Making Thinking Visible in Elementary Schools

Improvement Facilitators:
Kristen L. MacConnell, Ph.D.
And
Stacey Caillier, Ph.D.

Improvement Science Group
Rosemarie Biocarles-Rydeen, M.Ed.
Amber George, BFA
Grace Maddox, M.Ed.
Trevor Mattea, M.Ed.
Paul North, M.Ed.
Matt Sheelen, M.Ed.

Overview of Making Thinking Visible in Elementary Schools

Six teachers and one supporter at High Tech Elementary Chula Vista (HTeCV) explored ways to make thinking visible for their students. We felt like we were just scratching the surface with students' thinking and we were passionate about finding effective strategies to not only push our own students thinking throughout the day, but wanted to find effective strategies for our colleagues to use so as a school we could better support deeper thinking and deeper learning. We formed an improvement research team to explore how different change ideas around making thinking visible, documentation of student thinking, and use of specific language around thinking might impact student learning on a larger scale. As part of this work we set an overarching goal of identifying pedagogical practices around thinking that support and push student thinking and learning across grades and in a variety of contexts.

What is Thinking?

When we use the word "think" as a verb it is rated by the Oxford World Dictionary as the twelfth most used verb in the English language (Ritchhart et al., 2011). "Clearly the word think plays an astonishingly prominent role in our speech and writing, but for all of this usage, how well do we understand what it actually means to think" (Ritchhart et al., 2011)? Thinking is a large construct and as such has been defined by individuals in many different ways.

Researchers from Harvard's Project Zero discuss thinking as not only skills, but also as dispositions. These researchers report that in order to be a good thinker, one must be open-minded, demonstrate curiosity, use evidence to support ideas, exhibit skepticism, and show imagination (Perkins & Ritchhart, 2004; Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000). When students "develop greater awareness of thinking processes, they become more independent learners capable of directing and managing their own cognitive actions" (Ritchhart et al., 2011).

Why is Making Thinking Visible Important?

We live in world that is changing exponentially. There is no longer a competitive advantage for having an abundance of factual information as one enters the workforce. Knowledge has become "a commodity available to all with the swipe of a finger" (Wagner & Dintersmith, 2015). Instead of filling ourselves and students with facts, we need to teach students to be good thinkers. People who are successful are able to " ask great questions, critically analyze information, form independent opinions, collaborate, and communicate effectively" (Wagner & Dintersmith, 2015).

As this new vision for education emerges so does a new vision for our students. We need to paint a rich portrait of students who are engaged, active thinkers who can communicate,

collaborate, innovate, and problem solve (Ritchhart, 2015). Building a culture in schools and classrooms around thinking is a starting point for this shift from an antiquated model of education to a more modern view of education.

We have learned through research and through experience that children do not automatically recognize productive patterns of interaction. They need coaching about how to think and work collaboratively.

How and when will we make students' Making Thinking Visible?

This Change Package provides resources for supporting deeper thinking in the classroom in a variety of ways. By building in **opportunities** for students to share their thinking throughout the day, providing scaffolds for **language**, and by asking more **open-ended questions**, you can develop a culture of thinking in your classroom that supports students to stretch their thinking.

Remember these principles as you are designing your next lesson: (1) Learning is a consequence of thinking, (2) Good thinking is not only a matter of skills, but also a matter of dispositions, (3) The development of thinking is a social endeavor, (4) Fostering thinking requires making thinking visible, (5) Classroom culture sets the tone for learning and shapes what is learned, and (6) Schools must be cultures of thinking for teachers. (Ritchhart & Perkins, 2008).

How do I use this package?

This package contains strategies we have tried on our classrooms over the course of the year that we found particularly effective. Specifically, for each strategy, we provide 1) a brief overview of the strategy, 2) a rationale 3) how these strategies and practices will help your students, and 4) what, if any, instructional resources you will need.

