

# Questioning as thinking: a metacognitive framework to improve comprehension of expository text

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## Abstract

Despite a push to develop high levels of active engagement in learning by helping students reflect, refine and extend their ideas through effective questioning strategies, evidence suggests that teacher-dominated interaction patterns permeate classroom instruction. This Initiate, Respond and Evaluate process leads students to maintain a passive stance towards learning and non-engagement with text. As a result students fail to develop the strategies to solve comprehension problems and monitor their own learning with text. In contrast, effective, active instructional patterns provide students with opportunities to negotiate textual meaning. Through the use of the *Question as Thinking* framework we provide teachers with tools to enable pupils to reflect on their reading and understanding of expository texts. This article describes a framework for questioning designed to assist in the development of an active instructional pattern promoting the joint negotiation of meaning.

**Key words:** content area reading, metacognition, Questioning, Think Aloud

*"Today we are going to work on a strategy called Questioning as Thinking. This strategy draws on the language of Question Answer Relationships (QAR) that we have been using along with the Think Aloud. What makes this strategy different is that you, the reader, ask questions before, during, and after reading using both the QAR language and the think aloud to share what you are doing. As I demonstrate how the strategy works, take notes on the types of questions I ask and how you think asking these questions help me to understand our textbook."*

*"Before I read I have to activate my prior knowledge. I read the title First Battle of Bull Run (Macmillan/McGraw-Hill, 2008) and I ask myself, 'What do I already know about this topic?' To answer this 'On my Own' question, I remind myself that in class yesterday we talked about how the Battle of Bull Run was the first major battle of the Civil War. Then I wonder, 'Why am I reading this?' Another 'On my own' question. Now, I need to create a purpose. My purpose is developed from the title. It is to learn about the Battle of Bull Run and what it has to do with the Civil War."*

The teacher above introduces her students to a content area reading framework to assist them in integrating

their current learning strategies by modelling the *Questioning as Thinking* (QAT) framework for comprehension. The purpose of QAT is to engage students in cognitive and social practices that facilitate reading for learning from the myriad of texts encountered in and out of school (Moss, 2005). This framework incorporates the effective evidence-based learning strategies of Questioning and the Think Aloud to guide teachers and students in reflective metacognitive strategy application throughout content area instructional activities (DfES, 1998; Smith and Higgins, 2006). The framework is the result of a formative experiment with classroom teachers in Grades 4–12 which determined what teaching behaviours led to students' application of metacognitive questioning strategies. Through professional development, teachers learned to guide students in the cognitive and social practices that lead away from teacher-dominated interaction patterns. The QAT framework scaffolds instruction within authentic text and supports students becoming metacognitive. As students become familiar with the process, the teacher releases responsibility to the students to monitor their own learning. This article presents the QAT framework with specific suggestions for classroom application. In the first section the building blocks or theoretical background of the components of the QAT framework are presented. Next is the description of how the framework was developed. Finally the two phases of instruction for implementing QAT are presented with specific examples.

## Building blocks for QAT

Student learning is increased when carried out in social contexts. Moll (1994) discusses the importance of an interactive, meaning-based participatory approach towards the development of literacy skills where students are active learners, using and applying literacy as a tool for thinking. Roehler and Duffy (1991) note the importance of supporting higher-level understandings through actively constructing knowledge. In short, the student/teacher discourse allows for the construction of knowledge because ideas are being built together within the context of learning.

The manner in which students interact with content text determines how much they learn (Brozo and

Simpson, 2003). In the traditional Initiate Respond Evaluate pattern (Burns and Myhill, 2004; Cazden, 1998; John, 2009; Van Bramer, 2004) the teacher calls on a student, the student shares, and finally the teacher comments on the student's responses, creating a pattern of interaction in which the teacher governs the talk and judges the students' response (Cazden, 1998). The interactive model is focused on building understanding with discourse that resembles conversation. The conversation within the interaction allows for the construction of knowledge (Van Bramer, 2004) rather than the judgement of knowledge. With QAT, conversation may begin with the teacher but goes from student to student to student before the teacher responds. When the teacher responds, the goal is not one of evaluation but of clarification or addition. This interactive model scaffolds classroom dialogue to lead students to become reflective and self-regulated learners (Wilkinson and Sillman, 2000). In addressing the shift in classroom discourse, the QAT framework guides students in being metacognitive.

