to look at aggregate data across students in a particular school or class. At other times it is important to focus on a group of students or particular student and then see a variety of data for that student or small group. Consider the types of questions you have and what types of data you would need and then see how easy it would be to get access to that data. How many windows do you have to open, or how many links do you need to click on? The more user-friendly the interface and reporting, the more likely it will be used by teachers. For example, many districts now have EWI reports sent to teachers every few weeks with red, green, or yellow flags based on students’ attendance, behavior, and course grades. These reports support teachers and school administrators in identifying students in need of academic or behavioral support.

- **Dissemination:** How easy is it to share a data report with a teacher or a parent? When working toward improved student success, it is important to share data and information with everyone involved in a child's life. Having the ability to export and/or e-mail a student data report is important and allows everyone in the child's circle of support to remain informed.

These are just a few of the recommendations to consider when developing a data management system or selecting a product from a vendor. Many providers will make promises that they can give you what you need and work with the data you have, but it is important that the features just described be non-negotiable to support performance management in your district.

Practice 2: *Plan and implement a data system.*

Work closely with district or other individuals responsible for implementing a data system to ensure all potential users have appropriate access and training. A campus-specific plan is needed that addresses the roll-out of the data system, including its purpose and role in supporting campus goals, professional development for all who will have access to the data, clearly defined roles and responsibilities for users of the data, and opportunities for ongoing support and technical assistance as users become familiar with the new system.

District Support for Performance Management

According to Anderson, Leithwood, and Strauss (2010)²⁸, districts can play a valuable role in supporting schools in performance management by doing the following:

- setting expectations and monitoring data use for school improvement;
- modeling data use in district decision-making;
- providing access to supplementary tools and resources to facilitate data use (e.g., data reports for schools, curriculum-embedded teacher assessment instruments, time and data use teams); and
- sharing the expertise that they develop locally or provide schools with external expertise to support effective data use to improve teaching and learning.

When district administrators regularly engage in data discussions with school principals and teachers, data use becomes more of a routine practice.²⁸ For example, district administrators can work with school administrators to link their school goals and progress reports to student performance data. In addition, district leaders can support the gathering of best practices through evidence rather than informal observations and opinions. Districts can also set expectations for data-based evidence to justify expenditures. For example, if a school requests funding for specific targeted professional development, a district could request that data be provided to justify the area of focus of improvement addressed by the professional development.

A final key way districts can support performance management is to design benchmark assessments aligned with standards and expectations to assess performance of students and provide school leaders and teachers with data for performance management.

Conclusion

High quality research about effective data use is very limited, despite the attention and funding this issue has received over the last 10 years. It is difficult for researchers to tease out this topic from the larger contexts within which data play a role, such as leadership, effective instruction, and dropout prevention. It is often difficult to attribute causality in a study of these aspects of schooling to the role of data in achieving greater student outcomes.

The recommendations in this section are based on the expert opinion of both researchers and practitioners that have worked directly with schools to use data to improve instruction. The recommendations represent best practices used widely in successful schools. Further research that focuses specifically on those aspects of data use that seem to contribute most to positive outcomes for students and schools is critically needed to support education professionals who work with teachers, principals, students and parents.

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Appendix: Field Guide Summary

Research-Based Instruction



Reading and Reading Interventions

Reading is an essential skill for every subject area. Thus, it is vital to establish a school culture that recognizes that every teacher is a reading teacher. Effective practices include supporting students' ability to self-monitor comprehension and develop word knowledge and providing evidence-based interventions to students who struggle to learn to read.

Principle 1: Establish schoolwide practices for enhancing reading for understanding in all content area instruction.

Practice 1: Identify key words for learning, teach at least two words per class every day, and review one word from previous instruction.

Practice 2: Instruct students to ask and answer questions while they read to monitor comprehension and learning.

Practice 3: Teach students to comprehend the relationships among ideas using graphic organizers.

