

PATHWAYS TO UNDERSTANDING: DEVELOPING STUDENTS' MEMORY & NOTE TAKING SKILLS



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THE PURPOSE OF THESE MATERIALS

Memory takes on many forms: long-term, short-term, working, visual, sensory, episodic and several others. Our ability to hold information in our head and manipulate it in the short term relies on our short-term and working memory. This is a skill we use in reading, writing, and mathematics as well as in our general problem solving, following directions, and planning. The process of retrieving things from our working memory, as well as our manipulation of these items in our short-term memory assists the movement of information into our long-term memory. Activating retrieval processes immediately after exposure, rather than days or even weeks later when studying for a test, can better help to anchor ideas in our long-term memory.

There is currently a great deal of interest in developing students' working memory as research has shown it to be a key predictor of academic success, particularly in the early years. However, there are debates about how much working memory can be developed, that is how much can we increase our ability to hang on to information in the short run. Some studies suggest that working memory is limited to four unrelated, discrete items. However, we often in effect remember more through "chunking," or forming related groups. For instance, rather than remembering two numbers such as 5 and 8, we may put them together and recall 58 as one chunk. At the same time, early intervention to enhance memory in general may help to reduce some academic difficulties and assist the formation of long-term memory as well.

These materials offer some tools and strategies for helping to develop students' memory and assist them in their note taking and synthesizing of content. However, these tools also serve a much broader purpose: facilitating students' deep engagement with content. By recalling objects from memory or taking notes only after a presentation, students free themselves up to become more engaged in the moment. After their recall of events, ideas, or objects, discussion and interest are often piqued and there is the chance to delve more deeply into the ideas being explored. Furthermore, recent research has shown that when students try to take down every note during a class, whether when using a computer or taking notes, they not only are failing to participate but they also remember very little of the content. In contrast, when students do more synthesizing of ideas or recalling of important points to jot down *after* a lecture or presentation, this additional processing and retrieval of information helps to develop memory.

It could be argued that schools focus too much on memory already, often emphasizing short-term learning rather than deep understanding, so why develop routines for enhancing memory? One reason is that even when focusing on understanding and deep and rich learning, memory still plays a roll. We still need to get information from our short-term and working memories into our long-term memories as we build understanding. We need to hold content and ideas in our working memory as we discuss and explore ideas. Second, these strategies are not simple memory tricks, such as, mnemonic devices, but offer ways of helping to process, synthesize, classify, and question information.

HOW TO USE THESE MATERIALS

In this set of materials you'll find several different *thinking routines* that help students use and develop their memory of content, take notes on that content, and process what they are learning. A thinking

routine is a short, stepwise procedure that helps students think deeply about something. Thinking routines are designed to be simple to use and to teach themselves as they unfold. Neither you nor your students need prior experience with thinking routines in order to use them successfully. The concept of thinking routines was originally developed at Project Zero as part of the Visible Thinking approach. You can learn more about Visible Thinking and related Project Zero resources in the Further Resources section at the end of these materials.

There are two different ways to begin using these materials. Feel free to use whichever option appeals to you:

1. Introduce students to some of the research around note-taking, focused vs. distracted studying, and memory to students:
 - Research on the importance of avoiding distractions when studying, particularly social media web surfing, can be found at: Murphy Paul, Annie. "The new marshmallow test: Resisting the temptations of the web." *The Hechinger Report* 3 (2013).
 - Research on note taking can be found at: McGloin, Maggy. "What you miss when you take notes on your laptop." *Harvard Business Review*. July 31, 2015. Accessed from: <https://hbr.org/2015/07/what-you-miss-when-you-take-notes-on-your>
 - Research on the importance or retrieval of information for consolidating and building long-term memory can be found at: Karpicke, Jeffrey D. "Retrieval-based learning active retrieval promotes meaningful learning." *Current Directions in Psychological Science* 21.3 (2012): 157-163.

