

THINKING ROUTINES:
ESTABLISHING PATTERNS OF THINKING IN THE CLASSROOM

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Thinking Routines: Establishing Patterns of Thinking in the Classroom

As any one who has ever spent a day as a substitute teacher knows, classrooms are dominated by routines. From entering the room to final dismissal, from passing out papers to checking homework, routines order and structure the physical and social space of the classroom. Routines also play an important role in shaping and directing the intellectual space of the classroom. These “thinking routines” are simple patterns or structures, used over and over again, that support and scaffold specific thinking moves or actions, such as, Think-Pair-Share (TPS) (Lyman, 1981). In this widely used routine the teacher poses a question or problem, provides students time to think about that problem, asks students to pair up and discuss, and then to share their discussion with the whole class. Thinking routines such as these provide the structures through which students collectively as well as individually initiate, explore, discuss, document, and manage their thinking in classrooms (Ritchhart, 2002). Just as effective teaching demands that teachers establish routines to guide the basic physical and social interactions of the classroom, so too thinking routines need to be established to help guide students’ learning and intellectual interactions (Leinhardt & Greeno, 1986; Leinhardt, Weidman, & Hammond, 1987). Understanding how teachers establish, use, and adapt thinking routines to make them a part of the culture of the classroom provides useful insights into how thoughtful classroom environments can be established and maintained.

Over the past five years, the Visible Thinking Team at Project Zero at the Harvard Graduate School of Education¹ has been developing, refining, and implementing thinking routines using a design-research paradigm (A. L. Brown, 1992; Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; A. Collins, 1992; Allan Collins, Joseph, & Bielaczyc, 2004) operating across three major

¹ The Visible Thinking Team at Project Zero consists of the authors as well as David Perkins and Terri Turner who have each contributed greatly to the larger work discussed here.

professional development initiatives: the Innovating with Intelligence project, which ran from 2000–2005 in a state charter school in Sweden and included international schools in The Netherlands and Belgium, the Artful Thinking project now in its second year in the Traverse City, Michigan public school district, and the Cultures of Thinking project finishing its first year in a large independent school in Melbourne, Australia. Although each of these initiatives has its own particular focus², all share the use of thinking routines as a core practice. They also share a common goal of helping students develop thinking dispositions that support thoughtful learning by making thinking a more visible and apparent aspect of classrooms life (D. N. Perkins, 2003; Tishman & Palmer, 2005). This synergy across projects has provided us the opportunity for an in-depth study of thinking routines across diverse project sites.

The intent of our cross-project work on thinking routines is threefold: 1) Serve the local context and needs of the site professionally, 2) Inform educational practice around the teaching of thinking and the development of thoughtful classrooms, and 3) Contribute more broadly to theories about the development of thinking dispositions. In this paper, we focus our attention primarily on the second of these goals by presenting what we have learned about the design and use of thinking routines.

We first establish the theoretical foundation guiding the Visible Thinking project, situating thinking routines within the larger context of our enterprise to develop thoughtful classrooms and nurture students' thinking dispositions. We then articulate the overarching questions of design that guide our ongoing cross-project work with thinking routines. These questions take two forms, questions about the characteristics of thinking routines themselves and questions with regard to implementation.

² The Innovating with Intelligence project worked with the idea of “thinking ideals” as a platform for the integration of thinking. Artful Thinking is an approach for teaching thinking that uses art as a force for developing learners' thinking dispositions. The Cultures of Thinking project looks at transforming the culture of the school and classroom to reflect an emphasis on thinking and understanding.

Taking up our questions of characteristics, we provide an analysis of the key structural and epistemological characteristics of thinking routines. This sheds light on the design features that make certain thinking routines susceptible to wide-scale, cross-context use. The purpose of this analysis is not to evaluate the effectiveness of these routines on thinking, learning, or academic performance but to identify the unique characteristics of thinking routines. We then fold this emerging understanding of thinking routines into the context of classroom practice as we examine the questions of implementation. We look at data from our three sites, drawing on classroom observations, interviews, reflecting journals, study group logs, and surveys as we explore the uptake and trajectory of teachers' routine use over time in each settings. We examine what attracts teachers to specific thinking routines and how they view them as vehicles for promoting and revealing thinking. In discussing these findings, we relate them to the structural and epistemological characteristics of thinking routines which allows us to better understand which characteristics of thinking routines most influence teachers' use and affect their successful adoption, adaptation, and long-term use.

Although our presentation in this paper takes a linear form—analyzing the characteristics of thinking routines and then examining teachers' implementation—the process was in fact much more iterative. Throughout our work, we investigated teachers' use of routines—their adaptations, refinements and selection—in a way that fed back into our design efforts and informed the larger professional development aspects of our work at each site (Cobb et al., 2003). Implementation issues and insights often deepened our understanding of the important characteristics of thinking routines and caused us to re-look at which characteristics were most important and how the epistemic messages embedded in routines affected teachers selection and use. We make this iterative reflection on our previous learnings as explicit as possible to paint an accurate picture of the research process as it has unfolded.

Theoretical Foundation

At the top level, we ground our work with thinking routines in an enculturative model of dispositional development which views thinking, and more specifically the disposition toward thinking, as something that must be nurtured in students over time (Tishman, Perkins, & Jay, 1993). This approach goes beyond merely infusing opportunities for thinking into the curriculum in that it seeks to enhance students' inclination toward thinking and their awareness of opportunities for thinking as well as developing specific thinking abilities (David N. Perkins, Jay, & Tishman, 1993a, 1993b; David N. Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000). From an enculturative perspective, improvement in students' thinking dispositions in schools depends on developing a classroom culture that supports and nurtures thinking (Barell, 1991; Costa, 1991; David N. Perkins et al., 1993b; Ritchhart & Perkins, 2000; Tishman, Perkins, & Jay, 1995). Consequently, an overarching question guiding our work has been: How do we influence and shape classroom culture to reflect a greater focus on thinking?

This principal question led us to explore and identify some of the forces at work in shaping culture. In his ethnographic study of thoughtful classrooms, Ritchhart (Ritchhart, 2002) identified eight forces that shape classroom culture: expectations, time, modeling, routines, opportunities, relationships, physical environment, and language. From these forces, we identified routines as a potentially high-leverage practice for creating more thoughtful classrooms and nurturing students' thinking dispositions. Designing and developing thinking routines for teachers to use provided a very concrete intervention while enabling us to touch on several others of the cultural forces indirectly. Thinking routines focus on the establishment of structures that weave thinking into the fabric of the classroom and help to make the thinking of everyone in the classroom more visible and apparent (Perkins, 2004), thus, they provide models of thinking. Routines also provide a vehicle for incorporating thinking language (Lee, 1997; Tishman & Perkins, 1997) into classrooms as well as

time and opportunity for students' thinking. These links to the other cultural forces made thinking routines a strong platform from which to influence classroom culture.

It is worth noting that the idea of thinking routines is not a cosmetic shift in language, merely calling thinking strategies by the name of routines. We ground the idea that thinking is something that can be addressed through the development of routines in the broader notion of classroom routines as classroom culture builders (Leinhardt et al., 1987; Ritchhart, 2002). Routines are a useful way of thinking about the practice of teaching in that they recognize that effective teaching depends on more than the design of units and delivery of lessons. All instruction takes place within a context, and routines contribute to the establishment of that context. Whereas an instructional strategy may be used only on occasion, routines become part of the fabric of the classroom through their repeated use. Ritchhart (2002) found that the teachers he studied addressed the development of students' thinking in this way, by developing a set of routines that they used over and over again. Although the word routine carries with it notions of ordinariness, habit, and ritual, it would be a mistake to characterize them as simply mundane patterns of behavior. Classroom routines tend to be practices crafted to achieve specific ends in an efficient and workable manner. While these practices do become "our way of doing things," their adoption as routines, as patterns of operating, grows out of teachers' recognition of them as effective tools for achieving specific ends. This explicit and goal-driven nature of routines defines the various types of routines in most classrooms.

Types of routines

Researchers into classroom culture have identified four broad categories of routines: housekeeping, management, discourse, and learning (Leinhardt, 1986 #341 Leinhardt, 1987 #35). Housekeeping routines manage movement and physical materials within the classroom. For example, students might be required to turn homework in to a specific box, to put their book bags in a certain location, or to line up in a particular fashion. Such routines represent rules and guidelines for living

and working together as a group. Management routines help students prepare for learning. They include getting papers passed out, forming groups, coming to attention, transitioning from one activity to another, preparing for a discussion, and so on. As the name suggests, these routines focus on issues related to classroom management. Having efficient and well-tuned management routines in a classroom help it to run smoothly. Such routines focus on getting students ready to learn and to work but do not actually direct that learning or work.

