



**A Big 4 Strategy**

# INCREASING METACOGNITION THROUGH LEARNING PICTURES

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Metacognition is one of the four essential personal competencies emphasized by the Center on Innovations in Learning (Redding, 2014a, 2014b). Simply stated, metacognition is the process of thinking about thinking. It involves self-reflection: on one's current state, history, future goals, possible actions, and potential results and hence is critical in all aspects of school and in life (Fadel, Bialik, & Trilling, 2015). But how do we think about thinking? How do we know what we know, or perhaps even harder, what we don't know? In addition to building study skills and organizational strategies, we also need to foster our students (and our own) ability to know what they know. If "knowing" is the state of being cognizant or informed; of having awareness or familiarity (Oxford Living Dictionary, n.d.), we can conclude that being aware of one's own learning may be the definitive metacognitive competency.

Research concurs on the importance of thinking about thinking and knowing what you know. We can learn how to think about thinking through the deliberate use of practice and dedicated strategies that help us develop expertise faster and more effectively. In short, we can all get better at getting better (Boser, 2018). When learning something new, people who closely track their thinking outscore others, even those who have higher IQ levels. When developing mastery, focusing on what and how we understand produces outcome about 15 percentage points higher than intelligence alone (Veenman, 2008). Overall strategies to improve thinking about thinking include:

- **Setting achievable goals:**  
Then developing strategies to help reach those goals.
- **Considering your current state of knowing:**  
Asking: Do I really get this idea? Could I explain it to a friend? Do I need more background knowledge? Do I need more practice?
- **Reflecting on your learning:**  
Self-Assessing: Where am I now? What can I do next? What might the outcome be?



**Setting achievable goals****Considering your current state of knowing****Reflecting on your learning**

These three strategies hint at ongoing awareness of where you are academically (or across the personal competencies) and where you want to be. Tracking is essential for progress. It helps you know where you are and hints at numerous ideas to help you excel at your goal. Tracking triggers these self-reflection questions: Where am I in my own learning? What subskills have I mastered so far? Have I been studying or practicing enough? Do I know all the components of a complex issue? One won't know the answers to those questions without capturing some information somehow. Studies show that when students track their own knowledge and data, they take ownership of their learning, have more "intrinsic" motivation, and perform better on tasks in school (Marzano, 2009/2010). When students track their own progress on assessments using visual displays, the gains are even higher.

Take a look at the image in Figure 1 (Gregory, 1970). Unless you've seen this image before, it probably looks like an unorganized jumble of light and dark patches, not unlike the unorganized jumble of information we often get about our students or ourselves. But take a look at the picture again, this time knowing the title: Dalmatian (dog). Does the jumble make more sense now? Maybe?

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Figure 1.





Figure 2.

Now look at Figure 2 with the dog's image outlined and separated from the background "noise." You probably see the Dalmatian now and likely can't stop seeing it when you go back to look at Figure 1. What just happened? You were able to make sense out of the jumble of information in front of you.

We suggest that "learning pictures" allow you and your students to do the same thing with their learning—use visual imagery to gain a clearer picture of what is known, not known, and needs to be known. What do we mean by "learning pictures?" We mean information and measurement and evidence crafted into images that inform us about learning.

Learning pictures are stories quickly conveyed, stories about growth and learning goals. Humans quickly perceive patterns and connections, so learning pictures can reveal knowledge, status, relationships, and anomalies in ways that are easier to comprehend. Learning pictures can be broadly interpreted as students monitoring their own learning, which is linked to setting learning goals and tracking progress toward them. Marzano (2006) reminds us of the benefits of visual representations of student progress on motivation and outcomes. His data reveal a 26-percentile point increase in student achievement with regular use of graphical displays of data.

## ***What might learning pictures look like?***

The Appendix provides examples of the variety of ways learning pictures can be created and displayed. Sometimes a learning picture may be a chart or a graph. In fact, graphing itself is a critical skill; graphing one's own learning can increase both cognitive and metacognitive competences. However, learning pictures are not just limited to bar charts or line graphs or other more traditional visual displays of data (e.g., pie charts, box plots, scatter plots, spider charts, histograms). They may be similar to a classroom or school physical or virtual "data wall" (see TeachingChannel, n.d.), but they are more personalized with greater student ownership. More broadly, learning pictures can be embedded in student portfolios, digital records, or a collection of badges earned by demonstrating mastery or competency. Any imagery that conveys actionable information about performance, progress, and learning is considered a learning picture. The examples in the Appendix provide only a sampling of the infinite possible ways that students can capture and reflect on what they know. Teachers can

(and should) create learning pictures as well, both to visualize individual student or whole class learning<sup>i</sup> and to track their own professional development. Wormeli (2016) provides us with a number of examples:

We can also represent student growth in disaggregated areas of our curriculum through multi-shaded symbols of that curriculum. In science, for example, we can depict achievement in different areas of a topic by coloring different components of a diagram: a microscope, Period Table of Elements, barometer, magnet, or calipers. Or we can depict achievement through the successive attachments of pathways and switches to a master circuit design. In physical education, we can shade different systems of the body, a workout shoe, or a vertical rope climb. In English, it can be a multi-shaded shape symbolizing a style of argument, or perhaps a set of book spines set on a shelf on its way to a full "library" of knowledge and skills. (n.p.)