Metacognition in reading is when a reader thinks about the cognitive processes required to achieve comprehension, which involves monitoring, understanding and self-regulating mental processes. The reader does this by first recognising when understanding breaks down or more information is needed. Upon this recognition, the reader chooses from known strategies to improve comprehension. Teaching students to be metacognitive is a key element to developing effective readers (Pressley et al. 1998). Students using QAT become metacognitive by seeing the teacher model her metacognition with the Think Aloud, engaging in the analysis of strategies with questioning, and engaging in the sharing of metacognitive processes through the Think Aloud.

## The Think Aloud

The Think Aloud Strategy (Davey, 1983) is one in which the teacher thinks out loud and models the strategic decision-making and interpretive processes that a reader uses (Kucan and Beck, 1997). The teacher demonstrates ways of approaching difficult problems while making explicit the complex thinking processes that underlie comprehension. By verbalising inner speech while thinking through a problem, the teacher models how expert thinkers solve problems. When teachers make the invisible mental processes visible, they arm readers with powerful weapons. "I stop often to think out loud for my students. I describe what is going on in my mind as I read. When I get stuck, I demonstrate out loud the comprehension strategies I use to construct meaning" (Tovani, 2000, p. 27).

The opening vignette is an example of how a teacher shares her metacognition with students in the QAT framework. The Think Aloud is a powerful tool for demonstrating the thinking in which learners engage when learning; demonstrating and reinforcing the fact

that being knowledgeable is a process of learning and using information, which involves metacognition (Sternberg, 1998).

In QAT, students begin by watching the teacher model and then use the Think Aloud strategy themselves to demonstrate their own problem-solving processes, metacognition. When students use the Think Aloud strategy, they share their thinking processes as they generate questions and responses to ensure a higher level of understanding (Israel and Massey, 2005). As students think out loud, they gradually internalise this dialogue which is the means they use to direct their own behaviours and problem-solving processes.

## Questioning

Questioning has a strong research base across disciplines (Duke and Pearson, 2002; Sternberg, 1998). The student who questions is independently monitoring and regulating his thinking by asking "Does that make sense?" and "What is my learning goal?" to track learning. The student also asks questions that guide the use of metacognitive actions such as "How can I relate this information to what I already know?" and "What do I need to do to remember the ideas presented?" The answers to these questions inform the learner of the metacognitive tasks necessary for learning.

Question Answer Relationships (QAR) provides a language for students to discuss different types of questions (Raphael, 1986). It requires that students identify questions based on the relationship between the question and the text. For instance, a question whose answer is found in one sentence of the text is 'right there' and a question whose answer requires the use of prior knowledge with an understanding of the text is 'author and me'. The success of QAR has been validated by research across content areas and genres (Raphael and Au, 2005).

In QAT, students view teacher Think Alouds, use the language of QAR before, during and after the reading, and engage in conversations to comprehend content area texts. Students go beyond listening to teacher modelling to becoming independent in making their own decisions (Pressley et al., 1998). The teacher implementing the QAT framework analyses and evaluates herself, her students, her classroom and her expectations throughout the process to develop instructional techniques that build student thinking processes and independence, thus making her a reflective practitioner.

## Development of QAT

QAT developed through formative research (Reinking and Bradley, 2008) involving teachers engaged in professional development workshops to effect students' comprehension of text. The first author worked

with content teachers through a series of professional development workshops, lesson analysis and student achievement data to uncover a framework that would support students' metacognitive use of questioning strategies, beginning with working with teachers on QAR (Raphael, 1986).

The professional development focused on modelling the relationships between questions and answers and the identification of these relationships to help students become more proficient at answering after reading questions. The analysis of this phase of research demonstrated that it was successful in helping teachers and students with the identification of types of questions after reading but when teachers focused on the QAR strategy, students did not ask questions during reading and were thus not metacognitive.

As the experiment was formative, the researchers expanded the focus of the professional development from QAR to questioning in general. This iteration used a series of workshops designed to include why questioning in general is a good strategy for comprehension, what is QAR, and finally how to use the Think Aloud to improve classroom instruction and comprehension. It described how questions help students to implement a variety of reading strategies (Neufeld, 2005) and provided teachers with the rationale for focusing on questioning as key to improving reading comprehension. The focus on QAR was similar to the first initiative: focusing on identifying the relationships between questions and answers. The teachers now created Think Alouds for sharing their metacognitive processes when both recognising the relationship between the question and the text and then answering questions. Finally the focus on self-questioning addressed what students need to do before and during the reading process to be metacognitive.