Whereas management routines focus students and get them ready to learn, learning routines guide the actual learning and thinking of students as they engage with content. In some classrooms, a learning routine might be as basic as reading the lesson in the textbook, answering the questions that follow the reading, and checking in with the teacher if there are any problems. Although this is not a particularly rich routine in terms of the thinking involved, it is nonetheless a routine in that it provides a recognizable structure for students to work within. Richer examples of learning routines can be found in the use of journals, note-taking procedures such as mind-mapping (refs Buzan), problem-solving protocols, classroom debates about the interpretation of a passage, and so on. Learning routines give a structure to students' activities and provide the tools for engaging with content.

Discourse routines structure the discussion and sharing of students' learning, orchestrating the many types of conversations that occur among teachers and students. We are all familiar with the routine of raising one's hand for permission to speak, arguably the most ubiquitous routine in classrooms throughout the world. However, this is not the only way of structuring discourse. Other routines such as Think Pair Share, Leaderless Discussions (McKeachie, 1999), Buzz Groups (McKeachie, 1994), and Circle of Knowledge (Kagan, 1987) for instance are more interactive, student-centered routines. Discussion Protocols, guidelines for structuring a group conversation, are also a type of discourse routines (refs). Likewise, structures for giving feedback and listening, such as, The Ladder of Feedback (refs), fit in this category of routines as well.

Thinking routines are a subset of discourse or learning routines since the learning or the discussion of ideas is always the larger purpose behind them. The Think-Pair-Share (TPS) routine mentioned earlier is a good example. This routine structures the conversation among students and is therefore a discourse routine, but it also is designed to provide time for thinking, the exploration of ideas, and the rehearsal of one's thoughts prior to sharing. Thus, it serves a specific role in promoting thinking. Whereas other types of classroom routines are designed to direct overt behavior, thinking routines help to direct and guide mental action as well. We call these actions thinking or epistemic moves. The KWL strategy (Ogle, 1986): What do you know? What do you want to know? What have you learned? Serves to structure students' learning about a new topic and is a widely used learning routine in classrooms throughout the world. It is also a thinking routine since it activates prior knowledge, engages curiosity, and prompts reflection. We can say that practices such as TPS and KWL become routines rather than merely strategies through their repeated use. This repetition of use is a key characteristic of all routines. It is what makes them common, shared practices.

The effective schools research has shown that teachers establish housekeeping, management, and discourse routines earlier in the school and that this establishment is important in the long-term smooth running of classrooms. Teachers that fail to establish routines may struggle to keep their classes focused and orderly. Just as it is important for teachers to focus students' behavior so that classrooms can run smoothly and students can learn, teachers also need tools for structuring and scaffolding students' mental behavior. In his study of teachers who were effective at creating thinking cultures in their classroom, Ritchhart (2002) found that these teachers, while not neglecting management and housekeeping routines, spent considerable time developing thinking and learning routines in the first days of school. These routines helped to establish the culture of the classroom by sending messages to students about what learning in the classroom would look like, how it would unfold, and how it would be managed. The importance of establishing thinking routines as part of the development of a classroom culture has not been widely explored or understood. Indeed, popular

books for teachers even de-emphasize the importance of such routines, focusing instead on developing a climate of orderly workers by focusing primarily on management and housekeeping routines (Wong & Wong, 1997).

We have already mentioned two widely used thinking routines: KWL and Think-Pair-Share. To provide a richer context for the discussion that follows, we provide the reader with a few more examples of thinking routines. The table below (see Table 1) includes some thinking routines that many educators will be familiar with along with a few of the most widely-used routines developed as part of the Visible Thinking projects. For each routine, the key thinking moves it supports are identified. Although a table such as this may appear to be a starting point for implementation, it has in fact grown out of the design process itself. To better understand thinking routines and their role in establishing a culture of thinking versus a work culture in the classroom (Marshall, 1987, 1988; Ritchhart, 2002), we turn our attention to the design questions that have guided our work.

Figure 1. Sample thinking routines from the Visible Thinking projects.

<p style="text-align: center;">SEE-THINK-WONDER</p> <ol style="list-style-type: none"> 1. What do you <u>see</u>? 2. What do you <u>think</u> about that? 3. What does it make you <u>wonder</u>? 	<p style="text-align: center;">CLAIM-SUPPORT-QUESTION</p> <ol style="list-style-type: none"> 1. Make a claim about the topic 2. Identify support for your claim 3. Ask a question related to your claim
<p style="text-align: center;">CONNECT-EXTEND-CHALLENGE</p> <ol style="list-style-type: none"> 1. How are the ideas and information <u>connected</u> to what you already know? 2. What new ideas did you get that <u>extend</u> your thinking in new directions? 3. What is still <u>challenging</u> or confusing for you? What questions or puzzles do you now have? 	<p style="text-align: center;">LOOKING: 10 X 2</p> <ol style="list-style-type: none"> 1. Look image or artifact quietly for at least 30 seconds. Let your eyes wander. 2. List 10 words or phrases about any aspect of it. 3. Repeat Steps 1 & 2: Look at the image or artifact again and try to list 10 more words or phrases to your list.
<p style="text-align: center;">PERCEIVE-KNOW-CARE ABOUT</p> <ol style="list-style-type: none"> 1. What can the person or thing <u>perceive</u>? 2. What might the person or thing <u>know about</u>? 3. What might the person or thing <u>care about</u>? 	<p style="text-align: center;">THINK-PUZZLE-EXPLORE</p> <ol style="list-style-type: none"> 1. What do you <u>think</u> you know about this topic? 2. What questions or <u>puzzles</u> do you have? 3. What does the topic make you want to <u>explore</u>?

HEADLINES	WHAT MAKES YOU SAY THAT?
1. If you were to write a headline for this topic or issue right now that captures the most important aspect to keep in mind, what would that headline be?	1. What's going on here? 2. What do you see that makes you say that?

Design Research Questions

As with all design research, understanding the complexity of the intervention as it unfolds within the messiness of the classroom while in the midst of developing and reshaping the intervention is a daunting task (refs). Many questions about thinking routine helped to focus our ongoing work. Of course, ultimately we are interested in understanding student adoption and facility with using thinking routines and how this use affects their views on thinking, learning, and classrooms as well as their disposition toward thinking. However, we are only now at the stage where we can begin to collect data to help us answer this question. Within our earlier design process there were many more basic questions about routines that needed examination before we could turn our attention to their impact on students. Working backwards from the issue of impact, two classes of questions emerge: one about implementation and the other concerning the nature of routines themselves.

With regard to teachers' use and implementation of routines we sought information on the following to guide our design process: How do teachers come to adopt and incorporate thinking routines in their instruction? What does this trajectory look like from early learning to effortless use? How much use of a routine in a classroom is reasonable to expect from teachers? Can teachers keep a routine in play in a class without boring students? How does the use of a routine vary across teaching contexts such as school, grade level, and subject area? How and when do thinking routines get adapted and modified? When are modifications productive and when are they "lethal mutations" (Ann L. Brown & Campione, 1996)? How does familiarity with routines affect teachers' lesson

planning and instruction? How do teachers make sense of the information about students' thinking that routines produce?

Preceding these questions about the use of routines were more basic questions of routine design itself. Put simply, before heading into the classrooms we needed to understand just what it is that makes a good thinking routine. What are the important qualities and characteristics of thinking routines? This question has both structural and conceptual components. Initially our work focused on just the structural characteristics of routines, drawing on previous research on classroom routines in general and the use of cognitive strategies. Because we were concerned with “thinking” routines, there were also front-end epistemic questions about what mental moves would be embedded in a routine and how. These issues were addressed in the first phase of the design process with refinements occurring as we learned about implementation. In the process of implementation a third structural issue emerged, that of epistemic messages. While this issue was never far from the surface in our work—we knew that from an enculturation standpoint the messages of instruction were important—we hadn't addressed this issue from a design standpoint. However, as our work with teachers progressed we found the issue of epistemic messages weaving in and out of the process of implementation and one could not be fully understood apart from the other.

