GREAT SCHOOLS PARTNERSHIP

Complex Thinking and Transfer: Evidence and Resources

5. Complex Thinking and Transfer: Students are coached and taught to engage in higher order thinking through instructional activities and practice tasks. Curriculum, instruction and assessments are designed to prompt complex thinking, integration of concepts and ideas, and application of learned skills to new material or novel situations.

Supporting Beliefs

- Every student is capable of complex thought and transfer of learning.
- Higher order thinking promotes student engagement.
- Learning that promotes transfer of knowledge and skills prepares students for the future.

Key Traits

- Students engage in complex thinking throughout all stages of learning—from the introduction of new material to the application of what has been learned.
- Students ask and are asked questions that help them access and integrate knowledge to analyze, evaluate, and draw conclusions.
- Students are taught how to integrate and apply what they have learned within and across content areas and are given opportunities to practice.
- Students wrestle with complex and authentic problems.

Literature Supporting the Element

1. "[H]igher-order thinking happens when students engage with what they know in such a way as to transform it. That is, this kind of thinking doesn't just reproduce the same knowledge; it results in something new…. Higher-order thinking only makes sense if to truly 'know' something means that you can use it and transform it."
   —Brookhart, S.M. (2014). *How to Design Questions and Tasks to Assess Student Thinking* (pp. 2-3). Alexandria, VA: Association for Supervision and Curriculum Development.

2. "Liberating education consists in acts of cognition, not transferrals of information."
   —Freire, P. (2000). *The Pedagogy of the Oppressed* (30th ed.) (p. 79). New York, NY: Continuum.

3. "Schools that engage low-income and minority students in deeper learning have stronger academic outcomes, better attendance and student behavior, lower dropout rates, higher graduation rates, and higher rates of college attendance and perseverance than comparison schools serving similar students."
   —Noguera, P., Darling-Hammond, L., Friedlaender, D. (2015, October). Equal Opportunity for Deeper Learning, Executive Summary (p. 2). *Deeper Learning Research Series*. Retrieved from http://www.jff.org/sites/default/files/publications/materials/Equal-Opportunity-for-Deeper-Learning-Executive-Summary-092315.pdf

4. "Almost all of our teachers at Booker T. Washington were black women. They were committed to nurturing intellect so that we could become scholars, thinkers, and cultural workers–black folks who used our 'minds.' We learned early that our devotion to learning to a life of the mind, was a counter-hegemonic act, a fundamental way to resist every strategy of white racists colonization. Though they did not define or articulate these practices in theoretical terms, my teachers were enacting a revolutionary pedagogy of resistance that was profoundly anti-colonial."
   —Hooks, B. (1994). *Teaching to Transgress: Education as the Practice of Freedom* (p. 2). New York, NY: Routledge.

5. "It may seem counterintuitive to endeavor to inspire confusion, refusal and resistance in the learner, but cognitive developmental psychology and neuroscience have shown that authentic, complex, deep, and long-lasting learning seldom occurs without struggle. This is because cognitive dissonance forces a decision in the mind of the learner: 'Do I accept the new knowledge or work to reject it? And if I accept it, what needs to change in the way I think about things?' The learner's challenge of integrating the knowledge that comes in with the knowledge already possessed forces the brain to make comparisons, weigh perspectives, consider options, evaluate plausibility, and judge merits. When the learner is compelled to make these sorts of determinations, the process activates and strengthens the most complex parts of the brain."
   —Toshalis, E. (2015). *Make Me!: Understanding and Engaging Student Resistance in School* (p. 67). Cambridge, MA: Harvard Education Press.

6. "Newmann et al (1996) have presented three significant findings in relation to raising levels of academic achievement and intellectual quality: first, that students from all backgrounds are more engaged when classroom work is cognitively challenging than when it consists solely of conventional low-level work; second, that all students, regardless of social or ethnic background, achieve at higher levels when they participate in an intellectually challenging curriculum; and third, that equity gaps diminish as a result of engagement in such curricula."
   —Gibbons, P. (2009). *English Learners, Academic Literacy, and Thinking: Learning in the Challenge Zone* (pp. 3-4). Portsmouth, NH: Heinemann.

