



# Literacy Across the Curriculum: A Team Approach to Promoting Critical Thinking

## SUMMARY

Can higher-level thinking be taught more effectively through an interdisciplinary approach? A team of eighth-grade teachers in Schenectady County sets out to answer that question.

This article addresses recommendations 1, 2, 4, 6, and 13 of the “Reading Next” and recommendations 1, 3, 4, 9, and 10 of the “Writing Next” reports of the Alliance for Excellent Education and the Carnegie Corporation of New York. (See pages 95-96 and 98)

*“The writing assignments ... helped me become a better critical thinker because you could never just state your answer.*

*You had to state it and then explain why you thought what you thought.”*

— an eighth-grade student at Iroquois Middle School in Niskayuna

As one of our students so succinctly described above, we aim to show how an interdisciplinary team of teachers can develop their students’ critical thinking. Our team is made up of four core teachers at Iroquois Middle School: David Ackley, who teaches social studies; Laurie Farina in the area of English language arts; Monica Judd for science; and Randall Roeser in mathematics. We teach a group of approximately 100 eighth-graders and

have worked as a professional learning community (DuFour and Eaker 1998) for three years on an action research project with Dr. Eija Rougle, a consultant with the Center on English Learning and Achievement (CELA). Our team meets weekly to discuss students, curriculum and what we can do to help our students achieve. Finding that students needed to improve their critical thinking, three years ago we set out to develop an action research project for our team to build those skills.

This project was inspired and guided by instructional methods used in the Partnership for Literacy program (Langer and Applebee 2006). The partnership’s key elements are minds-on instruction, substantive discussions, curricular connections, and strategies that create classrooms rich in

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*Eija Rougle coaches teachers in CELA’s Partnership for Literacy. She and co-author Mary Adler have captured lessons from the Partnership in the book Building Literacy Through Classroom Discussion.*

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literacy and critical thinking. As a middle school interdisciplinary team, we also paid attention to discipline-based thinking (Langer 1993), as envisioned by professional organizations such as the National Council of Teachers of Mathematics and the National Science Teachers Association.

Our team worked for three years developing the program, and we continue to refine it. Our first year was devoted to discussion among ourselves about how to extend the CELA literacy model to all subject areas. In the second year we began to implement our ideas and engage students in tasks for each discipline that required critical thinking. We also developed a rubric for evaluating the critical thinking in students' writing, but did not use the rubric in a systematic way that year. The following year we made a commitment to meet weekly as a group to keep this goal at the forefront of our lesson planning and instruction. During our weekly meetings, which were most often during a planning period, we evaluated student writing, shared experiences from our classrooms, and reflected on the action research process.

This project sought to create opportunities across the team for students to develop deeper understandings of the content and to think critically. These opportunities came in two forms: writing — in journals, essays, and lab reports — that encouraged individual reflection; and discussions — in pairs, small groups, and whole-class circle formats — that allowed students and teachers to share ideas and learn from each other. During the first two years of our action research, our emphasis was on discussion techniques. In the third year, we decided to complement class discussions with a greater emphasis on writing. This article focuses on the writing component.

We defined critical thinking in terms of Bloom's taxonomy of educational objectives (Bloom 1956). To simplify our communication with students, we compressed Bloom's six categories into three levels: Level 1 (knowledge, comprehension, application); Level 2 (analysis); and Level 3 (synthesis and evaluation). The goal of our action research was for students to "climb the ladder" to exhibit higher levels of

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thinking more consistently in their writing over the course of the year.

## Action Research Plan

The first week of the school year, we asked students to write about their notions of what it means to be a “critical thinker.” With this baseline to direct our instruction, each teacher led discussions explaining critical thinking in their particular subject.