Understanding Thinking Routines: A Structural Analysis

The first phase of our design research focused on identifying the structural features of thinking routines. We drew on our understanding of and the research on classroom routines generally as well some well-known cognitive strategies that from our experience often take on routine-like form in some classrooms. We have mentioned KWL and Think-Pair-Share. To these we add PMI (Plus-Minus-Interesting) (de Bono, 1994), Brainstorming, Concept Mapping, and Reciprocal Teaching (Palinscar & Brown, 1984). As a starting point, it wasn't necessary, or particularly useful; to cast a wide net as our goal was merely to identify a useful starting point from which design could

proceed. To that end, a small, but diverse sampling of routines as well as the general backdrop of housekeeping, management, and discourse routines was sufficient.

All classroom routines are explicit in nature, that is, they must be known by the group of learners. Thus, in time, teachers can activate a routine merely by naming it. We see this in routines for lining up, getting into groups, or holding a debate. The explicit nature of thinking routines is often evidenced by having names or labels—such as brainstorming, webbing, pro and con lists, KWL—that allow us to easily recall the thinking moves involved and put them in play. As we have shown, these labels often name the steps of the routine itself, such as, Think-Pair-Share and See-Think-Wonder. Having only a few steps, often identified in language that makes the thinking moves explicit, is an important characteristic of routines as it makes them easy to teach, learn, and remember. To be useful as supports for teachers and students, thinking routines need to be streamlined so that they can easily be called to mind right as they are needed. David Perkins (refs) has dubbed this ease-of-access quality “action poetry,” indicating that there is a certain brevity and elegance that helps the routine stick in our mind.

Related to the explicitness of routines, which is often spelled out in their steps, is the idea that routines are instrumental in nature. That is, routines are designed, and ultimately adopted, to serve a purpose or goal. In this regard, routines operate as tools for getting a particular job done. In the case of thinking routines, the goal of the routine is to scaffold and support a particular set of thinking moves (see Table 1). While initially teachers may try out a routine as just an interesting activity, for routines to take hold in classrooms and serve as enculturating tools, teachers and students must come to see the routines as useful tools for achieving thinking and learning goals. They must internalize not just the actions but the purpose and messages behind those actions. With this in mind, we often see teachers modifying routines to fit with their goals and the needs of their students, thus maintaining the notion that the routines are tools to serve a purpose and not just activities. For instance, with the Headlines routines some teachers felt the need to take students beyond merely summarizing events to

providing an explanation and justification for that headline. Thus, the Headlines routine became the Headline News routine in which students were asked, “What’s the story behind the headline?”

While it seems axiomatic to say that routines are used over and over again in the classroom, it is worth focusing on this repetitive quality with regard to thinking routines, as it is what separates them from single-use strategies and practices. Teachers engage in all kinds of practices to get students thinking. They may ask pointed questions about a particular assignment or reading. They may propose activities that require thinking, such as comparing and contrasting two objects, writing a persuasive essay, creating an application for a new idea, and so on. While such tasks certainly encourage thinking, they wouldn’t be classified as routines because they aren’t core practices that are repeated. Thus, these practices don’t have a chance to become routinized for the individual or the class as a whole.

As has been shown, thinking routines are similar to other types of routines in that they are explicit, have only a few steps, are instrumental in nature, and get used repeatedly. Thinking routines are also often flexible in nature, allowing teachers and students to modify them to best meet their needs. Two additional characteristics set thinking routines apart from other types or routines, however. First, thinking routines are useful across a variety of contexts. Second, thinking routines exist as both individual and group practices.

Routines for passing out papers or straightening up the classroom at the end of the day are clearly one-shot, situation-specific routines. Such routines have a distinct goal and context that makes them of limited use in other situations. In contrast, much of the power of thinking routines is that they have wide applicability. All of the thinking routines we have mentioned—KWL, brainstorming, TPS, STW, TPE, Headlines—can be useful across a variety of grade levels, subject areas, and contexts. While subject specific routines do exist, such as Reciprocal Teaching in reading, the idea that routines should operate in as many contexts as possible seemed an important feature to strive for in our design of thinking routines.

Finally, thinking routines operate as individual and group practices. Many of the other types of classroom routines discussed earlier are for use only in the classroom. Thus, they get left behind once we leave the classroom—we seldom see people raising their hands to speak at a dinner party! But, this need not be true of thinking routines. Because of their broad applicability, thinking routines often are useful outside of the classroom. In addition, because thinking routines seek to activate individual as well as group thinking, individuals can use them to help them think. For instance, when we find ourselves in a rut, we can brainstorm new ideas on our own. When standing in front of a painting at a museum, we can identify what we see, think what it might mean, and pose wonderings to ourselves. In trying to make a decision, we can make a list of pros and cons. Although there are times when we might prefer to engage in the routine within a group, the thinking routine still can be of use to us in our private dealings. This aspect of thinking routines makes them useful tools in developing students' ability to think.

These six characteristics: individual and group practices, useful across a variety of contexts, used over and over again, instrumental in nature, explicit, and having only a few steps marked the starting point for our design work. As we began to work with teachers in the implementation phase two additional characteristics emerged, that of flexibility and language. In many cases, we learned that the steps of a routine could be used independently or recombined in new ways. For example, some teachers of young children use only the See and Wonder steps of the STW routine. Or, teachers may engage students with the Think and Puzzle while delaying discussion of the Explore step in TPE. While this type of flexibility isn't a necessary feature of all thinking routines, it is a quality we have seen that leads to the robust adoption and use of routines in classrooms. Another type of flexibility, that of format also became apparent to us as we saw teachers design their own recording sheets to use with students.

In addition, we found that in some instances teachers may make modifications to the language or steps to meet the needs of their students. The role of language was particularly important

with young children, but even with older students teachers often found that language need to be modified or built up so that it could be understood. We take a more in depth look at how these additional structural features emerged when we look at teachers' implementation of thinking routines.

Understanding Thinking Routines: An Epistemological Analysis

The foregoing structural analysis of thinking routines describes the set of structural features we initially identified to guide our design of thinking routines, as well the structural features that emerged as important along the way. We now turn to an epistemological analysis of thinking routines. If, as we have been arguing, thinking routines have an enculturative force in classroom practice, the epistemological content of thinking routines is likely to influence students' beliefs about knowledge and learning. Why is this relevant? Research has shown that epistemological beliefs are related to learning in several ways. For example, they are related to students' attitudes towards knowledge and learning (Ryan, 1984); to knowledge-related student outcomes such as text comprehension (Schommer, 1990); to students' attitudes toward school (Schommer & Walker, 1997); and, of special interest to us, to the thinking and learning practices that characterize students' engagement in the learning process (Dahl, Bals, & Turi, 2005).

We tackle the epistemological analysis of thinking routines in two stages. First we offer a typology of the cognitive behaviors that comprise the set of thinking routines under review. This typology classifies the kinds of thinking moves you'd see if you spent time in a classroom in which thinking routines are frequently used. We call these behaviors "epistemic moves" because they are the steps students take to move through learning experiences scaffolded by the thinking routines. Epistemic moves have been a natural focus for the Visible Thinking work from its inception, since an explicit goal of our work has always been to teach thinking and the epistemic moves constitute the "thinking" we are aiming to teach.

Using the typology of epistemic moves as a backdrop, we then consider the epistemic values and beliefs these moves embody. We call these values and beliefs “epistemic messages” because they are messages about thinking and learning that seem likely to be conveyed to students when they “routinely” engage in the epistemic moves described in the typology. While these messages have always been embedded the epistemic moves from the beginning, it is mainly now, in the later stages of the research, that we are beginning to see their enculturative power.

Epistemic Moves: What kinds of thinking do routines ask students to do?

Recall that a thinking routine is made up of a short series of steps, or thinking moves. For example, the routine, see/think/wonder is comprised of the three steps expressed in its title: 1. *What do you see?* 2. *What do you think about that?* And 3. *What do you wonder about?* Each step constitutes a certain sort of cognitive behavior. An analysis of the thinking moves across all the routines developed through the Visible Thinking work can be classified into the following broad types of cognitive behaviors:

- Generate lots of ideas.
- Give evidence and explanations.
- Look for comparisons and connections.
- Construct reason-based syntheses, summaries, and conclusions.
- Construct evidence-based interpretations and explanations
- Make discernments and evaluations
- Identify parts, components, dimensions
- Ask questions
- Identify and explore multiple perspectives
- Create metaphors
- Reflect on and consolidate learning

Taken together, these epistemic moves characterize a process-oriented conception of thinking that emphasizes critical thinking, creative elaboration, and reflection.

