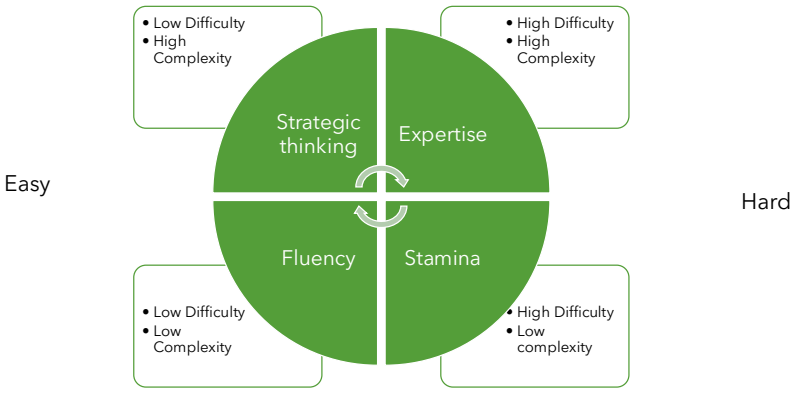
SURFACE, DEEP AND TRANSFER LEARNING

Levels of Demands

Lower-level demands (memorization): • reproducing previously learned facts, rules, formulas, definitions or committing them to memory • Cannot be solved with a procedure • Have no connection to concepts or meaning that underlie the facts rules, formulas, or definitions	**Lower-level demands (procedures without connections):** • are algorithmic • require limited cognitive demand • have no connection to the concepts or meaning that underlie the procedure • focus on producing correct answers instead of understanding • require no explanations
Higher-level demands (procedures with connections): • use procedure for deeper understanding of concepts • broad procedures connected to ideas instead narrow algorithms • usually represented in different ways • require some degree of cognitive effort; procedures may be used but not mindlessly	**Higher-level demands (doing mathematics):** • require complex non-algorithmic thinking • require students to explore and understand the mathematics • demand self-monitoring of one's cognitive process • require considerable cognitive effort and may involve some level of anxiety b/c solution path isn't clear

Leinwand, S., D. Brahier, and D. Huinker . *Principles to Action. Reston, VA*: National Council of Teachers of Mathematics, 2014 (pg 18)

More Complex



Easy

Hard

Less Complex

SURFACE

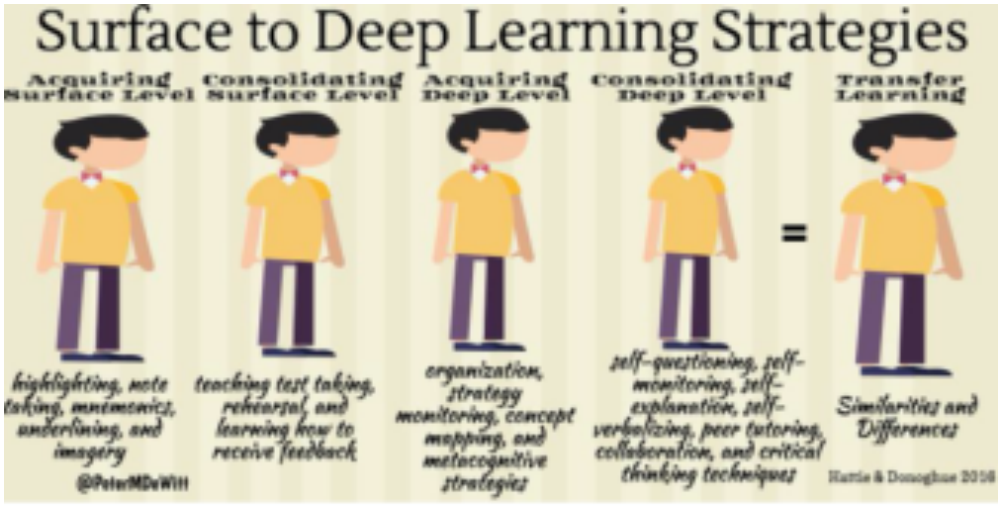
"Surface learning does not mean superficial learning. Rather, surface learning is a time when students initially are exposed to concepts, skills, and strategies. Surface learning is critical because it provides a foundation on which to build as students are asked to think more deeply." - Hattie, Fisher and Frey (*Visible Learning for Mathematics*, 2017)

DEEP

"We define deep learning as a period when students consolidate their understanding and apply and extend some surface learning knowledge to support deeper conceptual understanding . . . We think of this as a 'sweet spot' that will often take up more instructional time, but can be accomplished only when students have the requisite knowledge to go deeper." - Hattie, Fisher and Frey (*Visible Learning for Mathematics*, 2017)

TRANSFER

"Transfer learning [is] the point at which students take their consolidated knowledge and skills and apply what they know to new scenarios and different contexts. It is also a time when students are able to think metacognitively, reflecting on their own learning and understanding." - Hattie, Fisher and Frey (*Visible Learning for Mathematics*, 2017)



Surface Level vs. Deep Level Strategies

In John Hattie and Gregory Donoghue paper called Learning Strategies: A Synthesis and Conceptual Model they focused on surface, deep and transfer learning.

This is important for teachers, school leaders and instructional coaches to understand because when we all come together to talk about learning in our schools (i.e. stage meetings, teacher observations, walkthroughs, rounds etc.), we should spend part of that time focusing on how to get students from surface level learning, to a deeper level, and then ultimately get them to the place where they transfer that learning.

