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LET THE LEARNER DO THE LEARNING:

What We Know about Effective Teaching

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A swiftly evolving global economy has prompted U.S. policymakers and educators to raise the goals for K-12 schooling. No longer is basic proficiency – the aim of the 2001 No Child Left Behind Act – sufficient. Today's students must be prepared for the high-level intellectual demands of college work and the competitive challenges of the 21st-century workplace. Toward this end, more rigorous, research-based Common Core State Standards for student learning have been adopted by 44 states and the District of Columbia, with aligned curriculum frameworks and assessments to follow.[1] In many states, new evaluation systems for teachers and school leaders are also being put in place.[2]

These shifts intensify the focus on what we know, through decades of educational research, about high-quality instruction that successfully readies students for college and careers. We know that effective teachers expertly select and implement a rich repertoire of proven instructional practices that align with findings from cognitive science and neuroscience about how people learn.

Learning is an active process that belongs to the learner.

From infancy, we humans are constantly engaged in the business of making sense of the world; gathering, analyzing, organizing, interpreting, synthesizing, and using information to pose and solve problems – individually and in various social configurations. We encounter new experiences and information through *working memory* – the limited-capacity cognitive system that controls attention and focus. Working memory first associates the new with information we've already stored in our more robust *long-term memory* system, and then if we actively work with it, the new material becomes integrated with our existing knowledge via interconnected neural networks (or *schemas*) of memory, meaning, and understanding.

Effective instruction begins by tapping into students' schemas; activating existing understandings and misconceptions about a topic so that these can be modified and expanded as additional information

is incorporated. Active processing through various forms of practice, repetition, and problem solving enable students to master new facts and skills and to link these together into larger organizing principles or conceptual frameworks from which these facts and skills can be appropriately retrieved and applied to new situations later.[3] As students' familiarity and expertise in an area of study increases, their schemas become more tightly organized into interconnected "chunks" of related information, enabling them to more quickly see patterns and relationships where before, as novices, they only saw an overwhelming array of seemingly unrelated facts.[4]

Novelty, challenge, emotion, visual stimuli, and physical activity all enhance the learning process.[5] So does repeated, effortful recall through frequent self-testing. Spacing study and practice over time and locations; and mixing or "interleaving" different types of problems or content also strengthen learning for transfer.[6] Effective instruction incorporates all of these elements.

Effective teachers competently orchestrate the arrangement of students, information, time, space, materials, and activities. But the end result – student learning – is accomplished by the efforts of students themselves. The more ownership learners take of their own learning, the more *self-regulated* they become and the greater the extent of their understanding and mastery of desired outcomes.[7]

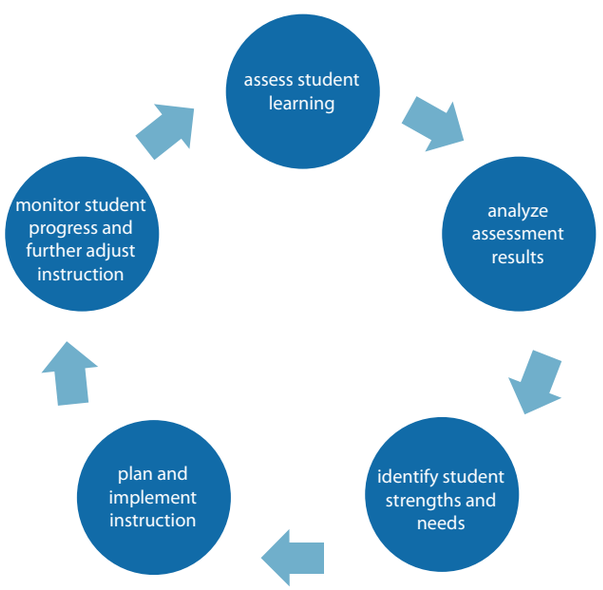
Self-regulated learning (or *metacognition*) entails knowing what you know, knowing what you need to learn, and knowing how to go about learning what you need to learn. Self-regulated learners strategically set learning goals, plan steps to meet those goals, monitor progress, and know when and how to ask for help along the way.[8] They develop a sense of intrinsic motivation and self-efficacy, and believe that errors afford learning opportunities. Self-regulated learners are aware of their own strengths and limitations and attribute outcomes to factors over which they have control, such as planning, practice, and effort; rather than to talent, ability, or luck.[9]

However, these self-directive learning processes do not come naturally to most students. They must be explicitly taught through a skillful combination of teacher- and student-directed activities that include well-defined learning goals, direct instruction, modeling, clear explanations, shared understandings of the criteria by which learning goals will be evaluated, and ample opportunity for guided and independent practice with feedback.[10]

Effective teachers purposefully cultivate a "growth mindset," which makes students eager for new challenges and enthusiastic rather than fearful about learning from mistakes. Students with a growth mindset understand that success is a result of effort, more than of raw ability alone, while students with a "fixed mindset" worry about the judgments of others, fear failure, and resist risks, thwarting their own learning.[11]

Learning is bolstered through a rich repertoire of effective teaching practices.