Epistemic messages

The typology of epistemic moves tells us what kinds of cognitive behaviors we'd be likely to see in a "thinking routines" classroom. The next natural question is, what is likely to happen to students, conceptually, when they engage in these sorts of behaviors? One thing we hope happens, of course, is that students develop new understandings about the topics on which the routines are used. Beyond subject-matter understanding, however, another kind of conceptual learning may occur that has to do with what students are learning about the nature of learning and knowledge itself. What kinds of epistemological beliefs and commitments are conveyed to students when they enact these behaviors?

Learning is doing. Perhaps the most obvious message is that learning involves actively doing something with the topic at hand, rather than just absorbing information. This view, often called "active learning," contrasts with a traditional transmission view of learning in which knowledge is passively received—something you *get* rather than *do*. The epistemic message that "learning is doing" also aligns with a performance theory of understanding, which says that learners demonstrate, as well as construct, their understandings of a topic when they engage in performances that make use of what they know (Blythe & Associates, 1998).

Learning starts with the learner's own ideas. Most thinking routines begin by asking students for their own ideas. Sometimes this means that students are asked to recollect ideas and information they already have, as in the "think" step of the think/puzzle/explore routine. ("What do you think you know about the topic?") Other times students are asked to generate ideas on the spot, for example when they are asked to generate questions, puzzles, claims, or observations. Whether they are recollecting prior knowledge or constructing it in the moment, the key point here is that the learning

experience builds on the foundation of students' own ideas. This epistemic message that learning starts with the learner is central to the constructivist view that learners construct new knowledge by actively building on what they know. It is important to note, however, that while thinking routines ask students to construct new knowledge by building on what they know, they don't encourage students to unreflectively pile new knowledge atop of old. Rather, they emphasize probing, challenging, and revising existing knowledge. For example, the claim/support/question routine starts with a student's own belief, the claim, and moves the student through a process of justificatory reasoning that ends by inviting a challenge to the initial claim.

Learning involves getting personally involved. It's a fact of human nature that when we are asked to contribute an opinion about something, we tend to become more engaged. Many thinking routines capitalize on this by asking students to take a stance, for example by stating an opinion, forming an interpretation, identifying an area of interest, or adopting a perspective. By encouraging students to insert their own opinions and ideas into the learning process, these moves give students a personal stake in what's going on. But it is important to note that the routines don't encourage inflexible stake holding. As explained above, in many thinking routines, the process of moving through the routine involves challenging one's own ideas. Stake holding—as well as stake-changing—sends the epistemic message that knowledge building is a spirited enterprise, and one that invites personal involvement.

Questions are engines and outcomes. As noted in the earlier section on epistemic moves, many thinking routines contain question-asking moves. Sometimes students' questions function as an engine of inquiry, fueling a search for answers. For example, in the Think/puzzle/explore routine, students generate several puzzles and questions about a topic and use them as a basis for further exploration. Just as often, however, question asking occurs at the end of a thinking routine and constitutes a learning outcome, such as in see/think/wonder and claim/support/question routines. The use of questions as both engines and outcomes of learning contrasts with the traditional notion that

learning is a closed loop that begins with a question and ends with an answer. The epistemic message here is that question asking plays multiple roles in the learning process, from giving shape to inquiry, to providing evidence of learning, to counting as an learning outcome.

Learning involves uncovering complexity. Using a thinking routine to explore a curricular topic often reveals quite a bit of dimensionality and complexity. Several factors contribute to this. For one, as the previous discussion of epistemic moves pointed out, thinking routines often ask students to generate lots of ideas—lots of observations, questions, claims, and so on. As anyone who has participated in a lengthy brainstorming session knows, when you have lots of ideas, you also tend to have more shifts in kinds of ideas, which in turn reveal more dimensions of the topic. Additionally, thinking routines often are used in a social context, with several students contributing at once. Multiple participants bring multiple perspectives, and this, too, contributes to complexity. The epistemic message here is straightforward: Thinking deeply about topics often reveals that they are more complex than they first appear.

Learning can be a group process and a group outcome. In our earlier structural analysis of thinking routines, we made the point that routines are used in groups as well as solo. Because most routines accommodate rather than eliminate students' ideas, the ideas that emerge when routines are used in groups are typically greater in number and more varied than they typically are when used solo. Further, because there is epistemic chemistry in a group setting -- such as when one student's idea sparks another's question, or when one student's claim sparks another's search for evidence—the “whole” of the group learning process is truly greater than the sum of its parts. Indeed, the ownership of the learning that occurs through group use of routines is often shared among all students in the group. This message, that learning can be both the process and product of a group, reflects a shift away from a more traditional, individualistic conception of learning as something that can only be experienced by, and be the property of, an individual mind.

Overall, an epistemological analysis of thinking routines paints the following picture: The epistemic moves that constitute thinking routines involve students in critical thinking, creative elaboration, and reflection. The epistemic messages about learning and knowledge that might be conveyed to students as they engage in these moves are: Learning is active, self-originated, social, and inquiry-oriented; knowledge is dynamic, personal, performance-oriented, multi-perspectival, and complex. This epistemological analysis of thinking routines, combined with the foregoing structural analysis, provides a theoretical backdrop for understanding what happens when thinking routines are adopted and adapted in the classroom. We now turn to an examination of three school-based cases.

Examining the Use of Thinking Routines in the Classroom

In our design process, we began by developing the idea for a particular routine around one or more key epistemological moves while adhering to structural criteria generally. That is to say, we kept the structural criteria in mind, but didn't allow it to limit us if we thought it might be useful to depart from it. For example, the Question Starts routine in which students generated questions about a topic based on a set of prompts had steps that couldn't be easily kept in mind and required a sheet to prompt both the students and teachers.

Our initial work occurred within the Innovating with Intelligence project, working with schools in Sweden, The Netherlands, and Belgium. At this time, we focused our work within four key epistemological areas: understanding, truth, fairness, and creativity. Project members proposed initial ideas for routines within the current area of focus with other group members offering comments and suggestions for modification. Once the idea for a routine was worked out, it would be tried out with a group of students in a local pilot site. During this phase we were particularly interested to see how students' responded to the routine, if the routine did in fact scaffold the epistemic moves we had built the routines around, and if it seemed that it helped to deepen their understanding of the content they were studying. Based on this pilot experience, modifications to

routines were often needed to shape both the language, sequence, and format of the routine. In a few instances, routines were abandoned or completely reworked.

Once we had created a set of thinking routines we felt had strong potential for classroom use, we then presented the routines to teachers as a set. By working with sets of routines, rather than merely individual routines allowed us to focus on the fundamental structural criteria for a routine, that it be used over and over again. This was a characteristic we couldn't build into a routine during the initial design phase or ever predict well in advance. It was something we could only determine through implementation. Providing teachers with a set of routines to work with over a semester, gave us the opportunity to examine the routines teachers naturally gravitated toward and used most readily in their classroom. Although teachers were encouraged to try all of the routines at some point, the flexibility of choice and time, helped to ensure that teachers weren't just piloting the routines but actually using them as tools for their instruction.

Across all the Visible Thinking projects, teachers met regularly with other project members, site-based support staff, and researchers to share student work derived from the use of a thinking routine. These meetings were documented either using videotape, study logs, facilitator notes, real-time documentation of conversation on chart paper, and/or researcher field notes. These meetings, occurring as often as once a week in some projects, provided a forum for teachers to share and discuss the routines within the context of actually student work and classroom experience. Within this context, teachers often built on one another ideas and discussed possible modifications of routines. These meetings gave us insights into how teachers interpreted routines, thought about them in different contexts, and used them instructionally. As researchers, we also observed teachers using routines in classrooms, collected samples of student work, surveyed teachers on the use of routines, and conducted in some cases conducted in-depth interviews. These layers of data help us to understand how teachers establish, use, and adapt thinking routines to make them a part of the culture

of the classroom provides useful insights into how thoughtful classroom environments can be established and maintained.

As one can image, the data from hundreds of teachers working with over forty thinking routines in five countries is voluminous and messy. In the two cases that follow, we do not attempt to explicate the complete nature of our work with thinking routines, but rather to contextualize it by grounding it in a few experiences that exemplify our learning about how these routines operate on the ground in schools and classrooms. As we discuss each case, we attempt to show how the structural characteristics, epistemological moves, and epistemological messages play out in practice. The first case examines one teacher's use of Connect-Extend-Challenge routines over two years and across two subjects. The second case comes from the Cultures of Thinking project and explores how the See-Think-Wonder routine evolved in a history classroom and across a school. We conclude with a case from the Artful Thinking Project in which we take a more holistic perspective, examining a whole-schools use of routines.