As a next step, we presented our team writing rubric (Fig. 1), developed over

the course of a few months based on Bloom’s taxonomy mentioned earlier. The format is based on the New York state assessment rubrics used for the eighth grade. This tool is adapted for each assignment, but the structure, essential elements and rater’s marks remain the same. This was a key instrument for promoting and evaluating students’ critical thinking. Our hypothesis was that a single rubric with common expectations and rater’s marks would have a greater impact than isolated efforts by each teacher

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**Figure 1: Team 82 Writing Rubric**

	LEVEL 1	LEVEL 2	LEVEL 3	RATER'S MARKS
Task Understanding	Demonstrates <i>little or no</i> understanding of the task.	Demonstrates <i>partial</i> understanding of the task.	Demonstrates <i>thorough</i> understanding of the task.	Comment if you did not follow directions, did not complete the task or misunderstood the task.
Conceptual Understanding	Demonstrates <i>little or no</i> understanding of the key concepts or “big ideas” in the task.	Demonstrates <i>partial</i> understanding of the key concepts or “big ideas” in the task.	Demonstrates <i>thorough</i> understanding of the key concepts or “big ideas” in the task.	Notation in margin: C Example of Level 2 understanding C+ Example of Level 3 understanding
Level of Thinking	Thinking limited to knowledge and comprehension. • facts • descriptions	Demonstrates analytical thinking. • explains • justifies • connects • classifies • compares or contrasts • illustrates • prioritizes • breaks down	Demonstrates synthetic or evaluative thinking. • generalizes • predicts • conjectures • critiques • judges • draws conclusions • recommends	Highlighted text:  Yellow Example of Level 2 thinking Pink Example of Level 3 thinking
Evidence	Presents <i>little or no</i> evidence (facts, details) to support argument.	Presents <i>some</i> evidence to support argument.	Presents <i>extensive</i> evidence to support argument.	Checkmark on each piece of evidence.
Vocabulary	Uses <i>little or no</i> vocabulary of the discipline accurately.	Uses <i>some</i> vocabulary of the discipline accurately.	Uses <i>extensive</i> vocabulary of the discipline accurately.	Box or loop around correct vocabulary usage. Parenthesis around incorrect vocabulary usage.
Mechanics	<i>Many</i> errors in grammar, capitalization, spelling and punctuation.	<i>Some</i> errors in grammar, capitalization, spelling and punctuation.	<i>Few or no</i> errors in grammar, capitalization, spelling and punctuation.	See English editing marks.

and would help students see the similarities in critical thinking among the four disciplines. The Levels of Thinking category of the rubric is most central to our action research interests, and we provided action verbs to help students understand the type of thinking that characterizes each level. Co-author Ackley also posted brief exemplars of writing in American history that correspond to each level, which many students found helpful. The rubric laid out performance expectations in other categories that we consider important to student writing, such as vocabulary, use of evidence, and mechanics. A Levels of Thinking graphic (Fig. 2) posted in classrooms provided a visual cue that helped students know how the team's critical thinking focus cut across the four subjects.

Then the writing began: literary interpretations in English; document-based questions (DBQs) in American history; lab reflections in physical science; reflections on big ideas in math. As a culminating activity in June, all students prepared a portfolio in which they used reflection and revision to polish a writing selection from each subject. They also wrote about their critical thinking, an exercise that allowed us to measure changes in student metacognition — how they thought about critical thinking — since their baseline musings in September.

To keep our task manageable, we selected a representative sample of 12 students whose written work was used to measure the impact of our interventions. These students also participated in an oral debriefing at the end of the year.

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**Figure 2: Three Levels of Thinking**



## Subject-Specific Cases

### American History – David Ackley

Throughout the year, students in Dave’s classes were taught how to write in response to DBQs that require students to analyze, interpret, evaluate, and synthesize information from a variety of primary and secondary sources.

A document-based question, also

World War II and describes the responsibilities that women had. The student noted that the war provided women with opportunities not previously available to them, a conclusion drawn by making a connection from previously learned material. The student also conjectured that the war might have been lost if not for the efforts made by women. Dave determined that the student demonstrated Level 3 thinking (highlighted in pink) because she made a connection and a conjecture.

### English – Laurie Farina

Laurie adapted the team rubric to specific writing assignments. In the following examples, students read and analyzed *All Summer in a Day* by Ray Bradbury. During the study of this story, students reviewed vocabulary words, read the story, “made their marks on it” (made notes on their copy of the text to further understanding), completed a contrast chart, and read a poem that has thematic connections to Bradbury’s story. Students also participated in class discussions where they could rehearse and compare their ideas and refine their thoughts. They were then asked to complete a formal writing assignment analyzing how the author uses the differences between the characters to emphasize the conflict in the story.