Principle 2: Teach word-meaning strategies within content area classes.

Practice 1: Provide explicit instruction for important words.

Practice 2: Provide instruction in word-learning strategies.

Principle 3: Activate and build appropriate background knowledge for understanding text content.

Practice 1: Instruct students to use text to support answers.

Principle 4: Teach students to use reading comprehension strategies while reading complex text.

Practice 1: Instruct students to generate questions while reading to build comprehension.

Practice 2: Instruct students to generate main ideas at regular intervals in a text.

Principle 5: Provide intensive reading interventions to students with reading problems.

Practice 1: Identify students who are two or more grade levels behind in reading and provide daily reading intervention.

Principle 6: Guide students during text-related oral and written activities that support the interpretation, analysis, and summarization of text.

Practice 1: Foster discussion among small groups of students.

Practice 2: Instruct students in how to summarize text.

Practice 3: Enhance text understanding through teacher-guided conversations.

Principle 7: Maximize opportunities for students to read and connect a range of texts.

Practice 1: Provide an advanced organizer of all of the key ideas and key words to better prepare students to read text.

Practice 2: Read for a specified amount of time (e.g., 3 minutes) and then provide a prompt for student response.

Practice 3: Have students participate in partner reading.

Principle 8: Organize students into collaborative groups for reading tasks.

Practice 1: Implement collaborative groups with strategic reading practices to improve student outcomes.

Practice 2: Implement team-based learning to clarify, apply, and extend students' understanding of text and content.

Principle 9: Discontinue using practices that are NOT associated with improved outcomes for students.

Practice 1: Take stock of all of the instructional practices and models that teachers are currently implementing and determine whether they are necessary and associated with improved outcomes for students.



Writing and Writing Interventions

Writing is an integral tool that supports and connects learning in all content areas in the middle grades. Students must master writing processes, knowledge, and skills. Students “learn to write” and “write to learn.”

Principle 1: Establish consistent schoolwide practices for using writing as a tool to support student learning in all content areas.

Practice 1: Ask students to analyze, interpret, or personalize in writing information that has been read or presented.

Practice 2: Ask students to provide written summaries of material read or presented in class.

Practice 3: Ask students to take written notes about material read or presented in class.

Practice 4: Ask students to answer questions in writing about material read or presented in class.

Principle 2: Explicitly and systematically teach students the processes, knowledge, and skills of effective writing.

Practice 1: Analyze and emulate model text to discover the characteristics of good writing and the features of specific types of text.

Practice 2: Model and teach strategies for planning, drafting, revising, editing, and publishing written work.

Practice 3: Teach students how to construct complex sentences.

Practice 4: Refine students’ spelling, grammar, and usage skills.

Principle 3: Establish word processing as the common medium for student writing.

Practice 1: Make enough word processors available in the school so that all students can use them to complete writing assignments.

Practice 2: Teach keyboarding skills and how to use word processing programs and software.

Principle 4: Assess and monitor student writing to improve instruction and identify students who require more intensive writing instruction.

Practice 1: Monitor students' progress as writers.

Practice 2: Provide students with feedback about their writing.

Practice 3: Teach students how to give one another feedback about their writing.

Practice 4: Teach students how to assess the quality of their own writing.

Principle 5: Provide extra assistance and instruction to students who experience difficulty learning to write.

Practice 1: Provide students with intensive and extra instruction to acquire the strategies, knowledge, and writing skills that still need to be mastered.

Practice 2: Teach students how to use word processing programs and software that provide assistance for targeted writing strategies and skills.

Practice 3: Provide to students experiencing difficulties intensive and extra instruction in using writing as a tool to support content learning.

Principle 6: Discontinue using practices that are NOT associated with improved outcomes for students.

Practice 1: Take stock of all of the instructional practices and models currently implemented and determine whether they are necessary and associated with improved outcomes for students.