Making Thinking Visible with Connect-Extend-Challenge

In October of 2003, the Innovating with Intelligence expanded from its core site in at Lemshaga Akademi in Sweden to include three international schools in Europe, among these, the International School of Amsterdam (ISA). ISA is a pre-K–12 schools of around nine hundred students from 45 nationalities. More than sixty percent of the student body speaks a home language other than English. The language and cultural diversity of the school provides an interesting backdrop from which to study the use of thinking routines as well as the development of a culture of thinking. Because students at international schools move frequently, the culture of the school and classroom is always being established and teachers are aware of the fact that their instructional practices, whatever they are, may be new to many of their students. Thus making teachers, students, and parents all much more aware of the instructional practices being used.

At ISA, eight teachers agreed to pilot the set of understanding routines and to meet regularly as a group to discuss their work with the routines. Mark Church, a middle school teacher at the International School of Amsterdam (ISA), was one of these teachers. A twelve-year veteran teacher in his fifth year at the school, Mark's university training was as an elementary school teacher. However, his strong interest in mathematics had lead him into middle school mathematics teaching seven years previously. In his years at ISA, Mark had become recognized as a leader in professional development around Teaching for Understanding (refs) and the implementation of the NCTM standards (refs). During the first year of his involvement with the Innovating with Intelligence project, Mark taught two sections of sixth grade mathematics and a section of both seventh and eighth grade mathematics. Mark's classes were mixed-ability, standard classes following the International Baccalaureate Middle Years Program using the Connected Mathematics series (refs)

Early on, Mark was enthusiastic about the Connect-Extend-Challenge (CEC) routine and thought it might help deepen his students' understanding in the Covering and Surrounding unit on which they were currently working. Mark felt the three steps of the routine were manageable for his sixth-grade students, and he wasn't too concerned that they would get hung up on the language of the routine since the Connected Mathematics series he was using already stressed Applications, Connections, and Extensions (ACE) as part of each investigation. Still, Mark wondered how this thinking routine might create a different way for students to think about the mathematics they were learning and was curious to see what kind of thinking might be revealed that might not necessarily come up when going over ACE questions. Mark made the comment that "Although I always felt that making connections was important for my students' learning, I don't know that I ever really gave the idea of connection making much thought or attention—other than superficially pointing out to the students how a particular mathematics problem relates to the real world."

For his first use of this routine, Mark constructed a three-column worksheet with the labels Connect-Extend-Challenge. He gave this to his students following a three-day, hands-on

investigation of two-dimensional geometry. In this particular investigation, students were given the task of designing all the rectangular dog pens possible using only a given amount of fence material, a changing area/fixed perimeter problem. In our discussions of his goals, Mark stated that he hoped that the CEC recording sheet might help push the students' reflections to go beyond simply reporting their answers to the problem or their like/dislike for the investigation and push them to look more closely for connections between ideas brought up in this investigation and the previous investigations of the unit.

Mark felt that his students had little difficulty filling in the column marked "Connect." However, the responses they gave were not always what he had hoped. For example, many students responded, "The dog-pen problem was like the bumper car problems we did before because they both involved area and perimeter." This kind of connection making didn't strike Mark as particularly powerful. "It just doesn't seem to push the student's thinking into anything new," Mark reflected. Although these simplistic connection-making responses were dominant, Mark, nonetheless, felt that his students had gained something from the routine. For instance, Mark had overheard some of his students initially say that this problem was the same as the problem about designing storm shelters (a fixed area, changing perimeter problem) but by the end of the dog pen designing, many of his students voiced the difference between these two investigations.

Mark brought his students' CEC responses to his weekly study group meeting to share and discuss. In reviewing the student work, the group noticed that some students were in fact making the richer kinds of connections Mark sought. One student wrote, "Just like when we laid the storm shelter floor plans out, the more 'bunched together' we make a shape, the less perimeter we'll use!" Although these kinds of responses were few compared to the entire set of CEC sheets collected, Mark commented to the group that these rich responses weren't just the province of high-achieving students. This caused Mark and the group to wonder, "How might this thinking routine allow for

students of different abilities to show significant thinking that we can then bring up for the entire class to talk about?”

In taking time to examine his students’ responses in depth, a fundamental puzzle began to emerge for Mark and the rest of the group around what kinds of connection making are meaningful in terms of advancing students’ understanding. Furthermore, the group wondered how they might support the development of those kinds of connections? Thus, though the routine was grounded in a particular sixth grade mathematics lesson, the pedagogical issues its discussion raised were important to all the teachers in the group.

Mark’s experience demonstrates that, although the epistemic moves of a routine may be ostensibly clear, teachers must still take on the quality and depth of students’ responses by providing models of appropriate responses and the expectation that students will go beyond the superficial and obvious. In reflecting on his first use of CEC, Mark identified this issue for himself, “Although I always felt that making connections was important for my students’ learning, I don’t know that I ever really gave the idea of connection making much thought or attention—other than superficially pointing out to the students how a particular mathematics problem relates to the real world...I’m wondering if my students could or would recognize the difference between types of connections—from the kind that seem more simplistic in nature to the kind that seem more elaborated and, well, that lead the learner somewhere further in understanding?” Although the language of “connections” was familiar to Mark’s students, the appropriate examples and clear models needed to truly flesh out the meaning of “connections” were missing for some students. This is something a routine itself cannot provide. Rather, it is something the teacher must bring to the routine. However, by working with the routine over time, and participating in regular meetings with colleagues, Mark was able to begin to explore what it means to make meaningful connections.

The issue of language and the deeper meaning emerged in students’ responses to “Extend” and “Challenge” as well. Under “Extend,” Mark and his colleagues noted that many students made

responses that they'd "learned a lot" by doing the investigation without any supporting statements or articulation regarding what exactly had been extended in their thinking. Many students had written nothing at all in this column. However, a few had written that their thinking was extended because they never knew that the area could change so much with a certain fixed perimeter. Mark found one student's comment particularly interesting. This student asked a question about what would happen if the fence sections didn't have to come in one-meter segments. That is, if fence sections could be split into fractions, would there be even more possible dog pens to make? Mark felt this question represented a leap in the student's understanding, and in the study group he wondered aloud about how he might bring this particular thought up with the whole class to further students' thinking and provide a model of what "Extend" could look like.

Under the "Challenge" column, a large number of students responded with: "I did not find anything hard," or "There wasn't anything difficult in this investigation—I understood everything I was supposed to do." Causing Mark to ask his colleagues, "Why are my students automatically jumping to words like difficult and hard when I've asked them what the challenge in this whole investigation was and do my students view a challenge as a bad thing, as in, 'if I have a challenge, then there must be something wrong with me as a learner because I should be finding it more easy?'"

Mark was initially attracted to the CEC routines because he felt it matched many of his instructional goals, the instrumental nature of the routine. However, he found that what he had initially perceived as being very explicit, the very idea of asking students to make connections, extensions, and identify challenges, was, in fact, not so clear. The language of the routine needed to be unpacked for students and models provided. Mark summed up the issue; "It seems to me that my students really weren't engaged in significant connection making like I thought they would be by distributing this sheet. Rather than doing Connect-Extend-Challenge, it seems they've done 'Look for what Matches Up, Report that you Learned a lot, and Say How easy the Task Was.' I thought that

if I distributed a worksheet with Connect, Extend, and Challenge clearly marked at the top of each column, I might get something different than what I got from most of them!”

As a member of an ongoing Visible Thinking study group at his school, Mark found support and encouragement to continue with the routine. The puzzles and issues raised by his students’ response to the routine actually seemed to energize Mark rather than defeat him. Perhaps another teacher trying out this routine on his own without the support of an ongoing pilot group or the Visible Thinking researchers might have found fault with the routine and abandoned it. However, Mark figured there might be some untapped potential in this particular thinking routine and he wanted to “allow myself to intellectually mess about with it” to see where it might take both him and his students.