In Hattie's work it all begins with learning intentions and success criteria. In the paper, Hattie and Donoghue write,

Knowing the success criteria. A prediction from the model of learning is that when students learn how to gain an overall picture of what is to be learnt, have an understanding of the

success criteria for the lessons to come and are somewhat clear at the outset about what it means to master the lessons, then their subsequent learning is maximized. The overall effect across the 31 meta-analyses is 0.54, with the greatest effects relating to providing students with success criteria, planning and prediction, having intentions to implement goals, setting standards for self-judgements and the difficulty of goals."

When students know the learning intentions and success criteria, they can go from surface level to deep, and even transfer learning better than they could if they never had it before. After teachers use learning intentions and success criteria, they can move on to different strategies that will lead to each level of learning.

Hattie and Donoghue focus on acquiring and consolidating the different levels of learning. When teachers work with students on acquiring surface level learning, they are teaching students to use strategies like *highlighting, note taking, mnemonics, underlining, and imagery*. When students go to the next level of consolidating surface level learning, they are using strategies like *test taking, rehearsal, and learning how to receive feedback*.

Hattie and Donoghue go on to focus on acquiring deep level, and suggest strategies such as *organization, strategy monitoring, concept mapping, and metacognitive strategies*. The next step is to consolidate that deep learning by using strategies like *self-questioning, self-monitoring, self-explanation, self-verbalizing, peer tutoring, collaboration, and critical thinking techniques*.

Teaching students these strategies, and how to use them, will all help lead to transfer learning, which is the ultimate goal for us as teachers. This, of course, takes us back to the success criteria we used to start all of this in the first place. Hattie and Donoghue write*,*
If the success criteria is the retention of accurate detail (surface learning) then lower-level learning strategies will be more effective than higher-level strategies. However, if the intention is to help students understand context (deeper learning) with a view to applying it in a new context (transfer), then higher level strategies are also needed.

In the End - Why does all of this matter? In Hattie's research he found that project-based learning (PBL), something many teachers like to use, has an average effect size of around .15 which is well below the .40 which represents a year's worth of growth for a year's input. One of the reasons for the low effect size is that we often throw students into PBL without providing them with surface level learning first...nor do we provide the strategies needed when they come to a point that is very challenging.

Talking about surface level, deep level and transfer learning, as well as the strategies to use at each point and the questions to ask, will help strengthen the learning that happens in the classroom, and can ultimately lead to a higher level of student engagement.
Imagine having the time in our PLC's or faculty meetings to explore topics like questioning and learning strategies, instead of spending our time solely on pacing, testing or random adult issues where they complain about a lack of student engagement instead of focusing on the questions we ask which may actually increase student engagement.

THE BIG IDEA

"What and when are equally important when it comes to instruction that has an impact on learning. Approaches that facilitate students' surface-level learning do not work equally well for deep learning, and vice versa. Matching the right approach with the appropriate phase of learning is the critical lesson to be learned." - Hattie, Fisher and Frey (Visible Learning for Mathematics, 2017

SOME EXAMPLES OF STRATEGIES THAT COULD SUPPORT SURFACE LEARNING

Jigsaw method USEFUL FOR: virtually all subjects; can potentially be used for deep learning and transfer learning, as well

- The Jigsaw Classroom

You're probably familiar with this method, which starts with 4, 5 or 6 students (we prefer 4) each learning a chunk of content. The students then go to expert groups to double check their understanding and make sure they can teach the material to other students. Then they return to their home group and take turns teaching the material.

The part we often forget is the next one, but it's arguably the crucial part: check every student's understanding of every piece of content (whether with a quiz or other method).

Furthermore, there are many possible extensions. John Hattie, Nancy Frey and Douglas Fisher (writing in *Visible Learning for Science;* Corwin, 2018) mention a next step in which students return to their expert teams and discuss how the different content components relate to one another (this can be an opportunity for **moving from surface to deep learning or transfer learning**). Base teams could also take the information learned in expert teams and combine it to solve a problem, apply the knowledge to make something new, or to create an interpretive project.

- Integrating prior knowledge

One theme that quickly emerges as you scan across the strategies for teaching at the surface, deep and transfer levels is that determining, activating and integrating prior knowledge is one of the most powerful teaching strategies. While the research is clear on this point, less well-known are the variety of ways we can do this in our classes. The links (and book excerpt recommendations from our lending library) below attempt to tackle that question.

- Summarization
- Mnemonics
- Leveraging prior knowledge
- Vocabulary programs
- Direct instruction
- Organizing
- Recordkeeping
- Note-taking

SOME EXAMPLES OF STRATEGIES THAT COULD SUPPORT DEEP LEARNING

- Organizing and transforming notes

While note taking is a key strategy for surface learning (acquisition from reading, video and lecture), going deeper by returning to notes and transforming them adds major power to their value.

- Class discussion
- Reciprocal teaching - **USEFUL FOR: Reading comprehension in almost any subject, but can be adapted for Math problem solving**

Reciprocal Teaching is a specific strategy that combines cooperative learning, classroom discussion, reading comprehension and metacognitive "learning to learn" approaches (all of which are highly effective approaches). It involves students each participating in one of four different specified roles (summarizer, questioner, clarifier, predictor) with each paragraph they read. Thus, it is **a collaborative close reading strategy** that is ideal for challenging reading material.

- Concept mapping
- Metacognitive strategy instruction
- Self-questioning
- Teacher Questioning
- Inquiry-based teaching
- Simulations

SOME EXAMPLES OF STRATEGIES THAT COULD SUPPORT TRANSFER LEARNING

1. Identifying underlying similarities & differences
2. Transforming conceptual knowledge
3. Organizing conceptual knowledge
4. Formal discussions
5. Problem-solving teaching
6. Synthesizing information across texts, reading across documents
7. Peer tutoring