Principle 7: Improve teacher capacity to teach writing and use it as a tool for learning.

Practice 1: Provide ongoing in-service professional development to all teachers to increase their capacity to teach writing.

Practice 2: Have teachers create learning groups to share their best writing practices and work together to discover new ones.



Mathematics and Mathematics Interventions

Mathematics includes a set of knowledge and skills used to access science, technology, engineering, and mathematics (STEM) applications and careers as well as a tool for improving reasoning and analytic thinking. Effective practices include using manipulatives to introduce mathematics concepts and applying systematic strategies for solving word problems.

Principle 1: Establish schoolwide practices for enhancing mathematics understanding within relevant content area instruction.

Practice 1: Encourage students to apply their understanding of mathematics concepts and procedures to draw conclusions and propose solutions about history, science, social studies, economics, and other content areas.

Practice 2: Ask students to analyze events and phenomena from a quantitative perspective and use their analyses to develop arguments and provide justifications.

Principle 2: Use a universal screener to identify students at risk for mathematics difficulties and to determine interventions to provide these at-risk students. Monitor the development of mathematics knowledge and skills of identified students.

Practice 1: Identify a system for screening and progress monitoring that prioritizes content and skills necessary for subsequent mathematics development.

Practice 2: Select a cut score for screening that balances the need to help the most at-risk students with the resources available.

Principle 3: Help students recognize number systems and expand their understanding beyond whole numbers to integers and rational numbers. Use number lines as a central representational tool in teaching this and other rational number concepts.

Practice 1: Use measurement activities and number lines to help students understand that fractions and decimals are numbers and share number properties.

Practice 2: Provide opportunities for students to locate and compare fractions and decimals on number lines.

Practice 3: Use number lines to improve students' understanding of fraction equivalence, fraction density (the concept that there are an infinite number of fractions between any two fractions), and negative fractions.

Practice 4: Explain that fractions can be represented as common fractions, decimals, and percentages, and develop students' ability to translate among these forms.

Principle 4: Develop students' conceptual understanding of mathematics and provide ample opportunities to improve procedural fluency.

Practice 1: Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.

Practice 2: Use meaningful fact practice activities for students lacking a strong foundation in math facts.

Practice 3: Address common misconceptions regarding computational procedures.

Practice 4: Present real-world contexts with plausible numbers for problems.

Principle 5: Provide explicit and systematic instruction during instruction and intervention.

Practice 1: Include explicit teacher or peer modeling and demonstrate key concepts and skills.

Practice 2: Include worked examples of key concepts and skills.

Practice 3: Gradually transition from teacher-modeled problem solving to student-directed problem solving.

Practice 4: Include opportunities for students to talk aloud about the skills, knowledge, or problem-solving procedures they are learning.

Practice 5: Provide immediate and corrective feedback with opportunities for students to correct errors.

Practice 6: Include sufficient, distributed, and cumulative practice and review.

Principle 6: Instruction should include strategies for solving word and algebra problems that are based on common underlying structures.

Practice 1: Include systematic instruction on the structural connections between known, familiar, and novel word problems.

Practice 2: Teach common problem types and their structures, as well as how to categorize and select appropriate solution methods for each problem type.

Principle 7: For students who struggle in mathematics, instruction and intervention materials should include opportunities to work with representations of mathematical ideas. Teachers should be proficient in the use of these representations.

Practice 1: Employ visual representations to model mathematical concepts.

Practice 2: Explicitly link a visual representation or model with the abstract mathematical symbol or concept.

Practice 3: Use consistent language across similar representations.

Principle 8: Establish a schoolwide plan to identify and improve teachers' mathematical and pedagogical content knowledge.

Practice 1: Assess teachers' needs in relation to mathematics content knowledge and mathematics pedagogical content knowledge across content areas.

Practice 2: Select and implement high-quality professional development that acknowledges different teachers' needs.