Students revealed many higher-level thoughts in this analysis. One student (Fig. 4) used literary vocabulary with

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### Figure 3: Example

"Writing to Promote Critical Thinking" - Fig. 3

One of the impacts was that women started to have equal power, work and pay. The women finally got the satisfaction that they have been wanting for many decades in US history. When men were at war, women took the man's place in factories and other places they could not have worked before. "We Can Do It!" represents that women should think that they could do whatever men can do and more. Rosie the Riveter said that. That was when men went to war, and women needed to replace the men in the jobs. The women mostly did all this to help the war. While they were at it, they got more rights on working. Women got way more opportunities to work in higher jobs such as supervisors and managers. If it weren't for the women working for the war, the allies probably would never have won the war. Women got many great opportunities during World War II.

known as data-based question, is an essay or series of short-answer questions constructed by students using their own knowledge, combined with support from several provided sources. A DBQ is one part of the NYS assessment in social studies. One DBQ asked students to discuss ways World War II affected American life at home. An excerpt from one student’s essay (Fig. 3) pointed out that women took the place of soldiers who fought in

his mention of “contrasts” and employed appropriate evidence from the text. The student touched on the conflict in the story without explicitly stating so, an indication of critical thinking, but did not clearly exemplify the concept of conflict in a story. A second student (Fig. 5) did demonstrate a partial explanation of the conflict of the story, “that the sun only comes out on Venus every seven years.” This student also demonstrated critical thinking, especially in her last line, “Maybe the conflict actually was the differences.” Laurie’s feedback encouraged the author to strengthen this argument in her revision.

### Math – Randall Roeser

Randy assigned a Mathematical Reflection related to a “big idea” taught in each unit. Typically, the reflections were given as homework due the next class period. For example, to close a unit on geometric transformations, Randy asked students to respond to the following prompts:

- Compare congruence and similarity transformations. How are they alike? How are they different?
- Predict how the rule  $(x,y) \rightarrow (2x,y)$  would transform a figure. Would this be congruence, or similarity transformation, or neither? Explain your thinking.

One student’s response to part (b) is shown in Fig. 6. The student accurately used several new math vocabulary

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### Figure 4: Example

“Writing to Promote Critical Thinking” - Fig. 4

In the short story, “All Summer in a Day”, the author uses contrasts to emphasize that the classmates are cruel to Margot. Margot and her classmates live on the planet Venus where it rains everyday. She frequently reflects back on the time that she lived on Earth, where it is often sunny. Her classmates are jealous of the fact that she used to live on Earth. They treat her in a mean way to try to make themselves feel better. Margot is a very shy person, unlike all the other kids who are outgoing. When the kids want to play tag she just stands there refusing to be a part of the game even when she’s tagged to be “it.” When playing tag, her classmates are having fun as a group and Margot is feeling left out and lonely. While the kids go play out in the sunshine, they, because of her differences, lock Margot in the closet making her feel even lonelier. Even though they are very different people from very different backgrounds they should still be able to be kind to each other.

*Although not clearly stated, you have the conflict!  
Emphasize how the differences between them created this conflict.*

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### Figure 5: Example

“Writing to Promote Critical Thinking” - Fig. 5

Margot was different from the other children on Venus because she came to Earth much more recently than them and could remember Earth, and more specifically, what the sun looks like, and how it feels. Margot seems more mature and less real than the others. She doesn’t laugh or play games or sing songs unless they’re about the sun. Margot also looks different. The story said, “She was a very frail girl who looked as if she had been lost in the rain for years and the rain had washed out the blue from her eyes and the red from her mouth and the yellow from her hair. She was an old photograph dusted from an album, whitened away, and if she spoke at all her voice would be a ghost.” The conflict was that the sun only comes out on Venus for a few hours every seven years. Since Margot remembered the sun and the other children didn’t they resented Margot and when she play their games or sing songs that only made the differences between Margot and her classmates easier to notice. I think the other kids were jealous of Margot. That she remembers the sun and because she may move back to Earth. It was because of this jealousy of her differences that made them lock her in the closet and miss the sun. Or maybe the conflict actually was the differences, and missing the sun was an effect of the differences between Margot and her classmates.