Learning pictures support visual thinking. They help students clarify and organize their thoughts about how they are doing and think analytically, for example, whether it's time to celebrate, keep on going, or try something different. Thinking and talking about their learning pictures provides critical practice in self-reflection, self-evaluation, and other social emotional competences. It supports thinking about presenting information in visual or graphical ways—how well the information is communicated to oneself and to others. Multiple learning pictures (across objectives or goals) support students' ability to evaluate and interpret information from diverse sources, assimilating or accommodating (or questioning) the various pieces of information into a more complete picture about themselves.

## ***How can learning pictures improve decision making?***

Better decisions can be made with learning pictures. Teachers can see when students are mastering new concepts or skills or when they might need more assistance. Not only might the need for assistance be flagged but also hints as to what type of assistance might be best: Does the picture indicate motivational issues? Is there a deficit in prerequisite skills? Could more practice be needed? Is there a particular pattern of errors that indicate a faulty notion? Student can ask themselves the same questions and reflect on what they know and don't know or even what type of learning picture may help them better think about their learning. Parents, administrators, specialists, all concerned members of the education community, can use learning pictures in the same way.



# ***What does it mean for students to create their own learning pictures?***

Creating and reviewing learning pictures can help build successful learning habits<sup>ii</sup> and increase student autonomy in choosing their route toward mastery and their goals. When students track their own mastery, their personal responsibility for learning increases, bolstered by real-time, tangible evidence of their progress (or lack thereof). They learn value of self-assessment and tracking progress over time, a skill relevant to life inside, outside, and beyond the classroom. Learning pictures can help students build self-efficacy; the visualization of their learning can spark effective action. We know that:

Students with high levels of personal responsibility and ownership of their learning use learning pictures to reflect on successes and failures;

They set measurable goals and map their progress toward achieving them;

They revisit and update their goals regularly using their learning pictures or other evidence to communicate changes; and

They frequently reflect on what is working for them and what they could do to better meet their goals.

Even small wins are enormous motivators. Learning pictures are a way to help students recognize (and celebrate) each step forward toward meeting their goals. A learning picture dedicated to personal successes big or small (victories) can help students remember what they have accomplished and can be particularly useful for motivation or self-reflection when things aren't going as planned. A catalog of daily success serves as a concrete visual reminder of growth. A victory learning picture can be as simple as an ongoing (and hence growing) list of achievements kept on the back of a student's notebook or a dedicated display; the important point is that it's easily accessible for recording and reflection.

# *How do we support students in creating their own learning pictures?*

Student learning pictures must be personal, and personalized.<sup>iii</sup> They should not only reflect an individual's performance or progress but also be in tune with the types of information that learner wants to see, how he or she wants to see it. Learning pictures should be personalized and express student ownership. Tracking information to be displayed on learning pictures should be quick and easy for that learner. Use a system that makes sense for that individual: consider age, interest, topic, and resources at hand, including digital devices. Gathering information for learning pictures should be simple enough that it becomes routine—in other words, a learning habit.

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## *How can learning pictures influence school culture?*

Schools, districts, and states that embrace learning pictures see measurement and data and analysis as positive, not punitive. Reactions can be constructive, and importantly, celebratory. They give learners and the people that care about them an effective tool to visually reflect on learning and convert insight into action. Teachers and administrators are instrumental in creating a culture that supports thinking about thinking and knowing about knowing through learning pictures. It requires establishing a positive environment and classroom norms<sup>iv</sup> in which using measurement, data, and learning pictures is considered a valued metacognitive competency.



## ***How might technology support learning pictures?***

The creation of learning pictures can be low tech (i.e., paper based) or high tech (i.e., digitally created; Twyman & Heward, 2018). Most of the examples in the Appendix are made with paper and other common classroom materials. However, with the use of personal devices and the use of learning and tracking apps on the rise, digital technologies<sup>v</sup> have an increasingly relevant role to play. Many e-learning software programs automatically create graphs of student performance or progress; teachers and students are increasingly familiar with visual displays, the management of data, and data interpretation. Electronic grade books are increasingly common and can be easily manipulated into learning pictures for teachers and students. For instance, in a table showing student progress toward a competency or standard, data fields could be shaded green when met, yellow when progressing, and red when assistance is needed, or different fonts (style or color) could be used for formative and summative test scores. A quick look immediately reveals which students have achieved competence, who might need help, or which standards are more difficult for a class as a whole (Wormeli, 2016). Electronic data visualization (putting data in a visual context to understand its significance), data mining (discovering models that support or explain sets of data), and learning analytics (analyzing data to understand and optimize learning; see Baker, 2013, 2016) are rapidly expanding areas of study that emerged from a concept as basic yet robust as learning pictures.



