

WWC: Recommended Strategies and Practices

The following teaching strategies come from What Works Clearinghouse, which has collections of evidence-based practices published by the U.S. Department of Education. WWC reviews existing research on various programs, products, practices, and policies in education so that educators are equipped to make evidence-based decisions in the classroom ([IES, 2020](#)).

The WWC presents the following recommendations after examining studies showing positive effects on writing quality across diverse populations and settings ([WWC p. 13](#)). These recommendations focus on self-regulated strategy development (SRSD), an approach in which teachers instruct using specific techniques and gradually release the responsibility for the writing process to students ([WWC, p. 13](#)). Studies of SRSD show they provide uniformly positive effects on writing outcomes, including the overall quality of students' writing ([WWC, p. 13](#)).

The WWC rates recommendations according to the following levels:

Level of Evidence	Description
Strong	Positive findings are demonstrated in multiple well-designed, well-executed studies, leaving little or no doubt that the positive effects are caused by the recommended practice.
Moderate	Well-designed studies show positive impacts, but there are questions about whether the findings can be generalized beyond the study samples or whether the studies show definitive evidence that the practice is effective.
Minimal	There is not definitive evidence that the recommended practice is effective in improving the outcome of interest, although there may be data to suggest a correlation between the practice and the outcome of interest.

The following table of teaching strategies have been assigned strong and moderate levels of evidence. Additionally, these strategies have been listed because of their anticipated compatibility with teaching STEM/CS concepts.

Strategy	Description	Objective / Notes	LOE	Grades	Page
POW	<ul style="list-style-type: none"> • Pick ideas (i.e., decide what to write about) • Organize notes (i.e., brainstorm and organize possible writing ideas into a writing plan) • Write and say more (i.e., continue to modify the plan while writing) 	A prewriting strategy. Supports students in planning what they will write.	Strong	1-6	16*
TREE	<p>As students write:</p> <ul style="list-style-type: none"> • Tell what they believe (i.e., state a topic sentence) • Provide three or more Reasons (i.e., Why do I believe this?) • End it (i.e., wrap it up right) • Examine (i.e., Do I have all my parts?) 	Supports student ability to write persuasively and analytically, as well as think critically. Scaffolds thesis writing.	Strong	2-3	26*
TREE	<p>In older grades, expand the strategy as follows:</p> <ul style="list-style-type: none"> • Replace the Examine step with Explain reasons. Students should say more about each reason. 	Supports student ability to write persuasively and analytically. This adjustment pushes students to communicate more about what they are thinking.	Strong	4-6	26-27*
K-W-L Chart	<p>Before and after a lesson, students complete a K-W-L chart:</p> <ul style="list-style-type: none"> • What I Know (i.e., brainstorm and reflect: what do I know about the topic?) • What I Want to know (i.e., extend brainstorming: what do I want to learn? What information would be helpful to know?) • What I Learned (i.e., reflect: what have I learned? Did I list anything during brainstorming that was inaccurate and needs 	Supports metacognition and reflective report writing.	Strong	2-6, 6-12	26*, 8**

	to be crossed off the chart?)				
Sensory Details	Using your five senses, write about the following: <ul style="list-style-type: none"> • What did you <i>see</i>? How did it <i>look</i>? • What sounds did you <i>hear</i>? • What did you <i>touch</i>? How did it <i>feel</i>? • What could you <i>smell</i>? • What did you <i>taste</i>? 	Students can reflect on the STEM activities they witness. Supports observation, metacognition and reflective report writing.	Strong	K-3~	26*
Imitation	Select a sentence, paragraph, or text excerpt and imitate the author's form (see Recommendation 2b, examples 2 and 3). Example text: <i>Charlotte's Web</i> .	This strategy would pair well with sensory details. For example, students can read an excerpt with strong observational details. With the teacher's help, students can identify examples of sensory details in the text before attempting the five senses prompt.	Strong	1-6	16*
Peer Revising	Students place a question mark (?) by anything they do not understand in their writing partner's paper, and a carat (^) anywhere it would be useful for the author to include more information.	Students will benefit from a directed approach to discussing and assessing what they are writing.	Strong	2-6	16*
DARE	Students dare to check their paper to be sure they have: <ul style="list-style-type: none"> • Developed their thesis. • Added ideas to support their ideas. • Rejected arguments on the other side. • Ended with a strong conclusion. 	Students will strengthen their critical thinking skills by, for example, learning to support their claims and observations. This strategy will require scaffolding for thesis, supporting ideas, counter-evidence, and conclusions.	Strong	4-6, 6-12	26*, 12**
Inform	Students study one purpose of writing, which is to inform, by examining previously learned information or providing new information. Students are exposed to the following genres:	Teachers must expose students to various purposes and contexts for writing. This list of evidence-based genres can be used to develop	Strong	N/A	21*