Observations and analysis of the teachers' work during this iteration found that most used QAR as a post-reading strategy, Self-Questioning as a pre-reading strategy, and the Think Aloud as an instructional strategy. An analysis of teacher lesson plans, peer observations and teacher informal comments identified that teachers either demonstrated isolated application or integrated application (Wilson et al. 2009). In the isolated approach teachers taught each strategy as a separate entity, and reported that students' comprehension was not improving. For instance, students used the QAR language only for post-reading questions, used self-questioning only when prompted, and shared their thinking without the QAR language or self-questioning. The lesson plans typically included the sharing of questions that were simply labelled using a particular QAR category, i.e. "What are the two ways to identify a triangle? (Think and Search)". However, teachers with integrated application included more details in their lesson plans, including the question along with an explanation, "What are the two ways to identify a

triangle?", which requires the student to go to two places in their notes: the section on using angles and the section on using sides to put together the two methods (Think and Search). Those with integrated applications self-reported success. A key finding in this analysis was the role of metacognition in the integration of the strategies. The successful teachers detailed the thinking that students could use in their plans. They understood the need for the Think Aloud to be applied by students working independently to monitor understanding and question text. Thus the framework was developed.

The third iteration of the research was focused on QAT as a framework. The framework combined all of the prior elements under one umbrella to provide a single lens to use questioning to actively construct knowledge throughout the reading process. QAT as a single framework focused on:

1. using QAR as the framing structure for talk and reasoning (Mercer, 2003);
2. structuring the questioning activities to support interaction among students and the sharing of thought processes;
3. supporting the teacher guiding students in using language as a tool for reasoning throughout the content area (Mercer, 2003).

The framework led to a classroom in which the structure of learning provided for a teacher/student conversation in which thought processes and problem solving were at the heart of content area reading (Mercer, 2008).

A fourth-grade teacher created the following QAT Think Aloud about classifying triangles:

*"When we think about how to classify triangles we must use Questioning as Thinking. We have to think about what we know about triangles, what our book tells us about triangles, and the information we learn about the triangles we are working to classify. First, I think about what I already know, on my own, I know that triangles have 3 sides and 3 angles. I then look back in my notes and see that that I have information about how I can classify a triangle by sides and angles, think and search. Finally I have to analyse the triangles in front of me, to classify them, author and me".*

*"As I look at my first triangle, I first measure the three sides. I note that side one is 2 centimetres, side two is also 2 centimetres, and side three also 2 centimetres. Since all three sides are the same I use my author and me strategies to look at the chart in my notes that tells me a triangle with three equal sides is an equilateral triangle. Now before we measure and talk about the angles together let's review the strategies we need to use – think and search and author and me".*

Once the framework was formalised and teachers trained, the effects of QAT were examined in a pilot study using pre- and post-testing of comprehension and vocabulary skills with the Stanford Diagnostic Reading Test (Hinders, 2007). The Hinders study collected data on 280, sixth-through 12th grade students in classrooms where teachers were implementing the QAT framework. The study measured students' comprehension to determine whether the framework improved students' reading comprehension beyond traditional instruction. The students learned to answer questions using QAR language and to engage in Think Alouds to demonstrate metacognitive processes when asking and answering questions. Of the 280 students, 150 scored below grade level in comprehension in the Autumn assessment. The students' growth was compared with the standard growth expected on the Stanford Achievement test given Autumn to Spring administrations. Because of the intervention, students were expected to attain at least 0.5 growth above the norm.

Post-test data indicate that 29 per cent of students who scored below grade level at the beginning of the year scored above grade level at the end of the year. In addition, 47 per cent of students who scored below grade level in the autumn scored 2 years above their grade level in the spring. Although QAT is a framework for developing metacognitive skills in comprehension, student achievement in the area of vocabulary also increased. On the Spring vocabulary assessment, 22 per cent of the students who scored below grade level in autumn scored above grade level. Another 46 per cent of the students who scored below grade level in the Autumn scored 2 years above their grade level in the spring. The demonstrated growth in students' comprehension skills and vocabulary was accelerated growth in prior years

### The reflective practitioner implements QAT

In QAT, students actively engage in metacognitive activities for comprehending expository text, learning and problem solving. They go beyond listening to teacher modelling and explanation to becoming independent (Pressley et al., 1998). The reflective practitioner examines her modelling to develop instructional techniques that build student thinking processes and independence.