7. "Experimental psychologists in the last half-century have been fascinated with motivation as a prerequisite for learning. They have discovered that when we come in contact with ambiguous, complex or conflicting information, our nervous systems become aroused, amping us up and forcing us to pay attention. When we are puzzled, we find a resolution very rewarding, which sets us up for efficient learning (Berlyne, 1966; Lowenstein, 1994)."
   —Ostroff, W. L. (2016). *Cultivating Curiosity in K-12 Classrooms: How to Promote and Sustain Deep Learning* (p. 12). Alexandria, VA: Association for Supervision and Curriculum Development.

8. "Assess higher-order thinking during all parts of instruction and assessment, both formative and summative. You can use higher-order thinking questions in many instances--oral class discussions, quizzes, exit tickets, and other classroom strategies, and tests. You can use higher-order thinking tasks in many instances as well--classroom learning activities, performance assessments, and short- and long-term projects. The most important point here is that higher-order thinking and questions and tasks should be infused throughout instruction and assessment. Don't wait until students have memorized some facts and then ask them to reason with the facts as a second step."
   —Brookhart, Susan M. (2014) *How to Design Questions and Tasks to Assess Student Thinking* (p. 4). Alexandria, VA: Association for Supervision and Curriculum Development.

9. "Transfer doesn't just happen as a result of a typical regimen of teaching and testing, no matter how rigorous the course of study. Transfer happens only when we aggressively teach and test for understandings that are applied in situations. As the authors of How People Learn put it: A key finding in the learning and transfer literature is that organizing information into a conceptual framework allows for greater "transfer"; that is, it allows the student to apply what was learned in new situations and to learn related information more quickly…. Transfer is affected by the degree to which people learn with understanding rather than merely memorize sets of facts or follow a fixed set of procedures; the research also shows clearly that "usable knowledge" is not the same as a mere list of disconnected facts."
   —Wiggins, G. (2010, March 27). What is the Transfer? *Big Ideas: An Authentic Education E-Journal*. Retrieved from http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

10. "Activities and assignments that promote learning tend to share certain characteristics: (1) they emphasize thinking and problem-based learning; (2) they permit student choice and initiative; and (3) they encourage depth rather than breadth."
    —Danielson, C. (2007) *Enhancing Professional Practice: A Framework for Teaching* (2nd ed.) (p. 58). Alexandria, VA: Association for Supervision and Curriculum Development.

11. "High schools must respect adolescents more and patronize them less. The best respect is high expectations for them, and a level of accountability more adult in its demand than childlike. We should expect them to learn more while being taught less. Their personal engagement with their own learning is crucial; adults cannot 'give' them an education."
    —Sizer, T. R. (2004). *Horace's Compromise: The Dilemma of the American High School* (p. 34). Boston, MA: Houghton Mifflin.

12. "I wanted to become a critical thinker. Yet that longing was often seen as a threat to authority."
    —Hooks, B. (1994). *Teaching to Transgress: Education as the Practice of Freedom* (p. 5). New York, NY: Routledge.

Resources and Readings

Brief Articles

1. Brookhart, S. M. (2016). Start with Higher-Order Thinking. *Powerful Lesson Planning*, 74(2), 10-15.
   This article outlines three strategies for incorporating higher order thinking (Open Questions, Thinking, Not Retelling, and Student Self-Assessment) into daily lessons, including examples of each strategy in use.

2. MindShift. (2016, August 10). The Role of Metacognition in Learning and Achievement. *KQED News*. Retrieved from https://ww2.kqed.org/mindshift/2016/08/10/the-role-of-metacognition-in-learning-and-achievement.
   This post contains an excerpt from "Four Dimensional Education: The Competencies Learners Need to Succeed" and describes the critical role of metacognition in transfer of knowledge, outlining several strategies to help students develop their metacognitive skills.

3. Newmann, F. M., and Wehlage, G. G. (1993). Five Standards of Authentic Instruction. *Educational Leadership*, 50(7), 8-12.
   This article explains five elements of authentic instruction (Higher-Order Thinking, Depth of Knowledge, Connectedness to the World Beyond the Classroom, Substantive Conversation, and Social Support for Student Achievement) and explains how they can be used together to impact classroom instruction.