	<ul style="list-style-type: none"> • Summaries of new or previously learned information • Instructions or directions • Letters • Newspaper articles • Science reports 	additional activities.			
Venn Diagram	Use a Venn diagram as a planning tool when writing a compare/contrast essay. Each circle can represent a different topic or position. The parts that overlap represent similarities, while the parts that do not overlap represent differences.	A strategy to explicitly teach the stages of planning and drafting in the writing process.	Strong	6-12	8**
Do/What	<p>Create a Do/What chart to thoroughly examine a prompt or instructions before beginning an assignment.</p> <ul style="list-style-type: none"> • Circle all verbs in the writing prompt that describe what you are being asked to do. • Underline the words that describe what the task is. 	This strategy is recommended for any genre of writing to help students synthesize what they are being asked to do.	Strong	6-12	10**
Set Goals	<p>Provide students with a list of writing goals that represent qualities of good writing and the criteria on which they will be evaluated. Examples include:</p> <ul style="list-style-type: none"> • Maintaining control of the topic • Organization • Voice • Vocabulary • Varied and complex sentences <p>Students should choose one or more goals to work on as they write.</p>	This prewriting strategy is recommended for any genre to support students in the planning and drafting phase of writing..	Strong	6-12	11**
Mini Arguments	Begin by drafting a claim and identifying two to four pieces of evidence to support that claim. This will serve as the first draft for the essay. Write a second	This drafting strategy supports hypothesis writing, critical thinking, and persuasive thinking. It can support	Strong	6-12	12**

	draft after using "Rank the Evidence" strategy.	students as they establish cause/effect relationships.			
Rank the Evidence	After students write their Mini-Arguments, instruct them to: <ul style="list-style-type: none"> 1. Trade drafts with peers 2. Peers rank the evidence from 1 to 4 based on how logical and relevant each piece is. Peers will discuss the ranking prior to writing a second draft. 	Students collaborate in identifying cause/effect relationships. This encourages diversity of thought, which will support the writing process.	Strong	6-12	12**
3-2-1	Students write: <ul style="list-style-type: none"> • 3 things they learned • 2 things they would like to learn more about • 1 question they have on the topic 	This drafting strategy is an alternative to the K-W-L chart.	Strong	6-12	12**
Color Coding	Use different colored fonts or highlights in a word processing program to categorize different concepts, thoughts, and writing elements.	This strategy supports students as they make sense of the world and ideas around them.	Strong	6-12	13**
CDO	C ompare, D iagnose, & O perate by reading through the paper and asking if any of the following example diagnoses apply: <ul style="list-style-type: none"> • There are too few ideas • Part of the paper doesn't belong with the rest • Part of the paper is not in the right order Then, students decide how they will rectify each situation identified.	This strategy is for all writing genres, but it is also listed as particularly beneficial with informative writing.	Strong	6-12	13,16* *
PLAN	Please see the diagrams on pages 17-18**: <ul style="list-style-type: none"> • Pay attention to the writing assignment by identifying what you are going to write about. • List your main ideas. • Add supporting ideas (e.g., details, examples, evidence, elaborations) to each main idea 	This strategy could be modified to help students process and report their observations.	Strong	6-12	17,18* *

	<ul style="list-style-type: none"> • Number the order in which you will present your ideas. 				
Exemplar Texts	<p>Expose students to exemplar informational and technical texts that have the following features:</p> <ul style="list-style-type: none"> • A topic or theme (may be repeated) • Present tense • Technical vocabulary • Descriptive attitudes and characteristic events • Definitions or explanations of terms • Visual elements such as diagrams, tables, and charts • Specialized topics • Instructions on how to do something <p>Ask students to highlight text features before asking them to practice emulating these features in their own writing.</p>	Exemplar texts will help model appropriate information and scientific writing for students. Teachers can also use past student writing as examples.	Moderate	Elem/Mid	36-38**
Graphic Organizers	<p>Teach and use graphic organizers (e.g., venn diagrams, cause-and-effect, properties and examples) to support students' understanding of patterns and relationships among facts, terms, and concepts. Before asking students to create graphic organizers, model how to "read" a one by walking through a completed one.</p>	This strategy expands on the "Venn Diagram" activity.	Strong	Elem/Mid	33-36, 44^
Inquiry Box	<p>To teach technical vocabulary terms, identify example items and show them from the IB. Consider pairing an exemplar text with box items, telling students that items represent a concept in the text.</p> <p>(E.g., exemplar text about solids, liquids, and gases. Box items include pencils, erasers, backpacks to exemplify solids.)</p>	This strategy is meant to extend student learning and understanding of new terminology.	Strong	Elem/Mid	42-43^

Mini-Vocabulary Lessons	<p>In a brief 10- to 15-minute mini-vocabulary lesson:</p> <ol style="list-style-type: none"> 1. Introduce the term, and ask students to practice saying its individual syllabus. 2. Define the term (e.g., <i>instructions</i> help us understand how to make or do something) with verbal examples (e.g., for ex., a teacher gives instructions to students so they know how to do their assignment) 3. Provide three written example sentences that illustrate the word's range of use. 4. Ask students to write these sentences in their vocabulary journal and/or write the word on a vocabulary card. Can also be paired with a graphic organizer, pictures, and video clips. 	<p>This strategy builds vocabulary <i>and</i> language skills.</p>	<p>Moderate</p>	<p>Elem/Mid</p>	<p>65, 18^</p>
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~Could be appropriate for K-8. Missouri State ENG 110 instructors regularly assign a sensory association essay with similar prompts to first-year students. Across ages and experiences, this assignment helps students make sense of their observations.