One thing Mark decided to do was to abandon the three-column worksheet idea and instead to focus more on using the language of the CEC routine in his classroom instructions and interactions. In reflecting with researches afterward, Mark stated, “I don’t know that the three-column sheet itself was a bad thing, but I felt like perhaps my students got the idea that this was just one more thing to do in order to complete the tasks I’d assigned. And, I wanted to give connection-making its own arena—it’s own value and importance as a result of all the work we’ve done up to this point in our investigations.” Subsequently, Mark made the decision to begin weaving Connect-Extend-Challenge type language into his instruction. For example, when launching a new assignment, Mark announced to his students “Now, as you work on this investigation in your small group today, not only do I want you to get to the work the problem is asking of you, but I also want you all to be thinking about how this investigation or problem connects with some of the problems we were doing last week AND what’s really new here? In what way does this investigation extend your thinking further or deeper from the place we left off at the last round of problems!”

At first, Mark said he needed to remind himself to ask these Connect-Extend-Challenge questions to the whole class by writing CEC in his plan book or in the corner of the whiteboard.

From time to time, he would stop the class during an investigation and ask students, “What are you noticing? How is this familiar to things we’ve been doing? What’s new here? Is this just the same old stuff or is there something different?” Mark also made an intentional effort to use these kinds of questions a part of his talk with individuals as they came up to show him their work or when he’d check in with a small group during the investigation time.

Over time, Mark noted that this way of questioning became a natural part of the interactions he had with his learners, “It didn’t seem forced or awkward after we’d done this a few times.... I really was fascinated by the kinds of things they’d respond, which often helped me formulate new questions for an individual or group, and many times, for the entire class. I was especially intrigued when students would make mention of other problems or investigations we’d done in other units and how what they were doing presently seemed to remind them of an aspect of something they’d seen or thought about before. In moments like that, I’d often pause all the groups and say something like ‘It seems like a lot of groups are making such-and-such a connection with the problems from last week (or from a previous unit), which is a great thing—seems like our theory last week is holding true for these problems too. However, I’m wondering, are groups finding some new layer here? Is there something about these problems that add another dimension to the theory we had last week? Make sure you’re all considering that as you work through this investigation.’”

By the last term of the school year, Mark did return to the three-column worksheet and even used it as the structure for students’ homework assignments on occasion. However, by this time the language of Connect-Extend-Challenge had been thoroughly unpacked for his students and models of good thinking in each of the three steps made visible through the numerous class discussions. Once these kinds of examples and experience were in place, the explicitness of the routine became apparent to students and they were able to engage with the routine independently and at a high level. This became evident to Mark, when he had a substitute teacher give his students Connect-Extend-Challenge as a homework assignment. Without any more instruction than that, students came to class

the next day with a wealth of observations to discuss, indication that the CEC had truly become a routine in Mark's class.

In observing Mark's classes near the end of the school year, this high level of independent student use of the routine was noticeable, as was student use of the language of the routine. We frequently heard students making comments about their thinking being "extended" or "challenged" or their pointing out a "connection" they had made. Another noticeable shift was observed in students asking of questions during the classes "Extend" and "Challenge" discussions. Recall that in his initial use of the routine only one student asked a question under "Extend," and many students commented, "Nothing was hard about this investigation" when asked about "Challenges." Through repeated modeling and making students' collective thinking visible, it appears that the idea that to extend and challenge one's thinking is to ask questions about what you are studying became ingrained in the minds of Mark's students. This shift in students' responses seems to indicate more than familiarity with the routine and expected types of responses. It suggests that students are internalizing the epistemic messages that "questions are engines and outcomes" and "learning involves uncovering complexity."

In the following school year, Mark was assigned a section of Social Studies to teach in addition to the mathematics courses he'd been teaching for some time. When asked how the CEC thinking routine differed across subject areas, Mark noted that it seemed that in mathematics, the connections and extensions students seemed to make always centered around mathematics problems whereas in Social Studies, the routine helped students think across a variety of sources they'd been working with—articles, text-based readings, internet searches, videos, etc. "I also noticed that the students with whom I taught both mathematics and social studies seemed to be making connections within our class discussions and with other pieces of work I'd assigned even when they weren't being asked to make connections using the CEC thinking routine."

Mark's observation of students' spontaneous connection making indicates that students' disposition to think are being enhanced. As CEC becomes more apart of their school experience, students are learning more than just how to do an assignment or answer the teacher's questions. Mark observed significant improvement in students' ability over time, but he also noticed that his students were becoming more inclined to look for connections, to see connection making as an important and worthwhile thing to do. In addition, his comments above suggested that students were spotting opportunities for connection making on their own as well. Thus, over time students' ability, inclination, and awareness of connection making, the disposition to make connections, was being enhanced through Mark's use of CEC.

Developing a Culture of Thinking with the See-Think-Wonder Routine

See-Think-Wonder spread rapidly throughout the classrooms as Bialik College in Melbourne, Australia. Within weeks of it's introduction the sixteen teachers in the Cultures of Thinking study group at this 1000 student, pre-K-12, independent school began using the routine in their own classrooms and sharing the results with other teachers at the school. Transcending traditional school boundaries of grade and subject level, See-Think-Wonder quickly found its way into many classrooms, demonstrating the usefulness of the routine across a variety of contexts. From middle school students' study of planets in science using satellite images to first graders' exploration of portraiture based on reproductions of museum artworks, from high school students' probing of the Hurricane Katrina response in the United States arising from an examination of a political cartoon in the daily paper to second graders' study of animal habitats grounded in nature photographs, teachers found the routine a good instrumental fit with their goals."

Like all routines, See-Think-Wonder has a transparent structure that is easy to learn and remember, and consequently, to share with others. The routine, developed in Lisa Verkerk's fifth-grade teacher at the International School of Amsterdam, is launched by presenting a visual stimulus

and asking students to observe closely and make note of what it is the actually “see.” Based on these observations, students begin to make interpretations with justifications as they explain what it is the “think.” The routine concludes with students posing questions and “wondering” about their observations and interpretations.

At the end of the first six months of the project, teachers in the Cultures of Thinking study groups (N=14) overwhelmingly identified See-Think-Wonder as the routine they most enjoyed doing with their students as well as the routine they used the most. Seventy percent of teachers reported using the routine more than five times with the remainder reporting medium use (two-four times). These patterns of use and enjoyment were duplicated by the second group of project teachers in year two of the project as well.

The attractiveness of See-Think-Wonder and its quick spread throughout the school might in part be due to its accessibility to teachers and students and its ability to engage students in an open-ended exploration. Teachers often find this kind of exploration works well at the beginning of a unit of study. As one teacher commented, “It [the routine] helps me to have a structured plan for class focusing on thinking [where I’m] using the subject matter as vehicle in order to develop thinking. Also, it’s very useful to introduction of the content starting from facts and secondly trying to think and wonder helping the students to understand the differences among these three actions.”

Accessibility plays out for students as well, and teachers identified this a key quality of the See-Think-Wonder routine on an anonymous survey about use of the routines. As one teacher commented, “The routine makes it visible. It gives an opportunity to all children to add to the conversation. No right or wrong answer.” This sentiment is echoed by other teachers as well, “It has been taken by the kids in a very non-threatening way, so they are prepared to take risks with their responses.” Teachers identified the routine as being useful for encouraging self-direction and personal involvement in learning for both strong and weak participants. One teacher commented, “I love the fact that it empowers the usually silent students to participate. It gives them a voice.” While

another teacher stated, “It exposes the thought process of all, but specifically those children willing to challenge themselves in their thinking.” As accessible and enjoyable as teachers find See-Think-Wonder is, it is not without its nuances and instructional implications. These are well demonstrated in the case of high school history teacher Sharonne Blum use of the routine across two school years.

Sharonne has been teaching Jewish Studies and History to 7th, 8th, and 9th graders at Bialik for 6 years. At this point in her career, she feels settled into teaching but not necessarily set in her ways. Like other high school teachers, she teaches her classes in a variety of rooms and doesn’t have a single space to personalize or make her own. Hence, the documentation of thinking and capturing of artifacts of class discussions is often a challenge, leading Sharonne to think about ways for students to self-document whenever possible. Recently she decided to have students begin saving their work so that they can look back and reflect on their group and individual progress. Sharonne found See-Think-Wonder a good fit for the subject of history, “I really like that [See-Think-Wonder], because it is easy and so suitable for history. Like with political cartoons. We look at lots of visuals.”

In initially learning to use the routine, Sharonne drew her students into the process of her own pedagogical learning, “I am completely honest with the class and tell them I am learning it and ask them to try it. I let them know this is a new way. I don’t pretend at all. Kids can read pretending.” When things didn’t work out the way she expected, she is open about that as well. “I learn it [the routine] by doing it. I told them, ‘We tried it and I didn’t think it was right.’ So, I told the class that we would do it again. Students respond to that. They like it. It makes them feel more equal since I am being honest and they see that I am making a mistake and being honest about it.”