- or -

 - Pick any of the thinking routines and just dive in. Simply read it over, select an image for introducing the NDA routine, a short video to try out the +1 routines, or a provocative reading to use with the Make Note routine, and then try it with students. To get a sense of how any content might work, it is always a good idea to try out the routine with the chosen content yourself first. This will give you an idea of the appropriateness of the content in terms of subject, length, and complexity.

Make Note

A routine for synthesizing key ideas, raising discussion points, and identifying puzzles of understanding



After a lecture, film, reading, or discussion learners “make note” of ONE of the following:

- What is the most important point?
- What are you finding challenging, puzzling or difficult to understand?
- What question would you most like to discuss?
- What is something you found interesting?

PURPOSE: WHAT KIND OF THINKING DOES THIS ROUTINE ENCOURAGE?

This routine can be used to enhance students' memory of and engagement with ideas by focusing on capturing the heart and distilling key issues and questions *after* a learning episode rather than in the midst of it. This allows them to participate fully knowing that there are times to consolidate their learning afterwards.

APPLICATION: WHEN AND WHERE CAN IT BE USED?

This routine can be used after any episode of learning, whether from a discussion, video, lecture, or reading. The routine may be done at the end of class or at regular intervals (every 10-15 minutes) during the class. It can also be done after an independent reading. Another alternative use is as an "exit ticket" strategy in which students make their note on an index card at the end of class and turn it in to teacher upon exiting the room.

LAUNCH: WHAT ARE SOME TIPS FOR STARTING AND USING THIS ROUTINE?

Explaining the psychology behind this routine can help students learn how to learn. The routine is not simply an activity you are asking to students to do, but a tool designed to help us use our brains more effectively for learning. Explain to students that our learning and memory are enhanced by the regular distillation of key ideas and points as well as our identification of emerging questions and puzzles. Furthermore, the sharing of these ideas and questions supports the group's learning by facilitating continued exploration, discussion, and synthesis as well as providing the instructor with learning feedback. Encourage learners to engage actively in the learning episode without taking notes so as to be fully present. Some students who are used to spending their time in class may initially resist this call to engage. For these students, it may be useful to share some of the research on note taking and the value of engagement. You might also want to prepare notes in advance yourself, and tell students you will be sharing your notes of key points with them after class but the point now is to engage with the ideas and issues.

At regular intervals (if there is a lot of content) or at the end of the lesson, pass out index cards and ask each student to *make note* using any one of the above prompts. Have students record their thinking anonymously. This will take approximately 3-5 minutes. Whether done at intervals or at the end, there needs to be some kind of sharing of the notes. This could be done in a number of ways:

- 1) Have small groups share and discuss what they have written,
- 2) Have one group collect their index cards and pass them to another group. Upon receiving the new note cards, the cards are randomly distributed and each student reads and responds to the card they receive. Cards are then recollected and passed back to the group from which they came.
- 3) The teacher collects all note cards and redistributes them randomly. Students then read aloud the note card they receive. The teacher may document and organize the responses.
- 4) If using the exit ticket method, the teacher collects, reads, and summarizes the Make-Note cards as a form of formative assessment and begins the next class by sharing or in some way making use of what was shared.

NDA: Name-Describe-Act

A routine for the looking closely, noticing, developing memory, & analyzing



Choose an image, object, or event to examine closely or select an object, event, or topic to analyze and:

- NAME** Recalling from memory, name and make a list of all the parts or features you can remember. These will most likely be nouns, things you can point to and name.
- DESCRIBE** For each of the things you have named, add a description. What adjectives would you add to the nouns you have listed?
- ACT** For each of the thing you have named, tell how they act. What are they doing? What is their function? How do they add or contribute to the whole?

PURPOSE: WHAT KIND OF THINKING DOES THIS ROUTINE ENCOURAGE?

This routine can be used to enhance close looking, develop descriptive language, and develop working memory. Depending on the stimulus/context, it can also be used to facilitate analysis of a topic

APPLICATION: WHEN AND WHERE CAN IT BE USED?