Addressing Stereotype Threats in Curriculum^^

Female students need intentional support and intervention during STEM/CS instruction to improve their chances of pursuing a career in these fields. Beginning in elementary and middle school instruction of math and science, girls and women begin to:

- Underestimate their abilities (6)
- Have less confidence (6)
- Show less interest in these subjects (6)
- Perform worse on standardized tests (especially when told they are being evaluated or when male students outnumber female students) (19, 20)
- Choose unchallenging problems to solve (19)
- Lower their performance expectations (19)
- Devalue a career choice in science, technology, engineering, and mathematics (19)
- Avoid asking for help with assignments (16)

This is because female students face **stereotype threats** in the fields of STEM/CS, which are assumptions that they will perform negatively; and, these negative assumptions directly affect a student's performance. Evidence from one small, cross-sectional observational study suggests that elementary school aged girls are aware of the stereotype that men are considered to be better at math than women; however, they still view girls and boys to be equally good at math (20). By the time girls reach middle school, stereotype threats can fully become a problem (20).

These stereotypes are operative (or default) unless measures are taken to counter them (20). Thus, teachers must be made aware of these barriers to learning so they can address them directly and proactively. The WWC offers the following recommendations to proactively address stereotype threats (6-7^^):

Rec. #	Recommendation	Level of Ev.
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1	Teach students that academic abilities are expendable and improvable.	Moderate
2	Provide prescriptive, informational feedback.	Moderate
3	Expose girls to female role models who have succeeded in math and science.	Low
4	Create a classroom environment that sparks initial curiosity and fosters long-term interest in math and science.	Moderate
5	Provide spacial skills training.	Low

The checklist on the following page provides the WWC’s intervention checklist (9). Additional research needs to be completed to address the effect of stereotype threat on multiple populations of students, including students of color.

Checklist for carrying out the recommendations

Recommendation 1: Teach students that academic abilities are expandable and improvable.

- Teach students that working hard to learn new knowledge leads to improved performance.
- Remind students that the mind grows stronger with use and that over time and with continued effort, understanding the material will get easier.

Recommendation 2: Provide prescriptive, informational feedback.

- Provide students with feedback that focuses on strategies used during learning, as opposed to simply telling them whether they got an answer correct. This strategy encourages students to correct misunderstandings and learn from their mistakes.
- Provide students with positive feedback about the effort they expended on solving a difficult problem or completing other work related to their performance.
- Avoid using general praise, such as “good job,” when providing feedback to individual students or an entire class.
- Make sure that there are multiple opportunities for students to receive feedback on their performance.

Recommendation 3: Expose girls and young women to female role models who have succeeded in math and science.

- Invite older girls and women who have succeeded in math- or science-related courses and professions to be guest speakers or tutors in your class.
- Assign biographical readings about women scientists, mathematicians, and engineers, as part of students’ assignments.
- Call attention to current events highlighting the achievements of women in math or science.
- When talking about potential careers, make students aware of the numbers of women who receive advanced degrees in math- and science-related disciplines.

- Provide girls and young women with information about mentoring programs designed to support students who are interested in mathematics and science.

- Encourage parents to take an active role in providing opportunities for girls to be exposed to women working in the fields of math and science.

Recommendation 4: Create a classroom environment that sparks initial curiosity and fosters long-term interest in math and science.

- Embed mathematics word problems and science activities in contexts that are interesting to both boys and girls.
- Provide students with access to rich, engaging relevant informational and narrative texts as they participate in classroom science investigations.
- Capitalize on novelty to spark initial interest. That is, use project-based learning, group work, innovative tasks, and technology to stir interest in a topic.
- Encourage middle and high school students to examine their beliefs about which careers are typically female-oriented and which are typically male-oriented. Encourage these students to learn more about careers that are interesting to them but that they believe employ more members of the opposite gender.
- Connect mathematics and science activities to careers in ways that do not reinforce existing gender stereotypes of these careers.

Recommendation 5: Provide spatial skills training.

- Recognize that children may not automatically recognize when spatial strategies can be used to solve problems and that girls are less likely to use spatial strategies than boys. Teach students to mentally image and draw spatial displays in response to mathematics and science problems.
- Require students to answer mathematics and science problems using both verbal responses and spatial displays.
- Provide opportunities for specific training in spatial skills such as mental rotation of images, spatial perspective, and embedded figures.

References

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^ ^	Halpern, D. F., Aronson, J., Reimer, N., Simpkins, S., Star, J. R., Wentzel, K. (2007). Encouraging girls in math and science. <i>United States Department of Education</i> , 1-55, https://ies.ed.gov/ncee/wwc/PracticeGuide/5 .