Practice 3: Improve teachers' knowledge and understanding of making practice decisions based on research evidence and student data.

Principle 9: Discontinue using practices that are NOT associated with improved outcomes for students and teachers.

Practice 1: Examine the evidentiary bases of practices currently used in teaching mathematics and identify and eliminate practices that are contra-indicated by existing evidence.

Practice 2: Monitor student learning formally and informally and use trend data to determine whether and how to adjust current practices.



Cognitive Science and Advanced Reasoning

Teachers can implement cognitive principles to increase the depth and efficiency of student learning across all content areas in the middle grades.

Principle 1: Distribute presentation, practice, and testing over time.

Practice 1: Present material at different points in time in different contexts.

Practice 2: Test or challenge students frequently.

Practice 3: Use cumulative tests.

Principle 2: Ground ideas in active, engaging experiences.

Practice 1: Present visual depictions of core concepts and ideas.

Practice 2: Encourage students to manipulate aspects of core concepts.

Practice 3: Capture content in stories.

Principle 3: Provide timely, qualitative feedback on students' learning activities.

Practice 1: Give students timely and accurate feedback on their performance.

Practice 2: Include qualitative explanations in feedback for complex material.

Practice 3: Adjust negative feedback to what the student can emotionally handle.

Principle 4: Encourage the learner to generate content.

Practice 1: Assign tasks that require writing or other forms of generation.

Practice 2: Arrange for students to teach other students.

Principle 5: Select challenging tasks that require explanations, reasoning, and problem solving.

Practice 1: Assign tasks that require explanation-based reasoning.

Practice 2: Ask students deep questions and train students to ask deep questions.

Practice 3: Present desirable difficulties that place the student in cognitive disequilibrium.

Principle 6: Design curricula, tasks, and tests in different contexts, media, and practical applications.

Practice 1: Vary the context and applications of tasks and problems.

Practice 2: Present learning materials through multiple media.

Practice 3: Encourage students to construct ideas from multiple points of view and different perspectives.

Principle 7: Promote self-regulated learning.

Practice 1: Train students on metacognition and strategies for self-regulated learning.

Practice 2: Provide students with an open learning environment.

Student Supports That Enhance Learning



Dropout Prevention

Dropout prevention strategies, such as using data to identify students at risk of dropping out and providing support to improve academic performance, have been proven to reduce the risk of students disengaging from and dropping out of school.

Principle 1: Use data systems to help identify students who are at risk of falling off the path to high school graduation.

Practice 1: Use data to identify incoming students with histories of academic problems, truancy, behavioral problems, and retention.

Practice 2: Continually monitor the academic and social performance of all students.

Practice 3: Monitor students' sense of engagement and belonging in school.

Principle 2: Assign adult advocates to students who are at risk of falling off the path to high school graduation.

Practice 1: Select adults who are committed to student success.

Practice 2: Keep caseloads low.

Practice 3: Match students with adult advocates purposefully.

Practice 4: Provide training to advocates on working with students, parents, and the school staff.

Practice 5: Establish a regular time in the school day or week for advocates to meet with students.

Principle 3: Provide academic support and enrichment to improve academic performance.

Practice 1: Provide individual or small group support in test-taking skills, study skills, or targeted subject areas, such as reading, writing, or mathematics.

Practice 2: Provide extra study time and opportunities for credit recovery and accumulation through after-school, Saturday school, or summer programs.

Principle 4: Implement programs to improve behavior and social skills.

Practice 1: Use adult advocates to help students establish attainable academic and behavioral goals.

Practice 2: Recognize student accomplishments.

Practice 3: Teach strategies to strengthen problem-solving and decision-making skills.

Practice 4: Establish partnerships with community-based program providers and other agencies, such as social services, welfare, mental health, and law enforcement.

Principle 5: Personalize the learning environment and instructional process.

Practice 1: Implement team teaching and smaller classes.

Practice 2: Use the school schedule to create extended time in the classroom.