QAT is implemented in two phases: (a) answering questions metacognitively using QAR; and (b) asking questions during reading.

#### *Phase 1: answering questions using QAR*

The first phase of QAT introduces the QAR language and requires students to think about the relationship between the text and the question.

A teacher models this relationship through a series of Think Alouds answering questions. The teacher determines a key content question that students need to

answer by examining student prior knowledge and classroom experiences to identify the variety of possible student responses. Finally the teacher prepares a Think Aloud to demonstrate how one question can have multiple responses depending on how information is used to answer the question. Notice how a fifth-grade teacher, working with students aged 9–11 years, models the different ways to answer the question, "What is a mixture?"

- The teacher demonstrates how scanning the textbook leads to finding an answer using Right There strategies.

*"If I scan the beginning of lesson three on page E60, I see that the title of the lesson is 'Mixtures and Solutions'. In the middle of the page I see the word mixture is highlighted in yellow. I know I should read the sentence before, with, and after the word mixture. 'That's because a salad is a mixture. A mixture is a physical combination of two or more substances. The substances in a mixture are not chemically combined as they are in a compound' (Badders and Houghton Mifflin Company, 2007, p. E60). Thus to answer this question I use Right There strategies to identify mixture is a physical combination between two things."*

- The teacher refers to an experiment as well as scanning the textbook to put ideas together using Think and Search strategies.

*"Another way to answer this question is to use what we learned from the experiment yesterday along with what we find from skimming the text, thus using Think and Search strategies. Yesterday the lab had us mix salt with water then sand with water. The textbook said that a mixture is 'A mixture is a physical combination of two or more substances' (Badders and Houghton Mifflin Company, 2007, p. E60) thus when I connect the two ideas I know that a mixture is like sand and water because two things are combined and you can separate them."*

Observe how the teacher demonstrates each type of response using a detailed description of her thinking processes, demonstrating metacognition and using the QAR language. Her Think Aloud provides students with a model for thinking about the relationship between texts and questions.

Once students recognise this relationship, the teacher provides opportunities for students to share their thinking while answering questions. The teacher chooses an appropriate content question and provides differentiated classroom activities. Observe the variety of response gathered from a sixth-grade science class, students aged 10–12 years, when asked, "What is the rock cycle?"

- The student instructed to scan the textbook and find the quote defining the rock cycle as something

that “describes how different kinds of rocks are related to one another and how rocks change from one type to another” (Glencoe McGraw-Hill, 2005) has found the answer Right There in the text.

- The student instructed to review diagrams in the text and read the text chapter applies Think and Search strategies when he refers to the diagram in the text and puts the information together.
- The student who thinks about what he already knows as they scan the text chapter uses Author and Me strategies.

As students respond to the question, they describe how and why they answered the question the way that they did. In these ways, students demonstrate metacognitive behaviours, using the QAR language to describe thinking. In addition, the teacher has the opportunity to self-assess her instructional implementation of rock cycle lessons and the students’ integration of knowledge from the text and classroom interactions. She considers whether students would benefit from additional modelling or probing questions to help students to see how questions lead to thinking.

Answering questions using the QAR language is an effective starting point for QAT because it involves a task that students are comfortable with and provides a common language. Thus QAR begins the process of QAT because it helps students to be metacognitive with a familiar task and provides the language for doing so.

### *Phase 2: asking questions during reading*

The QAR strategy gives students the tools and language for identifying how to answer questions; answering questions, including those based on expository text, is not enough. Students need to learn self-questioning strategies in order to be metacognitive when independently reading text, listening to a lecture or participating in a hands-on experience. As in phase 1, teaching students to ask questions during reading requires the teacher to model questioning strategies to provide students with a window into the thinking an expert uses when questioning. In preparing a model, the teacher chooses an expository text with which she expects students to have some difficulty. If the expository text is not difficult, the students will function automatically and see the metacognitive activity as something that could hinder functioning (Sternberg, 1998). After choosing an appropriate expository text, the teacher identifies questions students may have during reading and prepares a script of the metacognitive actions students would undertake. This teacher demonstrates thinking in an eighth-grade class, students ages 13–15, studying population differences using bar graphs from social studies.