This routine is used to help students notice and describe an image, object, or observed event in ever increasing layers of detail. For young children or for students learning another language the routine can also help to build up language proficiency. When used with a topic that has been studied, the routine helps to solidify understanding by analyzing the parts or aspects of the topics and then developing more detail and understanding around each of those aspects. It can be done in groups or individually but only when done individually is it likely to help boost working memory.

LAUNCH: WHAT ARE SOME TIPS FOR STARTING AND USING THIS ROUTINE?

Explaining the psychology behind this routine can help students learn how to learn. The routine is not simply an activity you are asking to students to do, but a tool designed to help us use our brains more effectively for learning. A simple explanation of the difference between long-term and short-term memory can be useful with emphasis on the retrieval process as a tool for moving things from short-term into long-term memory.

To facilitate looking closely and develop working memory, have students look silently at an image object, or event for 1-2 minutes. Instruct them to notice as much as they can. Remove the image from view and ask students to name as many things as they can that they recall seeing. Tell students to focus on just things they can name and touch, that is specific objects (i.e. “soldiers, guns, flames, etc.” rather than “a fight” or “war”). Doing this in writing helps students keep track of items. However, it can be done orally. Generally if students can name at least 10 objects, this is considered good memory. You might discuss with students how they remembered. For instance, some may have used visual memory to recreate the image they saw and then name things. Others might have chunked the image into sections.

Pair students up for 3-5 minutes of “Describing.” The first person names an item off their list while their partner chooses a word to describe that item. Roles are reversed and the second person then names a new item while their partner describes it. This process continues until all items are named and described. If one person names something that their partner didn’t notice, then the person describes it him or herself. An alternative approach would be to have students describe everything on their list with a single word that captures its key qualities. If you feel students might struggle with the description, you may choose to return the image or object to view for one more minute, asking students to look again at each item on their list to get a better sense of it. Ask them to think about what qualities it possesses, how it might be described to someone who couldn’t see it. Look for one minute without writing. Again, remove the image from view and ask students to add description to each item on the list.

For the “Act” component of the routine, you want students to focus on verbs that capture an action. This segment will also take between 3 and 5 minutes. You can return students to their pairs or form new pairs for this section of the routine. Again, have the first person read off something they have named from the image while the partner uses a single verb to tell how it is acting. You might want to tell students that once a verb has been used it can’t be used again. This will force students to be more imaginative and not merely keep saying objects are “sitting.” An alternative approach that young children sometimes enjoy is to pick an object from the image and then silent walk around the room “acting” as if they were that object. If you

feel students might struggle with the description, you may choose to return the image or object to view for one additional minute, asking students once again to focus on the items they have listed but with attention to how the item is acting. What is it doing? What role does it play? How does it contribute to the image as a whole?

As a conclusion, return the image to view as students discuss how this process helped to focus their attention and delve more deeply into the image. Often students' interest and curiosity are piqued by this routine and it can be a great opportunity to introduce background on your selected image that might set the stage for further study.

This routine also can be adapted for examining a course topic students have already studied or are about to study. To use NDA in this kind setting, have students make a list of all of the facts, parts, or aspects of the topic the class has studied from memory. Next, have them describe each of these parts, adding detail and descriptive language. Finally, for each item, have students tell how it acts in conjunction with other things? What is its purpose or role?

+1 Routine

A routine for the identifying important ideas worth remembering



After reading a text, watching a movie, listening to a lecture, or being presented with new information or ideas in some manner, a group of learners does the following:

- RECALL** In 2-3 minutes and working individually, each learner generates a list of key ideas that he or she recalls from the presentation that he/she feels is important to hang onto. Learners do this from memory rather than reviewing notes or material.
- ADD (+) 1** Learners pass their papers to the right. Taking 1-2 minutes, each student reads through the list in front of him/her and *adds one new thing* to the list. The addition might be an elaboration (adding a detail), a new point (adding something that was missing), or a connection (adding a relationship between ideas). REPEAT this process at least two times.
- REVIEW** Return the papers back to the original owner. Learners read through and review all the additions that have been made on their sheets. At the same time they may add any ideas they have picked up from reading other's sheets that they thought were worthwhile.