Ideas Worth Sharing

Title: Making Thinking Visible through Class Blogging *Author: Paul North*	
What is it?	A class blog where students write paragraph-long posts about their experiences at school and other students leave comments.
Rationale:	Student-written blog posts and comments position students at the center of the learning process and promotes dialogue. In addition, a blog allows for all students to participate in the discussion, as opposed to a verbal conversation, which may have a limited number of participants. In addition, a blog can give students more time to process information and form a response. From an analytic perspective, a blog provides a visible, objective record of students' thinking over time.
Student Outcomes	Students can strengthen and stretch their thinking about blog topics. Students can build strong relationships with classmates through digital interaction.
When to Use	Any time! During writing centers, a small group plans, drafts, and edits their blog posts with teacher support; at the same time, other students leave comments for existing blog posts.
Core Ideas	● Learning is a **social**, **dialogic** process. ● When students see themselves in the discussion, they feel **affirmed**. ● Students have more to say, if they are given **time and space** to say it.
Guidelines	Some guidelines include: ● Create and uphold strong norms for the blog (e.g. be kind, be specific, be helpful). If necessary, use administrator settings to avoid unhelpful comments. ● Highlight comments that share the author's thinking (e.g. connections, wonderings, reasoning). ● Encourage students to respond to each other's thinking by modeling and co-drafting comments. ● Support readers who many not be able to access text on the blog independently.
Tips	● Start blogging as a shared writing experience so students understand what makes a good blog post. ● Encourage parents to post comments to the blog so students can interact with a larger audience. ● Tweet your blog at #comments4kids to build an authentic and safe online audience for students
Examples	www.mrpaul3.weebly..com/blog

Title: Authentic student discussion in Number Talks *Author: Matt Sheelen*	
What is it?	A collection of sentence frames to use during number talks to increase student engagement and authentic response.
Rationale:	Number talks are an excellent way to develop student mathematical thinking but they lack the structure of student engagement with each other's ideas. These simple discussion starters can allow you to increase your student engagement in mathematical discussions while allowing for critical thought among peers.
Student Outcomes	Students will be able to comment and ask questions about each other's mathematical thinking.
When to Use	During Number Talks or any Math discussion
Core Ideas	**List intelligent, academic rationale behind work here when I find it.**
Guidelines	1. Introduce the sentence frame, for example "I agree because...." 2. Write the frame on the board or make an anchor chart so students can reference the frame 3. Model how to use the frame 4. Begin your discussion! 5. Prompt your students to use the frame as needed.
Tips	● Start slowly! ● Introduce sentence frames once per week or two weeks over a period of time. ● Start with some simple discussion starters and then advance as your students gain comfort and skill in utilizing the tools. ● Don't be afraid to remove phrases that aren't working for your class.
Examples	I agree because... I disagree because... I would like to revise my answer because... Why did you.... How did you...

Title: Teaching Students to Ask Purposeful Questions during Math *Author: Grace Maddox*	
What is it?	A step-by-step guide that helps students to pose clarifying and probing questions to a partner in math
Rationale:	When discussing math problems in partners, students often jump straight to comparing answers. They might say, "I got ____, what did you get?" However, students can learn much more when they focus on the problem-solving process rather than on the answers. This step-by-step guide helps students to look at a partner's work, identify misconceptions, and ask purposeful questions to arrive at deeper understandings together.
Student Outcomes	Richer conversations about math that are focused on explaining thinking, not just comparing answers
When to Use	Students should first have the opportunity to independently grapple with a math problem or performance task (between 5 and 15 minutes depending on the problem/task). This step-by-step guide can be used *after* independent work time when students are discussing the problem or task in partners or small groups.
Core Ideas	● Select a complex math problem or performance task for students to tackle. Illustrative Mathematics and Inside Mathematics are two great resources with which to start. ● Make a list of the discrete skills that students will need to have to solve the problem. For example, to successfully add two fractions with unlike denominators, students will need to know how to find a common denominator, add the numerators, list the factors, find the greatest common factor, simplify, and write their answer in a complete sentence. Note: for each of these discrete skills, there may be multiple strategies that students employ. ● Create a step-by-step guide that lists each discrete skill necessary to solve the problem and a question students could pose if their partner did not successfully complete a specific step in the problem-solving process (see example below). ● Adapt the guide to meet the demands of each new problem or task.