4. Schwartz, K. (2017, June 14). How Do You Know When a Teaching Strategy is Most Effective? John Hattie has an Idea. *KQED News*. Retrieved from https://ww2.kqed.org/mindshift/2017/06/14/how-do-you-know-when-a-teaching-strategy-is-most-effective-john-hattie-has-an-idea.
   In this brief article, the author described a learning model developed by Hattie and Donoghue that accounts for skills and knowledge, learning dispositions and motivation as well as defines what strategies are most successful for learning at surface and deep levels.

5. Wiggins, G. (2010, March 27) What is the Transfer? *Big Ideas: An Authentic Education E-Journal*. Retrieved from http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60.
   This piece defines transfer, discusses the challenges related to transfer of knowledge and outlines several strategies for use in the classroom that promote the transfer and application of knowledge.

Books and Reports

1. Bransford, J. D., Brown, A.L., & Cocking, R.R. (Eds). (2000). *How People Learn: Brain, Mind, Experience, and School*. Washington, DC: National Academy of Sciences.
   This text explains the research and brain science related to learning including how we learn, what makes experts different from novices, and how to promote transfer as well as the implications for classroom and instructional design.

2. Brookhart, S. M. (2014). *How to Design Questions and Tasks to Assess Student Thinking*. Alexandria, VA: Association for Supervision & Curriculum Development.
   This book outlines principles of assessing higher-order thinking and provides examples of how to incorporate higher-order thinking in a variety of assessment tasks including multiple choice questions, open-ended questions, and performance tasks.

3. American Institutes for Research. (2014). *Does Deeper Learning Improve Student Outcomes? Results from the Study of Deeper Learning: Opportunities and Outcomes*. Retrieved from https://www.air.org/sites/default/files/Deeper-Learning-Summary-Updated-August-2016.pdf.
   The study examines the relationship between deeper learning and student outcomes. The study includes strategies to develop three types of deeper learning competencies: cognitive (mastery of core content, critical thinking skills), interpersonal (collaboration skills, communication skills), and intrapersonal (learning-how-to-learn skills, academic mindsets).

4. McTighe, J., & Wiggins, G. (2013). *Essential Questions: Opening Doors to Student Understanding*. Alexandria, VA: Association for Supervision & Curriculum Development.
   This book explains the qualities of essential questions and outlines ways to create and use them to cultivate an environment of inquiry in the classroom and beyond. It is a useful companion to Understanding by Design or can be used on it's own.

5. Ostroff, W. L. (2016). *Cultivating Curiosity in K-12 Classrooms: How to Promote and Sustain Deep Learning*. Alexandria, VA: Association for Supervision & Curriculum Development.
   This book examines the role of curiosity in the classroom based on the science of learning and outlines ways to foster curiosity through the use of exploration and experimentation to create autonomous, reflective learners.

6. Deans for Impact. (2015). The Science of Learning. Austin, TX: Deans for Impact. Retrieved from https://deansforimpact.org/wp-content/uploads/2016/12/The_Science_of_Learning.pdf.
This report summarizes existing research in cognitive science including how students learn new material, solve problems, and apply and transfer learning. Furthermore, this report addresses questions of motivation to learn and offers practical suggestions and implications for classrooms and teachers.

Videos

1. Teaching Channel. Deeper Learning Series.
   Retrieved from https://www.teachingchannel.org/deeper-learning-video-series

2. Teaching Channel. Higher Order Questions: A Path to Deeper Learning.
   Retrieved from https://www.teachingchannel.org/videos/teaching-higher-order-thinking-skills

3. Teaching Channel. Deepening Text Analysis Through Student Talk.
   Retrieved from https://www.teachingchannel.org/videos/text-analysis-lesson-ousd

4. Teaching Channel. Engaging Students in Work that Matters.
   Retrieved from https://www.teachingchannel.org/videos/engage-students-meaningful-work-hth

5. Teaching Channel. Challenge at the Heart of Deeper Learning.
   Retrieved from https://www.teachingchannel.org/videos/deeper-learning-challenges-students-exl