*You are right on here. But be sure of your thoughts, no “I think” or “maybe.”*

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### Figure 6: Example

#### "Writing to Promote Critical Thinking" - Fig. 6

Neither because even though there is a scale factor it only applies to the x-axis which would make the image of the figure a different shape than the pre-image. In a congruent transformation and a similarity transformation the shape doesn't change. So the rule  $(x,y) \rightarrow (2x,y)$  isn't a congruent transformation or a similarity transformation because there the scale factor 2 would change the shape of the image from the pre-image.

*This is good thinking, but I'm wondering how the figure would be transformed.*

terms (other than those given in the prompt), as indicated by the circles. Her writing exhibited Level 2 thinking, highlighted in yellow; specifically, she gave a valid explanation for why the resulting figure would be neither congruent nor similar to the original figure. This explanation, combined with her response to part (a), also demonstrated a thorough understanding of the con-

cepts of congruence and similarity, thus earning the "C+" mark. However, she did not predict how the figure would be transformed (a horizontal stretch that distorts the shape of the figure), which would have been considered Level 3 thinking.

### Physical Science – Monica Judd

Critical thinking skills are essential for scientific analysis. Monica used the team rubric to encourage and assess the critical thinking skills of her students in a unit on atoms. To engage the students in this unfamiliar and abstract concept, she used an excerpt from Bill Bryson's thought-provoking book, *A Short History of Nearly Everything* (2004).

After students had read the excerpt for the first time, it was clear they were intrigued by various ideas initiated by the piece. Their questions, however, often did not stray far from Bryson's. After completing the unit on atoms, students became more reflective. They now possessed the vocabulary and understanding to take their own ideas further. As a concluding assignment, Monica asked students to write a new paragraph for Bryson's book. They were to consider what they wanted to share about atoms and to write about it in a way that would capture the reader's interest. The team's writing rubric helped to stretch each student's level of thinking. One student combined his knowledge about the speed of atoms

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### Figure 7: Example

#### "Writing to Promote Critical Thinking" - Fig. 7

I think atoms are amazing because their electrons can move so fast they make everything feel solid, like a very fast moving fan blade. Electrons move slower in cold temperatures, so what if something was frozen enough that its electrons would stop? Would that thing break down? Then the electrons in the air would slow down too, along with everything else. What if everything shrank to the size of an atom? What would that feel like?

with his own curiosity (Fig. 7). The higher-level thinking became evident when the student went beyond the concept of the movement of electrons and how temperature affects movement to the idea of air becoming involved and his curiosity about materials condensing (pink highlighting). Monica was pleased to find evidence that students were incorporating their own ideas into this assignment.

## Conclusions

We are encouraged by our progress in developing a team model for promoting critical thinking across all subjects. Because we have a common vocabulary, expectations, and ways to give feedback, students are doing more higher-level thinking and are more aware of their own learning. At the end of the year, students were asked to reflect on the process we used to improve their critical thinking skills.

Approximately 75% reported that they had noticed more critical thinking in all classes. Comments included, “I had to analyze and look deeper into everything,” “The teachers got us to question things” and, rather insightfully, “Teachers

were more reluctant to answer questions.” When asked, “How have your ideas of what it means to be a critical thinker developed this year?” one student replied, “I realize that everything can be improved, and that my mind wants to do it rather than be lazy and leave it the way it is.”

In the end-of-year portfolios and interviews, most students cited the rubric as a helpful tool. They also valued talk; as one of our eighth graders said, “Discussions help a lot. When writing essays you have ideas from other people to put in your essay.” We also saw growth in their understanding of critical thinking, which one student described as the “ability to reflect on your writing and on the knowledge you need to be able to figure out an answer to a question.”

Based on our experience and the feedback from our students, we continue to refine our definition of critical thinking, the rubric, and our action research methodology. We invite you to follow our journey and add your own insights at our wiki: <http://criticalthinking8thgrade.wikispaces.com>

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