Practice 3: Foster after-school activities and encourage participation in them.



School Climate, Culture, and Partnerships

Successful schools create a shared vision for high academic achievement and student success that reflects the vision of the community and is supported by the entire school staff. Schoolwide efforts to increase student attendance, promote positive behaviors, and increase student effort allow students to take full advantage of classroom instruction.

Principle 1: Create a *can do* school culture marked by a shared mission among the staff members that centers on academic achievement and a shared belief that they can collectively enable students to succeed.

Practice 1: Organize the school around teams of teachers working collectively with a common set of students that is stable and of a manageable number.

Practice 2: Establish a distributive leadership structure so that all key stakeholders are involved in school decision making and committed to do what it takes to raise student achievement, with time and effort invested in mission building among the staff.

Principle 2: Create a school environment in which mutually supportive relationships between students, teachers, and parents can develop.

Practice 1: Use surveys to gather information on school climate and culture.

Practice 2: Use teams of parents, teachers, administrators, and students to analyze survey data and to create and implement action plans based on the needs the survey identified.

Principle 3: Engage in schoolwide efforts to increase student attendance, promote positive behaviors, and increase student effort (where needed).

Practice 1: Measure and analyze data on chronic absenteeism, suspensions, and sustained mild misbehavior.

Practice 2: When chronic absenteeism and student misbehavior are at significant levels, implement evidence-based, whole-school strategies to prevent and reduce these behaviors.

Principle 4: Focus the school-family partnership on communicating to students the importance of high academic and educational aspirations and showing the steps that need to be taken to actualize these aspirations.

Practice 1: Provide parents, supportive adults, and students with information on the important role the middle grades play in high school readiness, high school graduation, and postsecondary success.

Practice 2: Create and provide parents and students with ready access to high school readiness benchmarks.

Practice 3: Make adult participation a critical part of your process.

Principle 5: Conduct student-need and asset analyses and select community partners and supports based on student need. Design and manage a plan to link community supports to success in school and use common metrics to gauge their impact.

Practice 1: Create and maintain on-site, in-school coordination and monitoring of community support programs.



Student Behavior and Motivation

A schoolwide behavior support system can improve attendance and behavior by instructing students in a consistent manner, reaching out to students who struggle in behavioral areas, intervening with research- and evidence-based interventions, and recognizing students and classes that reach their attendance and behavioral goals.

Principle 1: Consistently teach, model, and recognize appropriate and positive academic and social behaviors across all classrooms.

Practice 1: Modify and reduce maladaptive classroom behavior through consistent teaching, modeling, and recognition of positive classroom behaviors.

Principle 2: Provide classroom instruction in self-monitoring and regulation, academic organization and study skills, goal setting, persistence, and healthy behaviors.

Practice 1: Teach academic and healthy behaviors that support success in school.

Practice 2: Embed the self-monitoring and regulation, academic organization and study skills, goal-setting, persistence, and healthy behavior skills into the academic courses students take throughout the middle grades.

Practice 3: Provide students with opportunities to practice and employ these skills through service learning projects, as well as high interest and participatory electives with strong cognitive content like drama, debate, and robotics.

Principle 3: Establish processes for identifying problem behaviors early, diagnosing their causes, identifying effective interventions, applying the interventions at the scale and intensity required, and monitoring their effectiveness.

Practice 1: Implement an intervention framework generalized to student attendance, behavior, and course performance.

Practice 2: Connect teachers to one another or to mentors to help with ongoing problem solving, student behavior, and any other classroom management needs.

Principle 4: Make the value of schooling personal.

Practice 1: Engage students in activities that allow them to reflect on the influence school will have on their future life and goals.

Principle 5: Create a sense of belonging for all students.

Practice 1: Include information on social integration in middle school transition programs.

Practice 2: Carefully frame academic tasks to reduce the risk of stereotype threats.