Learning pictures provide students with the visual representations they need to self-monitor, self-reflect, and determine their next steps in learning. By supporting and enhancing metacognition, the use of learning pictures encourages students to recognize how they learn best and take ownership of their learning. They are tools for lifelong learners, a goal we have for all our students and ourselves. Learning pictures support educator analysis of their own teaching and impact on student learning, likely leading to more effective action. They are easy to create, can have a positive impact on motivation, and support thinking about thinking; let's use them.

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<sup>i</sup> When creating publicly displayed learning pictures (in the classroom or school), ensure compliance student data privacy policies and federal law (FERPA). For instance, in places with public access (all students, parents, the community), student names must not be displayed; however, some code or nickname may be used. Student names may be used only in secure locations.

<sup>ii</sup> See the chapter “Learning Habits” in this volume

<sup>iii</sup> See the chapter “Portraits and Possibilities” in this volume.

<sup>iv</sup> See the chapter “Norming” in this volume.

<sup>v</sup> See the section chapter “Digital Technologies in Support of Personalized Learning” in this volume.

# Appendix. Learning Picture Examples and Descriptions



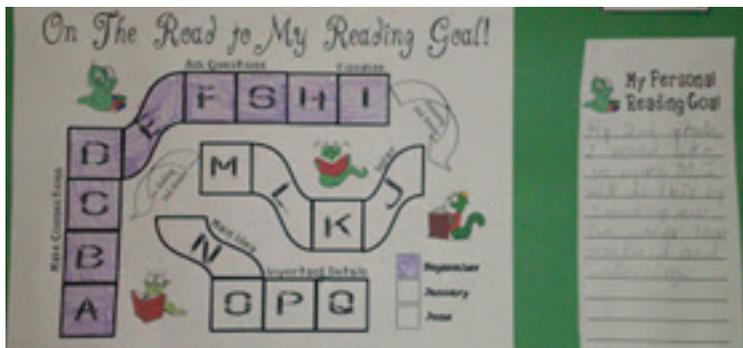
Ex. 1. A student maintained bar chart of pretest knowledge by objective. As skills are learned, or at posttest, more boxes are colored in.  
Source: YoungTeacherLove (n.d.)



Ex. 2. A student chart displaying sight words reading performance. Using a different color, the student circled and then plotted the number of words read correctly each day.  
Source: Creating Readers and Writers (2013)

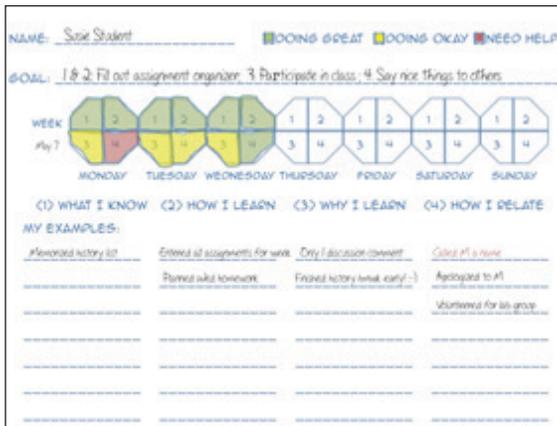


Ex. 3. Student sailboats represent their current DIBELS® data; students move their sailboats from red to yellow to green (the benchmark) as their fluency increases over time.  
Source: Focus on Results (2008)



Ex. 4. Sharing common overall reading goal, students celebrate growth by coloring the path as skills are mastered.  
Source: Focus on Results (2008)

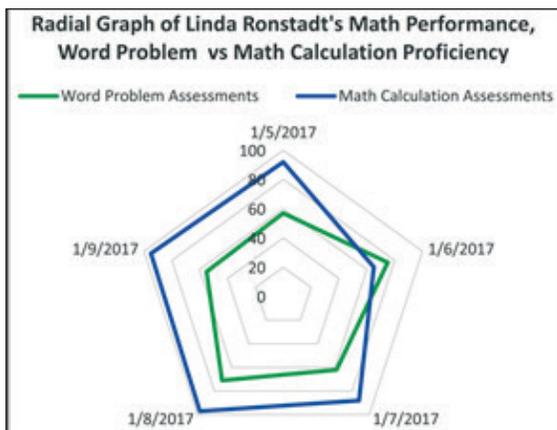
**Appendix. Learning Picture Examples and Descriptions, continued**



Ex. 5. Color-coded daily chart of a student’s self-report of functioning within each the four personal competencies, with specific examples listed for the day. A student goal might be to color all greens in a single competency area or across all competencies. Source: Twyman (2018)



Ex. 7. Students color in their pre- and posttest scores across objectives (or any instructional content) and are able to both specific growth and change over time. Source: YoungTeacherLove (n.d.)



Ex. 6. This spider chart (radial graph) represents a student’s percent score each day of the week for two learning goals. It both communicates progress and reveals patterns that indicate need for intervention. Source: Wormeli (2016)



Ex. 8. A daily tracker helps students keep track of things on a daily (or weekly) basis, such as turning in assignments, arriving to class on time, participating in class discussion, or saying something nice to someone. Daily squares can be shaded to indicate the quality of the behavior or numbered to indicate how many times it occurred. Source: Little Coffee Fox (n.d.)



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