*“Today we will practise reading bar graphs and use the information shown to help understand other cultures in the world. Have you ever looked at a graph and wondered what is this telling me? What does the author want me to*

*know? Often we look at graphs and pass right over them thinking that they are trying to take up space. The authors actually want you to read these graphs and answer questions in order to better understand information that is talked about in the text. Where is the answer? Today we are going to look in-depth on how to interpret bar graphs.”*

*“Let’s look at the graph that you have in front of you. I look at these bar graphs and ask myself what is being shown? What is the title? Both of those questions are Right There because I can look at the graphs and see the words that answer both questions. Look at the other graphs present on the same paper. I know that if a question wants me to compare two of these graphs then I know that I have to look at both models in order to answer the question. A Think and Search is when I have to look at one and then the other comparing the information. If I see words repeated in both graphs, then I know that both are looking at the same information. If none of the words are repeated, then maybe the author wants us to look at these graphs for different reasons. See how this bar graph talks about the population aged 0–14 in China, Japan, Korea and the US, Does the second bar graph also discuss these same countries? What words are repeated? Are they using common language? Are they comparing the same topics but in different forms? Asking yourself these Think and Search questions helps you understand that you need to use information from different sections, or in this case bar graphs, to understand the information that the author has presented.”*

Notice how the teacher incorporated the language of QAR with the Think-Aloud and asked questions that demonstrated the explicit metacognitive strategies required to actively complete the task. The demonstration of the Think Aloud provided students with the what, how and why for implementation of QAT. The teacher then guides students to use QAT independently, providing time to monitor students’ use of the framework. This guidance can come in multiple steps; such as working with the whole class, having students work in small groups, and using prompts to help students respond to questions (see Table 1).

After providing students with guides for asking and answering questions, students need opportunities to practise. Eventually students are able to independently develop and/or respond to questions and share their thinking while doing so. The teacher continues to provide opportunities for implementation of these techniques over a series of texts and situations, thus encouraging students to implement QAT independently across content areas.

Finally, students are expected to become independent in asking questions during reading. Students in a fifth-grade class studying the Holocaust are encouraged to ask questions regarding their understanding during the reading of *Surviving Hitler* (Warren, 2001); they

Table 1: An example of guiding students to be metacognitive during Questioning as Thinking (QAT)

Question	Highly supportive clues to help you use QAT	Moderately supportive clues to help you use QAT	Minimally supportive clues to help you use QAT
Stop reading at the end of paragraph 4 and ask a question that helps you remember how the five themes of geography interact	Develop a Think and Search question Scan the text for ideas supporting how the five themes of geography interact Put together the ideas presented Create a response to your question	Develop a Think and Search question Put together the ideas presented Create a response to your question	Develop a Think and Search question Create a response to your question

developed questions that enabled them to relate Jack's story to what they had learned from their class studies. After reading page 16, one student asked, "It said right in the book, that Hitler invaded Poland and beat the Polish easily. So, why wasn't Jack more afraid of the Nazi army after hearing everything that Hitler said on the radio?" Notice that in QAT the questions students ask themselves during reading are communicated using the language of QAR.

These opportunities provide teachers with the chance to analyse student learning and understand the metacognitive processes used when implementing QAT. The teacher must provide students with multiple opportunities across contexts to practise and share their metacognitive thinking aloud.

## Conclusion

In content area learning the teacher can no longer be the dispenser of knowledge and students passive learners. Teachers must have strategies and practices to engage learners in developing critical skills for content literacy (Flynt and Brozo, 2009). In this article the framework of QAT was explicitly presented to provide teachers with the tools to help students become active learners who are metacognitive in content area reading (Vacca and Vacca, 2007).

QAT is an interactive framework that works well across the content areas to help students improve their comprehension of expository text and content area materials. Students benefit from QAT by developing metacognitive thinking skills that enable them to engage deeply with expository text and understand the material they are learning. The integration of the Think Aloud and Questioning into a single framework strengthens students' application of metacognitive thinking processes. When QAT is implemented as an instructional strategy, students internalise the framework as a process for comprehending expository texts and other content materials regardless of the level of

complexity. The dynamics of classroom instruction change from an Initiate, Respond and Evaluate model to one where teachers and students are collaboratively involved in the instructional process. QAT provides for the development of a common language for metacognition and the learning process resulting in students becoming more metacognitive, empowered, engaged and increasingly self-directed in their learning (Abdullah, 2001).

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