Effective teachers follow a regular instructional cycle. They assess student learning; analyze assessment results to identify student strengths and needs; plan and implement instruction based on identified strengths and needs; and monitor student progress to further adjust instruction as needed.



Effective teachers begin with a clear focus on the end result, giving attention to what is to be learned, why it is to be learned, and what is the measurable evidence of competence or mastery.[12] They use *diagnostic* assessment to determine baseline knowledge and skills for purposes of appropriate student placement; ongoing *formative* assessment to monitor progress toward learning goals; and *summative* assessment at the end of each unit of study to provide specific and detailed information about which learning goals have and have not been achieved.[13] Of these three assessment types, ongoing formative assessment is particularly vital to helping teachers make the most efficient use of time to advance student learning.

Regular monitoring of each student's progress gives teachers data to guide instructional planning and decisions about how to group students for instruction and practice. And as long as formative assessment is accompanied by timely, constructive feedback about students' progress and guidance for how to improve, it develops students' capacity to become reflective, self-managing learners. Students who receive focused, helpful comments about their performance on assessment tasks engage more productively in their work and learn to better evaluate their own learning needs.[14]

Research shows that students achieve more in classes in which they spend much of their time being directly taught or supervised by their teacher,[15] and that students optimally hook new knowledge to previous learning when they are presented with an appropriate level of challenge in a safe, responsive, and supportive learning environment. Effective teachers carefully sequence texts and tasks in lessons and units of study, supporting or *scaffolding* their students' efforts to move from novice to competent to proficient levels of performance.[16] They do this by:

- holding high expectations for every student;
- utilizing efficient classroom routines;
- stating lesson goals and presenting new information clearly;
- activating students' prior knowledge through questions, cues, and advance organizers;
- breaking complex tasks into smaller steps;
- helping students take notes, summarize, distill, organize, store, and retrieve knowledge for transfer;
- providing regular opportunities for guided and independent practice with new concepts and skills;
- focusing on higher-order thinking skills, modeling powerful thinking strategies; and explicitly teaching students to identify similarities and differences, compare, classify, and create metaphors and analogies;
- modeling procedures;
- using multiple approaches, examples, and illustrations, including nonlinguistic representations (graphic organizers, pictures, pictographs, mental pictures), concrete representations, and kinesthetic activity to help students understand new concepts;
- assigning meaningful homework; and
- providing regular, focused reviews of key concepts and skills.[17]

At the same time, no two students are exactly alike. They differ in the pace at which they learn, in their readiness to learn, and in which concepts and skills they still need to learn. So when it comes to helping every student learn in a formal classroom setting, following the same sequence and emphasis will never benefit each student equally.[18] Instructional content, processes, and products must be differentiated to meet each student's learning needs and goals.[19]

Differentiating instruction does *not* mean assigning students to permanent low-, medium-, and high-performing groups, since students in each group will vary in their performance and will change at different rates. Effective grouping of students is flexible, based upon frequent assessment and analysis, and shifts as individual students master skills or continue to need additional instruction.[20]

Structured group work allows all students to

experiment with critical thinking, receive peer validation, and build confidence. This requires teacher planning for grouping students in ways that will best accommodate individual student needs, capabilities, and styles. When students work in effective pairs or groups they exert more effort to achieve, use higher-level reasoning strategies more frequently, and retain information more accurately. Their understanding of concepts and ideas, as well as their interpersonal communication skills, increase when they must work to explain and argue ideas rather than passively receive transmitted information.[21]

The teacher remains an active, circulating resource during group work; monitoring, arbitrating, and redirecting as necessary. Group work is most successful when there is both group and individual accountability, with assessment rubrics for group tasks that are clear from the beginning so that both students and the teacher can evaluate the group's work.[22]

Finally, effective teachers design learning activities judiciously to avoid cognitive overload that can become counterproductive. Since it is mental activity that moves academic concepts and skills from working memory to storage in long-term memory, any physical or behavioral activity on the part of the learner must support and maximize, rather than impede, cognitive processing within the limits of working memory. Activities that are interesting or engaging in their own rite may impose considerable demands on novice learners' working memory, leaving little room for the selecting, organizing, and integrating of the vital information that is to be retained.

Some examples of approaches found to lessen cognitive load and result in learning for mastery and transfer for novice learners include:[23]

- distributing practice exercises over the entire unit of instruction rather than clustering all of them at the end;
- providing tailored explanatory feedback to learner responses;
- providing pre-made graphics rather than asking students to generate or complete graphics;
- lecturing rather than requiring group discussion;
- using still pictures rather than animation or video; and
- replacing some practice problems with examples showing all the steps (worked examples).[24]

In summary, effective teaching is complex, intellectually and emotionally demanding work. Learning to select and sequence the most appropriate instructional practices aligned both with the learning needs of every student and with the college- and career-readiness demands of the Common Core State Standards is the challenge that lies at the core of the art, craft, and science of teaching in U.S. schools today.

Endnotes

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