In her second use of See-Think-Wonder with her 9th graders, Sharonne presents the class with a political cartoon from a 1959 Australian publication, The Bulletin. The cover of this issue of The Bulletin features a slightly distorted map of eastern hemisphere with the outline of Northern Territory and Queensland visible in the lower right hand corner. Over the map a large spider with a “C” on its back is spinning a web with its center near Moscow. The web covers most of Eastern Europe and

continental Asia with just one string of the web anchoring in Australia. Trapped in the web are what appear to be human figures. Sharonne chose this images because, “The class has been learning about the Cold War, and the “weapons” of the Cold War: propaganda, fear, paranoia, etc. They [the class] is familiar with cartoon analysis and have also experienced the See-Think-Wonder routine once before.”

Sharonne hands out copies of the cartoon to pairs of students along with a recording sheet with four columns: See: What do you see in this picture? Think: What do you think this means? Justify: What makes you say that? And, Wonder” What do you wonder about what you see? This addition of the justify column represents not so much a modification of the routine, as it does making an inherent part of the routine explicit for students. When the routine was done orally, Sharonne would question her students interpretations by asking them, “What makes you say that?” Thus, combining two routines. Many teachers have found this simple question of elaboration and justification increases their understanding of students’ responses and enhances class discussion. In her recording sheet, Sharonne makes this following-up questioning explicit. The intent of the recording sheet is to provide the basis for the class discussion and documentation of students’ ideas as opposed to something that will be graded.

After ten minutes of looking at the cartoon in pairs and recording their responses, Sharonne brings the class together for a group discussion that uncovers much of its symbolism and emotional connotations. Sharonne begins with one student and her what she sees, “Australia in the corner of the picture” and says she thinks this means “Australia is being cornered.” Sharonne asks the class for other interpretations and gets, “Australia is being attacked by the communist web.” For both of these responses, Sharonne follows up with, “What makes you say that?” Both students concur that it is because, “The web is touching the tip of Australia.” This seems a fairly straightforward response shared by many other students. When Sharonne asks these two students and the rest class what they “wonder” about this particular feature they have seen and interpreted, the discussion opens up.

Students ask, “Are there communists in Australia? How did Australia react? Did the ‘cornering’ make sense or was it just propaganda?” These questions provide a rich basis for future exploration.

The class discussion follows this rhythm for the rest of the class period. Since this is a fairly straightforward black and white image, it is not surprising that most students “see” the same types of things and even make similar interpretations. The richness emerges as students provide justifications for their interpretations and begin to wonder: Why was the spider chosen? How can you stop the web from expanding? How did they get people to think like that and change their ideology? Why is there only one spider? What is the spider trying to achieve? In this way, students come to see that questions are both engines and outcomes of learning as complexity is uncovered.

In reflecting on the routine, Sharonne is aware of how the routine has changed the way she approaches her content, though not the content itself. “The main difference between the way we used to analyze cartoons and this routine is we used to begin by identifying the overall message, and now that is the last stage of the analysis.” She also finds the routine changes the class discussions and sends the message that learning can be a group process, “We have more discussions...and it is changing the way I run a discussion. Rather than just hearing an idea and asking students to justify their positions, now, the way the discussion runs is more open and free but also more structured. The structure gives freedom.” Elaborating on the structure of the conversation, Sharonne adds, “I feel students are able to be more objective by having the ‘see’ as the first step. It stops them from jumping to conclusions. They learn to read a text more closely. Also, the ‘wonder’ section gives the student a voice, and it is just as important [of a step] as the observation and thoughts.”

Perhaps most significantly, use of See-Think-Wonder and other routines has changed the way Sharonne views students. “In previous years I was sometimes too quick to earmark a student as weak purely based on work output, his or her traditional comprehension skills and analytical skills.... What I had seen as a clever or good student was someone who gets it all the time rather than someone who raises questions.... However, this year I have been pleasantly surprised to see students who I had

labeled as weak, actually shine, as the thinking routines gave many of them a way to structure, understand and reflect on their own thoughts.” Sharonne provides a concrete example, “ I have a student whose handwriting and spelling are terrible and his comprehension is challenging. He doesn’t have learning difficulties in terms of needing support, but he is average. But, after hearing his thoughts and ideas it made me realize that what he knows about the world and politics is amazing. Apart from knowing information he is developing his own identity about the world around him. If you give him something pedestrian to do in class he is just average, but in terms of developing himself he is head and shoulders above others.... For the first time I was able to acknowledge that this student really is capable of “deep level thinking”, and I was able to acknowledge this because I believe that the thinking routines enabled me to recognize it. I have started to use terms like “deep level thinking” and “sophisticated thought processes” more often in my reporting and with less self-consciousness because I have actually *seen them* and I therefore feel I can make comments about them.

One of the big lessons Sharonne learned in using routines such as See-Think-Wonder was that they are not fool-proof lessons or great activities to pull out but rather structures to work within and adapt to meet the needs of the content and the particular students. This was driven home to her when she began the new school year confident that her ninth graders, having come from several classrooms that used the See-Think-Wonder routine would be automatically engage deeply with some images she had presented them of the Cronulla race riots that took place in Australia in December, 2005. “After class I reviewed their recordings, and I felt disappointed because the students’ thinking seemed rather shallow and abbreviated.” One problem she identified was that rather than stating a small detail that they could “see,” students were actually providing an overall interpretation of the picture or just picking up on the focus of the picture: a fight, flags and people, and so on.

The next day Sharonne brought this problem to her students' attention and asked them to do the routine again but this time by focusing on the details of the picture. She then modeled this process for the class. By elaborating a set of details in the picture rather than only one piece, Sharonne helped her students to uncover the complexity in the images which was initially difficult sense students were so familiar with this event and had already formed a lot of interpretations. This is in marked contrast to the Cold War image discussed previously, which was comparatively unfamiliar to students.

This ongoing learning about the intersection of routines, students, and content is significant. The goal of all the routines is to provide a structure that engages students deeply with content, fosters their understanding, and uncovers their thinking in the process. As Sharonne states, "What has been most rewarding for me in this project is seeing how a thinking routine works in the classroom. It's when you can hear students talking about the idea outside of the classroom, not the routine but the idea.... I get excited hearing students' thoughts. Getting close to their minds."

Artful Thinking and the Use of Thinking Routines

Since 2004, Long Lake Elementary School in Traverse City, Michigan has been involved in the Artful Thinking project developed in collaboration with the Traverse City Area Public Schools (TCAPS) through a Department of Education Arts Education Model Dissemination grant. TCAPS is a large rural school district with almost 11,000 students, many of who are considered "at-risk." On any given day, you can walk into Long Lake, a typical school in the district demographically, and observe teachers and students engaged with a thinking routine. As you look around the classrooms and hallways, you could see visible evidence of student thinking—lists of questions and "wonderings", charts with sticky notes reflecting students' ideas, and diagrams of class discussions. Students in some rooms might be gathered around a work of art establishing and exploring different points of view about it.

For the past year and a half, all teachers at Long Lake Elementary School have been involved with Artful Thinking. The project was faced with the challenge of creating an arts integration program for a school where most of the twenty teachers were classroom teachers who had little or no background or interest in the arts. By using thinking routines to explore works of art, we have found that teachers are able to think more deeply about art. Developing understanding about works of art also help teachers and students make connections to other topics. We have also seen that thinking routines not only help teachers and students to think about art and other subjects in new ways, but also encourage them to think more deeply about thinking. Important epistemic messages are conveyed through the use of thinking routines when looking at art or using routines in other subject areas.

In this case study, we will examine Long Lake teachers' use of thinking routines. Teachers reported routine use at their bi-weekly study group meetings by filling out a "think-track" sheet, which asked them to approximate how many and which routines they used in the classroom. Individual teachers were interviewed mid-year. In March all teachers responded to a survey about routine use and benefits. Drawing on this survey, interview and observational data, we describe the frequency and trajectory of routine use and consider what attracts teachers to specific routines. We also explore what Long Lake teachers describe as the student benefits and instructional benefits of using routines.