Title: Time Tracker *Author: Amber George*	
What is it?	A tool to support students' thinking and planning during project time
Rationale:	5th graders engage in a variety of activities during their time in art. It is important that students understand the relationship between the studio habits they are learning and the work they are creating. Understanding these relationships leads to deeper and thinking and learning. In order to make these connections, students also need to manage and plan their projects.
Student Outcomes	Students understand that habits lead to learning and overall improvement of skills. Students become aware of which activity or project leads to growth in what habit/skill.
When to Use	Daily.
Core Ideas	- Asking students to name their activity reinforces choice, independence and identity as a creative thinker and maker. - Requiring students to keep track of how they spend their time holds them accountable for productivity and time management. - We can monitor which studio habits students think about as they engage in project work.. - We can assess whether students are making meaningful connections between studio habits and project work, (i.e. reading an art history text may not help strengthen the habit of craft, learning how to use materials). - It allows for follow up and further discussion with a particular student on a particular habit.
Guidelines for the Routine	Students are given the time tracker at the beginning of class and are expected to have it filled out as they work and move (or don't) move from one project to another. At the end of class they turn them into the teacher for review and to give the instructor an idea of student progress and focus.
Tips	The habits can be changed to suit any focus of learning at any grade level.
Examples	Time Tracker Chart

Title: Math in 3 Acts *Author: Trevor Mattea*	
What is it?	This routine involves presenting math as stories, rather than traditional word problems. Instead of immediately giving students all of the information needed to solve a problem, students accumulate information gradually based on their questions. Think of these math stories as having three acts.
Rationale:	This routine resembles how we encounter math in the real world and encourages participation among students who might otherwise have trouble with written language or not see themselves at being "good at math." Plus, it's more fun!
Student Outcomes	Using this routine consistently increased participation among students who did not typically volunteer to ask questions or share their answers during conversations tied to traditional math instruction.
When to Use	Try this routine once a week to generate interest in math content you plan to teach through traditional math instruction.
Core Ideas	When some information is purposely withheld at the onset of a lesson, it puts all students on equal footing, thereby encouraging students who may not usually participate to play a more active role.
Guidelines	1. Students study a picture or watch a short video without any words or numbers, and they generate their own questions. The teacher poses a question that cannot be answered right away and asks students to estimate the answer and determine what information is still needed to solve. 2. Students collect additional information and revise their estimates in discussion with each other. 3. Students attempt to solve the problem and share their answers and strategies with each other before finally seeing another picture or watching another short video containing the answer to the problem.
Tips	● Record conversation notes in a Google Doc and project it in front of the class during the lesson to encourage participation, provide access, and reference later. ● Add relevant questions, information, and links to the Google Doc before the lesson to save time. ● It takes a long time to have each student share both the number she thinks is too low and the number she thinks is too high, so have each student share a low-high number range instead. ● If students share strategies on the whiteboard, take a picture and add it to the original Google Doc to reference later.

	● Use sentence frames to help students reflect on what they learned during the lesson. ● Ask students to create a visual to show what they learned during the lesson.
Examples	Math in 3 Acts: Giant Box of Donuts Outline Math in 3 Acts: Giant Box of Donuts Conversation Notes Math in 3 Acts: Giant Box of Donuts Student Reflection Math in 3 Acts: Giant Box of Donuts Student Illustration

Title: Using Student's Thinking as Models *Author: Rosemarie-Biocarles-Rydeen*	
What is it?	A structure where students use student thinking as a model to expand upon their own thinking.
Rationale:	Students have an opportunity to revisit deeper thinking modeled by peers and in turn, can reflect upon their own thinking. This structure allows students to think more deeply about their ideas and decide whether their ideas have changed or remained the same.
Student Outcomes	Students develop metacognition (thinking about their thinking) and practice the language needed to communicate their thinking.
When to Use	We recommend Implementing this strategy after you have documented a striking example of student's thinking (through video or dictation). This model of deeper learning may be thought provoking or controversial. The purpose is to create opportunities for students to think more deeply about a topic.
Core Ideas	● Taking time to reflect helps us make connections and deepen our learning. ● Thinking about what we learn today impacts how we think and what we do tomorrow. ● While teacher models of thinking are important, peer models can be even more powerful. The more models and examples we can provide for students, the more we can stretch their thinking. ● The more opportunities students to have to share thinking in a way that encourages and supports deeper thinking, the more agency they develop for sharing their ideas with others.
Guidelines	● Make sure students are comfortable sharing their thinking aloud. Build in a regular structure for sharing thinking, like a 10 minute reflection time following project work.