PURPOSE: WHAT KIND OF THINKING DOES THIS ROUTINE ENCOURAGE?

The routine provides learners with a structure for identifying key ideas and committing them to memory. Research has shown that engaging students in memory work immediately after the presentation of information helps learners to retain that information more effectively.

APPLICATION: WHEN AND WHERE CAN IT BE USED?

As learners we often encounter new ideas, information, and content. At upper levels, students often take notes on this material but too often may do so in a superficial, unthinking manner by merely writing down everything for possible review later. This routine could be used as an alternative to traditional note taking. The benefit of post-lecture note taking is that students are required to identify key ideas, an important processing move, which is often easier to do after material is presented than during its presentation. At the same time this routine harnesses the power of the group to enhance everyone's notes while providing individuals with a written record to hang onto for future reference.

LAUNCH: WHAT ARE SOME TIPS FOR STARTING AND USING THIS ROUTINE?

When presenting students with new information, in whatever form, tell them that you will be trying out a new note taking routine that will help them identify key ideas from the lesson/material. Instead of taking notes, ask learners to listen, engage, and participate fully in the lesson/lecture. You may want to assure them that they will have access to your slides or lecture notes so that students are worried about missing important information. Explaining the psychology behind this routine can help students learn how to learn. The routine is not simply an activity you are asking to students to do, but a tool designed to help us use our brains more effectively for learning. You may wish to tell students that research has shown it is important to engage memory right away when something is learned rather than waiting to try and memorize things for a test later. At the end of the lesson allow 10-15 minutes for the routine. Timing may be influenced by the complexity, richness and depth of the material that was presented as well as the age of students. Debrief this note taking method and discuss how to make it better next time.

ACKNOWLEDGEMENTS AND FURETHER RESOURCES

ACKNOWLEDGING GENEROUS SUPPORT

This bundle on transfer of learning is one of four related Visible Thinking bundles, all produced with the generous support of Independent Schools Victoria of Victoria State, Australia, Chief Executive Michelle Green. Warm thanks to Michelle and to Independent Schools Victoria for making possible the development of these materials.

FOUR VISIBLE THINKING BUNDLES

The four bundles include:

- *Exploring Complexity*, which offers thinking routines for investigating complex objects, systems, perspectives, controversies and more, across the disciplines.
- *Global Thinking*, which offers thinking routines fostering understanding and appreciation of today's complex globalized world.
- *Portable Knowledge*, which helps learners transfer what they learn in particular subjects to other contexts and studies far and wide.
- *Developing Students' Memory & Note Taking Skills*, this bundle.

VISIBLE THINKING IN GENERAL

This bundle of thinking routines reflects the Project Zero Visible Thinking Approach. Visible Thinking provides a research-based method to integrate the teaching of thinking flexibly into content learning, a method that both deepens content learning and fosters the development of thinking skills and dispositions. The approach has been developed over a number of years at Project Zero of the Harvard Graduate School of Education by several researchers including the present authors, with the participation of several schools and funding from multiple sources. Researchers and educators both within and beyond Project Zero have taken this general approach in several fertile directions while maintaining the general spirit and structure.

Besides the bundles referred to here, Visible Thinking offers many other thinking routines and ideas addressing various aspects of thinking and learning. There are two websites:

http://www.visiblethinkingpz.org/VisibleThinking_html_files/VisibleThinking1.html

and <http://pzartfulthinking.org/>.

Two books by Ron Ritchhart and colleagues present a version of Visible Thinking that emphasizes cultures of thinking: *Making Thinking Visible* and *Creating Cultures of Thinking*.

Online courses from the Harvard Graduate School of Education offer an introduction: *Visible Thinking* and *Creating Cultures of Thinking* – see <https://www.gse.harvard.edu/ppe/programs/online>.

Independent Schools Victoria from time to time offers a three session general online introduction to Visible Thinking, called *Visible Thinking*.