Frequency and Trajectory of Routine Use

In the first semester of the 2005–06 school year, the second year of the program, all teachers consistently reported using 1–3 routines a week, although some did report using more than three. By March 2006, more than half of the teachers reported using 4–6 or more routines per week. The increased frequency of routine use over this year shows that teachers are now comfortable using routines on a regular basis. But this was not always the case. During the first, or start-up, year of the

program, teachers were gradually introduced to new routines at different times. They would often try out routines once to gain familiarity with them before returning to a few routines that would then be used repeatedly. This exercise initially came across as a classroom activity in itself rather than using a routine instrumentally to achieve specific thinking goals. During this time, apparently, teachers were just getting familiar with the concept of routines. But, of course, the uptake of certain routines was quick and we'll take a look at the most popular ones in the next section.

Another indication that teachers became more confident with routines over the course of the project is their experimenting with the structure of the routines. As certain routines became more familiar, we observed teachers taking parts of the routine and using them independently of each other; or just taking the needed steps; teachers started to layer routines on top of routines and blend them together. Other routines were otherwise tweaked or adapted to fit the needs of the teacher or a particular lesson. For example, the Headlines routine was modified into the Headline News routine described earlier in this paper. Other times teachers have extended the Headlines routine, adding stars or question marks to indicate headlines that need to be revisited or investigated further. Teachers also became more creative with ways to document the thinking generated from routines, often involving students in this process. These experiments indicate to us that the teachers are becoming more comfortable with the routines, but also they are more aware of the types of thinking that the routines can elicit.

Which routines are used most?

In all, Artful Thinking had introduced 16 routines to the Long Lake teachers as of March 2006. Of these sixteen, we found that the three most commonly used routines are What Makes You Say That?—a routine adapted for teaching thinking from a routine for examining works of art developed by Philip Yenawine and Abigail Housen (Housen, 1996; Housen, Yenawine, & Arenas, 1991)—See-Think-Wonder, and Headlines. While the data indicate that many teachers use a wide

variety of routines, all teachers have used these three routines most frequently. Most teachers have used See-Think-Wonder and What Makes You Say That? consistently over the past year. They report that these routines target specific kinds of thinking that they are interested in developing in their students.

In our surveys, 16 out of 20 teachers reported See-Think-Wonder as one of their most commonly used routines. An analysis of the “think-track” data collected over the years also shows that STW was one of the most heavily and consistently used routines by all teachers. About half of the teachers report that WMS was among their most frequently used routines and again this is confirmed by the “think track” data. Slightly less than half of the teachers reported Headlines among their most frequently used routines. Interestingly, teachers report that their use of the What Makes You Say That? routine is almost impossible to quantify, as that core prompt has become an integral part of almost every routine. Teachers find themselves continually asking students to support their thinking with evidence and report this in both survey and “think-track” data.

Student and Instructional Benefits

These three routines share the common structural characteristics of all routines: they are simple, explicit and easy to learn. They are useful across a variety of subjects and grade levels. As we have seen, they are flexible and dynamic. But how do teachers view them as vehicles for promoting and revealing thinking?

In discussing their use of these three routines in surveys and interviews, teachers talk about the benefits for their students and for their own instruction. These benefits reflect many of the epistemic moves and messages described earlier in this paper. Key thinking moves in the What Makes You Say That? routine include giving evidence and explanations, generating ideas, and, peripherally, identifying and exploring multiple perspectives. These epistemic moves are essential in

so many different areas of study in school and in life, which may make the routine appealing to so many teachers and students.

A fourth-grade teacher reports that the What Makes You Say That? routine “extends students’ thinking and gives them the space to support their ideas with evidence. The fact that I’m so curious and intrigued with their thinking is part of the ‘hidden curriculum’ in our room that says to students that their ideas and evidence are important. Following through with What Makes You Say That? is a bit like ‘wait times’ in that I’ll wait, saving conversational space for kids to explain their ideas fully rather than accept ‘the answer’ on the surface and move on. In general, What Makes You Say That? gives me a glimpse of what students understand and why it’s much easier to do a quick assessment of whether that student ‘has it’ or if and what I need to re-teach.” Another teacher adds, “I learn things they know or notice that I would not otherwise know, it leads to a discussion. I often use their evidence as a launch into another question.”

These teachers point out that the instructional benefit of the What Makes You Say That? routine is diagnostic, revealing students’ conceptions or misconceptions and ideas and indicating future instructional direction. It also uncovers students’ interests, encourages them to make connections and helps to launch new ideas. In addition to the structural characteristics of this routine, its messages that learning starts with one’s own ideas and students need to get personally involved with learning seem to be leading reasons for the popularity of this routine.

Some of the epistemic moves most strongly connected to the See-Think-Wonder routine include generating ideas and questions, and making discernments and evaluations, among others. This routine sends powerful epistemic messages about learning, specifically that learning starts with the learner’s own ideas and that questions are engines and outcomes. A first grade teacher says that “See-Think-Wonder allows us to share ideas and deal with misconceptions and ‘wonder’ increases our curiosity! Students feel like we are here to build their understanding.” Another teacher reports, “I

find out what students are interested in and can hear how their vocabulary is developing. It gives me a picture of their understanding.”

The messages this routine sends are similar to the What Makes You Say That? routine: learning starts with learner’s own ideas, and learning involves challenging and revising one’s ideas. The routine encourages students to get personally involved by asking them to make observations and connections and to share thoughts and wonderings. The See-Think-Wonder routine leaves students with “wonders”, or questions, rather than answers which is a powerful shift in understanding for some students.

The main epistemic move associated with the third most commonly used routine, Headlines, asks students to reflect on and consolidate learning. Additionally, the Headlines News routine asks students to construct a reason-based synthesis. Both versions of this routine send the strong message that learning involves uncovering complexity. When teachers talk about the Headlines routines, they often mention the essence-capturing function of the routine and how it helps provide insight into their students’ understanding of a topic. “Headline News encourages students to see the “big idea,” reports one teacher. “It allows them to put their knowledge in their own words.”

A third grade teacher also uses the routine to get a better sense of her students’ understandings and to consider the shape of future lessons: “I think it’s a great vehicle for closing a group of experiments for the end of the day or the end of that time that you are working, because I think it also puts that information of headlines in the kids’ heads so they are thinking about it even though they are going home or whatever. I think they are pretty powerful. It gives good direction as to where to go, because it really kind of outlines the direction of the next day’s lesson. You might have misconceptions that come up and disagreement, so you have lots to work with the next day.”

Reflections on routine use at Long Lake School

Routines are an important part of the school culture at Long Lake, shaping the daily activities of teachers and students. Teachers have integrated routine use into the everyday fabric of their classrooms across many subject areas with a wide variety of routines being used. Teachers consistently use a much smaller subset of these routines across all grade levels. What Makes You Say That?, See-Think-Wonder and Headlines are three successfully adopted routines at Long Lake. The epistemic messages being conveyed through the use of these routines indicate that the Long Lake community is striving for an inquiry-oriented and active approach to learning. These teachers want their learners to be self-motivated, engaged and encouraged to reflect on their own thinking. Teachers report that thinking routines are contributing to deeper thinking and understanding in their classrooms, benefiting both the students and their own instruction:

The routines provide easy access to kids' thinking. They promote substantive conversation. They let me choose the kind of thinking I want others to do. They provide thinking rich activities. In most cases, I get a better idea of how students are applying knowledge in their own thinking and assignments/projects. In some cases studying kids' responses reveals their misconceptions or superficial knowledge and point me back toward more concept development before pressing ahead.

Conclusions

In the Visible Thinking project, we began our work with the premise that routines were culture shapers, and, hence, a potentially powerful way of conceptualizing the teaching of thinking so as to transform classrooms into more thoughtful places. This core principle has been substantiated by our work across three projects on three different continents. In each case, we have seen that thinking routines are more than strategies that cultivate students' ability or that simply engage them in interesting activities. Through the epistemic messages embedded in the routines, both students and teachers come to view and approach thinking and learning differently as a result of using routines.

Students become more self-directed learners. Teachers come to see students as more thoughtful and engaged. Learning becomes a collective endeavor involving both teachers and students.

This shift doesn't occur through the simple application of a set of steps however, but over time and with considerable thought. As teachers begin to unpack the thinking moves designed into a routine they are able to lead students beyond superficial responses. As they develop models of and language for thinking in their classrooms, thinking is demystified and made visible to students. As teachers use routines to focus on thinking, they themselves are drawn into students' thinking and ideas. In this process, teachers come to see that assessing students' understanding requires that their thinking be made visible. In this way, thinking routines are often self-perpetuating. The response of students from their use encourages their continued use. Over time, the routines of a classroom do become explicit, and through their use patterns of thinking are established.

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