	● Ask probing questions like, "What makes you say that?" ● Have a structure in place in which you document student thinking (video, exit slips, journals, daily oral reflection). ● Present the model of student thinking and have students revisit their thinking (add to, revise)
Tips	● Always have your phone or a camera in reach! ● Make sure you upload your videos and delete them off your device so you don't run out of storage space during a great thinking moment! ● If you know you will be reflecting on an important question in class, invite a colleague to come in and capture video for you.
Examples	● Video of students thinking before and after using a model of student thinking. ● Video of Students sharing their thinking about the essential question of their project, "What is the magic of the Circus?"(this video was shown to students to help expand their thinking about what they learned in their project)

Improvement Science as a Model for Professional Learning- The Rollout

Improvement science builds on other forms of practitioner research – such as action research and design-based research – and assumes practitioners and students, as insiders, are in a unique and powerful position to both contribute to the knowledge base and transform schools (Bryk et al., 2011; Donovan, 2013; Gutiérrez & Penuel, 2014, Caillier, 2008). At its best, Improvement Science cultivates dispositions to learn with and from students, to ground our reflections and next steps in evidence of student learning and engagement, to engage in reflective conversations with colleagues, and to look to existing research and craft knowledge to identify best practices and adapt them for our own contexts.

Using Improvement Science as a model of professional learning has a lot of promise in schools because of its inherent structures: in depth investigation for understanding the problem; the importance of developing a theory of action grounded in the literature; setting a specific aim that is observable and measurable; quick, iterative cycles of inquiry; easy and meaningful data collection to guide learning; structures for sharing; a method for documenting ideas, predictions, learning, and next steps, and a person who serves as a hub to help support the process.

In this section you will find the facilitator's agenda for our first 3 sessions with the staff. We spent a total of 4 hours and 15 minutes with staff rolling out our work with improvement

science for the school year. In addition, we devoted one of our first staff meetings of the year to talking about what we wanted to get better at in our practice and sought feedback from the staff on initial ideas. We used the staff's initial ideas to help us narrow down topics when identifying improvement groups in our first session launching improvement science. Another important note is that while we did not spend time as a staff digging into the literature, the hub of each group was grounded in the literature. It is important that at least one member of the team has a firm understanding of the literature. I would recommend allocating time for your staff to read a few articles together to help ground them in their topic before launching into PDSA cycles. This session could be a 4th session and to close out the meeting you could have staff revisit their driver diagram's and see if they wanted to make any adjustments to drivers or change ideas.

Facilitators Agendas and Presentations

Session 1: Identifying Improvement Groups
Session 2: Digging into the Problem & Developing a Theory of Action- Part I
Session 3: Digging into the Problem & Developing a Theory of Action- Part II

Plan, Do, Study, Act Cycles (PDSAs)

Our team met every other week for one hour, as a team, to check in and share our learning. Because our time was limited, one person's work was showcased each session so we could share our practice and get some feedback. We followed the same protocol each meeting:

AGENDA

Whip Around: What did you learn? What are you excited about? What challenges did you face? (10 minutes)

Data Dive: Showcase Teacher's work (15 minutes)

Record your learning on your PDSA (5 minutes)

Partner Up- What's next? Fill out your new PDSA form (20 minutes)

Exit Card: Where are you at with your thinking? (10 minutes)

I served in the role as the Hub. As the Hub I facilitated the meetings, set the agendas, supported teachers with data collection and analysis, and I met with teachers one to one on the off weeks to ensure the work retained its momentum between our bi-weekly meetings, and I kept the group grounded in the literature which guided our work.

Making Thinking Visible Resources

- Articles
  - When Kids Have Structure for Thinking, Better Learning Emerges (2016)
  - Why Don't You Tell Other Kids? (2015)
  - Fostering Deep Thinking in the Primary Classroom (2015)
  - Helping Students Become Better Thinkers (2014)
  - Tools to Enhance Young Children's Thinking
  - Accountability in Three Realms: Making Learning Visible Inside and Outside the Classroom (2010)
  - Uncovering students' thinking about thinking using concept maps (2009)
  - Visible Thinking (2005)

- Books
  - Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners (2011)
  - Creating Cultures of Thinking: The 8 Forces We Must Master to Truly Transform Our Schools (2015)
  - Visible Learners: Promoting Reggio-Inspired Approaches in All Schools (2013)

- Thinking Routines
  - Understanding Routines
- Websites
  - Project Zero
  - Artful Thinking

Additional Information About Our Improvement Science Project

Literature Review
Theory of Action
- Driver Diagram
- Fishbone Diagram

Our School
References