Principle 6: Connect students' academic success to effort.

Practice 1: Set high expectations for students and clearly communicate those expectations and the belief in their potential to succeed when providing feedback to students.

Practice 2: Eliminate the use of indiscriminate incentive programs and unearned praise.



Extended Learning Time

Successful middle schools provide students with opportunities to learn outside the school day that connect and align with students' existing academic programs.

Principle 1: Align the Extended Learning Time (ELT) program academically with the school day.

Practice 1: Use ELT program coordinators to develop relationships and maintain ongoing communication between schools and the ELT program about student academic performance and personal and social issues.

Practice 2: Designate a school staff person to coordinate communication with ELT programs.

Practice 3: Connect ELT instruction to school instruction by identifying school goals and learning objectives.

Practice 4: Coordinate with the school to identify staff for ELT programs.

Principle 2: Maximize student participation and attendance.

Practice 1: Design program features to meet the needs and preferences of students and parents.

Practice 2: Promote awareness of the ELT program within schools and to parents.

Practice 3: Use attendance data to identify students facing difficulties in attending the program.

Principle 3: Adapt instruction to individual and small group needs.

Practice 1: Use formal and informal assessment to inform academic instruction.

Practice 2: Break students into small groups and use one-on-one tutoring if possible.

Practice 3: Provide professional development and ongoing instructional support to ELT instructors.

Principle 4: Provide engaging learning experiences.

Practice 1: Make learning relevant by incorporating practical examples and connecting instruction to student interests and experiences.

Practice 2: Make learning active through collaborative learning and hands-on academic activities.

Practice 3: Build adult-student relationships among ELT program participants.

Principle 5: Assess program performance and use the results for program improvement.

Practice 1: Develop an evaluation plan for ELT programs.

Practice 2: Collect program and student performance data.

Practice 3: Analyze the data and use findings for program improvement.

Informed Decision Making



Performance Management

This approach builds the capacity of educators to use data to prioritize activities that (a) advance core goals, (b) measure progress toward meeting those goals, and (c) make informed decisions regarding the best ways to improve student achievement. Specifically, performance management strategies can aid schools in effectively using data at the school and classroom levels to improve instruction and learning, monitor progress toward goals, and evaluate the effectiveness of decisions.

Principle 1: Establish and communicate a strong commitment to evidence-based decision making.

Practice 1: The principal establishes a schoolwide data team with ongoing responsibility for promoting and ensuring effective data use.

Practice 2: Develop a data-use plan that articulates activities, roles, and responsibilities.

Practice 3: Develop common understanding of key terminology among all data users.

Principle 2: Identify and monitor indicators aligned with campus goals.

Practice 1: Review lagging data to determine performance goals.

Practice 2: Determine indicators for measuring progress toward goals.

Practice 3: Establish targets for indicators based on school goals.

Principle 3: Guide and support teachers in the use of data to meet the needs of students and to support them in reaching their goals.

Practice 1: Provide targeted professional development and ongoing data support.

Practice 2: Designate a school-based facilitator who meets with teachers to discuss data.

Practice 3: Dedicate structured time for staff collaboration.

Practice 4: Organize and prepare a variety of data about students and student learning.

Practice 5: Interpret data and develop theories about how to improve student learning.

Practice 6: Modify instruction to test theories and increase student learning.

Principle 4: Guide and support parents and students to stay on track to postsecondary success by selecting goals and monitoring their progress toward those goals.

Practice 1: Explain expectations and assessment criteria.

Practice 2: Provide feedback to students that is timely, specific, well formatted, and constructive.

Practice 3: Provide tools that help students learn from feedback.

Practice 4: Use students' data analyses to guide instructional changes.

Principle 5: Ensure that school-level and student data needs are incorporated into districtwide data management system planning and implementation.

Practice 1: Involve a variety of stakeholders in defining user requirements for the system.

Practice 2: Plan and implement a data system.